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1 INTRODUCTION

1.1 Background of the Project

1.1.1 Quarry operations at Anderson Road over the last 35 years have resulted in steep rock faces over 200m high extending over a distance of 1.5km. A scheme of quarrying and rehabilitation for the existing Anderson Road Quarry area above Anderson Road started in March 1997. The quarry operation in existing Anderson Road Quarry area will be carried out up to January 2012 and followed by nearly 2 years of establishment works to December 2013. The works within the proposed Anderson Road Development area (the site bounded by Anderson Road and the realigned Sau Mau Ping Road) were subjected to further study on the possible implementation approaches.

1.1.2 According to the Territorial Development Strategy Review 1996, the housing supply capacity of current approved plans and programmes will not be adequate to meet the estimated housing demand after 2000/01. The Development area was identified as one of the potential supplementary housing sites.

1.1.3 Civil Engineering Department commissioned the Consultants to undertake a planning and engineering feasibility study for development at Anderson Road. The development site is located in the East Kowloon District. It is bounded by Anderson Road to the north, the realigned Sau Mau Ping Road to the south, Po Lam Road to the east, and Lee On Road and Shun On Road to the west. The Project is proposed to form platforms for housing development and associated uses in an area of about 50 hectares, and to carry out necessary infrastructural upgrading or improvement works to cater for the proposed development. Figure 1.1 and Figure 1.2 show the location of the development site and the Project Layout Plan respectively.

1.1.4 The recommended development is based on a plot ratio of 7.5 and provides 867,984 m^2 of residential floor space in 13,302 housing units, representing accommodation for 40,883 persons. The public / private housing mix is about 60:40 in terms of residential units. The target population intake date of the development is March 2009.

1.2 Local Development Context

1.2.1 There are a number of re-development schemes in the vicinity of the development site which are at various stages of planning and construction. Sau Mau Ping Estate located immediately to the southwest of the development site is currently redeveloped and the final phase will be completed in 2005. As part of the redevelopment programme, the section of Sau Mau Ping Road between Sau Mau Path and Hiu Kwong Street is scheduled to be realigned and widened to 13.5 metres. The target date for this realignment is 1999.

1.2.2 There is a proposal for redevelopment of Shun Lee, Shun On and Shun Tin Estates. Nevertheless, it is in a very preliminary stage and there is no definite programme at the present moment. Po Lam Road Platform located to the south of the development site is currently under construction. It is expected that occupation of public housing on Po Lam Road Platform will be in 2001.

1.2.3 The Anderson Road Quarry, adjacent to the development site, has a new phased programme of extraction, processing and rehabilitation. The 17-year rehabilitation scheme of Anderson Road Quarry includes 15 years of operation to January 2010 followed by nearly 2 years of establishment works with completion in December 2013.

1.3 Objectives of the Study

1.3.1 The overall objectives of the Study are :

(a) To assess the suitability of the site for housing development;

(b) To examine the development potential of the site whilst maintaining compliance with the environmental and planning legislative requirements;

(c) To advise on the need of modifying development parameters to fully utilise the development potential;

(d) To examine the implications of, and the future linkage and integration with the quarrying and rehabilitation scheme of Anderson Road Quarry and neighbouring developments;

(e) To recommend effective and practical mitigation measures to reduce potential adverse impacts; and

(f) To explore the opportunities for environmental enhancement and infrastructure development in the surrounding area.

1.4 Project Implementation Program

1.4.1 Four Work Packages are recommended by the consultant engineering team for executing the works. They are:

- Work Package 1 (WP01) - Southern Site
  - Southern Access Road
  - Junction improvement at Southern Access Road / Po Lam Road
  - Platforms E, D and C(3)
  - Infrastructure within the works area
- Work Package 2 (WP02) - Northern Site
  - Platforms A, B, C(1) and C(2)
  - Electricity sub-station site adjacent to Platform A
  - Freshwater pumping station site at corner of Shun On and Sau Mau Ping Roads
  - Infrastructure within the works area
- Work Package 3 (WP03) - Northern Access Road
  - Northern Access Road
  - Junction improvement at Northern Access Road / Clear Water Bay Road
  - Freshwater and saltwater service reservoir sites and access road
  - Infrastructure within the works area
- Work Package 4 (WP04) - Infrastructure Outside the Proposed Development at Anderson Road
  - Improvements to five local road junctions to support the Proposed Development at Anderson Road
  - Upgrading of downstream sewerage pipes and box culverts

1.4.2 Key dates are listed in Table 1.1 for the Work Packages and for the main items of works to be undertaken by others.

Table 1.1 Key Dates of Project Implementation Program

Item	Description	Start Date	Completion Date
WP01	Southern Site	Nov 2001	Jan 2005
WP02	Northern Site	Nov 2001	Mar 2005
WP03	Northern Access Road	Apr 2003	Jun 2007
WP03	Site Formation of Reservoir Sites	Apr 2003	Oct 2005
WP04	Infrastructure Outside the Proposed Development at Anderson Road	Mar 2006	Dec 2007
EPD / DSD	Sewerage Treatment	Feb 2001	Aug 2008
WSD	Water Supply	Mar 2005	Aug 2008
TD / HyD	Strategic Roads	Feb 2001	Aug 2008
HD	Building Construction - First Phase	Aug 2004	Aug 2008
HD	Building Construction - Second Phase	Dec 2004	Nov 2008
Private Developers	Building Construction - Third Phase	Mar 2005	Feb 2009

1.5 Purpose of this Report

1.5.1 The purpose of this report is to report the findings and recommendations of EIA study conducted under the Planning and Engineering Feasibility Study for this proposed development. The brief of this study identifies the following requirements for the Environmental Impact Assessment (EIA) Final Assessment Report (FAR):

- fully satisfies the requirements of the brief in respect to the prediction and assessment of impacts, the identification of environmental impact mitigation measures and the associated residual impacts;
- describes the agreed schedules and programmes for monitoring and audit requirements;
- prescribes the specification for detailed design, construction and operation requirements of the proposed project and outlines the action(s) to restore and/or rehabilitate the site to an acceptable level prior to handing over to Government or any legal successor(s); and
- provides with the impacts summary, the study findings, conclusions, recommendations and a mechanism for implementation.

1.5.2 This report presents detailed assessment of various environmental issues of concern for the Preferred Development. The quantitative models and calculation method and the input parameters in this study have been verified and agreed with the relevant government departments. Where practicable, realistic worst case scenario has been adopted for impact assessment. Environmental impact mitigation measures, where considered necessary during construction and operational phases of the development, are recommended in this report. Details of the proposed environmental monitoring and audit program for the development are provided in a separate Environmental Monitoring and Audit Manual (EM&A Manual) issued at about the same time as this report.

1.5.3 In addition to the development itself, which is considered as a Schedule 3 Designated Project under the EIAO, it is also a purpose of this report to identify and assess the environmental impacts of those elements within this project, as well as works outside the project that are recommended in this study to make this project feasible, that are considered as Schedule 2 Designated Projects under the EIAO. Discussion on Schedule 2 Designated Projects is presented in Section 11 of this report.

1.5.4 As discussed in Section 11 of this report, only the proposed road improvement scheme at the junction of Southern Access Road / Po Lam Road, which is outside this development, is considered as a Schedule 2 Designated Project. The assessment of the environmental impacts and the recommended mitigation measures for this road improvement work are presented in Section 12 of this report.

1.5.5 In this project, Civil Engineering Department will undertake the site formation works for the proposed service reservoirs and pumping station. The proposed water supply facilities are to be implemented by the Water Supplies Department as a separate project in a later stage. A preliminary environmental review of the proposed water supply upgrading works is included in Chapter 11 of Report of WS1 Water Supply to describe the environmental issues in relation to the implementation of the proposed waterworks.

1.5.6 From the perspective of the EIA study, the project is confined to the development site area shown in Annex C of the Study Brief, i.e. the Project Layout Plan in Figure 1.2. The infrastructure improvements recommended in this feasibility study to make the development feasible are reviewed in Chapter 11 of this report, which concludes that only the proposed Po Lam Road Widening is a Schedule 2 Designated Project (DP) under the EIA Ordinance. To save the time and cost involved in a separate future detailed EIA study, the EIA study for this Schedule 2 DP is included in this report for convenience. Other non-DP infrastructure improvements recommended in this feasibility study do not require an EIA study and are not covered by this report.

1.6 Structure of this Report

1.6.1 This report has been written in 15 sections with this section providing a broad introduction.

Section 2	is an assessment of air quality issues.
Section 3	is an assessment of noise issues.
Section 4	is an assessment of landscape and visual issues.
Section 5	is an assessment of ecology issues.
Section 6	is an assessment of water quality and drainage issues.
Section 7	is an assessment of sewerage issues.
Section 8	is an assessment of solid waste issues.
Section 9	is an assessment of contaminated land issues.
Section 10	is an assessment of landfill gas issues.

Section 11	is the discussion on Schedule 2 Designated Projects
Section 12	is an environmental review of the proposed junction improvement at the junction of Southern Access Road / Po Lam Road
Section 13	discusses environmental monitoring and audit issues.
Section 14	is to summarise the potential environmental impacts of concern and give further recommendations.

1.6.2 Since no site of historic or cultural heritage would be affected in this project, assessment of impacts on sites of cultural heritage is not required. The proposed project is undertaken inland and no direct or indirect discharges of any kind of pollutants into sea would be expected. In addition, no agricultural activities would be affected by this project. Therefore, impacts on agricultural and fisheries activities are not of concern in this report.

1.6.3 Predictions of likely future environmental conditions in the absence of the project are discussed in appropriate sections of the subsequent chapters.

2 AIR QUALITY

2.1 Introduction

2.1.1 Air quality, in particular dust impact, is considered as one of the key environmental issues of concern during both construction and operational phases of the development. During the construction phase of the development, there will be potential dust impacts on existing and future sensitive receivers from the construction activities undertaken at the development site and its nearby redevelopment sites, as well as from the quarrying activities at Anderson Road Quarry. During the operational phase of the development, potential dust impacts are anticipated during the early stage of site occupation, with on-going operations of Anderson Road Quarry. Traffic emission impact is also considered in the operational phase assessment.

2.1.2 This section presents the assessment on construction phase dust impacts and the operational phase dust and traffic emission impacts. Environmental impacts in the operational phase are assessed on the basis of the Preferred Development.

2.2 Legislation, Policies, Plans, Standards and Criteria

2.2.1 The assessment criteria related to air quality impact should make reference to Annex 4 of the Technical Memorandum on Environmental Impact Assessment Process, the Hong Kong Planning Standards and Guidelines (HKPSG), and the Air Pollution Control Ordinance (APCO) (Cap. 311).

2.2.2 The APCO (Cap. 311) provides powers for controlling air pollutants from a variety of stationary and mobile sources and encompasses a number of Air Quality Objectives (AQOs). Currently AQOs stipulate concentrations for a range of pollutants, of which carbon monoxide (CO), nitrogen dioxide (NO_2), respirable suspended particulates (RSP) and total suspended particulates (TSP) are relevant to this study. The AQOs are listed in Table 2.1.

Table 2.1 Hong Kong Air Quality Objectives

Parameter	Maximum Average Concentration (μgm^{-3})[1]			
	1-Hour[2]	8-Hour[3]	24-Hour[3]	Annual[4]
CO	30000	10000	—	—
NO_2	300	—	150	80
RSP	—	—	180	55
TSP	500[5]	—	260	80

1 Measured at 298 K and 101.325 kPa.
2 Not to be exceeded more than three times per year.
3 Not to be exceeded more than once per year.
4 Arithmetic mean.
5 Not an AQO but is a criteria for evaluating air quality impacts as stated in Annex 4 of *Technical Memorandum on Environmental Impact Assessment Process*.

2.2.3 For construction dust, it is stated in Annex 4 of *Technical Memorandum of Environmental Impact Assessment Process* to use a TSP limit in air over an 1-hour period of 500 μgm^{-3}. The maximum

acceptable TSP concentration averaged over a 24-hour period is 260 μgm^{-3}, as defined in the AQOs.

2.2.4 The APCO specifies a number of processes which require licensing and are subject to special controls. For quarry operation, licensing would be required for size reduction activities (namely rock crushing and the subsequent handling of the products that would give rise to dust) exceeding an annual processing capacity of 5000 tonnes. Cement works is also covered by the APCO if the total silo capacity exceeds 50 tonnes. Compliance with limits imposed under licence is monitored by EPD.

2.2.5 The Air Pollution Control (Construction Dust) Regulation is effective from 16 June 1997. Site formation is one of the processes enforced under this regulation. Contractors and site agents are required to inform EPD and adopt dust reduction measures to cut down dust emission while carrying out construction works.

2.3 Baseline Conditions

2.3.1 The development site is currently a steep and vegetated area located immediately south of Anderson Road. The development site is surrounded by Anderson Road Quarry to the north, Po Lam Road Platform Development and Sau Mau Ping Estate Redevelopment construction sites to the south, and public housing estates to the west. There is no industrial area in proximity to the development site.

2.3.2 In the absence of the proposed project, dust impacts from Anderson Road Quarry would be the main impact before 2013. Local traffic emission would be considered insignificant as no high density of road works in this area.

2.3.3 Existing air quality impacts on the development site are mainly dust impacts from Anderson Road Quarry and the nearby construction sites. Existing traffic emission impact on the development site is not considered significant in view of the density of road network in the area and the higher elevation of the development site.

2.4 Sensitive Receivers

Construction Phase

2.4.1 Existing and future air quality sensitive receivers located within 500 metres from the boundary of the development site are identified for the construction phase assessment. Representative air quality sensitive receivers are identified and listed below:

- Cleared site of Shun Lee Tsuen Temporary Housing Area
- Shun Chi Court
- Shun Lee Estate
- Shun On Estate
- Shun Tin Estate
- Sau Mau Ping Estate
- Po Lam Road Platform (future receivers)
- United Christian Hospital

2.4.2 The locations of the selected representative air quality sensitive receivers are shown in Figures 2.1 and 2.2.

Operational Phase

2.4.3 Sensitive receivers considered in the operational phase assessment are limited to those future receivers on the development site, as there will be no direct impacts from the development site on surrounding receivers once construction is completed. Traffic emission impact from the development on the surrounding area is not considered significant in view of the low density of road network in the area and the higher elevation of the development site.

2.4.4 Future air quality sensitive receivers on the development site include residential buildings, schools and recreational open spaces. The locations of the future air quality sensitive receivers on the development site are shown in Figures 2.3 to 2.5. In this assessment, air quality impacts at those future sensitive receivers are indicated by pollutant concentration contours plotted over the development site.

2.5 Assessment Methodology

Construction Phase

2.5.1 The major potential air quality impact during the construction phase of the project will result from dust arising from various construction activities including haul road emission, open site erosion, excavation and filling activities, drilling and blasting. Vehicle and plant exhaust emissions from the site are not considered to constitute a significant source of air pollutants. Blasting and crushing of rock may be allowed on the site.

2.5.2 In order to assess the potential dust impact on the sensitive receivers, dust emissions from the construction sites were modelled. 9-hour working day and 6-day working week were assumed for the construction phase of the development.

2.5.3 Dust emissions from the operation of the Anderson Road Quarry and adjacent construction sites were also considered to assess the cumulative dust impact on sensitive receivers.

Emission Calculations

2.5.4 In this assessment, two construction cases were considered. For Case 1, the soft-cut materials will be transferred by the trucks and disposed at the South East Kowloon Development site for reclamation. The rock-cut materials will be transferred to Anderson Road Quarry Site by conveyor belts for commercial use. For Case 2, there will be a mobile crusher on the site to crush the rock-cut materials and all the excavated materials (both soft-cut and rock-cut) will be transferred and disposed at the South East Kowloon Development site for reclamation and commercial use. The soft-cut materials will be transferred by the trucks like Case 1 while the crushed and screened rock-cut materials will be loaded into the dump trucks on the site.

2.5.5 Dust emission sources on the development site include the following:

- Loading and unloading of construction materials
- Trucks travelling on unpaved site roads and access roads
- Rock crushing and screening
- Drilling
- Blasting
- Wind erosion of open site

2.5.6 The prediction of dust emissions was based on typical values and emission factors from USEPA *Compilation of Air Pollutant Emission Factors* (AP-42), 5th Edition. Average wind speed was calculated from the wind data of the Kai Tak Airport meteorological station, which is the closest station to the site. The detailed calculations of the emission factors are given in Table A1.1 in Appendix 1 of this report.

2.5.7 In this assessment, the following mitigation measures have been taken into account in the dispersion modelling:

Site Practice

- The speed of haulage trucks travelling within the site area is 10 $kmhr^{-1}$.
- A 50% reduction of dust generated from wind erosion would result from twice daily watering with complete coverage of all open site area according to AP-42 .
- An estimated dust reduction of 75% was taken for regular watering (once every 1.5 hours) of the site roads and active site areas to reduce the dust generated from vehicle movements on dusty roads and earth movements.
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.
- Establishment and use of vehicle wheel and body washing facilities at the exit points of the site, combined with cleaning of public roads where necessary.
- The northern and southern temporary access roads are paved to reduce the dust emissions due to the movement of trucks.

Blasting

- Use of select aggregate and fines to stem the charge with drill holes and watering of blast face (assumed 30% dust reduction).
- Vacuum extraction drilling methods (assumed emission factor for wet quarry drilling from AP-42).
- Carefully sequenced blasting.
- No blasting under unfavourable meteorological conditions with wind speed less than 2 ms^{-1} (same as the current contract requirement for the operator of Anderson Road Quarry).

Crushing

- Fabric filters installed for the crushing plant.
- Water sprays on the crusher.

Loading and Unloading Points, and Conveyor Belt System

- Water sprays at all fixed loading and unloading points (at the crusher and conveyor belts).
- The loading point at the crusher is enclosed with dust collection system installed.
- When transferring materials from conveyor belt or crusher to the dump trucks, chutes or dust curtains are used for controlling dust.
- Conveyor belts are totally enclosed.

2.5.8 For dust emissions from quarry operations, dust emissions were estimated based on the information detailed in *Po Lam Road Housing Development, Noise and Dust Assessment of the Revised Anderson Road Quarry Rehabilitation Scheme and Alternative Height of Development - Final Report*, Wardell Armstrong,

prepared for the Hong Kong Housing Authority.

Dispersion Modelling

2.5.9 Dispersion modelling was undertaken using the USEPA approved Industrial Source Complex Short Term 3 (ISCST3) model to assess potential dust impacts from the construction activities. Elevation difference between the quarry and the development site was considered by the model. Surface roughness of the terrain in the study area was taken as 1 metre in the model and the mixing height was assumed to be 500 metres.

2.5.10 To ascertain the worst-case condition, the dispersion modelling was undertaken using 540 predefined separate meteorological conditions. The resolution on the wind direction was set to 10 degree increments. The models were tested with Pasquill stability classes B, D and F (classes B and D for day-time hours, and classes D and F for night-time hours), and 5 wind speed conditions of $1ms^{-1}$, $2ms^{-1}$, $4ms^{-1}$, $6ms^{-1}$ and $8ms^{-1}$. At each receiver location the 1-hour average concentration for TSP was predicted for each of the predefined meteorological condition. The maximum 1-hour average TSP concentration was calculated at selected air quality sensitive receiver for each of the day-time or night-time meteorological conditions.

2.5.11 For the purpose of this assessment, it is considered that dust emissions from vehicles moving on unpaved road surfaces contribute the major dust source for most of the construction sites. Since no site specific information is available relating to particle size distribution, and the unpaved road emission equation from AP-42 5th Edition is applicable for different industry and geographical conditions, the particle size distribution used in the model is estimated based on the particle size multipliers for the unpaved road emission equation. With particle size classes of 0-2.5μm, 2.5-5μm, 5-10μm, 10-15μm and 15-30μm, the percentage in each class is estimated to be 9.5%, 10.5%, 16%, 14% and 50% respectively.

2.5.12 9-hour working day was assumed for general construction activities. Site erosion would take place over a 24-hour period. At each receiver location the maximum 1-hour average TSP concentration was predicted by adding the impacts from construction works and wind erosion. The maximum 24-hour average TSP concentration was estimated by averaging the sum of the 9-hour construction work emission and the 24-hour site erosion emission over a 24-hour period.

2.5.13 For the purpose of this assessment, a background TSP concentration of 75 μgm^{-3} was added to the maximum 1-hour average and maximum 24-hour average results. This background TSP concentration was taken from the air quality impacts assessment of *Rehabilitation of Anderson Road Quarries - Final Report* and was based on the results of daily dust monitoring in Junk Bay.

2.5.14 The vicinity of the study area is a sloped terrain with the Anderson Road Quarry at the top and the Sau Mau Ping Estate at the bottom. The topography was taken by the dispersion model and the model would assume the dispersion of pollutants following the terrain. For ground-based emission sources like dust emission from construction sites, the highest dust impacts would be predicted at ground level. In this assessment, it is confirmed that the highest dust impacts were predicted at ground level over the study area. The predicted dust impacts are therefore presented in the form of dust concentration contours over the study area at 1.5m above local ground level (which varies from about 180mPD at Anderson Road Quarry to about 90mPD at Sau Mau Ping Estate) to represent the worst case impact, 1.5m being the average height of human breathing zone.

2.5.15 A sample output file of an ISCST3 model run, which include all the input information and model setting for this assessment, is included in Appendix 1 of this report for reference.

Operational Phase

2.5.16 For the purpose of this assessment, the operational phase is divided into 2 stages. Stage 1 starts from the occupation of the development site (estimated to be March 2009) to January 2012 (the end of quarry operation). Stage 2 is from February 2012 onwards. In Stage 1, air quality impacts due to both quarry operations and traffic emissions were considered in the assessment. In Stage 2 of the operational phase, Anderson Road Quarry is rehabilitated and only traffic emissions impact was assessed.

2.5.17 The major potential dust impacts from the on-going operation of Anderson Road Quarry will result from dust arising from various quarrying activities including haul road emissions, open site erosion, excavation and filling activities, as well as dust emissions from blasting and quarry plants.

Emission Calculations - Quarry Dust

2.5.18 Dust emissions from quarry operations were estimated based on the information detailed in *Rehabilitation of Anderson Road Quarries - Final Report*, Ove Arup & Partners, prepared for the Geotechnical Engineering Office, Civil Engineering Department and *Po Lam Road Housing Development, Noise and Dust Assessment of the Revised Anderson Road Quarry Rehabilitation Scheme and Alternative Height of Development - Final Report*, Wardell Armstrong, prepared for the Hong Kong Housing Authority.

2.5.19 Besides dust emissions from quarry operations, wind erosion of open site areas of the quarry was incorporated in this assessment. For the purpose of this assessment, wind erosion was assumed for all open areas of the quarry. Conservative estimation of dust emission factor for wind erosion was taken from Table 8.19.1-1 (Uncontrolled Particulate Emission Factors for Sand and Gravel Processing Plants) of USEPA *Compilation of Air Pollutant Emission Factors* (AP-42), 4th Edition.

2.5.20 Details of dust emission factors are presented in Table A2.1 in Appendix 2 of this report.

2.5.21 10-hour working day (from 8:00 am to 6:00 pm) was assumed for the quarrying activities. The site erosion would take place over a 24-hour period. At each receiver location the maximum 1-hour average TSP concentration was predicted by adding the impacts from construction works and wind erosion. The maximum 24-hour average TSP concentration was estimated by averaging the sum of the 10-hour construction work emission and the 24-hour site erosion emission over a 24-hour period.

Dispersion Modelling - Quarry Dust

2.5.22 Dispersion modelling was undertaken using the United States Environmental Protection Agency (USEPA) preferred Industrial Source Complex Short Term 3 (ISCST3) model to assess potential dust impacts from the quarrying activities. Elevation difference between the quarry and the development site was considered by the model. Surface roughness of the terrain in the study area was taken as 1 metre in the model and the mixing height was assumed to be 500 metres.

2.5.23 To ascertain the worst-case condition, the dispersion modelling was undertaken using 540 predefined separate meteorological conditions. The resolution on the wind direction was set to 10 degree

increments. The models were tested with Pasquill stability classes B, D and F (classes B and D for day-time hours, and classes D and F for night-time hours), and 5 wind speed conditions of $1ms^{-1}$, $2ms^{-1}$, $4ms^{-1}$, $6ms^{-1}$ and $8ms^{-1}$.

2.5.24 In accordance with the contract requirements for the quarry operator, no blasting shall be performed during periods when the wind speed is less than $2ms^{-1}$. Dust emissions from blasting were therefore not included for predefined meteorological conditions with wind speed less than $2ms^{-1}$.

2.5.25 At each receiver location the 1-hour average concentration for TSP was predicted for each of the predefined meteorological condition. The maximum 1-hour average TSP concentration was calculated at each receiver location for each of the day-time or night-time meteorological conditions.

2.5.26 For the purpose of this assessment it is considered that dust emissions from vehicles moving on unpaved road surfaces contribute the major dust source from the quarry. Since no site specific information is available relating to particle size distribution, and the unpaved road emission equation from AP-42 5th Edition is applicable for different industry and geographical conditions, the particle size distribution used in the model is estimated based on the particle size multipliers for the unpaved road emission equation. With particle size classes of 0-2.5μm, 2.5-5μm, 5-10μm, 10-15μm and 15-30μm, the percentage in each class is estimated to be 9.5%, 10.5%, 16%, 14% and 50% respectively.

2.5.27 Modelling was undertaken to establish the TSP concentrations over the development area for 1-hour and 24-hour average time periods. It was assumed that most of the quarry operations will take place during day-time from 8 am to 6 pm and wind erosion of open quarry areas will take place over the whole day. At each receiver location the maximum 1-hour average TSP concentration was predicted by adding the impacts from quarry operations and wind erosion. The maximum 24-hour average TSP concentration was estimated by averaging the sum of the 10-hour of quarry operations emissions and 24-hour of site erosion emissions over a 24-hour period.

2.5.28 For the purpose of this assessment, a background TSP concentration of 75 μgm^{-3} was added to the maximum 1-hour average and maximum 24-hour average results. This background TSP concentration was taken from the air quality impacts assessment of *Rehabilitation of Anderson Road Quarries - Final Report* and was based on the results of daily dust monitoring in Junk Bay.

2.5.29 The vicinity of the study area is a sloped terrain with the Anderson Road Quarry at the top and the Sau Mau Ping Estate at the bottom. The topography was taken by the dispersion model and the model would assume the dispersion of pollutants following the terrain. For ground-based emission sources like dust emission from construction sites, the highest dust impacts would be predicted at ground level. In this assessment, it is confirmed that the highest dust impacts were predicted at ground level over the study area. The predicted dust impacts are therefore presented in the form of dust concentration contours over the study area at 1.5m above local ground level (which varies from about 180mPD at Anderson Road Quarry to about 90mPD at Sau Mau Ping Estate) to represent the worst case impact, 1.5m being the average height of human breathing zone.

2.5.30 A sample output file of an ISCST3 model run, which include all the input information and model setting for this assessment, is included in Appendix 2 of this report for reference.

Emission Calculations - Traffic Emissions

2.5.31 The traffic on Sau Mau Ping Road, Po Lam Road, Shun On Road, Anderson Road, proposed new

access roads, and all proposed internal roads are included in the assessment. The A.M. peak hour traffic flow data for Year 2011 are given in Table A3.1 in Appendix 3 of this report.

2.5.32 Vehicle emission factors for carbon monoxide (CO), oxides of nitrogen (NO_x) and respirable suspended particulates (RSP) are taken from the *Fleet Average Emission Factors - EURO2 Model* provided by EPD. Fleet Average Emission Factors of NOx for Year 2011 taken in this assessment are given in Table A3.2 in Appendix 3 of this report. No speed correction or other adjustments were made. 20% of NO_x was assumed to be NO_2 as normally adopted for similar assessment. The detailed calculations of vehicle emission factors are given in Table A3.3 in Appendix 3 of this report.

Dispersion Modelling - Traffic Emissions

2.5.33 Dispersion modelling was undertaken using USEPA approved CALINE4 dispersion model to assess traffic emissions impact from nearby road network. In the dispersion model, meteorological conditions of wind speed $1ms^{-1}$, Pasquill stability class D, mixing height of 500 metres, horizontal wind direction standard deviation of 18 degrees and worst-case wind direction were taken to represent the worst-case 1-hour average conditions. Sample CALINE4 input and output files are given in Appendix 3 of this report.

2.5.34 Due to the inability of the CALINE4 model in simulating dispersion over complex terrain of the development site and its surrounding area, the area was assumed virtually flat in the model. All the receiver heights are measured from the local ground level.

2.5.35 Noise mitigation measures including vertical noise barriers are proposed in this EIA report for noise reduction purposes. The secondary air quality impacts of the implementation of those noise mitigation measures were incorporated into the air quality modelling. It was assumed that, with the installation of vertical noise barriers, all the traffic pollutants generated from the mitigated road section would be emitted from the top of the noise barriers. In the air quality model, the elevation of the mitigated road section was set to the elevation of the barrier top, the width of mixing zone was set to the actual width of the road due to physical obstruction of the barrier walls, and the road type was set to 'fill'. No correction or adjustment to the receiver heights was made in the model.

2.5.36 The modelling was undertaken at receiver heights of 1.5 m and 5.8 m above local ground level (to be representative of normal human breathing zone at pedestrian level and the first floor level respectively).

2.5.37 For the purpose of this assessment, a background NO_2 concentration of 50 μgm^{-3} was added to the maximum 1-hour average results. This background NO_2 concentration was adopted in *EIA Study of South East Kowloon Development.*

2.5.38 A sample output file of a CALINE4 model run, which include all the input information and model setting for this assessment, is included in Appendix 3 of this report for reference.

2.5.39 The quantitative models and calculation method and the input parameters in this study have been verified and agreed with the relevant government departments. Where practicable, realistic worst case scenario has been adopted for impact assessment.

2.6 Potential Impacts

Construction Phase

2.6.1 The predicted worst case 1-hour average and 24-hour average TSP concentrations at the representative ASRs are tabulated in Table A1.2 in Appendix 1 of this report. The heights of the representative ASRs taken in the model were the heights of the first sensitive floor.

2.6.2 As shown in Table A1.2, the predicted dust levels at the representative ASRs in Case 2 would be slightly higher than the predicted levels in Case 1 (about 3% higher in average). It is because rock crushing within the development site (as compared with rock crushing at Anderson Road Quarry in Case 1) is located closer to the ASRs at the redeveloped Sau Mau Ping Estate in Case 2. The modelling results showed that with the implementation of dust mitigation measures listed in Section 2.5.7, the dust levels at all selected representative ASRs will comply with the 1-hour average TSP guideline level and the 24-hour average AQO for TSP in both construction Case 1 and Case 2.

2.6.3 The predicted worst case 1-hour average and 24-hour average TSP concentration contour plots for Case 1 are shown in Figures 2.6 and 2.7 respectively. The predicted worst case 1-hour average and 24-hour average TSP concentration contour plots for Case 2 are shown in Figures 2.8 and 2.9 respectively. Exceedances were predicted at some of the residential blocks along Sau Mau Ping Road and Po Lam Road (Receivers 223, 224 and 2102) at 1.5m above ground as shown by the contour in Figures 2.7 and 2.9. However, the first residential floors of Receivers 223 and 224 are at 5.8m above ground and the first residential floor of Receiver 2102 is on top of a bus terminus at 16.2m above ground. The modelling results showed in Table A1.2 of Appendix 1 indicate that there would be no exceedance of the TSP AQO and guideline level at the lowest sensitive floors of these receivers.

Operational Phase

Quarry Dust

2.6.4 Maximum 1-hour and 24-hour average TSP concentrations were predicted over the development site at receiver height of 1.5m above local ground level. The modelling results are presented in the form of concentration contours as shown in Figures 2.10 and 2.11 respectively for worst case 1-hour average and 24-hour average TSP concentrations. The concentrations presented in the figures included a background TSP concentration of 75 μgm^{-3} assumed in this assessment.

2.6.5 As shown in Figures 2.10 and 2.11, the highest worst case 1-hour average and 24-hour average TSP concentrations were predicted at the back of the quarry with the most intensive quarrying activities and haulage of excavated materials. High TSP concentrations were also predicted around the two quarry plants located adjacent to the development site at the northern and southeastern sides of the development site.

2.6.6 With reference to the layout of Preferred Development (Figure 1.2), a buffer area is planned between the quarry and the sensitive receivers on the development site. Except for part of a residential block located at the northern corner of Platform E, all the other residential blocks and schools planned on the development site are located at more than 100m from the boundaries of the two closest quarry plants as recommended in HKPSG for dusty uses. Dust impacts from the quarry on the development site should therefore be reduced.

2.6.7 The modelling results showed that exceedances of the 1-hour average TSP guideline level of 500μgm^{-3} would not be expected within the development site (Figure 2.10).

2.6.8 As shown in Figure 2.11, exceedances of the 24-hour average AQO for TSP of 260 μgm^{-3} would be expected within part of the development site in close proximity to both the quarry plants at the northern and southeastern sides of the development site. Nevertheless, buffer distance is planned between the quarry plant and the future sensitive receivers on the development site. The modelling results showed that exceedances of the 24-hour average AQO for TSP at the sensitive receivers would not be expected (see Table A2.2 of Appendix 2).

Traffic Emissions

2.6.9 The predicted worst-case 1-hour average NO_2 concentration contour plot is shown in Figure 2.12. As shown in the figure, the future air quality sensitive receivers on the development site would not experience high traffic emissions impacts.

2.6.10 Predicted worst case 1-hour average NO_2 concentrations are shown in Table A3.4 in Appendix 3 of this report. The modelling results showed that the predicted worst-case 1-hour average NO_2 concentrations at the future air quality sensitive receivers on the development site are all well below the 1-hour average AQO for NO_2. It is predicted that the 1-hour average NO_2 concentrations at all the selected receivers at both 1.5m and 5.8m heights would be less than 50% of the 1-hour average NO_2 AQO.

2.7 Proposed Mitigation Measures

Construction Phase

2.7.1 Since the development site is located next to the Anderson Road Quarry, the cumulative impacts would be considerably high. Therefore in order to comply with the 1-hour average TSP guideline level and the 24-hour average TSP AQO, a commitment by the contractor to adopt the following mitigation measures is necessary:

Site Practice

- Mean vehicle speed of haulage trucks at 10 $kmhr^{-1}$.
- Twice daily watering of all open site areas.
- Regular watering (once every 1.5 hours) of all site roads and access roads with frequent truck movement.
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.
- Establishment and use of vehicle wheel and body washing facilities at the exit points of the site, combined with cleaning of public roads where necessary.
- Suitable side and tailboards on haulage vehicles.
- Watering of temporary stockpiles.
- Paved northern and southern temporary access roads.

Blasting

- Use of select aggregate and fines to stem the charge with drill holes and watering of blast face.
- Use of vacuum extraction drilling methods.

- Carefully sequenced blasting.
- Blasting should not be carried out under unfavourable meteorological conditions with wind speed less than 2 ms^{-1}.

Crushing

- Fabric filters installed for the crushing plant.
- Water sprays on the crusher.

Loading and Unloading Points, and Conveyor Belt System

- Water sprays at all fixed loading and unloading points (at the crusher and conveyor belts).
- The loading point at the crusher is enclosed with dust collection system installed.
- When transferring materials from conveyor belt or crusher to the dump trucks, chutes or dust curtains are used for controlling dust.
- Cover the conveyor belts with steel roof and canvas sides .

2.7.2 Apart from the dust suppression measures listed above, the Contractor should also satisfy the requirements stipulated in *Air Pollution Control (Construction Dust) Regulation*. It is noted that no adverse environmental effects from the above mentioned mitigation measures and unacceptable residual impacts after implementation of mitigation measures would be expected.

3 NOISE

3.1 Introduction

3.1.1 This section describes the potential noise impacts arising from construction activities of the proposed development to the existing receivers as well as road traffic noise and noise from the on-going quarry operations to the proposed development during the operational phase.

3.1.2 Noise impacts were predicted for the existing receivers during the construction phase and the future receivers based on the Preferred Development during the operational phase of the development.

3.2 Legislation, Policies, Plans, Standards and Criteria

3.2.1 The Noise Control Ordinance (NCO) provides the statutory framework for noise control. Assessment procedures and standards are set out in five Technical Memoranda (TM) listed below:

- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites;
- TM on Noise from Construction Work other than Percussive Piling;
- TM on Noise from Percussive Piling;
- TM on Noise from Construction Work in Designated Area; and
- TM on Environmental Impact Assessment Process.

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

3.2.3 For the purpose of this assessment and with reference to the interpretation in *Po Lam Road Housing Development, Noise and Dust Assessment of the Revised Anderson Road Quarry Rehabilitation Scheme and Alternative Height of Development - Final Report*, Wardell Armstrong, prepared for the Hong Kong Housing Authority, construction work is considered as the quarrying activities prior to the primary crushing plant. For quarrying activities downstream of, and including the primary crushing plant, assessment was undertaken in accordance with *TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites.*

Construction Noise and Quarry Noise (Excluding Plant Noise from Quarry Site)

3.2.4 *Annex 5 : Criteria for Evaluating Noise Impact of TM on Environmental Impact Assessment Process* defines the criteria for daytime construction noise. It sets daytime noise limit of 75dB(A) $L_{eq\ (30\ min)}$ at the facades of dwellings, and 70 dB(A) at the facades of schools (65 dB(A) during examinations) between the hours of 07:00 and 19:00 on normal weekdays. These criteria were adopted for the current assessment, since it is understood that the quarrying activities (except operations of the plants) would be restricted to day-time hours on normal weekdays.

Plant Noise from Quarry Site

3.2.5 The *TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites* provides the statutory control and mechanism for assessing noise from plants. It provides a method for determining the Area Sensitivity Rating (ASR) of a Noise Sensitive Receiver (NSR), and the Acceptable Noise Level (ANL). Table 3.1 shows the criteria for determining the ASR and Table 3.2

shows the ANLs with respect to the time of the day.

Table 3.1 Area Sensitivity Rating (ASR)

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

Table 3.2 Acceptable Noise Levels (ANLs), dB(A)

Time Period		ASR		
		A	B	C
Day	(0700 to 1900)	60	65	70
Evening	(1900 to 2300)			
Night	(2300 to 0700)	50	55	60

3.2.6 In this assessment, the development area is considered to be an urban area and directly affected by the Anderson Road Quarry. An ASR of C was taken for noise sensitive receivers facing the Quarry in the plant noise assessment. According to the *TM on Noise from places other than Domestic Premises, Public Places or Construction Sites*, the ANLs are:

- Day-time and evening (0700 to 2300): 70 dB(A) $L_{eq, 30mins}$,
- Night-time (2300 to 0700): 60 dB(A) $L_{eq, 30mins}$

3.2.7 Since plants within the quarry are fixed noise sources, according to *Annex 5: Criteria For Evaluating Noise Impact of TM on Environmental Impact Assessment Process* , the level of the intruding noise at the facade of the nearest sensitive use should in general be the lower of prevailing background noise levels and 5 dB(A) below the appropriate ANL, i.e. 65 dB(A).

Traffic Noise

3.2.8 *Annex 5: Criteria For Evaluating Noise Impact of TM on Environmental Impact Assessment Process* defines

the criteria for road traffic noise at various NSRs (Table 3.3).

Table 3.3 Road Traffic Noise Criteria

Noise Sensitive Receiver (NSR)	Noise Level Limit ($L_{A10\ peak\ hour}$) dB(A)
Dwelling	70
Technical Institute / School	65
Hospital	55

3.3 Baseline Conditions

3.3.1 Quarry plants operation noise and traffic noise from Po Lam Road, Sau Mau Ping Road and Anderson Road would be expected in future environmental conditions in the absence of the project.

3.3.2 Existing noise impacts on the development site are due to the operation of Anderson Road Quarry and the nearby construction sites as well as traffic noise from the surrounding roads including Po Lam Road, Sau Mau Ping Road, Shun On Road, Lee On Road and Anderson Road.

3.4 Sensitive Receivers

Construction Phase

3.4.1 There are a number of sensitive receivers located within 300m from the boundary of the development site which will be affected by noise during the construction phase. Sensitive receivers include but are not limited to:

- Cleared site of Shun Lee Tsuen Temporary Housing Area
- Shun Chi Court
- Shun Lee Estate
- Shun On Estate
- Shun Tin Estate
- Sau Mau Ping Estate
- Po Lam Road Platform (future receivers)

The redevelopment of Sau Mau Ping Estate and development on Po Lam Road Platform will take in population prior to and during the construction phase of this project. The locations of the representative noise sensitive receivers are shown in Figures 3.1 to 3.3.

Operational Phase

3.4.2 Sensitive receivers considered in the operational phase assessment were limited to those future receivers on the development site, as there will be no direct impacts from the development site on surrounding receivers once construction is completed.

3.4.3 Future noise sensitive receivers on the development site include residential buildings and schools (Figures 3.4 to 3.6). In this assessment, preliminary noise impacts are indicated by noise levels

calculated at representative facades of the future receivers on the development.

Quarry Noise

3.4.4 Future sensitive receivers with direct line of sight of the quarry will subject to noise impacts from ongoing quarry operations. The affected sensitive receivers will include the residential flats and schools on Platforms A, B, C and E facing the quarry. For the purpose of this assessment, 21 representative locations of noise sensitive receivers are selected and they are shown in Figures 3.4, 3.5 and 3.6 and listed in Tables 3.5 and 3.6. Four receivers are selected locations at schools and 17 receivers are selected locations at residential buildings. At each selected location, noise levels were calculated for the potentially affected facades at different floors. For schools, noise levels were predicted for the 1st floor, the 3rd floor and the top floor. For residential buildings, noise levels were predicted for the first and top floors and every five floors in between.

Traffic Noise

3.4.5 Future sensitive receivers with direct line of sight of the realigned Sau Mau Ping Road, Po Lam Road, Anderson Road and the main access roads to the development will subject to higher traffic noise impacts. For the purpose of this assessment, 249 representative locations of noise sensitive receivers (NSRs) are selected and they are shown in Figures 3.4, 3.5 and 3.6. NSRs 3001 to 3224 represent locations at residential flats and NSRs 1 to 30 represent locations at schools. For schools, noise levels were predicted for the 1st floor, the 3rd floor and the 6th floor. For residential buildings, noise levels were predicted for the 1st floor, the 10th floor , the 20th floor, the 30th floor and the top floor.

3.4.6 In this assessment, 24 sensitive receivers (NSRs 2076 to 2099) on Po Lam Road Platform Development were selected to determine the traffic noise impacts from the proposed southern access road to the development site. Calculation have been performed at receiver points located at five different elevations (i.e 1st floor, 10th floor, 20th floor, 30th floor and the top floor) for residential blocks. For the school, 2 receiver points (NSRs 2100, 2101) were selected and calculation have been undertaken at three elevations (i.e 1st floor, 3rd floor and 6th floor). The representative receivers are shown in Figure 3.3.

3.4.7 Besides, 24 representative NSRs (Receiver 201 to 224) along Sau Mau Ping Road were selected in this assessment to evaluate the traffic noise impacts from the proposed new roads. Calculations were performed at receiver points at four different elevations, 1st floor, 10th floor, 20th floor and 25/30th floor. The location of representative receivers are indicated in Figures 3.1 to 3.3.

3.5 Assessment Methodology

3.5.1 The quantitative models and calculation method and the input parameters in this study have been verified and agreed with the relevant government departments. Where practicable, realistic worst case scenario has been adopted for impact assessment.

Construction Phase

3.5.2 The methodology outlined in the *Technical Memorandum on Noise from Construction Works other than Percussive Piling* was used for the assessment of construction noise. For the purpose of this assessment, in order to allow the effects of distance attenuation, the TM states that all items of powered mechanical equipment (PME) should be considered to be grouped at a position mid-way between the

approximated geographical centre of the construction site and its boundary nearest to the noise-sensitive receptor. If the construction site is large such that the notional source position would be greater than 50 m from the point on the site boundary nearest to the NSR the position shall be taken to be a point 50 m from that point on the site boundary measured along the line between the approximate geographical centre of the site and the point on the site boundary nearest to the NSR. This approach was used to determine the notional source positions.

3.5.3 As the development site is large and linear in shape, the site was divided into 6 work areas for the assessment of construction noise impacts:

- Platform A and the northern part of Platform B
- Platform B
- Platforms C(1) and C(2)
- Platform C(3)
- Platform D
- Platform E

3.5.4 For calculations of noise from roadworks, the notional source position was assumed to be at point on the centre line of the nearest proposed new roads of the development.

3.5.5 The assessment was carried out on the basis of cumulative sound power level (SWL) of PME likely to be used for each location and phase of the construction period in the vicinity of the receiver location. In order to predict noise levels as realistic as possible, PME was divided into groups required for each discrete construction task. The objective was to identify a worst case scenario representing those items of PME which would be in use concurrently at any given time. The noise levels were then combined, depending on the number of plants, their frequency of operation, and their distance from receivers. The proposed PME for the construction works of the development are given in Tables A4.1 to A4.7 in Appendix 4 of this report.

Operational Phase

Quarry Noise

3.5.6 Noise impact on the development site from the quarry operations is of particular concern because this is under statutory control. Although the quarrying activities are scaled down from that used for the rehabilitation study, there was reliance on the ridge to protect receivers. The situation now will remove the ridge and place sensitive receivers in this location. Quarrying activities are covered under both the *Technical Memorandum on Noise From Construction Work Other Than Percussive Piling* and the *Technical Memorandum on Noise From Places other than Domestic Premises, Public Places or Construction Sites*. The former TM covers working face operations as the Noise Control Ordinance defines extraction of materials from the earth as a construction activity. The latter covers the plants such as the stone crusher.

3.5.7 The methodology outlined in the *TM on Noise from Construction Work other than Percussive Piling* was used for the assessment of quarry noise (excluding plant noise). For plant noise, the methodology outlined in the *TM on Noise From Places other than Domestic Premises, Public Places or Construction Sites* was taken.

3.5.8 Information of noise sources within the quarry was taken from *Po Lam Road Housing Development,*

Noise and Dust Assessment of the Revised Anderson Road Quarry Rehabilitation Scheme and Alternative Height of Development - Final Report, Wardell Armstrong, prepared for the Hong Kong Housing Authority and is reproduced in Appendix 5 of this report. Since the occupation of the proposed development will start around 2008, the quarrying activities considered in this assessment are those included in Scenario 3 (year 2008 onwards) in the above report. From the information provided by quarry plant operator, the new plants in the quarry site would have lower SWLs and no new plants would be added in the site in future. Therefore the condition of the quarry adopted for this assessment are the worst scenario.

3.5.9 The assessment was carried out on the basis of cumulative SWLs of PME used for the quarry operations. The noise level due to individual PME was calculated at each receiver location and then combined to give the $L_{Aeq\ (30\ min)}$ level. Correction factors were applied, where relevant, in accordance with the TMs. The influences of the topography on the transmission pathways between the PME and the receiver locations were also considered in the calculations. An assessment on the noise impacts from the potential sound reflection of the quarry faces indicates that the impact will be insignificant as compared with the noise impacts from the quarry plants. The calculations are included in Appendix 5 of this report.

3.5.10 It was confirmed that there is currently no night-time quarry operation in the Steering Management Group Meeting on 3 July 1998. Besides, with reference to the contract clauses for the Anderson Road Quarry operation on the restrictions on working hours, no work involving the drilling, excavation, loading or the transportation of rock, waste rock, overburden, or soil, or construction within the site and no crushing or processing of rock or rock products shall be carried out between 1900 hours and 0700 hours on working days or at any time on General Holidays. Permission for work to be carried out within the restricted times may be granted by the Supervising Officer and approved by the Director of Environmental Protection. Assessment of quarry plant noise was therefore undertaken for day-time period only.

Traffic Noise

3.5.11 Traffic noise was predicted using the methodology provided in the UK, Department of Transport Calculation of Road Traffic Noise (CRTN), 1988, and is based on projected peak hour flows for the worst year within 15 years of commencement of operation.

3.5.12 Based on an estimated occupancy date of 2008/09, the worst traffic projections up to 2024 (15 year after the proposed occupation date of the development) should normally be taken in the assessment. However, 2024 planning parameters are not available at the present moment. The future traffic forecast is produced for the design year of 2001, 2006 and 2011 as part of the Traffic Impact Assessment (TIA) of this study. In the TIA for year 2011, the projected population figures of the future development of Shun On, Shun Lee, Shun Tin and Shun Lee THA and Rehabilitation of the existing Anderson Road Quarry planned beyond 2011 are included to predict a worst case traffic projection. The traffic forecast for year 2011 was therefore taken in the noise impact assessment to predict worst case noise impacts.

3.5.13 Traffic flows and future vehicle composition prepared for the TIA were used in this noise impact assessment. Traffic speeds were based on the design speed for different road types, that is, 70 kmh^{-1} for a primary distributer and 50 kmh^{-1} for district distributers and local roads.

3.5.14 In this assessment, the traffic data for year 2011 (AM peak hour) provided by the traffic consultant and

reviewed by the Transport Department and the Planning Department were used. The traffic flows and percentage of heavy goods vehicles taken in this assessment are shown in Appendix 6B.

3.5.15 The road network, proposed building layout and all other features that could have noise screening or reflective effects, were digitised in the road traffic noise model. The roads were divided into segments, each of which was assigned a road layout number. A road layout defines the road width, opposing traffic lane separation, road surface type and traffic mix, flow and road design speed. The segmentation and calculation process were carried out using the model 'HFANoise' (Halcrow Fox Associates). This software follows the UK Department of Transport Technical Memorandum *Calculation of Road Traffic Noise, 1988 (CRTN).*

3.5.16 Roads considered in the traffic noise model include Sau Mau Ping Road, Shun On Road, Lee On Road, Po Lam Road, Anderson Road, the proposed main access roads to the development site and the local roads within the site.

3.6 Potential Impacts

Construction Phase

Construction Noise Impacts

Unmitigated Scenario

3.6.1 The predicted noise levels at the representative noise sensitive receivers (NSRs) are given in Tables A4.8 to A4.14 in Appendix 4 of this report. The results indicated that the construction noise would exceed the daytime noise criteria at some of the NSRs when construction activities occur in close proximity to NSRs or when a number of heavy construction activities taking place concurrently.

3.6.2 Since major construction works would be carried out on the high raised platforms of the development site, those NSRs located at lower elevation (less than 130 mPD) would be possibly screened by the terrain from excessive construction noise.

3.6.3 The construction noise impacts would be the highest during site formation period of the development when rock drilling and rock breaking would be carried out for rock-cut excavation. There would be exceedances at most of the NSRs if there is no mitigation.

3.6.4 The construction noise impacts from other construction works would be less significant. There would be no exceedance, except at the school receivers.

Mitigated Scenario

3.6.5 The assessment has indicated that some exceedances of non-statutory criteria may occur under worst case conditions. Three residential receivers and 1 school would be affected by construction noise. Since 6 mm window panes and air-conditioning would be provided for the affected school in accordance with the final EIA report of "Proposed Public Housing Development at Po Lam Road, Sau Mau Ping, Kowloon", it is expected that the school would not have adverse impact from construction noise. Mitigation measures for affected residential NSRs should be taken to reduce noise towards acceptable levels. An effective approach to noise reduction would be to employ quieter plant. These quieter power mechanical equipments (PME) have been identified from BS5228 : Part 1: 1984. This

process has only been undertaken for those tasks where exceedances have been predicted. The mitigated results are shown in the Table A4.18 of Appendix 4.

3.6.6 Minor exceedances are still predicted at two NSRs 217 and 221 during site formation process after employing quieter PME. Proper scheduling of site formation works is required. It is recommended that rock drilling cannot be undertaken concurrently (i) at Platforms C(1) and C(2) and Platform C(3); and (ii) at Platforms C(1) and C(2) and Platform B to avoid adverse impacts at these two sensitive receivers. By applying the control measures of scheduling of work, exceedance of the day-time noise criteria would not be expected at these two NSRs. The mitigated noise levels are presented in Table A4.18 of Appendix 4 of this report.

Operational Phase

Quarry Noise (Excluding Plant Noise From the Quarry)

3.6.7 The locations of the quarry plants and nearby sensitive receivers are shown in Figure 3.13. Predicted noise levels at selected receiver locations due to noise arising from quarry operations other than plant noise are summarised in Table 3.6. Detailed results are listed in Appendix 5 of this report. It should be noted that the noise levels at some of the receiver locations would be attenuated as a result of the shielding effects of local terrain.

3.6.8 As shown in Table 3.6, the predicted noise levels at the selected receiver locations are all below the fixed noise standard stipulated in *Annex 5: Criteria for Evaluating Noise Impact of TM on Environmental Impact Assessment Process*. Adverse noise impacts at the development site from quarry operations other than plant noise from quarry are therefore not expected.

Plant Noise From Quarry

3.6.9 During the initial 3 years of the operational phase, there will be potential noise impacts from on-going operation of the Anderson Road quarry which is contractually required to restrict noise levels not to exceed the limits of the Noise Control Ordinance at any noise-sensitive receivers. Additional mitigation measures at the quarry to further reduce the noise level at the future noise sensitive receivers on the Development have been considered and are described below. Figure A5.1 in Appendix 5 shows four items of plant, which have been identified as dominant noise sources, would require some sort of a noise enclosure to lower the noise level from 70 dB(A) to 65dB(A).

Table 3.4 The Dimensions of the Enclosures for the Quarry Plants

Plant	Indicative Length (m)	Indicative Width (m)	Indicative Height (m)	Indicative Footprint (sq m)
Tarmac Asphalt Plant	50	25	10	2500
New Crushing Plant	100	20	15	5300
New Concrete Batching Plant	50	50	15	4750
Pioneer Asphalt Plant	50	25	10	2500

3.6.10 Enclosures of these very large sizes and designed to building regulations for industrial safety would be

extremely expensive under the existing quarry rehabilitation contract and not cost-effective for use only during the two years and ten months of the quarry operations to January 2012. In addition, the construction noise arising from construction works for these enclosures, in particular the foundation work which involves rock breaking and drilling work, will affect the surrounding existing NSRs. Therefore, other mitigation option, i.e. refinement of Platform E of the development was considered.

3.6.11 In the original layout (Figure 3.7), only one residential block (Block H6) is affected by the daytime quarry noise and exceeded the daytime NCO noise limit of 70 dB(A). Several alternative layouts of Platform E have been examined and only two arrived at which can be made to fit the site. They are shown in Figures 3.8 and 3.9 and referred to as Alternatives A and B respectively. Both alternatives will result with no exceedance of the daytime NCO noise limit of 70 dB(A) at all the residential flats on the development. The 70dB(A) contour shown in Figures 3.7 to 3.9 indicates the 70dB(A) noise level at the worst affected elevation of about 204mPD (above 15th floor level).

3.6.12 Table 3.5 below summarises the predicted noise impacts at the residential blocks on Platform E for the two alternatives.

Table 3.5 Predicted Quarry Plant Noise Impacts on Alternative Layouts of Platform E

Residential Block	Noise level at facades facing the quarry in dB(A)	
	Alternative A	Alternative B
H5	58-68	58-65
H6	56-67	58-70
H7	Shielded by other blocks	57-67
H8	55-68	58-68
H9	57-67	58-69
H10	55-66	Shielded by other blocks

3.6.13 As shown in Table 3.5, all the residential flats in both alternatives will not be exposed to noise levels exceeding 70dB(A). The highest predicted noise levels in Alternatives A and B are 68 dB(A) and 70 dB(A) respectively. It should be noted that the school in Alternative A will be shielded by the local topography and will not be subjected to adverse quarry noise impact.

3.6.14 Notwithstanding the highest predicted noise levels in Alternative A are lower than those in Alternative B, there is a large deficiency in the width of the school site in Alternative A as compared with the criteria stated in HKPSG (40m versus a minimum of 65m stated in HKPSG). Alternative A is considered not meeting the minimum requirements for the width of the school site as stated in HKPSG while Alternative B would provide the following benefits:

- The school is more easily accessible;
- The area of school site can be better utilized; and
- It will have a more appropriate layout for the school site as it will have a better open view from the school, rather than facing and close to quarry cliff or high rise residential blocks.

3.6.15 Besides, in urban design and landscape planning point of view, the layout of Alternative A does not retain the preferred urban design of the blocks surrounding an open space in the centre of Platform E. Instead, it replaces the open space to the east of the access road with an uninspiring wall of identical residential blocks parallel to the road. Not only is this layout less flexible in terms of housing area but it also allows no common area in the platform.

3.6.16 It is considered that the above provides sufficient justification to support the recommendation of Alternative B as the preferred revision.

3.6.17 It should be noted that in both alternatives, the shaded area delineated by the 70 dB(A) contour line as shown in Figures 3.8 and 3.9 indicates the area with predicted plant noise level exceeding 70 dB(A) at the worst affected elevation of about 204mPD (about 15th floor level). It is recommended that noise sensitive uses including residential uses should not be planned within the shaded area. In order to comply with the day-time NCO noise limit of 70 dB(A), noise sensitive uses, if any, planned within the shaded area should not exceed the elevation of 190mPD until quarry plant operation ceases in January 2012. Noise level of 70 dB(A) is also predicted at Block P10 within private development site. However, it is confirmed that the residential zone areas are within the platform, no shaded area should be recommended at this site

3.6.18 Alternative B is therefore recommended as the preferred revision of Platform E and is considered for the detailed assessment in this report.

3.6.19 Based on the layout of the Preferred Development with the incorporation of Alternative B for Platform E, the predicted day-time noise levels at selected receiver locations due to noise arising from plant noise from quarry are summarised in Table 3.7. Detailed results are listed in Appendix 5 of this report. Noise levels at some of the receiver locations are attenuated as a result of the shielding effects of local terrain.

3.6.20 As shown in Table 3.7, no exceedance of the day-time ANLs under the Noise Control Ordinance is predicted. Hence, with the adoption of the refined layout, it is considered that the residual noise impact from the quarry plants would not constitute long term, serious adverse implications for the proposed Development which complies with Annex 5 of the TM on Environmental Impact Assessment Process. As stipulated in the rehabilitation contract of the Anderson Road quarry, there is no quarry operation between 19:00 hours and 07:00 hours on working days and at any time on general holidays unless approved by the director of Environmental Protection. In addition, the quarry noise impact is not considered as long term because it will last for 2 years and 10 months which is comparable to the some typical construction periods. For instance, the site formation of Anderson Road Development requires about 4 years. No serious adverse impact will be expected as the noise levels do not exceed the NCO level of 70 dB(A) and there is no known planned major fixed noise sources other than the quarry operation.

Table 3.6 **Predicted Day-time Noise Levels at Selected NSRs Due to Quarry Noise (Excluding Plant Noise from Quarry)**

Selected NSR	Receiver No.	Predicted Noise Level L_{Aeq}, dB(A)	Non-statutory ProPECC Day-time Noise Limit L_{Aeq}, dB(A)
S1 (all storeys)	1	53	70 (65 during examination)
S2 (all storeys)	9	56	70 (65 during examination)
S3 (all storeys)	14	56	70 (65 during examination)
S4 (all storeys)	20	56	70 (65 during examination)
P3 (all storeys)	3010	52-62	75
P9(all storeys)	3034	55-65	75
P10 (all storeys)	3038	55-65	75
P11 (all storeys)	3042	55-65	75
P16 (all storeys)	3061,3062	55-65	75
P17 (all storeys)	3066	55-65	75
P18 (all storeys)	3070	55-65	75
H1 (all storeys)	3073	57-67	75
H2 (all storeys)	3081	58-68	75
H3 (all storeys)	3089	58-68	75
H4 (all storeys)	3097	59-69	75
H5 (all storeys)	3107	59-69	75
H6 (all storeys)	3114	60-70	75
H7 (all storeys)	3121	59-69	75
H8 (all storeys)	3129	59-69	75
H9 (all storeys)	3137	59-69	75

Table 3.7 **Predicted Day-time Noise Levels at Selected NSRs Due to Plant Noise from Quarry**

Selected NSR	Receiver No.	Predicted Noise Level L_{Aeq}, dB(A)	Annex 5 of TM on EIA Process /Noise Control Ordinance L_{Aeq}, dB(A)
S1 (all storeys)	1	66	65/70
S2 (all storeys)	9	61-67	65/70
S3 (all storeys)	14	60	65/70
S4 (all storeys)	20	59	65/70
P3 (all storeys)	3010	64-66	65/70
P9(all storeys)	3034	68-70	65/70
P10 (all storeys)	3038	69-70	65/70
P11 (all storeys)	3042	69-70	65/70
P16 (all storeys)	3061,3062	65-69	65/70
P17 (all storeys)	3066	64-69	65/70
P18 (all storeys)	3070	63-68	65/70
H1 (all storeys)	3073	56-64	65/70
H2 (all storeys)	3081	56-64	65/70
H3 (all storeys)	3089	56-64	65/70
H4 (all storeys)	3097	57-64	65/70
H5 (all storeys)	3107	58-65	65/70
H6 (all storeys)	3114	60-70	65/70
H7 (all storeys)	3121	57-67	65/70
H8 (all storeys)	3129	58-67	65/70
H9 (all storeys)	3137	58-66	65/70

Traffic Noise

Given Scenario

3.6.21 A private housing site with eighteen residential blocks (Blocks P1 to P18) and four schools (Schools S1 to S4) are planned in the northern part of the development site. Blocks P1 to P15 are to be built on top of 14 m high podia and Blocks P16 to P18 are to be built on top of 12 m high podia.

3.6.22 The modelling results showed that the northern facades of the 10th and/or upper floors of Blocks P2 and P3 (NSRs 3006 and 3010) would be impacted by the proposed northern access road and the Anderson Road. Noise exceedances of 1 to 3 dB(A) are predicted.

3.6.23 Noise exceedances of 4 dB(A) is predicted at the southern facade of the first floor of Block P3 (NSR 3012) facing the local road. Besides, up to 4 dB(A) exceedances are predicted at the northern facades of lower floors of Blocks P4, P5, P6 and P12 (NSRs 3013, 3014, 3018, 3022, 3046) due to traffic noise from local road. Noise exceedances of up to 6 dB(A) are also predicted at the facades of the lower to middle floors of Blocks P9, P10 and P11 facing the local road (NSRs 3033, 3034, 3038 and 3042). In addition, up to 5 dB(A) exceedances are predicted at the eastern facades of the lower floors of Blocks P16, P17 and P18 (NSRs 3062, 3066 and 3070).

3.6.24 The compliance rate of the northern private housing site is approximately 93%. It is expected that the noise exposure could be reduced by proper detailed design of the development.

3.6.25 School S1 is bounded by the northern access road and a local road whereas Schools S2, S3 and S4 are bounded by two local roads. Noise exceedances of up to 12 dB(A) are predicted at various facades of School S1. Noise exceedances of 2 to 11 dB(A) are predicted at most of the facades of Schools S2, S3 and S4. Although the platform of Schools S2, S3 and S4 are lower than the elevation of the adjacent local roads, the benefit of terrain shielding effect is limited to some classrooms at the ground floor and first floor levels only. Mitigation measures are required to protect the sensitive uses at the four schools.

3.6.26 A public housing site with nineteen residential blocks (Blocks H1 to H19) and one school (School S5) are planned in the southern part of the development site. Blocks H1 to H19 are standard housing blocks with blanked end facades. Blocks H5 to H12 and H18 and H19 are to be built on top of 10m high podia and Blocks H14 and H15 are to be built on top of 4 m high podia.

3.6.27 The modelling results showed that the northern facades of the 20th to 30th floors of Blocks H3 and H4 (NSRs 3089, 3090, 3097 and 3098) facing Anderson Road and the local road would be subjected to 1 to 2 dB(A) noise exceedances. The southern facades of lower floors of Blocks H3 and H4 (NSRs 3093, 3094, 3101, 3102) facing the local road would be subjected to 1 to 4 dB(A) noise exceedances.

3.6.28 Some of the northern and eastern facades of the first floor of Blocks H13, H16 and H17 (NSRs 3169, 3170, 3171, 3172, 3195, 3196, 3202) facing the local road would be subjected to 1 to 3 dB(A) noise exceedances. Besides, the eastern facades of all floors of Block H17 (NSRs 3203 and 3204) facing the junction of the local roads and the proposed southern access road would be subjected to 3 to 5 dB(A) noise exceedances due to traffic noise impacts from both new roads and existing roads. The southern facades of the tenth and upper floors of Block H17 (NSRs 3205 and 3206) would be subjected to 2 to 5 dB(A) noise exceedance mainly due to the traffic noise impacts from the re-aligned Sau Mau Ping Road and Po Lam Road.

3.6.29 The compliance rate of the southern public housing site is approximately 95%. It is expected that the noise exposure could be reduced by proper detailed design of the development.

3.6.30 Noise exceedances of up to 9 dB(A) are predicted at School S5 located next to the junction of the local roads and the proposed southern access road. Noise mitigation measures are required.

Mitigated Scenario for Schools

3.6.31 As standard schools will have some form of boundary wall, the effectiveness of a 3 m high solid boundary wall has been considered to reduce the impact on the schools.

3.6.32 Noise exceedances of up to 12 dB(A) are still predicted at some classrooms of School S1 facing the Northern Access Road after the installation of a 3m high noise barrier at the rear of footpath along the Northern Access Road (Figure 3.10). Since the elevation of the Northern Access Road is higher than that of the school site, a solid boundary wall along this road will not be effective in reducing the impact. 3m high boundary walls are proposed at the rear of footpath along the local roads to the south and to the west of School S1 (Figure 3.10). Some of the affected facades (NSR 3 at first floor and NSR 5 at all floors) are acoustically protected. Noise exceedance up to 12 dB(A) would still be predicted at some classrooms at upper floors. Therefore, indirect mitigation measures such as air conditioning and acoustic insulation are required for the affected classrooms of the school.

3.6.33 Due to higher elevation of the surrounding roads, a boundary wall will not be effective to protect School S2. Noise insulation and air conditioning would be required for the affected classrooms. It is recommended that ArchSD and CED during the detail design stage of the noise barriers to decide if any modifications are required to match the final school layout.

3.6.34 A 3m high boundary wall is proposed at the rear of footpath along the local road to the west of Schools S3 and S4 (Figure 3.11) to provide partial screening for the western classrooms at lower floors. Besides, a 3m high boundary wall is proposed along the footpath to the south of School S4. However, noise exceedances are still predicted. Noise insulation and air conditioning would be required for the affected classrooms.

3.6.35 A 3m high boundary wall is proposed at the rear of footpath along the local roads to the south of School S5 to screen the traffic noise from the local roads. However, noise exceedances of up to 9 dB(A) are still predicted. Indirect technical remedies in the form of glazing window and air-conditioning are required for the affected classrooms.

Summary

3.6.36 Figures 3.10 to 3.12 show the location and extent of the proposed school boundary walls. The detailed assessment results are presented in Appendix 6A. A summary of the predicted percentage of flats that would comply with the EIAO-TM is shown in Table 3.8.

Table 3.8 Summary of Compliance Rate in the Given Scenario

Site	Total Number of Flats	Given Scenario	
		Number of flat exceeded 70dB(A)	Compliance rate (%)
Private Housing	5912	424	92.8 %
Public Housing	7390	400	94.6 %
Overall	13302	824	93.8 %

3.6.37 Those residential flats and school classrooms with residual noise impacts should be mitigated with indirect technical remedies such as window glazing with air conditioning.

Existing Receivers along Sau Mau Ping Road

3.6.38 Traffic noise assessments were undertaken for 24 representative NSRs at Shun Chi Court, Shun Lee Estate, Shun On Estate, Shun Tin Estate and Sau Mau Ping Estate. The detailed results are included in Appendix 6A. Noise exceedances of up to 4 dB(A) are predicted at some residential NSRs due to the existing Sau Mau Ping Road. Since the noise levels from existing roads are more than those from the new roads by at least 10 dB(A), the new road contribution to the increase in noise level is less than 1 dB(A). It is therefore acoustically ineffective to install direct technical remedies on the new roads. Due to the new road noise contribution less than 1 dB(A), these NSRs would not be eligible for indirect technical remedies.

Receivers at Po Lam Road Platform

3.6.39 Traffic noise assessments were undertaken for NSRs at Po Lam Road Platform. Results show that minor exceedance is predicted at NSR 2091 (Figure 3.3) at top floor only. The other residential NSRs are complied with the noise criteria. Noise exceedance at NSR 2091 is dominantly due to the widen section of Po Lam Road. Noise exceedances are also predicted at two NSRs at the school in Po Lam Road Platform due to the existing road noise. Noise contribution from the southern access road to the increase in noise level is insignificant. According to the final EIA report of " Proposed Public Housing Development at Po Lam Road, Sau Mau Ping, Kowloon ", 6 mm pane window and air conditioning would be provided for the affected classrooms and residential flats to alleviate traffic noise from Po Lam Road. Therefore, road traffic noise from proposed southern access road would not be an adverse impact for these NSRs.

3.7 Proposed Mitigation Measures

Construction Phase

3.7.1 The intention at each stage of the construction period should be to minimize site noise levels, whilst having due regard to the practicability of any proposed control or mitigation measures. The initial aim in the design of the construction programme should be trying to schedule the minimum number of simultaneous operations.

3.7.2 Proper scheduling of site formation works is required to avoid several site formation works to occur concurrently in the areas close to sensitive receivers. It is recommended that rock drilling cannot be undertaken concurrently (i) at Platforms C(1) and C(2) and Platform C(3); and (ii) at Platforms C(1) and C(2) and Platform B to avoid adverse impacts at sensitive receivers. In addition, quieter powered mechanical equipment should be employed during site formation process.

3.7.3 Operation of noisy equipment, such as hydraulic hammer and drilling rig, near school receivers should be kept to minimum. The operation of noisy equipment should not be carried out during examination period. The operation of noisy equipment should be carried out during non-school hours (i.e. lunch time and around 4:00 pm - 7:00 pm) whenever possible.

3.7.4 The basic requirement for any construction contractors is to use all available techniques to minimise the noise level to which operation and others in the neighbourhood of site operations would be exposed. The effective measures are as follows :

- a rigorous EM&A programme should be undertaken, and should focus on those NSRs of particular concern, in order to identify and rectify any problems at the earliest possible stage;
- construction plant should be properly maintained and operated;
- conditions from EPD's Recommended Pollution Control Clauses should be incorporated into future contract documents and implemented in order to control construction noise impacts to within acceptable levels; and
- any scheduling of occupancy of sensitive receivers e.g. new schools or residential units, shall be at a time when all noisy construction works in nearby areas have been completed.

Operational Phase

3.7.5 In order to minimise the plant noise impacts from the Anderson Road Quarry during operational phase of the development, it is recommended that noise sensitive uses including residential uses should not be planned within the shaded area in Platform E as shown in Figure 3.9. In order to comply with the day-time NCO noise limit of 70 dB(A), noise sensitive uses, if any, planned within the shaded area should not exceed the elevation of 190mPD until quarry plant operation ceases in January 2012.

3.7.6 Solid boundary walls are proposed to reduce the traffic noise impacts at schools during the operational stage of the development. Locations and extent of the proposed boundary walls are shown in Figures 3.10 to 3.12 and 14.2 to 14.4.

3.7.7 The residential flats and school classrooms with residual traffic noise impacts should be mitigated with indirect technical remedies such as window glazing with air-conditioning.

3.7.8 No adverse secondary effects from the mitigation measures for construction and operational phases would be expected. No unacceptable residua impact would be anticipated after implementation of mitigation measures.

4 LANDSCAPE AND VISUAL

4.1 Introduction

4.1.1 The landscape and visual impact assessment identifies the impacts of the proposed development upon the resources that make up the landscape, upon the character of that landscape and upon the visual amenity of the area. Landscape and visual impact assessment is not an objective science but is based upon a structured and systematic evaluation of predicted impacts, informed by professional judgement and experience.

4.1.2 For the purposes of assessment, a clear distinction is drawn between the assessment of *landscape impacts* and the assessment of *visual impacts*.

4.1.3 **Landscape impacts** are impacts on the intrinsic fabric (i.e. natural landform, vegetation, geology, drainage etc.) and indirectly upon the character of a landscape: that is, upon the combination of natural and man-made components that go together to give a landscape its specific identity.

4.1.4 **Visual impacts** are impacts upon the views of the landscape of individual viewers (known as *receptors*). Visual impact assessment involves the identification of receptors who will be affected by a change to a given view, (be they residents, those working in the landscape, travelling through it, or using it as a recreational resource) and an assessment of the impacts of that change.

4.2 Legislation, Guidelines and Planning Policy

4.2.1 This section briefly outlines Ordinances, Government guidance and landscape planning policies that are relevant to the assessment of visual impacts in Hong Kong in general and to the Project Site in particular.

Legislation

4.2.2 The requirement for and approach to environmental impact assessment generally is regulated by the Environmental Impact Assessment Ordinance (Cap.499). The prescribed approach to landscape and visual impact assessment is laid down in Annex 18 of The Technical Memorandum, published as a statutory instrument under Section 16 of the Act.

Landscape Planning Policy

4.2.3 Metroplan, the strategic planning document for the urban conurbation of Hong Kong, identifies parts of the Project Site as a *Visually Prominent New Development / Redevelopment Zone* (Figure 17 - 'Urban Design Statement - Key Plan'). It also notes that this is a "highly sensitive development area. Impacts should not prejudice scenic backdrop. Maintain view corridor"[to peak of Tai Sheung Tok]. Metroplan policy with regard to *Visually Prominent New Development/Redevelopment Zones* is to "ensure that built form is of an appropriate form (height and bulk) and treatment (shape and colour) in relation to impact on the urban fringe and/or harbour areas." In addition, policy aims to "promote the creation of views through development areas to urban fringe and harbour" ('Metroplan - The Selected Strategy Executive Summary', p.49).

4.2.4 In addition, Anderson Road Quarry is identified in Metroplan as a *Citywide Landmark/Visual Reference Point* (Figure 17). Para 39(c) states that policy is orientated towards the "use of building

height to define other key landmarks or visual focal points such as those which .....promote identity and legibility at the district...level..."

4.2.5 Figure 11 of Metroplan ('The Design Context of the Metro Area') identifies the Tai Sheung Tok ridge as a *Principal Ridgeline*. Policy with regard to the relationship between buildings and the city's peaks and ridgelines, is that "as a general principle, all new development/redevelopment should make allowance for the retention of at least 20%-30% visibility of enclosing peaks/ridgelines when viewed from the opposite side of the harbour (at sea level)" (ibid., p.53, para 39(a)).

4.2.6 In Figure 13 of Metroplan ('Landscape Strategy for the Urban Fringe and Coastal Areas') the Project Site is designated as *Degraded Landscape to be Reinstated/Reformed*. Metroplan states that these areas "have been identified for specific action to remedy unsightly scars caused by activities such as quarrying ...for example , the quarries at Anderson Road. Major recontouring, mass tree planting and erosion control will be required to rehabilitate these areas." ('Metroplan - The Selected Strategy (Technical Report)', para 74(e)).

4.2.7 The document published separately to Metroplan, entitled 'The Metroplan Landscape Strategy for the Urban Fringe and Coastal Areas' identifies in Figure H, a suggested outline layout for the Anderson Road site, which shows two development platforms separated by a "hill park and landscape buffer".

4.2.8 The Kwun Tong North Outline Zoning Plan (OZP) designates the Project Site as *Other Specified Uses*, to be used in connection with the rehabilitation of Anderson Road Quarry. Small areas beyond the northern and southern ends of the Site are designated *Green Belt* areas which "will be retained in their natural state" (para 7.3).

4.2.9 An incoherent area of Jordan Valley west of the Shun On Estate is designated as Green Belt under the Draft Ngau Tau Kok OZP (April 1995) with the provision that it may be used for passive recreation. Otherwise, the only other significant landscape designation is provided in the Draft Tseng Lan Shue OZP (July 1995) which designates most of the land immediately north and east of Tai Sheung Tok as *Conservation Area*. The policy for this area is that "it should retain its natural character..." (para 8.9.1). This wooded area is deemed to be of "significant landscape value" (para 8.9.2).

Guidelines

4.2.10 'The Hong Kong Planning Standards and Guidelines' (in Chapter 10 - Landscape and Conservation) outlines those design criteria that should be considered when planning developments in agricultural and fish farming areas, woodlands, and water storage areas.

4.2.11 Government restrictions on the preservation and felling of trees in Hong Kong are detailed in Government General Regulation 740, Works Branch Technical Circular No.24/94 and Planning, Environment and Lands Branch Technical Circular No.3/94. The Forests and Countryside Ordinance (Cap 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Its subsidiary Regulations prohibit the picking, felling or possession of listed rare and protected plant species. The list of protected species in Hong Kong is defined in The Forestry Regulations, issued under Section 3 of the Forests and Countryside Ordinance (Cap. 96).

4.2.12 The 'Broad Height Concept' developed in the Central and East Kowloon Development Statement gives guidance on the potential disposition of tower blocks at Anderson Road, in relation to the Quarry face behind it. It suggests that buildings be located on the northern and southern parts of the

Site despite the fact that this risks breaching the ridge line in these locations. This would allow one to "preserve the appearance of the central part of the quarry face (to be rehabilitated) and hence form a landmark feature on the Kowloon Hill, exposed to key vantage points in South East Kowloon and Hong Kong Island."

4.3 Baseline Conditions

Landscape

4.3.1 Landscape impacts are assessed against both *landscape resources and landscape character*. Baseline conditions for both of these issues are set out below.

Landscape Resources

4.3.2 Generally, the landscape resources on the Site are not of exceptional value (Figure 4.1). The Site lies on the mid levels of the south side of Tai Sheung Tok (a hill reaching a height of 419mPD). The Site slopes steeply from north-east to south-west and much of the south-western boundary of the site comprises cut rock slopes or shotcreted slopes above Sau Mau Ping Road, which are often extremely steep (around 1:1). The highest point of the Site is at around 200mPD whilst the lowest is at around 100mPD.

4.3.3 The underlying geology of the Site consists of igneous rock, comprising granites and porphyritic granite (known as 'Hong Kong Granite' from the Upper Jurassic period. This rock is common across Kowloon and north Hong Kong Island (per Atherton, M.J. and Burnett, A.D.)

4.3.4 Soils on the Tai Sheung Tok ridge consists generally of red-yellow podsols which are common across the New Territories and Lantau. These are acid soils with low organic content and comprise completely decomposed granitic material (per Grant, C.J).

4.3.5 Like most of Hong Kong, the prevailing winds are from the east or north-east. This means that the Site is sheltered from winds for much of the year by Tai Sheung Tok, resulting in increased humidity and temperatures on the Site. Mean annual rainfall in the area is between 2400mm and 2800mm, roughly average for Hong Kong (per Dudgeon, D. and Corlett, R.).

4.3.6 The Site is for the most part vegetated, comprising a mosaic of grassland and scrub woodland of commonly found species (Figures 4.1). Typical tree species include *Macaranga tanarius*, *Litsea glutinosa*, *Schefflera octophylla*, *Mallotus paniculatus*, *Casuarina equisetifolia*, *Acacia confusa*, *Ficus hispida*, *Celtis sinensis*, *Musa paradisiaca* and *Arundinaria* spp.

4.3.7 A number of small stream courses emanate or originate on the upper slopes of the site. Some of these may be ephemeral and while contributing to the diversity of the site, they are not of exceptional value as landscape features (Figure 4.1).

4.3.8 The site also contains four temples (Kwun Yam Temple, Tai Shing Temple, Hoi Kwok Tin Hau Leun Leun Temple and Luk Fung Temple) landscape features of some cultural significance (Figure 4.1). Of these, the Kwun Yam Temple is now disused, whilst only part of the Hoi Kwok Tin Hau Leun Leun Temple actually falls within the site. As the site faces out to sea (and is therefore propitious in fung shui terms) there are also 23 known graves located around the site, concentrated at the south-eastern end (Figure 4.1).

Landscape Character

4.3.9 The Project has the potential to impact on the character of the landscape at a number of scales, from the local landscape through to the sub-regional landscape. These different landscapes are:

Local Landscape (Tai Sheung Tok Ridge)
District Landscape (Kowloon Coast)
Sub-regional Landscape (Hong Kong)

These *landscape character* areas are shown in Figure 4.2.

4.3.10 **The Tai Sheung Tok Landscape Character Area (LCA)** - The Tai Sheung Tok ridge plays an important role in the wider landscape of east Kowloon and Hong Kong Island (Figure 4.2). Rising to 419mPD, the ridge is wooded on its eastern side, whilst to the west, it is dominated by Anderson Road Quarry which is cut into its upper slopes, forming a significant human intrusion into the landscape. Thus, whilst the eastern side of the ridge is richly textured, the western side is more homogenous and is dominated by the large scale feature of the quarry (Figure 4.3).

4.3.11 Below the quarry, the lower slopes of Tai Sheung Tok are characterised by a pattern of disturbed semi-natural vegetation. This area also contains the Project Site itself, which comprises an incoherent mixture of natural and human features, including scrub vegetation, grassland, rock slopes, informal parking areas, metal storage yard, derelict buildings, building redevelopment as well as a small reservoir. Below the Project Site, lie *Sau Mau Ping, Sun On, Shun Tin and Shun Lee Estates*. Typical of many public housing estates, they comprise a dense landscape of tower and slab blocks, interspersed by public spaces. The residential blocks are large in scale and in varying states of repair. Sau Mau Ping Estate is now almost obsolete and progressive redevelopment is underway, introducing the disturbance of construction work into the landscape.

4.3.12 The Tai Sheung Tok Landscape Character Area is therefore characterised by its large scale elements and by contrasting features (Figure 4.3). A complex interaction of human and often disturbed natural features creates a landscape that has considerable texture and variety but which lacks coherence. In general therefore, it is a landscape which possesses little sensitivity to further development. However, it should be noted that the Project Site itself has a certain landscape significance as the only part of this area to retain substantially its natural formal and textural qualities.

4.3.13 **The Kowloon Coast LCA** - Kowloon, an area of the southern New Territories, is centred on the Kowloon Peninsula which forms the north shore of Victoria Harbour and is defined by a steep line of hills to the north (Figure 4.4). To the east, it extends as far as Tsuen Wan, where the mountains fall dramatically into the sea, and to the east, as far as Junk Bay (Figure 4.2).

4.3.14 Topographically, Kowloon is extremely varied, comprising both extensive areas of reclamation close to sea level, but also taking in the line of steep hills to the north, which include Lion Rock, Fei Ngo Shan and Tai Sheung Tok. The hills are largely undeveloped and natural in character and create a large scale and dramatic backdrop to the Kowloon landscape.

4.3.15 The lower lying parts of the landscape, including the whole of the Kowloon Peninsula, are almost entirely urbanised (Figure 4.4). This extensive area, running along the coast from Tsuen Wan to Yau Tong, comprises a dense fabric of high-rise development and highways infrastructure, much of which is varied both in character and quality. The urban area includes extensive commercial and residential

areas, particularly in the north west around Tsuen Wan, where there are large areas of industrial and port-related development around Kwai Chung. These areas are often incoherent and frequently detract from the character of the wider landscape.

4.3.16 The dense urban fabric of Kowloon is punctuated infrequently by undeveloped areas, usually on the steeper ground which is unsuitable for development. Such areas, are found in Jordan Valley, Lam Tin and Kowloon Tong and generally comprise wooded or scrub covered peaks.

4.3.17 The landscape is characterised by a number of large scale features, which include Kai Tak Airport, Anderson Road Quarry, the Kwai Chung Container Terminals as well as the ongoing West Kowloon Reclamation. These features are all to a greater or lesser degree, intrusive elements and contribute to the often incoherent quality of the wider landscape.

4.3.18 Generally then, Kowloon is a predominantly urban landscape of large scale and of considerable contrast. Whilst at the local scale, much of the urban area is incoherent, at the wider scale, there is a discernible pattern and texture to the development, which neatly follows the coastal plain. It is above all, the proximate relationship between the intensely developed lower lying areas and the undeveloped uplands, which characterises the landscape of the Kowloon Coast.

4.3.19 **The Hong Kong LCA** - The Hong Kong landscape is a sub-regional landscape in geographical terms and therefore not a discrete 'natural area' (Figure 4.2). However, it has been given considerable identity and homogeneity by cultural factors and can therefore be considered as a landscape character area in its own right.

4.3.20 Hong Kong has a landscape of considerable diversity and contrast. Essentially a mountainous coastal landscape, its steep-sided hills rise sharply from the sea to heights of 957mPD (Tai Mo Shan). The coastline is complex and comprises numerous bays, inlets, promontories and dozens of islands of varying size, of which Lantau is the largest. This has the effect of creating a significant interlock and relationship between land and sea (Figure 4.5).

4.3.21 The vast majority of Hong Kong is still undeveloped, comprising mountainous uplands, which are generally scrub or grass-covered, with rocky outcrops. For the most part, these areas are uninhabited, with villages scattered throughout valleys and along the coast, where a limited and small-scale system of agriculture has historically developed. In addition, a number of new towns have recently been built in coastal locations throughout the New Territories.

4.3.22 Along the coast, the mountains fall steeply towards the sea, leaving only narrow coastal plains. These plains have been extended by reclamation from the sea and now form the principal sites of urban development in Hong Kong (Figure 4.5). There is therefore, considerable contrast between the natural forms, colours and textures of mountains and the characteristics of the urban areas next to them.

4.3.23 The Hong Kong landscape is generally large in scale and contains a number of large scale features, which play an important part in the sub-regional landscape. These include the airport developments at Kai Tak and Chek Lap Kok, the power stations at Tsing Yi, Lamma and Castle Peak, the various New Towns, NENT, SENT and WENT landfills, the Tsing Ma Bridge and Anderson Road, Lamma Island and Shek O Quarries. These features are generally all intrusive and detract from the natural qualities of the landscape.

Visual Baseline

4.3.24 The Project's visual baseline is established by reference to the extent of its visibility, to its visual amenity, the character of key views and by the views of visual receivers at various locations.

Visibility

4.3.25 The visual envelope of the development (that area from which any part of the development can be seen) will be fairly extensive. For the purposes of clarity, the visual envelope has been divided into *primary* and *secondary* envelopes. The 'primary visual envelope' is that area within 5km of the site from which any part of the development may be visible. A 5km radius is chosen as this is the furthest distance from which the human eye can distinguish significant detail. Beyond this, detail becomes blurred. Those areas beyond 5km from which the site can be seen are termed the 'secondary visual envelope'. By virtue of distance, visual impacts from this area will be less significant than in the primary visual envelope. The visual envelope for the proposed development is shown in Figure 4.6.

4.3.26 At its furthest, the visual envelope extends as far as Lantau Island. Given the generally poor visibility in Hong Kong, these views are available on rare occasions only.

4.3.27 Along the north coast of Hong Kong Island, the visual envelope is constrained by the ridge of hills running from Mount Davis and Victoria Peak in the west to Mount Parker and Mount Collison in the in the east.

4.3.28 In Kowloon, the visual envelope extends west as far as Tsing Yi and follows a line from the Kowloon Reservoirs and is defined by the watersheds of Beacon Hill, Lion Rock and Fei Ngo Shan.

4.3.29 In the east, the tops of certain towers will be visible above the ridge of Tai Sheung Tok. The visual envelope is contained by the ridge of hills around Tseung Kwan O and by the watershed of Clearwater Bay Peninsula. The furthest extent of the visual envelope in this direction is likely to be around High Junk Peak. The extent of the visual envelope into Junk Bay is contained by a ridge between Ma Yau Tong and Yau Tong south across the mouth of Victoria Harbour to Chai Wan.

4.3.30 For the purposes of assessment, the visual envelope has been divided into five zones, based largely on distance from the Site (Figure 4.6).

Character of Key Views

4.3.31 The character of key views of the Site are described below. The locations of key views are illustrated in Figure 4.7.

Views from Sau Mau Ping (50m-100m) - Figure 4.8

4.3.32 In close views of the Site from Sau Mau Ping Estate and adjoining areas views of the Site are dominated by the ridgeline of Tai Sheung Tok to the rear, forming a simple composition of three elements with the Site in the foreground, Anderson Road Quarry in the middle distance and the ridge of Tai Sheung Tok and sky above in the background. In these views, the ridgeline is extremely sensitive because there are so few visual elements, accentuating the transition between land and sky.

Views from Shun Tin Estate (200m) - Figure 4.10

4.3.33 The Shun Tin Estate is one of the closest residential areas to the Project Site and has good views of it. In these views, the Site in the foreground and middle distance. In the background lies Anderson Road Quarry. The visual quality of these views is compromised by slope retaining works and by the proximity of Anderson Road Quarry.

Views from Lam Tin (1km) - Figure 4.8

4.3.34 Lam Tin is a significant viewpoint, as it is one of the few areas close to the Project Site where there is significant development at around the same height as the Site itself. Views from Lam Tin generally have buildings or slope stabilisation works in the foreground. The Site and Anderson Road Quarry lie in the middle distance with Fei Ngo Shan in the background. There are a number of visual detractors in these views, including road infrastructure, ongoing construction work as well as Anderson Road Quarry itself.

Views from Kwun Tong (Laguna City) (1.5km) - Figure 4.8

4.3.35 From Kwun Tong, the Site is seen from below and the foreground and middle distance is occupied by buildings obscuring the Site itself. Beyond this, the face of Anderson Road Quarry forms the backdrop. Though the Site itself is not always visible, the tops of the proposed development will be clearly visible above existing buildings.

Views from Tseung Kwan O (1.5-2km) - Figure 4.9

4.3.36 Tseung Kwan O is a new town currently under construction on the other side of Tai Sheung Tok from the Project Site and will house a substantial population once completed. Certain developments will have views of Tai Sheung Tok ridge (over which it is possible the tops of several towers at Anderson Road may appear). The ridge appears as a background element with a foreground and middle distance of urban development. The ridge is extremely sensitive as it visually and psychologically separates Tseung Kwan O from the urban development of Kowloon and Hong Kong Island.

Views from Tsui Lam (1.7km) - Figure 4.12

4.3.37 From Tsui Lam, the foreground of views are occupied by a limited area of housing development and a service reservoir . Tai Sheung Tok ridge, lies in the middle distance of these views and generally offers a green backdrop to views from Tsui Lam. However, a limited amount of disturbance associated with the quarry is visible at the top of the ridge. The ridge is important in these views , both as a backdrop to Tseung Kwan O, but also as a element separating this landscape from the urban landscape of Kowloon. Although the Site itself is not visible in these views, the tops of several of the new towers will appear above the ridge.

Views from Quarry Bay (3.5km) - Figure 4.14

4.3.38 Quarry Bay is the closest point on Hong Kong Island from which the Project Site is visible. The Harbour forms the foreground to these views. In the middle distance lies the ribbon of high-rise development along the Kwun Tong waterfront with the Project Site and Anderson Road Quarry in the background. Views of the Site are from below and the effect of this would be to make the tops

of proposed towers appear closer to the ridgeline behind. As in other views, the quarry detracts significantly from the quality of the views.

Views from North Point (4.2 km) - Figure 4.8

4.3.39 North Point is a key viewpoint because it lies almost perpendicular to the site, across the harbour and because it offers unobstructed elevational views of it. In these views, the foreground is composed by the Harbour, the middle distance by buildings on the Kwun Tong waterfront and the background by Anderson Road Quarry and Tai Sheung Tok. The site is prominent as it lies on the visual transition between the tops of buildings on the waterfront and the quarry. Attention is also drawn towards the Site by virtue of its proximity to the quarry. Again, the quarry detracts from the quality of views.

Views from Hung Hom Waterfront (5km) - Figure 4.16

4.3.40 From the Hung Hom waterfront, the Site appears as an element in the middle distance behind buildings along the waterfront of Kwun Tong. Behind the Site lies the scar of Anderson Road Quarry. Views contain shipping activity in the Harbour and are panoramic in nature and so the eye is not necessarily drawn to one single element. This detracts from the importance of the Site. Anderson Road Quarry also significantly detracts from the general overall quality of these views.

Views from Wanchai Waterfront (7-8km) - Figure 4.18

4.3.41 The new Exhibition Centre Extension is a significant attraction both to business visitors and to tourists to Hong Kong and it offers fine views across Victoria Harbour. From the Exhibition Centre, the Project Site is seen in the background as a distant element marking the entrance to the Harbour. The ridgeline of the Kowloon Hills, of which Tai Sheung Tok forms a part, forms the backdrop to these views, which are panoramic in quality and full of activity. These characteristics will tend to draw the eye away from any particular location. Anderson Road Quarry, as elsewhere, detracts from the quality of views.

Views from Central Business District (9km) - Figure 4.9

4.3.42 Central is Hong's Kong's most high profile business district and contains some of Hong Kong's tallest buildings with extensive views. The density of building means that views of the Project Site are often glimpsed or partial. However other views are panoramic in nature and include the Project Site amongst the wider backdrop of Victoria Harbour and Kowloon. The Site is visible as a distant element sandwiched between Anderson Road Quarry and buildings along the Kwun Tong waterfront. Because of the panoramic quality of these views and the intense activity, the eye is often distracted by other features. Anderson Road Quarry tends to detract from the quality of these views.

Views from Victoria Peak (11.2km) - Figure 4.20

4.3.43 There are distant views of the Site from Victoria Peak. Victoria Peak is a viewpoint much frequented by tourists from where there are panoramic and elevated views towards the Site. In these views, the site forms a small and distant part of a much wider panorama of Victoria Harbour. Anderson Road Quarry is the most significant visual detractor in these views. The breadth of these views, the range of features which they include a well as the constant activity in the harbour encourages the eye not to settle on any given feature.

Views of Tai Sheung Tok Generally

4.3.44 All key views of the Project Site include views of the Tai Sheung Tok ridge to the rear of the Site. As noted above, Metroplan has identified this ridge as an important feature in views and has stated that general policy is that buildings should not encroach within 20-30% of its height when viewed from sea-level on the opposite side of the Harbour.

4.3.45 The visual importance of the ridge is its contribution to the natural backdrop to the Project Site. Despite the presence of the quarry on its slopes, the uncluttered and natural line of the ridge top offers a natural setting which alleviates the hard lines of urbanism below the Site. Equally important, the peak of Tai Sheung Tok punctuates and articulates the skyline of the Harbour and adds to the visual rhythm of its panoramas.

Visual Amenity

4.3.46 The visual amenity of the landscape around the Project Site is generally low. It contains a number of features that detract from visual quality (including shotcrete slopes, powerlines, informal car parks and metal storage yards). In addition, the area around the site also contains numerous visual detractors, such as Anderson Road Quarry, the numerous estates to the south (especially Sau Mau Ping) and construction works in adjoining areas (Figure 4.3). Anderson Road Quarry in particular is a vast intrusive element which is distinctly separated from the surrounding urban area by the project site. This juxtaposes in an awkward way, two elements of similar scale but of widely differing character, that is, the quarry and the lower urban areas. This juxtaposition exacerbates the lack of integration of the two elements.

4.3.47 This is however a landscape of considerable visual diversity in terms of colour, texture and scale, facilitating the inclusion of further features. The more natural aspects of the Site such as its scrub woodland and grassland play an important part in relieving the impact of human features and in varying the visual experience. The ridge of Tai Sheung Tok is of particular visual significance in creating a natural line as the backdrop to wider views of Kowloon. However, it also serves to draw attention to the negative visual feature of the quarry.

Receivers

4.3.48 The development Site is currently visible to many thousands of people daily, including residential receivers, occupational receivers, recreational receivers and travelling receivers. For the purposes of assessment, the visual envelope has been divided into five zones of different visual sensitivity (Figure 4.6). These zones correspond principally to distance from the Project Site. The views of sensitive receivers within those five zones are described below.

Zone One (0.1km-1km including Sau Mau Ping, Shun On Estate, Shun Tin Estate)
Residential, Recreational and Travelling Receivers

4.3.49 Zone One is a small area, but is adjacent to the Project Site. It is reasonably densely populated and those falling in this band are mainly residential receivers living in tower blocks. Views of the Project Site are to a great degree dependent on orientation of flats. Those who face the Site have close views of the in which it forms a dominant foreground element with Anderson Road Quarry to the rear.

Zone Two (1km-2km including Jordan Valley, Ngau Tau Kok, Kwun Tong, Lam Tin and Tseung Kwan O) Residential, Recreational, Occupational and Travelling Receivers

4.3.50 Zone Two is a more extensive area which is fairly densely populated and which includes predominantly residential receivers. It also includes Tseung Kwan O new town which will include a large population of largely residential receivers. For those in this area, the site is a distant or middle distant element in a wider urban panorama, which may be broken by other buildings in the foreground.

Zone Three (2km-5km including Wong Tai Sin, Kowloon City, To Kwa Wan, Hung Hom, North Point, Quarry Bay, Shau Kei Wan and Hang Hau)

4.3.51 Zone Three is densely populated and covers some of the major residential areas of Hong Kong. The only exception to this is the more rural area south east of Hang Hau. Whilst most of the receivers are residential, there are significant numbers of occupational receivers in offices and working on the harbour. In addition, significant numbers of travelling receivers have views of the Site from the Island Eastern Corridor. Those in this area have views of the site as a distant element amongst the wider background of the Kowloon landscape and the Harbour.

Zone Four (5km-10km including Stonecutters Island, Sham Shui Po, Mong Kok, Tsim Sha Tsui, Central, Wanchai, Causeway Bay, North Point and High Junk Peak)

4.3.52 Zone Four is an extremely extensive area covering the major urban areas of Hong Kong. It includes very large numbers of residential, commercial and travelling receivers (especially those on the Harbour). In particular it also includes a significant number of recreational receivers in country parks in Kowloon, on Hong Kong Island and Clear Water Bay Peninsula. From elevated positions and buildings in Kowloon and Hong Kong Island, good views are available towards the Project Site, which forms a small part in a much wider panorama. Elsewhere, and especially on the Kowloon Peninsula, the quality or extent of views is very much dependent on the orientation of receivers and the locations of buildings and localised landforms so that many receivers have only glimpsed or broken views of the Site. The generally poor visibility in Hong Kong has significant impacts on how visible the Site is within this band.

Zone Five (including Tsing Yi, Sai Wan, Peng Chau and Lantau)
Residential, Recreational and Travelling Receivers

4.3.53 Within Zone Five, the poor visibility within Hong Kong tends to limit good views of the Project Site to rare occasions only. In addition, compared to other bands, there are only a small number of receivers in this area. When views are available, viewers experience the Site as merely a speck in a much wider panorama. Travelling receivers are constantly moving about the harbour and experience views of the site only transiently.

4.4 Assessment Methodology

4.4.1 Landscape and visual impact assessment is not an objective science but is based upon a structured and systematic evaluation of predicted impacts informed by professional judgement and experience.

4.4.2 The methodology adopted for the Project conforms to the requirements of the Environmental Impact Assessment Ordinance and consists of:

1. Identification of Baseline Conditions
2. Analysis of Alternative Proposals
3. Identification of Potential Sources of Impact
4. Assessment of Potential Landscape and Visual Impacts
5. Mitigation of Impacts
6. Prediction of Future Landscape and Visual Conditions in Absence of Development
7. Conclusions

These stages are described in detail in the following paragraphs.

1) Identification of Baseline Landscape and Visual Conditions

4.4.3 In order to identify clearly the impacts of a proposed development, it is necessary to establish the baseline landscape and visual conditions. This is performed through desk study and verified through field survey. The following aspects of the site are appraised :

- landscape context
- land uses
- vegetation
- topography
- features
- geology and soil
- climate and microclimate
- landscape character
- key views of the development
- identity of viewers
- statutory designations appertaining

2) Analysis of Alternative Proposals

4.4.4 A number of alternative proposals are briefly analysed to identify how the proposed development ranks in terms of landscape and visual impacts.

3) Identification of Sources of Impact

4.4.5 The key potential landscape and visual impacts of the proposed development are next identified. Impacts can result from each of the project's basic components. Impacts can also be direct, indirect (e.g. traffic resulting from construction works), positive or negative.

4) Assessment of Potential Impacts

4.4.6 Both the landscape and visual impacts of the development are assessed at this stage.

Landscape Impacts

4.4.7 Landscape impacts are assessed at two levels :

- impacts upon individual *landscape resources*
- aggregate impacts upon *landscape character*

4.4.8 "Landscape resources' are the natural and man-made physical features which combined, make up the landscape itself (e.g. geology, vegetation, water curses, buildings etc). 'Landscape character' is the aggregate effect or impression created by this combination of physical resources.

4.4.9 Landscape impacts are assessed as a function of the magnitude of an impact and the sensitivity of the landscape resource or landscape character. Sensitivity of landscape character is a measure of its ability to accommodate change without prejudice to its intrinsic landscape character. Sensitivity of a landscape resource is a measure of the condition and the importance of that landscape resource.

4.4.10 Significant impacts are assessed as high, moderate or low. All insignificant impacts are termed *negligible*. The matrix below is used to assess landscape impacts.

Table 4.1 Matrix for Assessment of Significance of Landscape Impact

		Sensitivity of Landscape Resource / Character		
		High	*Moderate*	*Low*
Magnitude of Change	*High*	High	High to Moderate	Moderate to Low
	Moderate	High to Moderate	Moderate to Low	Low to Negligible
	Low	Moderate to Low	Low to Negligible	Negligible

Visual Impacts

4.4.11 Visual impacts are assessed against two types of receiver. These are the *key views* of the Site, as well as the *viewers* who will be affected. Visual impacts are defined as a function of the sensitivity of a receiver and the magnitude of the change to that receiver's view.

4.4.12 The assessment of visual impacts is structured by receiver sensitivity. Receivers are identified through the definition of the development's visual envelope (i.e. the area within which views of the development are possible). For the purposes of this study, receivers have been grouped into the following categories:

- Residential Those people who would view the scheme from their home
- Occupational Those people who would view the scheme from their workplace
- Travellers Those people who would view the scheme from vehicles or on foot
- Recreational Those people who would view the scheme whilst engaging in recreational activities

4.4.13 The *sensitivity of receivers* to visual impacts is influenced by the immediate context of the viewer, the activity in which they are engaged and the value that they attach to this location in particular. Receivers are categorised as being of high, moderate or low sensitivity to visual impacts.

4.4.14 Those who view the scheme from their homes are considered to be highly sensitive to any visual intrusion. This is because the attractiveness, or otherwise, of the view will have a notable effect on a residents' general quality of life and acceptability of their home environment.

4.4.15 Those people who view the scheme from their workplace are considered relatively less sensitive to visual intrusion. This is because they are employed in activities where visual outlook plays a less important role in the perception of the quality of the working environment. They are classified as a low sensitivity group.

4.4.16 For those who view the scheme whilst engaging in outdoor leisure pursuits, visual sensitivity varies depending on the type of recreational activity. Those taking a stroll in a park, for example, would be classified as a high sensitivity group compared to football players who would have a low sensitivity rating.

4.4.17 For those people who view the scheme from public thoroughfares, the degree of visual intrusion experienced depends on the speed of travel and whether views are continuous or only occasional. Generally, the slower the speed of travel and the more continuous the viewing experience, then the greater the degree of sensitivity.

4.4.18 The criteria used to determine the *magnitude of change* to a view are given below :

- value of existing views
- degree of change to views
- proximity of receivers
- availability and amenity of alternative views

4.4.19 Significant impacts are assessed as high, moderate or low. All insignificant impacts are termed *negligible*. The matrix below is used to assess visual impacts.

Table 4.2 Matrix for Assessment of Significance of Visual Impact

		Sensitivity of View or Receiver Group		
		High	*Moderate*	*Low*
Magnitude of Change	*High*	High	High to Moderate	Moderate to Low
	Moderate	High to Moderate	Moderate to Low	Low to Negligible
	Low	Moderate to Low	Low to Negligible	Negligible

4.4.20 The assessment of impact significance does not take into account the numbers of receivers in any given group, but is rather an assessment of the significance of a an impact upon a single receiver within that group, at a given location. An indication of the numbers of receivers in any given group at any given location is however given in this assessment and this should be considered when fully evaluating the implications of impact significance.

5) Mitigation Proposals

4.4.21 Landscape and visual impacts identified during the assessment process are where possible, subject to specific mitigation proposals and are thus ideally 'designed-out'.

6) Prediction of Future Landscape and Visual Conditions in Absence of Development

4.4.22 The future landscape and visual characteristics of the Site and its surroundings, should the proposed development not go ahead, are described. As it is not always easy to predict future development, this description covers only committed or likely development and is subject of course to the design and siting of those developments, which may affect, positively or adversely, their impacts on the landscape and visual characteristics of the area.

7) Conclusions

4.4.23 The Conclusion of the assessment summarises the results and makes recommendations for further detailed work relating to landscape and visual issues.

4.5 Analysis of Alternative Proposals

4.5.1 A complete comparative analysis of five potential development options has been undertaken as part of Report TR3. The development options were named 1L, 1H, 2L, 2M and 2H and differed in terms of their plot ratios, development platform size and tower positions. All options are described fully in the report. The following is a general summary of findings regarding the landscape and visual impacts of the Preferred Development.

4.5.2 Option 2M ranked as the most favoured option against all but three criteria. Its combination of smallest amount of building development, lowest average tower height and sensitive positioning of towers in relation to Tai Sheung Tok, meant that visual impacts in particular are less than other options. Only on three criteria did it rank lower than another option. In these cases, this was because its impacts on vegetation are greater than in Option 1H, (resulting in increased impacts on landscape resources and on close views) and also because of its more uniform topography than Option 1H.

4.5.3 Therefore, because of its consistently higher ranking compared with other options, the conclusion of the comparative analysis of development options was that Option 2M was the Preferred Development in terms of landscape and visual impact and has been taken forward as the subject of this full environmental impact assessment.

4.6 Potential Impacts

4.6.1 In this section, the potential *sources* of landscape and visual impact are described and the *significance* of impacts is assessed.

Sources of Impact

4.6.2 This section describes the sources of landscape and visual impact resulting from the proposed development, during construction and operation. The most significant elements of the Project which will give rise to potential impacts are:

- Housing platforms as well as the towers themselves
- Access road from the north
- Noise barriers

Construction Impacts

4.6.3 Construction impacts will include the effects on views and viewers of massive earth moving operations, new earth and rock slopes, extensive loss of vegetation across the Site, site formation, the presence of construction machinery for a protracted period (including towers cranes), and construction works on towers and infrastructure. Indirect impacts on views will result from movements of construction traffic around the site.

Operational Impacts

4.6.4 Impacts during operation will result from a number of sources. These will include the effects of the extensive soil and rock cut slopes required to create development platforms, resulting in the extensive loss of vegetation. These effects will be partially reduced by mitigation planting.

4.6.5 The development platforms themselves will represent new and artificial topographical elements in the landscape.

4.6.6 However, the principal impacts will result from the presence of numerous building towers on the Site and in views of it. The towers will also have impacts on views of Tai Sheung Tok ridge.

4.6.7 In addition, impacts will result from the proposed access road created to service the Site, which will require the creation of rock and soil slopes (with appropriate mitigation planting).

4.7 Assessment of Significance of Landscape and Visual Impacts

4.7.1 Landscape and visual impacts are assessed both during the construction period as well as during the operational life of the project. Operational impacts are assessed at Year 1 of operation and at Year 20, when mitigation planting is assumed to be mature. Year 20 impacts are assumed also to be residual impacts.

Landscape Impacts

4.7.2 Landscape impacts are summarised in Table 4.3. The following is a commentary on the significance of various landscape impacts.

Landscape Resources

4.7.3 Because of the scale and extent of the works during **construction**, almost all of the Site's landscape resources will be affected. The magnitude of impacts on the Site's topography, vegetation, drainage and cultural features, all of which will be lost or at least very significantly changed, will all be high. However, the sensitivity of these features is generally low and so the significance of impacts is also generally low. Only with the loss of stream courses and vegetation, are impacts assessed as moderate.

4.7.4 During **operation**, there will be no further impacts on the Site's landscape resources. Impacts will therefore generally remain the same as during construction. However, resoiling of much of the Site with topsoil will have a limited mitigatory effect on the Site's drift geology, so that these impacts will be negligible. Similarly, replanting of slopes will in part mitigate the loss of the Site's vegetation and impacts in this regard will be low.

4.7.5 At **Year 20**, residual impacts on landscape resources will generally be the same as during operation. Only in the case of vegetation loss will impacts be reduced (to low/negligible) through the maturing of mitigation planting.

Landscape Character

4.7.6 *Tai Sheung Tok LCA* - During **construction**, loss of vegetation and earth moving works on the Site will detract from the natural characteristics of Tai Sheung Tok. In addition, the presence of large scale construction machinery on the Site will introduce new human forms into the landscape. This will have the effect of introducing further disturbance into what is already a significantly disturbed landscape. Although the sensitivity of the landscape is low, the scale of the change will mean that impacts on landscape character will be moderate.

4.7.7 During **operation**, numerous new human features will be introduced into this landscape and .the loss of a green site will certainly impact on the few natural qualities of the west side of Tai Sheung Tok. However, this is a landscape already compromised to a large extent by human intervention (in the form of Sau Mau Ping Estate and Anderson Road Quarry). New residential development will not therefore appear totally alien in this context. Operational impacts on this landscape will therefore be moderate/low.

4.7.8 At **Year 20**, residual impacts on landscape character will be reduced only insignificantly by the maturing of mitigation planting and will therefore remain as moderate/low.

4.7.9 *Kowloon Coast LCA* -During **construction**, the regrading of slopes, removal of vegetation and presence of tower cranes will have the effect of introducing disturbance and further human features further up the slopes of the ridge behind Kowloon. This largely undeveloped ridge is one of the characteristic features of the Kowloon Coast landscape and its sensitivity to this kind of change is fairly high. Set against this, is the somewhat degraded character of this part off the ridge which lowers its sensitivity somewhat. In addition, the project Site makes up only a small part of this landscape unit, so that the magnitude of the impact will be low. Impacts on landscape character during construction will therefore be moderate.

4.7.10 During **operation**, the new tower blocks and access roads will represent further human features within the wider landscape. This will alter to a limited extent, the pattern of built form, sea and topography that characterises the wider landscape, by pushing development further up the ridge behind the urban area. The magnitude of change to this landscape will not however be great. Landscape impacts during operation will therefore be moderate.

4.7.11 Impacts will not be significantly reduced by **Year 20** and will therefore remain as moderate.

4.7.12 *The Hong Kong LCA* - During **construction, operation and at Year 20**, there will be a minor encroachment of the urban area into the natural landscape of the south coast of Hong Kong. Although the landscape of Hong Kong is finely balanced and is in some regards a moderately sensitive one, the scale of the proposed development in relative terms is small. The proposed development will however affect one of the characteristic coastal ridges of the Hong Kong landscape which separate its urban areas. It is a significant change to the landscape though in itself, it marks a small scale of change to the sub-regional landscape. For these reasons, during both construction and operational phases of development, landscape impacts on the SAR landscape will be low.

Visual Impacts

Impacts on the Character of Key Views

4.7.13 Impacts on key views are summarised in Table 4.4. The following is a commentary on the significance of impacts on key views.

4.7.14 In general, during the **construction** period, impacts will result from the loss of vegetation on the Site as well as the presence of artificial forms such as cranes and partly completed buildings being set against the face of Anderson Road Quarry. Although construction works are a common sight in Hong Kong, the visual prominence of the Site, the height of tower cranes, as well as a lengthy construction period will tend to accentuate impacts.

4.7.15 Construction impacts will be greatest in close views (Sau Mau Ping, Shun Tin), as it is only in these views, that the full impact of earth moving and vegetation removal is really evident. There will also be high impacts on views from Tsui Lam, where the undeveloped ridgeline is a key feature of views westward. In very distant views, such as Victoria Peak, the effects of poor visibility in Hong Kong and the panoramic nature of views will tend to reduce impacts.

4.7.16 Construction impacts on views of the ridge of Tai Sheung Tok will be significant, as the hard lines of tower cranes will contrast with the natural line of the ridge top.

4.7.17 In general, **operational** impacts on key views and those impacts at **Year 20** will involve an increased sense of urbanisation created by the numerous new towers. (Operational impacts on a number of key views are illustrated in Figures 4.11, 4.13, 4.15, 4.17, 4.19 and 4.21). The principal impact on more distant views will be to change the traditional relationship between urban form and landform by advancing development up the Kowloon ridge. Impacts will however be slightly reduced by the fact that the proposed development will in part obscure the face of the (partially revegetated) Anderson Road Quarry, which for many years will remain a visual detractor.

4.7.18 The greatest impacts during operation will be in close views (Sau Mau Ping, Shun Tin) where views are most focused on the development. These will be in part mitigated over time as new planting matures. There will also be significant impacts on views from Tsui Lam where a number of towers will represent significant new human elements on an otherwise largely undeveloped ridgeline. These impacts will not be mitigated over time (e.g. by planting) and so will remain significant at Year 20.

4.7.19 Elsewhere, impacts on completion of development will generally be moderate or low by virtue of distance, Hong Kong's typically poor visibility and the positive impacts resulting from the partial obscuring of Anderson Road Quarry. These will be mitigated somewhat over time as planting matures, though the effect of this mitigation will be less in distant views.

4.7.20 In views of Tai Sheung Tok, the towers will breach the lowest parts of the ridgeline and the hard forms of the development will contrast with the natural line of the ridge. However, the development will actually have certain limited positive impacts on views of the ridgeline. For example, it will frame views of the peak of Tai Sheung Tok, enhancing its landmark character. In addition, the clustered form of the Preferred Development creates visual rhythms which respond to the form of Tai Sheung Tok and which work in counterpoint to the form of the ridge itself. This should be contrasted to a linear form of development which has a much less sympathetic effect on the ridge (Figure 4.22).

Impacts on Sensitive Receivers

4.7.21 The significance of impacts on sensitive receivers is summarised in Table 4.5. The following is a commentary on the significance of impacts upon visual receivers.

Zone One - Residential, Recreational and Travelling Receivers

4.7.22 Those in this zone will be significantly affected by **construction** works as they will experience not only the works themselves from close distances, but will also be affected by views of construction traffic moving on and around the Site. Removal of vegetation, regrading of slopes and the presence of construction machinery will dramatically change the natural characteristics of views of the Site. Impacts will range from moderate for travelling receivers, to high for a small number of residential receivers.

4.7.23 During **operation**, those in and around Sau Mau Ping and Shun Tin will have close views of the development which will appear as a significant new element against the skyline of the Tai Sheung Tok Ridge. Mitigation measures will only slightly counter the effects of the new development during early stages of operation and impacts will remain unchanged from the construction period. By **Year 20**, mitigation planting will have a greater effect, though will do little to offset the presence of the towers. At this point, impacts will range from moderate for travelling receivers to high for a small number of residential receivers.

Zone Two - Residential, Recreational, Occupational and Travelling Receivers

4.7.24 During **construction**, viewers in this area will be affected by removal of vegetation, regrading of slopes and by the presence of construction machinery for a long period of time. These will detract from the natural qualities that the Site currently has. In particular, those in Ngau Tau Kok and Kwun Tong are likely to see tower cranes breaking the skyline of Tai Sheung Tok. Impacts will vary between high for certain residential receivers in Lam Tin to moderate for travelling receivers.

4.7.25 During **operation**, the development will become a distant or middle distant element in a wider urban panorama, which may be broken by other buildings in the foreground. The development will introduce new urban elements into views and because it will breach the skyline of Tai Sheung Tok, there will be significant visual impacts. It should be noted that the development may in fact help to integrate the quarry face with the urban environment. Impacts will range between high for certain residential receivers and moderate for certain occupational receivers.

4.7.26 By **Year 20**, impacts will have been reduced by the development of mitigation planting. It should be noted that mitigation measures will be more effective in Zone Two than elsewhere, as closer to the Site, views will be dominated by the presence of the towers and further away, replanting will scarcely be visible. Impacts will therefore range between low for travelling receivers and moderate for residential receivers.

4.7.27 There will be views of the southern end of the development from Tseung Kwan O New Town and Tsui Lam. Those in Tsui Lam and around Po Tsui Park are likely to have views of the tops of towers where they break the skyline of Tai Sheung Tok. This will introduce new built features into views of the ridgeline and is likely to have significant visual impacts by making viewers more aware of the urban area on the other side of the ridge. Elsewhere in Tseung Kwan O New Town, views of Tai Sheung Tok vary considerably and are often obscured by buildings or landforms. However, certain

viewers, and particularly residents in and around Po Hong Road, Po Fung Road and Po Lam Road will experience changes to their views. Visual impacts will however depend to a great extent on the nature of localised views towards Tai Sheung Tok. Impacts during all stages of the Project's life, are therefore likely to vary between high for a small number of residential receivers and negligible for other residential, travelling or recreational receivers.

Zone Three - Residential, Recreational, Occupational and Travelling Receivers

4.7.28 In Zone Three, **construction** impacts such as removal of vegetation and regrading of slopes will not have as a great an impact as for viewers closer to the Site and the principal impacts will be the presence of ongoing development and tower cranes breaching the skyline of Tai Sheung Tok. Impacts will range between high for certain residential receivers to moderate for occupational receivers.

4.7.29 During **operation**, the development will appear as a distant element amongst the wider background of the Kowloon landscape. On completion, significant visual impacts are likely though it should be mentioned that the development may assist in integrating the quarry with the urban environment of Kowloon generally. Because of the distance of views, mitigation measures will tend to have little effect on impacts, over time. The most significant impacts will be on residential receivers on Hong Kong Island, who will have moderate impacts, whilst travellers will have low impacts. In Kowloon, impacts will generally be lower as many views are broken by buildings.

4.7.30 Impacts at **Year 20** will not be changed from Year 1 of operation, since mitigation measures will not have a significant effect at this distance.

Zone Four - Residential, Occupational, Recreational and Travelling Receivers

4.7.31 During **construction**, impacts on receivers in Zone Four will be reduced to some extent by poor visibility and by the presence of Anderson Road Quarry. Impacts will result less from removal of vegetation and regrading of slopes and more from the presence of cranes breaching the skyline. Impacts will generally be mitigated by the panoramic nature of many views, especially on Hong Kong Island. Residential receivers in elevated positions in Hong Kong Island will be most affected by these impacts and some will experience moderate impacts whilst travellers will experience low impacts. Impacts in Kowloon will generally be lower than those on Hong Kong Island by virtue of its flatter topography and the numerous buildings that interrupt views of the Site.

4.7.32 During **operation**, the proposed towers will represent new artificial forms close to the distant skyline, but their impacts will be offset to a degree by distance, poor visibility and by their value in obscuring the face of Anderson Road Quarry. The highest impacts, for a few residential and recreational receivers will be moderate, though generally impacts will be lower than this, especially in the Kowloon Peninsula where many views are obscured by buildings. Travelling receivers in this zone will experience only negligible impacts. Because of distance, mitigation planting will have little effect on impacts and these will remain the same at **Year 20** of operation as they are at Year 1.

Zone Five - Occupational, Recreational and Travelling Receivers

4.7.33 From Zone Five, **construction** work on the development will not represent a significant change to the character or quality of the views of any receivers, by virtue both of distance and the generally poor visibility in Hong Kong. Even on the few days when visibility is very good, impacts on high sensitivity recreational receivers will be negligible.

4.7.34 During **operation**, the same considerations will apply and impacts on all receivers will be negligible only. Impacts at **Year 20** will not be changed from Year 1 of operation, since mitigation measures will not have a significant effect at this distance.

Table 4.3 Summary of Landscape Impact

Landscape Receiver	Source of Landscape Impact	Sensitivity of Resource	Magnitude of Impact	Impact During Construction	Impact During Operation	Mitigation Measures	Residual Impact
Landscape Resources							
Geology (Solid and Drift)	formation of development platforms for tower blocks, earthworks for access road	low	moderate (about 9Mm^3 of excavated material to be removed offsite)	low	low	conservation of CDG/CDV for re-use during resoiling works	negligible
Topography	regrading of slopes for development platforms, and access road	low	high (disturbance of 56ha of landscape)	low	low	none possible	low
Vegetation	loss of much existing woodland, scrub and grassland vegetation	low	high (loss of 16ha woodland, 14ha grassland, 1ha agricultural land)	moderate	low	hydroseeding and replanting of embankments, cut slopes, and other disturbed areas, with native tree and shrub species; transplanting of specimen trees of value	low / negligible
Drainage / Stream Courses	loss / culverting of stream courses	low	high (loss of 300m stream course)	moderate	moderate	none possible	moderate
Cultural / Human Features	removal of temples and graves	low	high (potential removal of 23 graves and 4 temples (1 disused))	low	low	(it is not clear whether certain graves will be permitted by relevant Government departments to remain)	low
Landscape Character							
Tai Sheung Tok Landscape Character Area	new tower blocks, regraded slopes, temporary loss of vegetation, access road	low	high	moderate	moderate / low	planting of slopes, and architectural treatment of structures and retaining walls	moderate / low
Kowloon Coast Landscape Character Area	new tower blocks, regraded slopes, temporary loss of vegetation	moderate	low	moderate	moderate	planting of slopes, and architectural treatment of structures and retaining walls	moderate
Hong Kong Landscape Character Area	new tower blocks	moderate	low	low	low	planting of slopes	low

Table 4.3 Summary of Landscape Impact (con't)

Landscape Receiver	Source of Landscape Impact	Sensitivity of Resource	Magnitude of Impact	Impact During Construction	Impact During Operation	Mitigation Measures	Residual Impact
Special Interests and Values							
Tai Sheung Tok Ridge	breaches of ridgeline at low points at northern and southern ends of the Site	moderate	moderate	low	moderate	none possible	moderate
Green Belt (surrounding Site)	new tower blocks, regraded slopes, temporary loss of vegetation	low	moderate	low	low	replanting of slopes	low

Table 4.4 Summary of Visual Impact Assessment - Impacts on Key Views

Location of Key View	Type of View	Source of Visual Impact	Distance to Site	Magnitude of Change	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
Shun Tin Estate	vista	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access road	200m	high	replanting of slopes, colouring of shotcrete slopes	high	high	moderate
Lam Tin	vista	removal of vegetation, regrading of slopes, construction activity and presence of new buildings	1km	high	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	high	high	moderate
Kwun Tong (Laguna City)	vista	construction activity and presence of new buildings	1.5km	moderate	colour treatment of towers	moderate	low	low
Quarry Bay	panorama	removal of vegetation, construction activity and presence of new buildings	3.5km	moderate	replanting of slopes and colour treatment of towers	moderate	moderate	moderate
North Point	panorama	removal of vegetation, construction activity and presence of new buildings	4.2km	moderate	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	moderate	moderate	moderate
Wanchai	panorama	removal of vegetation and presence of new buildings	7.5km	low	colour treatment of towers	moderate	low	low
Central	panorama	construction activity and presence of new buildings	8.5km	low	replanting of slopes, colour treatment of towers	low	low	low
Victoria Peak	panorama	construction activity and presence of new buildings	11.2km	low	replanting of slopes and colour treatment of towers	low	negligible	negligible
Sau Mau Ping Estate	vista	removal of vegetation, regrading of slopes, construction activity and presence of new buildings	50-1km	high	replanting of slopes, colouring of shotcrete slopes	high	high	moderate
Tseung Kwan O	glimpse	construction activity and presence of new buildings	1-3km	moderate	colour treatment of towers	moderate	moderate	moderate

Table 4.4 Summary of Visual Impact Assessment - Impacts on Key Views (con't)

Location of Key View	Type of View	Source of Visual Impact	Distance to Site	Magnitude of Change	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
Tsui Lam Estate	panorama	removal of vegetation, construction activity and presence of new buildings	1.7km	moderate	colour treatment of towers	high	high	high
Hung Hom	panorama	construction activity and presence of new buildings	5km	moderate	colour treatment of towers	moderate	moderate	moderate

Table 4.5 Summary of Visual Impact Assessment - Impacts on Sensitive Receivers

Type & Location of Receiver	No. of Receiver	Source of Visual Impact	Distance to Site	Duration & Direction of View	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
RESIDENTIAL								
Zone 1 - Sau Mau Ping, Shun On Estate, Shun Tin Estate	few	removal of vegetation, regrading of slopes, construction activity and presence of new buildings, and access roads	50m-1km	constant-only those facing site	replanting of slopes, colouring of shotcrete slopes	high	high	high
Zone 2 - Jordan Valley, Kwun Tong, Lam Tin, Tseung Kwan O, Tsui Lam	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings, access roads	1-2km	constant-only those facing site	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	high	high	moderate
Zone 3 - Wong Tai Sin, To Kwa Wan, Hung Hom, Quarry Bay, Sai Wan Ho, Hang Hau	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings	2-5km	constant-only those facing site	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	high	moderate	moderate
Zone 4 - Tai Wo Ping, Sham Shui Po, Mong Kok, Yau Ma Tei, Central, Wanchai, Causeway Bay, North Point	very many	removal of vegetation, construction activity and presence of new buildings	5-10km	constant-only those facing site	replanting of slopes and colour treatment of towers	moderate	low	low
Zone 5 - Tsing Yi, Sai Wan, Lantau, Peng Chau	few	construction activity and presence of new buildings	10km+	constant-only those facing site	colour treatment of towers	negligible	negligible	negligible
OCCUPATIONAL								
Zone 1 - Sau Mau Ping, Shun On Estate, Shun Tin Estate	very few / none	removal of vegetation, regrading of slopes, construction activity and presence of new buildings, and access roads	0-1km	daytime	replanting of slopes, colouring of shotcrete slopes	moderate	moderate	moderate

Table 4.5 Summary of Visual Impact Assessment - Impacts on Sensitive Receivers (con't)

Type & Location of Receiver	No. of Receiver	Source of Visual Impact	Distance to Site	Duration & Direction of View	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
Zone 2 - Jordan Valley, Kwun Tong, Lam Tin, Tseung Kwan O, Tsui Lam	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads.	1-2km	daytime-only those facing site	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	moderate	moderate	low
Zone 3 - Wong Tai Sin, To Kwa Wan, Hung Hom, Quarry Bay, Sai Wan Ho, Hang Hau	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads	2-5km	daytime-only those facing site	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	moderate	low	low
Zone 4 - Tai Wo Ping, Sham Shui Po, Mong Kok, Yau Ma Tei, Central, Wanchai, Causeway Bay, North Point	very many	removal of vegetation, construction activity and presence of new buildings	5-10km	daytime-only those facing site	replanting of slopes and colour treatment of towers	low	negligible	negligible
Zone 5 - Tsing Yi, Sai Wan, Lantau, Peng Chau	few	construction activity and presence of new buildings	10km +	constant-only those facing site	colour treatment of towers	negligible	negligible	negligible
RECREATIONAL								
Zone 1 - Sau Mau Ping, Shun On Estate, Shun Tin Estate	very few	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads	0-1km	daytime	replanting of slopes, colouring of shotcrete slopes	high / moderate	high / moderate	high / moderate
Zone 2 - Jordan Valley, Kwun Tong, Lam Tin, Tseung Kwan O, Tsui Lam	few	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads	1-2km	daytime	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	high / moderate	high / moderate	moderate

Table 4.5 Summary of Visual Impact Assessment - Impacts on Sensitive Receivers (con't)

Type & Location of Receiver	No. of Receiver	Source of Visual Impact	Distance to Site	Duration & Direction of View	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
Zone 3 - Wong Tai Sin, To Kwa Wan, Hung Hom, Quarry Bay, Sai Wan Ho, Hang Hau	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings	2-5km	mainly daytime	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	high	high/moderate	moderate
Zone 4 - Tai Wo Ping, Sham Shui Po, Mong Kok, Yau Ma Tei, Central, Wanchai, Causeway Bay, North Point, Lion Rock Country Park, Tai Tam CP, Aberdeen CP	very many	removal of vegetation, construction activity and presence of new buildings	5-10km	daytime-only those facing site	replanting of slopes and colour treatment of towers	moderate	low	low
Zone 5 - Tsing Yi, Sai Wan, Lantau, Peng Chau	few	construction activity and presence of new buildings	10km+	constant-only those facing site	colour treatment of towers	negligible	negligible	negligible
TRAVELLERS								
Zone 1 - Sau Mau Ping, Shun On Estate, Shun Tin Estate	few	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads	0-1km	less than 1 min.	replanting of slopes, colouring of shotcrete slopes	moderate	moderate	moderate
Zone 2 - Jordan Valley, Kwun Tong, Lam Tin, Tseung Kwan O, Tsui Lam	many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings and access roads	1-2km	intermittent	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	moderate	moderate	low
Zone 3 - Wong Tai Sin, To Kwa Wan, Hung Hom, Quarry Bay, Sai Wan Ho, Hang Hau	very many	removal of vegetation, regrading of slopes, construction activity and presence of new buildings	2-5km	intermittent	replanting of slopes, colouring of shotcrete slopes, colour treatment of towers	moderate	low	low

Table 4.5 Summary of Visual Impact Assessment - Impacts on Sensitive Receivers (con't)

Type & Location of Receiver	No. of Receiver	Source of Visual Impact	Distance to Site	Duration & Direction of View	Mitigation Measures	Visual Impact During Construction	Visual Impact Upon Completion	Visual Impact At Year 20
Zone 4 - Tai Wo Ping, Sham Shui Po, Mong Kok, Yau Ma Tei, Central, Wanchai, Causeway Bay, North Point	very many	removal of vegetation, construction activity and presence of new buildings	5-10km	intermittent	replanting of slopes and colour treatment of towers	low	negligible	negligible
Zone 5 - Tsing Yi, Sai Wan, Lantau, Peng Chau	few	construction activity and presence of new buildings	10km +	intermittent	colour treatment of towers	negligible	negligible	negligible

Note: Professional consensus in the field of visual impact assessment suggests that under ordinary circumstances, visual impacts on views over a distance of 3-5km are not significant. Though this is particularly true in the case of Hong Kong where visibility is poor for most of the year, impacts beyond a distance of 5km have been considered in this case, by reason of the prominent position of the proposed development site and the size of the proposed structures.

4.8 Mitigation Measures

4.8.1 Mitigation of landscape and visual impacts has been achieved largely by the careful location and design of components of the development (eg tower blocks, regraded slopes, access road alignment etc.). These *inherent* mitigation measures are the most significant in reducing landscape and visual impacts. *Additional* mitigation measures have also been recommended. These measures comprise surface treatments to the elements of the Project (e.g. slope planting, colour treatments).

4.8.2 These mitigation measures are described below and are illustrated in Figure 4.23.

Inherent Mitigation Measures

4.8.3 In designing and laying out elements of the Project, reducing landscape and visual impacts to a minimum, was one of the key design criteria. Efforts taken to fulfil this criterion included careful attention to the layout of the tower blocks themselves. These have been concentrated into two separate groups on either side of the peak of Tai Sheung Tok, rather than in a single wall along the length of the ridge. This leaves the peak visible as a landscape feature whilst at the same time creating, when viewed from a distance an interesting compositional rhythm, in counterpoint to that of the ridge itself. The towers in each group have been composed so that the highest towers are at the centre of each group, and the lowest, at the edges, thus creating coherent forms echoing the shape of the ridge.

4.8.4 In addition, the location of towers in staggered rows, means that from important viewpoints (such as Quarry Bay), views are available through the groups of towers to the ridge behind, breaking up the mass of the development and helping to integrate it with the landscape.

4.8.5 The alignment of the road has sought to follow the natural contours of the surrounding hillside. This results in a form that is sympathetic to the surrounding landscape and in harmony with its relief and character, whilst at the same time reducing the amount of slope regrading and elevated structure required, to an absolute minimum.

Additional Mitigation Measures

4.8.6 During construction, the ability to mitigate landscape and visual impacts will be limited by virtue of the large scale of the works and machinery necessary to carry it out. Measures such as screen hoardings will be effective for screening those people viewing the Site from very close range.

4.8.7 During the operational phase of development, the size of the proposed towers means that it is likely to be impossible entirely to mitigate landscape and visual impacts. However, measures can be taken to reduce certain impacts to a practicable minimum. These will include:

- Planting and vegetation restoration on soil slopes. This will include restoration of grassland, scrub and woodland on slopes around the development platforms and access roads. Restoration would be undertaken using predominantly native species. Soil slopes may include slopes which are currently rock-covered;
- Screen planting along the access roads, to limit impacts of elevated structures and rock slopes.
- Colouring of and limited planting on, shotcrete slopes.

- Landscape buffers and planting in and around the development itself to screen partially close views of the site.
- Colour rendering of towers to minimise visual impacts.
- Screen planting in front of retaining walls as well as granite cladding to those walls to reduce glare and visual impacts;
- Careful design of road elevated structure and abutments, to limit visual impacts.
- Colour rendering of roadside features to limit visual impacts.
- Conservation of CDG (Completely Decomposed Granite) or CDV (Completely Decomposed Volcanic) recovered from the site for re-use in the landscape restoration;
- Conservation of top soil and the preservation and/or transplanting of valuable trees. All slopes should be designed to be hydroseeded and planted with trees and shrubs
- Preservation (by transplanting if necessary) of any trees identified as being of particular landscape value.

4.8.8 Planting will take a number of years to establish and so the full effects of mitigation will not be seen until some 15-20 years after completion of the project. The planting strategy for the development is shown in Figure 4.23. The various types of planting and suggested species are elaborated below.

Table 4.6 Types of Planting and Suggested Species for the Development

Peripheral Slopes

Climbers on rock slopes
Parthenocissus himalayana
Ficus pumila
Lantana montevidensis
Ipomoea cairica

Screen Planting

Trees
Bambusa glaucescens
Bambusa vulgaris v. striata
Bambusa vulgaris v. Wamin
Callistemon viminalis
Eculyptus robusta
Schefflera octophylla
Acacia confusa
Caryota ochilandra
Ficus microcarpa
Cinnamomum camphora
Macaranga tanarius

Shrubs
Acalypha wikesiana 'Java White'
Acalypha wikesiana 'Magrginata'
Aglaia odorata
Rhaphis excelsa
Jasminum sambac
Gardenia radicans
Gordonia axillaris
Rhaphiolepis indica
Ilex rotunda

Street Trees

Celtis sinensis
Cinnamomum camphora
Delonix regia
Bombax malabaricum
Bauhinia blakeana
Liquidambar formosana
Schima superba
Bischofia trifoliata

Recreational Open Space

Trees
Terminalia catappa
Washingtonia robusta
Livistona australis
Plumeria rubra
Plumeria nigra "Italica"
Michelia alba
Cassia suranttensis
Ficus religiosa
Garcinia spicata
Erythrina indica
Delonix regia

Shrubs
Aglaia odorata
Acalypha wilkesiana
Acalypha wilkesiana 'Java White"
Allamanda neriifolia
Cordyline terminalis
Eranthemum nervosum
Jasminum sambac
Nandina domestica
Michelia figo
Pittosporum tobira
Rhododendron simsii
Yucca filamentosa

Ground covers
Rhoeo discolor
Russelia equisetiformis
Serissa serissoides
Sygonium auritum
Spathiphyllum sp.

4.9 Prediction of future Landscape and Visual Conditions in Absence of Development

4.9.1 It is obviously difficult to predict precisely what the future landscape and visual conditions of any landscape will be and the best one can reasonably do is to describe the likely development in any given area. This can only be done in the most general of terms and of course is subject to the design and siting of the future developments envisaged.

Future Landscape Baseline

4.9.2 The platform of Anderson Road Quarry is likely to be developed in the future as a housing site. Housing would probably be high rise and would have an urbanising effect on the landscape character of the Tai Sheung Tok ridge and the Kowloon Coast, though affecting landscape resources very little in what is highly disturbed landscape already.

4.9.3 The face of Anderson Road Quarry will be progressively restored by remodelling and re-vegetation which will diminish to a limited extent, its artificial qualities and negative impacts on the landscape character of Tai Sheung Tok and Kowloon. These actions are likely to have a positive impact on the landscape resources of the area.

4.9.4 The South East Kowloon Reclamation is likely to proceed, though at what scale, has yet to be determined. Together with the lifting of building height restrictions in Kowloon, this is likely to introduce large numbers of large scale urban elements into the landscape of Kowloon generally, reinforcing to a small extent the urban qualities of that landscape.

Future Visual Baseline

4.9.5 the restoration of Anderson Road Quarry will have the effect of reducing to a small extent, the glare and artififcaila character of the quarry face in views of the Harbour. However, development in the base of the Quarry and in South East Kowloon will have the effect of introducing further urban features in to these views and of reinforcing their urban qualities.

4.9.6 In addition, further development in these locations, will introduce large numbers of additional recreational and occupational receivers who would be affected by any further change to views of the landscape.

4.10 References

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5 ECOLOGY

5.1 Introduction

5.1.1 This section describes the results of the ecological survey, provides an assessment of the ecological impacts, including cumulative impacts arising from the proposed project, and outlines mitigation measures.

5.2 Legislation, Policies, Plans, Standards and Guidelines

Hong Kong Legislation and Guidelines

5.2.1 Hong Kong government ordinances and regulations relevant to the present project include the following:

- **The EIA Ordinance (Cap. 499);**
- **The Forests and Countryside Ordinance (Cap. 96)**, which protects both natural and planted forests;
- **The Forestry Regulations**, which protect specified local wild plant species;
- **The Wild Animals Protection Ordinance (Cap. 170)**, which provides for protection of listed species of wild animals by prohibiting the disturbance, taking or removal of animals and/or their nests or eggs; and
- The Town Planning Ordinance.

5.2.2 In addition, the study makes reference to the following Technical Memorandum, Technical Circular and Guidelines:

- **Technical Memorandum on Environmental Impact Assessment Process** (EIA Ordinance, Cap. 499, S. 16) (the "TM on EIA Process");
- **Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures** (PELB Technical Circular 1/97, Works Branch Technical Circular 4/97, dated 17 February 1997) (the "Technical Circular"); and
- **Hong Kong Planning Standards and Guidelines: Chapter 10, "Conservation".**

5.2.3 Annex 16, Appendix A, Note 2 of the Technical Memorandum sets forth a number of "important habitats which will need an ecological assessment". These include the following categories which occur in the study area:

1. Mature woodland of over 1 ha in area;
2. Natural stream courses and rivers of over 100 m in length.

International Conventions

5.2.4 The study takes note of the following relevant international agreements:

- *United Nations Convention on Biodiversity*

5.2.5 The United Nations Convention on Biological Diversity (Rio, 1992) addresses the urgency of protecting biodiversity on local and international scales. The present study takes note primarily of Article 8 of the Convention, which states (Paragraph (c)) that each Contracting Party shall "regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use." Article 8 also sets forth requirements to "promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings" (Paragraph (d)) and to "rehabilitate and restore degraded ecosystems" (Paragraph (f)).

5.2.6 The PRC, a Contracting Party, has not yet indicated whether it will extend application of the Convention to Hong Kong. However, the Hong Kong Government has stated that it is "committed to meeting the environmental objectives" of the Convention (PELB 1996).

5.3 Assessment Methodology

5.3.1 Relevant departments holding information on baseline environmental conditions were approached. A review of the existing data sources, including local records and studies was also performed. As stated in the review of the report *Review of Proposed Development Parameters*, no ecological assessment or studies had been undertaken for the site. The ecological baseline was described based on the results of field surveys for this study. Field visits were performed on 23, 27 October 1997 and 14 May 1998 to describe the ecological resources on the site.

5.3.2 Plant species seen were identified to species and recorded by their relative abundance. Special attention was focused on habitats and species of conservation significance. The conservation status of tree species follows Zhuang *et al.* (1997).

5.3.3 Birds heard and seen during field surveys were identified to species. Names follow Viney *et al.* (1994). Surveys of mammals, reptiles and amphibians were performed in the course of avifauna surveys. Individuals seen were recorded by species, number, and habitat. Searches were carried out for burrows, dens, trails, rooting sites, or other signs of mammalian activity. Species identification was assigned to indirect evidence of mammal activity where possible.

5.3.4 A breeding bird survey was conducted on 14 May 1998. The method used is a modified version of Sharrock (1976). Birds were graded according to the behaviour observed (Table 5.1). No intensive search for nests was performed.

Table 5.1 Criteria of the Breeding Bird Survey

Grades	Behaviour
A. Present	Species present in the sites
B. Possible breeding	Species present in potential breeding habitats
C. Probable breeding	Pair observed in suitable nesting habitat in breeding season, or species observed showing territorial behaviour, such as intensive singing and calling for territories, or chasing intruders out of territories, or species displaying or observed carrying nesting materials
D. Confirmed breeding	Nest found, or adults observed carrying food for juveniles, or adults observed feeding juveniles, or nesting or recent fledged juveniles observed.

5.3.5 A habitat map was prepared at 1:5000 scale based on field surveys and the aerial photo taken on 26 May, 1997 from the Government Map Office. The aerial photos taken on 18 November, 1996 and 14 November 1997 were also used to differentiate grasses from woodland patches.

5.3.6 Impacts to habitats, species or groups were assessed based on the guidelines in Annexes 8 and 16 of the TM, the consultants local knowledge and the international standards / practice in conservation biology.

5.4 Baseline Condition

Landuse and Conservation Area

5.4.1 The majority of the Development site (about 95%) falls within the "Other Specified Uses" zone annotated "Mining and Quarrying" whilst the northern corner of the site falls within the "Green Belt" zone on the approved Kwun Tong (North) Outline Zoning Plan No. S/K14N/2. The Outline Zoning Plan (OZP) was exhibited for public inspection under Section 9(1)(a) of the Town Planning Ordinance on 5 July 1994. According to the Explanatory Statement of the OZ P, the "Other Specified Uses" zone annotated "Mining and Quarrying" serves to facilitate the implementation of the rehabilitation scheme for the quarries, while the "Green Belt" zone covers mainly the steep hill slopes which are unsuitable for urban type development and will be retained in their natural state. As such the "Green Belt" zone is not strictly an ecological category.

5.4.2 There are no country parks, special areas. Sites of Special Scientific Interest (SSSIs), Marine Parks or Reserves or other designated sites of conservation interest within or in the vicinity of the site.

Terrestrial Habitats and Flora

5.4.3 The site is more or less an isolated "island" in an urban environment, bounded by housing estates and construction sites to the south and the quarry operations to the north. Major habitats found within the 50 ha of the Development site included woodland, grassland, agriculture and disturbed area. A habitat map is provided in Figure 5.1. A total of 107 plant species, including 41 tree and 17 shrub species, was recorded on the site (Table 5.2). About one third of the species recorded were exotic.

No species protected under local regulations or species known to be rare were found.

5.4.4 The site was highly disturbed with concreted steep slopes, the quarry works area, dumping sites, car parks, village houses and scattered open areas (these areas are collectively referred to as "disturbed/urbanised area" in Figure 5.1). Most village houses had been abandoned for approximately 2-3 years, although some of the agricultural plots were still maintained by non-residents. Grassy habitats dominated by *Miscanthus* spp. and *Panicum maximum* were mostly found near the abandoned village houses and agricultural plots, along paths, or on hydroseeded slopes.

5.4.5 Woodlands occupied about 30% of the Proposed Development at Anderson Road (15 ha), mainly at the northern and southern ends of the site. The northern woodland habitat in general had a very open canopy of about 5-8 m dominated by a native pioneer tree *Mallotus paniculatus* (Figure 5.2). Other species forming the canopy include *Bambusa spp.*, *Casuarina equisetifolia, Litsea glutinosa, Ficus hispida, Celtis sinensis,* and *Macaranga tanarius*. Numerous Banana trees (*Musa paradisiaca*) occupied the ravines, while other fruit trees including *Dimocarpus longan, Clausena lansium, Eriobotrya japonica, Carica papaya,* and *Sterculia nobilis* were also found. Since most of the village houses were recently abandoned, the understorey was not well developed. Other than the houses, a few tree seedlings (*Schefflera octophylla, Evodia lepta*), small shrubs (*Ligustrum sinensis, Lantana camara, Ficus hirta*), bamboo (*Arundinaria* sp.), ferns (*Pteris* spp., *Christella parasitica*) , and grass (*Lophatherum gracile*) constitute the relatively more shady area of the understorey. Climbers (e.g. *Mikania micrantha, Ipomoea cairica*) and grasses (*Miscanthus* spp., *Panicum maximum*) covered the woodland edge, the canopy gaps, and the grassland habitat. These areas were covered with dust from the quarry site. Overall, this woodland was young, disturbed, simple in structure and low in species diversity.

5.4.6 A woodland patch to the south of the site was also young but relatively less disturbed and more diverse, probably due to the absence of village houses and paths. *Schefflera octophylla, Machilus* sp., *Mallotus paniculatus, Litsea glutinosa*, and *Sterculia lanceolata* formed the 5 to 7 m canopy of this woodland. The understorey was diverse with a number of native tree seedlings, shrubs and climbers, including *Syzygium jambos, Dimocarpus longan, Sterculia lanceolata, Psychotria rubra, Desmos chinensis, Ardisia* spp., *Cocculus trilobus* and *Gnetum montanum*.

5.4.7 Most of the streams within the site were modified to provide paths, bridges and village houses. Apart from a few riparian trees such as *Ficus superba* and *Sterculia lanceolata* and the banana *Musa paradisiaca*, not many species were found along the streamside.

Table 5.2 Plant Species Recorded within the Proposed Development at Anderson Road, 1997-8

Species	Growth Form	Exotic	Relative Abundance	Species	Growth Form	Exotic	Relative Abundance
Alangium chinensis	T		+	*Lantana camara*	S	E	+
Alocasia macrorrhiza	H		+	*Ligustrum sinensis*	S		+
Amaranthus viridus	S		+	*Liriope spicata*	H		+ +
Aporusa dioica	T		+	*Litsea glutinosa*	T		+
Ardisia crenata	S		+ +	*Lophatherum gracile*	G		+
Ardisia quinquegona	S		+	*Ludwigia perennis*	H		+ + +
Artocarpus heterophylla	T	E	- + +	*Macaranga tanarius*	T		+
Arundinaria sp.	B		+	*Machilus* sp.	T		+ +
Bambusa sp.	B		+ -	*Maesa perlarius*	S		+
Bambusa vulgaris	B		-	*Mallotus paniculatus*	T		+
Bambusa vulgaris var. striata	B	E	-	*Malvastrum coronmandelinum*	H		+ +
Basella rubra var. alba	H	E	-	*Malvaviscus arboreus*	H		+
Bauhinia variegata	T		-	*Manihot esculenta*	H	E	+ +
Bidens bipinnata	H		+ +	*Melastoma sanguineum*	S		+
Boehmeria nivea	S		-	*Melia azedarach*	T	E	+
Brassica chinensis	H	E	+	*Mikania micrantha*	C	E	+
Bridelia tomentosa	T		+	*Mirabilis jalapa*	H	E	+
Carica papaya	T	E	+	*Miscanthus floridulus*	G		+
Casuarina equisetifolia	T	E	+ +	*Miscanthus sinensis*	G		+
Casuarina stricta	T	E	+	*Musa paradisiaca*	T	E	+ +
Celtis sinensis	T		+ -	*Oxalis corymbosa*	H		+
Christella parasitica	F		+	*Pandanus urophylla*	T		+
Cinnamomum camphora	T		+	*Panicum maximum*	G	E	+
Cissus maxima	T	E	- + +	*Pennisetum purpureum*	G	E	+
Clausena lansium	T	E	- -	*Pentaphylax euryoides*	T		+ +
Cocculus trilobus	C		+	*Pilea microphylla*	H		+ +
Colocasia esculenta	H	E	- + +	*Plantago major*	H		+

Table 5.2 Plant Species Recorded within the Proposed Development at Anderson Road, 1997-8 (con't)

Species	Growth Form	Exotic	Relative Abundance	Species	Growth Form	Exotic	Relative Abundance
Commelina nudiflora	H		-	*Polygonum chinensis*	H		+
Cratoxylum cochinchinensis	T		+ + +	*Praxelis clematidea*	H	E	+
Desmos chinensis	S		-	*Psidium guajava*	T	E	+
Digitaria sp.	G		-	*Psychotria rubra*	S		+ +
Dimocarpus longan	T	E	+	*Pteris biaurita*	F		+
Dioscorea sp.	C	E	- +	*Pteris ensiformis*	F		+ + +
Elephantopus tomentosa	S		+	*Pteris vittata*	F		+ +
Embelia laeta	S		+	*Rhus chinensis*	T		+ + +
Eriobotrya japonica	T	E	- +	*Rhus succedanea*	T		+
Euonymus chinensis	T		+	*Rubus reflexus*	C		+
Euphorbia hirta	H		+ + -	*Sansevieria cylindrica*	H	E	+
Evodia lepta	T		+	*Sapium discolor*	T		+ +
Ficus elastica	T	E	+	*Schefflera octophylla*	T		+
Ficus hirta	S		+	*Schima superba*	T		+
Ficus hispida	T		+	*Scleria chinensis*	SE		+ +
Ficus microcarpa	T		+	*Setaria* sp.	G		+
Ficus pyriformis	S		+	*Sterculia lanceolata*	T		+
Ficus superba	T		+	*Sterculia nobilis*	T	E	+
Ficus variegata	T		+	*Strophanthus divaricatus*	S		+ +
Glochidion eriocarpum	S		+	*Syzygium jambos*	T	E	+ +
Gnetum montanum	C		+	*Thysanolaena maxima*	G		+ + +
Gordonia axillaris	T		+	*Triumfetta bartramia*	H		+
Hedychium coronarium	H	E	+	*Uvaria microcarpa*	S		+ +
Impatiens basalmina	H	E	-	*Viburnum odoratissimum*	T		+ +
Ipomoea batatas	C	E	-	*Zea mays*	G	E	+
Ipomoea cairica	C		- -	*Zingiber officinale*	H	E	+ +
Lactuca sativa	H	E	+ + +				

T = tree, S = shrub, H = herb, G = grass, C = climber, B = bamboo, F = fern
+ - + = common, + + = occasional, + = rare

Aquatic Habitat

5.4.8 During the October survey most of the streams within the site were dry. Only one stream was flowing (Figure 5.1), probably with runoff from the quarry works which included rock face leaching and cleansing water run off. If the quarry runoff were diverted from the stream, the stream would become ephemeral. Surface run off was collected in a catchwater and then discharged into the stream directly.

5.4.9 The stream formed a series of pools and waterfalls which dropped steeply towards the road. The channel was 3 m wide and bordered by large boulders. The depth of water in the pools was between 10 and 20 cm. Silt on the stream bed in some places reached 30 cm deep. All the rock pools were covered in very fine silt. At the time of surveys the stream was flowing, carried a heavy load of fine suspended sediment, and smelled of untreated sewage.

5.4.10 Along the whole course of the stream no aquatic fauna was seen, nor was there any indication that any existed. It appeared that silt had smothered the stream vegetation and suspended material had impaired stream conditions.

5.4.11 No further ecological surveys are required to describe aquatic fauna whilst the stream is in its existing condition.

5.4.12 Other streams were observed flowing during the spring survey. However, due to little flow and poor water quality, ecological surveys were not performed.

Avifauna

5.4.13 A total of 27 bird species was recorded in the Development site (Table 5.3). Four species, although not habitat specific, are of relatively restricted distribution locally (Viney *et al.* 1994). These were the Hwamei, Fork-tailed Sunbird, Scarlet-backed Flowerpecker, and White-backed Munia. The former three species are also uncommon regionally (Yan *et al.* 1996), while the Scarlet-backed Flowerpecker is declining in local abundance (Viney *et al.* 1994). The other species recorded are mostly common and widespread in Hong Kong. However, some of them are woodland dependent (e.g., Great Tit and Yellow-browed Warbler). The Grey Wagtail and Violet Whistling Thrush are common species but are usually found near water (Viney *et al.* 1994). Therefore, the stream passing through the site, despite its polluted nature, probably provides foraging habitat for these two species.

5.4.14 A total of 16 species (59% of total recorded) was recorded on the northern woodland as possible, probable and confirmed breeders (Table 5.3). The confirmed breeder Black-faced Laughing-thrush was observed carrying food for juveniles and all the probable breeders were observed calling for territories and chasing intruders out of territories. A couple of resident species (e.g., Fork-tailed Sunbird, Japanese White-eye and Scarlet-backed Flowerpecker) recorded only in October 1997 are also possible breeders in the site. Berry-bearing plants were abundant on the site and could provide food during breeding season (e.g. *Cinnamomum camphora, Celtis sinensis*) and during winter for overwintering birds (e.g. *Mallotus paniculatus, Psychotria rubra*). In addition, the density and structure of the woodland of the site, although poor, could provide breeding sites for these birds.

Table 5.3 Bird Species Recorded in the Proposed Development at Anderson Road

Common Name	Latin Name	Status	Abundance	Breeding grade
Spotted Dove	*Streptopelia chinensis*	R	1	C
Large Hawk-cuckoo	*Cuculus sparverioides*	SV	2	C
Koel	*Eudynamis scolopacea*	R	1	C
Greater Coucal	*Centropus sinensis*	R	1	C
Barn Swallow	*Hirundo rustica*	SV PM	1	B
Grey Wagtail	*Motacilla cinerea*	WV	1	A
White Wagtail	*Motacilla alba*	WV	1	A
Crested Bulbul	*Pycnonotus jocosus*	R	1	C
Chinese Bulbul	*Pycnonotus sinensis*	R	1	C
Red-vented Bulbul	*Pycnonotus aurigaster*	R	1	A
Magpie Robin	*Copsychus saularis*	R	1	C
Violet Whistling Thrush	*Myiophoneus caeruleus*	R	1	C
Yellow-bellied Prinia	*Prinia flaviventris*	R	1	A
Common Tailorbird	*Orthotomus sutorius*	R	1	C
Yellow-browed Warbler	*Phylloscopus inornatus*	WV	1	A
Black-faced Laughingthrush	*Garrulax perspicillatus*	R	1	D
Hwamei	*Garrulax canorus*	R	2	C
Great Tit	*Parus major*	R	1	A
Fork-tailed Sunbird	*Aethopyga christinae*	R	2	A
Scarlet-backed Flowerpecker	*Dicaeum cruentatum*	R	3	A
Japanese White-eye	*Zosterops japonica*	R	1	A
Magpie	*Pica pica*	R	1	B
Jungle Crow	*Corvus macrorhynchus*	R	1	A
Black-necked Starling	*Sturnus nigricollis*	R	1	A
Crested Myna	*Acridotheres cristatellus*	R	1	B
Tree Sparrow	*Passer montanus*	R	1	B
White-backed Munia	*Lonchura striata*	R	2	B

Status: R = resident and WV = winter visitor, SV = summer visitor, PM = passage migrant.
Abundance: 1 = common and widespread, 2 = local but not uncommon and 3 = very local or rare.
Breeding Grades: A = present, B = possible breeding, C = probable breeding, D = confirmed breeding.
Species in Boldface are regionally uncommon.

Other Fauna

5.4.15 Rooting sites were observed during October 1997 in various spots in the woodland on the northern part of the site, suggesting that Wild Boars (*Sus scrofa*) were active in the site. However, such signs were not found during the May 1998 survey. No other fauna were heard or seen. No other signs of mammalian activities were observed.

Conservation Values of Various Habitats

5.4.16 Based on the results of the field study, the overall conservation values of various habitats found in the Development site are evaluated and ranked as follows:

Table 5.4 Evaluation of the Habitats in the Proposed Development at Anderson Road

Criteria	Northern woodland	Southern Woodland	Stream	Agriculture	Grassland
Naturalness	1	3	3	1	1
Size	5	2	3	1	1
Species Diversity	2	3	1	1	1
Habitat Heterogeneity	2	2	3	1	1
Irreplaceability	3	5	1	1	1
Integrity	1	1	1	1	1
Ecological linkage	1	1	1	1	1
Potential value	3	3	1	1	1
Nusery/breeding ground	3	1	1	1	1
Age	1	1	1	1	1
Abundance /Richness of wildlife	3	1	1	1	1
Total	25	23	17	11	11

* relative ranking with 1 representing the lowest conservation value (e.g. small size, less diverse, highly fragmented, easily recreated) to 5 representing the highest conservation value (e.g. big size, more diverse, less fragmented, difficult to re-create).
Maximum potential conservation value score = 55, minimum score = 11.

Potential Ecological Conditions Without Development

5.4.17 In the absence of the proposed project, and given time and continued protection from disturbance, the young and disturbed woodland on the site could potentially develop into mature woodland. Light demanding pioneer native species (e.g. *Mallotus paniculatus, Macaranga tanarius*) dominating the woodland canopy would be replaced gradually by relatively shade tolerant species (e.g. *Schefflera octophylla, Machilus* sp.). Woodland understorey would be more developed in terms of species diversity and structure. The constraints on woodland maturation and succession, however, include dust generated from the quarry, possible reoccupation of village houses in the area, and extensive growth of exotic and invasive climbers (e.g. *Mikania micrantha*). The agricultural area is likely to be maintained by morning walkers while more shrubs and herbs would establish on grassland habitat.

5.4.18 The main stream in a potential ecological conditions without development would still be seriously affected by the quarry operation, which is programmed to continue for the next 15 years. The polluted runoff from the quarry excludes aquatic fauna from the stream and thereby depresses the ecological value of the stream. After the quarry ceases operation, the stream would still likely be ephemeral and still have limited ecological value.

5.4.19 Terrestrial fauna species richness would be unlikely to increase due to the presence of the operating quarry and the isolated nature of the site, although a more mature woodland canopy would probably provide better shelter and more food for wildlife, possibly leading to an increase in fauna abundance.

5.5 Potential Impacts

Impact Identification and Prediction

5.5.1 According to the Technical Memorandum, following assessment of the severity of impacts arising from a project, the policy for mitigating serious impacts on habitats and wildlife is to pursue impact avoidance, impact minimisation, and impact compensation in that order of priority. Impact *avoidance* typically consists of modifications to the existing project design, but may in extreme cases require abandonment of the project (the "no-go" alternative). Impact *minimisation* includes any means of reducing the scope or severity of a given impact, e.g. through timing of construction works, modification in design, or ecological restoration of disturbed areas following the completion of works. Impact *compensation* assumes that an irreversible impact will occur upon a given habitat or species and attempts to compensate for it elsewhere, e.g. by enhancement or creation of suitable habitat. Compensation may take place on-site or off-site; the latter is discussed as "off-site mitigation" for the purposes of this study.

5.5.2 According to the PELB/Works Branch Technical Circular on off-site mitigation of ecological impacts, off-site mitigation should be considered only if significant residual impacts remain after all on-site opportunities have been exhausted. Off-site mitigation proposals should be based on the "like for like" principle enshrined in the Technical Circular, and every attempt should be made to place mitigation sites as close as possible to the project site.

5.5.3 Finally, the Technical Memorandum and other Government documents recommend the assessment of cumulative impacts.

5.5.4 The proposed development, according to the Project Layout Plan of the Preferred Development (Figure 1.2), will include formation of platforms, access roads, and slopes. The vegetation within these areas needs to be removed to accommodate earthworks, and this will constitute the direct impact of th project. Habitat loss is estimated using Figure 1.2 and Figure 5.1 by overlay method.

5.5.5 The potential impacts of the proposed projects are summarised in Table 5.5. These will include permanent loss of approximately 15 ha woodland, 14 ha grassland, 1 ha agricultural land, and 300 m stream course, which would be about 0.2%, 0.09% and 0.07% of the total respectively in the SAR (Table 5.6). It should be noted that Ashworth *et al.* 1993 classified the habitats in the study area as "low shrub" and "high density urban" on a 1:50000 scale, while in this study the habitats are classified as "woodland, grassland, agriculture, and disturbed" at 1:5000 scale. However, since Ashworth *et al.* provide the only available estimates of surface areas in the HK SAR, their estimates were used for reference and comparison. The percentage loss is only a rough estimate and should be interpreted with caution.

Table 5.5 Potential Impacts on Ecological Resources due to the Proposed Development

Period of Works	Potential Impacts	Ecological Resources Potentially Impacted	
		Direct Impact	Indirect Impact
Construction	Habitat Loss	Loss of woodland, agriculture, grassland, and stream habitats and associated plant species	Loss of foraging/ breeding/ roosting areas for birds, mammals and other species using the habitat
	Noise, light and human disturbance from construction	disturbance to plants, birds, mammals, and other species using the adjacent habitats	
Operation	Contamination of water courses through stormwater run-off from roads and covered areas	health or survival implications for plants, birds, mammals, and other species groups using the habitat	
	Noise, light and human disturbance from residences	disturbance to plants, birds, mammals, and other species using the habitat	

Table 5.6 Percentage of Habitat Loss due to the Proposed Anderson Road Development

Habitat	SAR Total (ha)*	Potential Loss (Permanent) (ha)	% of total in the HKSAR
Woodland	10062	15	0.15%
Grassland	15000	14	0.09%
Agriculture (Active)	1414	1	0.07%

* Ashworth *et al.* 1993

Impact Evaluation

5.5.6 The woodland habitats found in the site are young, disturbed, fragmented, with a very open canopy, and of low or moderate diversity. Plant species recorded are common and widespread. However, the woodland sites consist of numerous tree and shrubs species providing extensive food sources for avifauna. These woodland patches serve as a refuge for avifauna in the urban environment. The sites also have moderate to high potential values to develop into mature woodland given time and continued protection from disturbance. The northern and southern woodland scored 25 and 23 respectively (Table 5.4), which indicates a low to moderate conservation value. However, of the 5 habitats in the site, woodland scored the highest, implying its relative importance among the 5 habitats

types on site. For these reasons, permanent loss of the woodland will be ranked as a moderate impact.

5.5.7 Permanent loss of grassland and agriculture habitats are of minor ecological significance due to the limited size, commonness and fragmented nature of the habitats (Table 5.4).

5.5.8 Although the main stream habitat discussed in Section 5.4 is fairly natural (with few sections being culverted or channelled), its existing and potential ecological values are severely affected by the quarry operation, which is programmed to continue for the next 15 years. The polluted runoff from the quarry excludes aquatic fauna from the stream and thereby depresses the ecological value of the stream. Few aquatic fauna would be expected in the other streams at the site due to low flow and the highly disturbed or urbanised nature in the catchment areas. The potential ecological impacts due to permanent loss of the stream channels are therefore considered minor.

5.5.9 The direct impact to birds which use the site would be the permanent loss of breeding and foraging habitats. Although most of the species recorded were common and widespread, 3 are regionally uncommon species, and one of these is declining in local abundance. Impact to these species would be weighted more heavily, all else being equal. The size of the woodland and the amount of food source to be lost are fairly substantial. However, because these species are not habitat specific (not woodland dependent), and similar habitats, although with a smaller size, are still available to the north of the site, the impact to these species is considered to be moderate.

5.5.10 Impacts from noise, light and human disturbance caused by construction would be temporary, while the operation impacts from noise, light, human disturbance, and contamination of water courses would be long-term. Based on the limited signs of other fauna observed in the field and the urbanised nature of the surrounding habitat, which isolates the site from larger natural habitat areas, these impact to other fauna is considered minor.

Cumulative Impacts

5.5.11 No data were available regarding cumulative woodland loss due to various projects in the East Kowloon area, and therefore it was not possible to assess the cumulative impacts in the localised region. However, woodland loss caused by major on-going infrastructure projects in Hong Kong SAR is well documented in various EIA reports. Among these, Route 3 caused a loss of 8.7 ha of woodland (CES 1995a,b,c), while the KCRC West Rail (Phase 1) will cause a loss of 1 ha of woodland (ERM 1997). Although mitigation is being / will be provided for these other losses, the new plantations will take time to reach maturity and fulfil the ecological functions of the woodland lost. Loss of 16 ha of woodland, in spite of its young age and simple structure, is comparable to these major projects and therefore constitutes a moderate cumulative impact on woodland.

5.6 Proposed Mitigation Measures

5.6.1 Based on the Project Layout Plan of the Preferred Development (Figures 1.2 and 5.3), a total of approximately 13.4 ha of soft cut slopes at 30° would be formed on the periphery of the development. These cut slopes, when result in exposed area of soil (known as "cut soil slopes"), will be potentially available for woodland planting. A list of native trees and shrubs proposed for revegetation is provided in Table 5.7. Many of these species are found on the site, and many are berry-bearing plants which provide a food source for birds. Planting with native species will enhance the ecological value of the area. Some fast growing native trees, including *Liquidambar formosana, Casstanopsis fissa,* and *Schima superba* are currently used in reforestation projects and can be planted as nurse species. Others (e.g.

Rhodomyrtus tomentosa, Gordonia axillaris, Ternstroemia gymnanthera, Rhus spp., *Rhaphiolepis indica, Ficus* spp.) are pioneer species able to thrive in poor conditions. Loss of woodland can only be mitigated by planting native species, preferably with documented ecological utility (e.g. Corlett 1992). Native species should be used as possible in other landscape planting programmes on the site as well.

5.6.2 Seeds of the native species when possible should be added into the hydroseeding mix. Seedlings should be pit planted with placement of slow release fertilizer. Maintenance and service, including weeding, fertilizing, replacement of dead plants, etc. should be performed during the first 2 years of planting. Little maintenance is anticipated, however, in a long term.

Table 5.7 Native Tree and Shrub Species Recommended for Revegetation at Anderson Road Development

Species	Growth form	Species	Growth form
Acronychia pedunculata	tree	*Microcos paniculatus*	tree
Aporusa dioica	tree	*Ormosia emarginata*	tree
Bridelia tomentosa	tree	*Quercus edithae*	tree
Castanopsis fissa	tree	*Quercus myrsinaefolia*	tree
Celtis sinensis	tree	*Rhus chinensis*	tree
Cinnamomum camphora	tree	*Rhus succedanea*	tree
Cleistocalyx operculata	tree	*Sapium discolor*	tree
Cratoxylum cochinchinensis	tree	*Sapium sebiferum*	tree
Daphniphyllum calycinum	tree	*Schefflera octophylla*	tree
Evodia lepta	tree	*Schima superba*	tree
Ficus hispida	tree	*Sterculia lanceolata*	tree
Ficus microcarpa	tree	*Ternstroemia gymnanthera*	tree
Ficus superba	tree	*Ardisia crenata*	shrub
Ficus variegata	tree	*Ilex pubescens*	shrub
Gordonia axillaris	tree	*Ligustrum sinensis*	shrub
Itea chinensis	tree	*Litsea rotundifolia*	shrub
Liquidambar formosana	tree	*Melastoma candidum*	shrub
Litsea glutinosa	tree	*Melastoma sanguineum*	shrub
Macaranga tanarius	tree	*Psychotria rubra*	shrub
Machilus breviflora	tree	*Rhaphiolepis indica*	shrub
Machilus spp.	tree	*Rhodomyrtus tomentosa*	shrub
Mallotus paniculatus	tree	*Sarcandra glabra*	shrub

5.6.3 Landscape contractors should be consulted for provision of native plants, which are in relatively short supply and require a relatively long lead time to produce. The landscape contractor should also be responsible for the planting and maintenance of the plantation for at least 2 years to enhance the

survival rate of the plants. Detailed planting specification and the cost of revegetation should be estimated and included in the detailed design phase.

5.6.4 Maximum available area on soft cut slopes (about 13.4 ha) would be less than the total area of woodland loss (15 ha). However, due to the nature of the woodland to be lost, compensatory planting with a ratio less than 1:1 in this case is considered to be sufficient.

5.6.5 Should this mitigation measure be implemented, there will not be significant residual impacts from the project. In addition, no adverse secondary effects from the mitigation measures.

5.6.6 No other mitigation measures are considered necessary due to the minor nature of other impacts.

5.7 Reference

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6 WATER QUALITY AND DRAINAGE IMPACT

6.1 Legislation, Policies, Plans, Standards and Criteria

6.1.1 The Water Pollution Control Ordinance (WPCO)(Cap. 358) provides the statutory framework to set up Water Control Zones (WCZs) in which effluent discharges are regulated. The study area is located within the catchment area for Victoria Harbour (Phase I) WCZ, which was gazetted on 1 November 1994. A summary of the Water Quality Objectives for the Victoria Harbour WCZ is presented in Table 6.1.

6.1.2 The *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters* specifies effluent qualities that apply to different receiving water bodies under each WCZ. All discharges are subject to licencing control except domestic sewage discharged to public foul sewers and unpolluted water into stormwater drains, river courses and water bodies. Effluents discharged into the inland waters of the Victoria Harbour WCZ from the study area during both construction and operational phases of the development should meet the effluent standards specified in the TM as shown in Table 6.2.

6.1.3 Besides, Annex 6 of the *Technical Memorandum on Environmental Impact Assessment Process* specifies the assessment criteria for evaluating water pollution.

Table 6.1 Summary of Water Quality Objectives for the Victoria Harbour Water Control Zone

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Colour	Not to exceed 50 Hazen units, due to human activity	Inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E. coli	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Inland waters
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mgL^{-1} for 90% of samples	Marine waters
Depth averaged DO	Not less than 4.0 mgL^{-1} for 90% of samples	Marine waters
Dissolved Oxygen	Not less than 4.0 mgL^{-1}	Inland waters
pH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
	Not to exceed the range of 6.0 - 9.0 due to human activity	Inland waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Suspended solids	Not to raise the ambient level by 30% caused by human activity	Marine waters
	Annual median not to exceed 25 mgL^{-1} due to human activity	Inland waters
Ammonia	Annual mean not to exceed 0.021 mg L^{-1} as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth average inorganic nitrogen not to exceed 0.4 mgL^{-1}	Marine waters
BOD_5	Not to exceed 5 mgL^{-1}	Inland waters
Chemical Oxygen Demand	Not to exceed 30 mgL^{-1}	Inland waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phases One, Two and Three) Water Control Zone).

Table 6.2 Water Quality Standards for Effluent Discharged into the Inshore Waters of the Victoria Harbour Water Control Zone

Flow rate (m^3/day) / Determinant	≤ 10	> 10 and ≤ 200	> 200 and ≤ 400	> 400 and ≤ 600	> 600 and ≤ 800	> 800 and ≤ 1000	> 1000 and ≤ 1500	> 1500 and < 2000	> 2000 and ≤ 3000	> 3000 and ≤ 4000	> 4000 and ≤ 5000	> 5000 and ≤ 6000
pH (pH units)	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
Temperature (°C)	40	40	40	40	40	40	40	40	40	40	40	40
Colour (lovibond units) (25 mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	50	30	30	30	30	30	30	30	30	30	30	30
BOD	50	20	20	20	20	20	20	20	20	20	20	20
COD	100	80	80	80	80	80	80	80	80	80	80	80
Oil & Grease	30	20	20	20	20	20	20	20	20	20	20	20
Iron	15	10	10	7	5	4	2.7	2	1.3	1	0.8	0.6
Boron	5	4	3	2.7	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Barium	5	4	3	2.7	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.7	0.5	0.4	0.25	0.2	0.15	0.1	0.1	0.1
Total toxic metals	2	2	1.6	1.4	1	0.8	0.5	0.4	0.3	0.2	0.14	0.1
Cyanide	0.2	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.03	0.02	0.02	0.01
Phenols	0.5	0.5	0.5	0.3	0.25	0.2	0.13	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	100	100	100	100	80	80	50	50	50	50
Total phosphorus	10	10	10	10	10	10	8	8	5	5	5	5
Surfactants (total)	20	15	15	15	15	15	10	10	10	10	10	10
E. coli (count/ 100ml)	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000

(All units in mg/l unless otherwise stated; all figures are upper limits unless otherwise indicated)
Source: EPD Technical Memorandum on Effluents Standards, Table 9a.

6.2 Baseline Conditions

6.2.1 Hydrology of the existing landform is split by Anderson Road into two areas: the quarry area to the north (existing Anderson Road Quarry site) and the squatter areas/vegetated slopes to the south (the Development under this study). The majority of the runoff from the former site is collected within the basins formed on the lower platforms of the quarry. There is therefore limited discharge from the site. The runoff from the latter site drains to natural stream courses and are intercepted by the stormwater drains running along Po Lam Road, Sau Mau Ping Road and Shun On Road. There are

five main existing stormwater discharge points (1 to 5) collecting runoff from the existing catchment under this study as shown in Figure 6.1.

6.2.2 In accordance with the findings in the *Final Drainage Impact Assessment (DIA) Report*, certain parts of the existing drainage system would have inadequate flow capacity and experience flooding during a 1 in 200 year rainfall. Table 6.3 provides a summary of these locations. The node locations are presented in Figure 6.2.

Table 6.3 Existing Locations of Flooding and Inadequate Drainage Capacity for a 1 in 200 Year Rainfall

Discharge Point	Node		Flooding Manhole	Inadequate Capacity	Location
	From	To			
2 (Q_B)	Y1.080	Y1.090	Yes	Yes	Shun On Road
	Y1.100	Y1.110	No	Yes	Sau Mau Ping Road
	Y1.150	Y1.170	No	Yes	Hip Wo Street
	Y1.230	Y1.240	Yes	No	
	Y1.260	Y1.270	No	Yes	
	Y1.270	Y1.280	No	Yes	
	Y1.280	Y1.290	Yes	No	
	Y1.350	Y1.450	No	Yes	Tsui Ping Road
	Y1.470	Y1.471	Yes	No	
	Y1.471	Y1.481	Yes	Yes	
	Y1.482	Y1.483	No	Yes	Decked Nullah Section of Existing Footbridge
	Y1.484	Y1.485	No	Yes	
	Y1.490	Y1.510	No	Yes	
	Y1.511	Y1.512	No	Yes	
	Y1.513	Y1.514	No	Yes	
3 (Q_A)	A51.70	Y61.080	No	Yes	Sau Ming Road
	Y61.080	Y61.090	No	Yes	
	Y61.120	Y61.130	No	Yes	
4 & 5 (Q_D) Trunk Drain upstream of Y1.470	Y1D.200	Y1.210	Yes	No	Kai Lim Road

Source: Table 4.2 of the *Final DIA Report*.

6.2.3 In terms of water quality, no existing data for the runoff is available. A site visit revealed that surface runoff from the quarry site, including dust suppression water, flows through a stream within the study area. It was observed that the water from the stream was turbid.

6.2.4 There are no aquacultural areas in the vicinity of the proposed development site. Adverse impacts on aquaculture due to stormwater runoff from the proposed development site is therefore not anticipated.

6.2.5 The Jordan Valley, Ma Yau Tong West and Ma Yau Tong Central landfills located close to the development site. Nevertheless, all three landfills are located more than 250m away from the development site and at lower elevations. The Anderson Road development site is at least about 50m above the highest point of these landfills. Ground investigation carried out during this feasibility study indicates that the ground water level was approximately 2m above the rock head (top of rock) level. Any leachate arising from these landfills would not be expected to affect this development site. Furthermore, these landfills are subject to landfill restoration programmes, under which leachate is monitored. Where leachate poses a potential problem to their neighbouring areas, control measures are in place to limit its impacts. It is therefore concluded that leachate from these landfills is not considered to be an insurmountable environmental constraints to the Anderson Road development site.

6.3 Potential Impact

Construction Phase

6.3.1 The construction work will be land based, thus no direct impact on marine water in Victoria Harbour is anticipated. Potential water quality impacts would arise mainly from suspended solids contained in the runoff from exposed areas (especially steep and freshly cut slopes), together with oils and other chemicals resulting from spills in active works areas, particularly from fuel storage sites. Effluent from site facilities, such as toilets and canteens, could also be polluting if appropriate measures are not taken with respect to treatment and discharge.

6.3.2 If the potential for water quality impacts is adequately addressed, then actual residual impacts after adoption of standard mitigation measures should in general be low. In particular, with reference to EPD's ProPECC Note PN1/94 *Construction Site Drainage*, some major pollution problems associated with construction activities as listed below can be prevented or minimized:

- siltation in storm drains caused by excessive sand and silt in the storm runoff;
- visual nuisance and hazard to aquatic life caused by discharge of muddy water into streams or the sea; and
- pollution caused by improper handling and disposal of other types of construction site wastewater such as sewage from site toilets.

Operational Phase

6.3.3 On completion of the developments, the area will be covered by residential blocks and roads. This will cause an increase in flow, resulting from the increased impervious areas. In addition, the drainage system within the Development is required to cater for the flow from the Existing Anderson Road Quarry site by conveying it across the Proposed Development at Anderson Road to the down stream drainage system at Sau Mau Ping Road. As previously mentioned, the majority of the runoff from the site is currently collected within the basins formed on the lower platforms of the quarry. There is therefore limited discharge from the site. However, upon completion of the existing Anderson Road Quarry and with the removal of these basins, there will be a gradual increase in discharge from the quarry site. As a result, there will be a substantial increase in additional runoff from the Development. (Table 6.4)

Table 6.4 Proposed Peak Runoff at Discharge Points for a 1 in 200 Year Rainfall After Development (in m^3/s)

Discharge Point	Q_B	Q_C	Q_D
Node	Y1.110	A51.10	Y1B.050
Rehabilitated Quarry Site	4.5	-	19.7
Development at Anderson Road	15.9	3.2	10.8
Other Runoff (Shun Tin Estate, Sau Mau Ping Estate, Slope Toe below Northern Catchment of the Proposed Development at Anderson Road and Slope Toe below Southern Catchment of the Proposed Development of Anderson Road)	9.1	5.5	-
Total Flow	28.9	8.6	28.3
Existing Runoff at Discharge Points	18.8	5.1	20.8
Current Capacity at Discharge Points	21.1	*7.0	35.6

* Capacity will be increased to $25.8m^3/s$ by HD's new culvert
Source: Table 5.3 of the *Final DIA Report.*

6.3.4 Four discharge points (Q_A, Q_B, Q_C and Q_D) have been proposed as illustrated in Figure 6.3. As indicated in Table 6.4, flow increases of 54%, 69% and 36% can be expected at the proposed discharge points Q_B, Q_C and Q_D, respectively. At further downstream of discharge points Q_C and Q_D, there will be a general increase of 10% and 35% of runoff. In accordance with the findings of *Final DIA Report*, their respective downstream drainage will be capable of conveying these additional flows. However, for the downstream drainage system from discharge point Q_B, the increased runoff will induce extra drainage impacts in addition to those under-capacity drainage structure for a 1 in 200 year rainfall. Thus, the improvement of the existing drainage system has been proposed which is discussed below under the mitigation measures.

6.3.5 Changes of runoff quality are also expected. Currently, the site is covered by vegetation. Runoff is generally free of contaminants. After the development, the potential for contamination of the receiving waters arises mainly from surface runoff across the paved surfaces of the development including new roads and the open bus bays which are classified as non-point pollution sources. Such runoff, particularly in the first flush following a prolonged dry period, would contain several different contaminants resulting from fuel combustion, as well as eroded brake linings and tyre deposits and discarded refuse.

6.3.6 Contaminant levels in road and urban area runoff have been measured in several studies. The concentrations of certain pollutants are provided in Table 6.5, with the higher range of values reported from the "first-flush" event. Pollutants concentrations typically decline rapidly during a rainstorm event. These values should be treated cautiously, however, as they apply to European and American conditions and were also measured prior to the widespread introduction of unleaded fuel and exhaust emission controls. Equivalent figures for the Hong Kong situation are not available, but are likely to be of the same order because of the use of diesel and leaded fuels. Concentrations may, however, be lower on average because of the intense rainfall events experienced during the rainy season.

Table 6.5 Reported Pollutant Concentrations in Urban Stormwater

Parameter	Pollution concentration reported by:				
	Carleton (1990)[1]	Ellis (1989)[2]	Perry (1989)[3]	Marsalek (1990)[4]	NURP(1983)[5]
	urban runoff	highway runoff	urban runoff	urban runoff	urban runoff
BOD	47 mg/l	12-32 mg/l	---	---	15 mg/l
COD	132 mg/l	128-171 mg/l	36-575 mg/l	---	140 mg/l
Suspended Solids	141 mg/l	28-1178 mg/l	< 15-3600 mg/l	---	300 mg/l
Oil	---	---	6-23 mg/l	---	---
Lead	---	0.15-2.9 mg/l	0.1-8.0 mg/l	0.1460 mg/l	0.350 mg/l
Zinc	---	---	0.1-3.4 mg/l	0.4900 mg/l	0.500 mg/l
Copper	---	---	< 0.003-0.04mg/l	0.0015 mg/l	0.093 mg/l
Cadmium	---	---	0.007-0.03 mg/l	0.0030 mg/l	---
Chromium	---	---	0.002-0.08 mg/l	---	---
PAH	---	0.36-6.0 µg/l	---	6.9500 µg/l	---

1 Carleton, M.G., Comparison of overflows from separate and combined sewers - quantity and quality. *Water Sci Technol.*, 22 (10/11), 31-38, 1990.
2 Ellis, J.B., The management and control of urban runoff quality. *J.IWEM*, 3(2), 116-123, 1989.
3 Marsalek, J., Evaluation of pollutant loads from urban non-point sources. *Water Sci Technol.*, 22 (10/11), 23-30, 1990.
4 Perry, R., Concentration of pollutants in urban runoff, Pers.Comm.
5 Site median Event Mean Concentrations for 90% urban site obtained by US Nationwide Urban Runoff Project (NURP) Studies.

6.3.7 Most of the surface runoff from the development site will be carried by the surface water drainage system and discharged to the Victoria Harbour. Based on the site median Event Mean Concentrations (EMC) of 90% urban sites studied in the United States by the Nationwide Urban Runoff Project (NURP) as presented in Table 6.5 above and the estimated annual rainfall of 2,200mm, the annual pollutant loads of the surface runoff from impervious area (total area excluding the planted areas) of the northern and southern catchment areas are estimated and show in Table 6.6. The impervious areas of the northern and southern catchment areas are estimated to be 14ha and 12ha respectively.

Table 6.6 Estimated Pollutant Loads of Surface Runoff from the Development Site

Parameter	Site Median EMC (mg/l)	Pollutant Load Per Year (kg/yr)			Pollutant Load Per Day (kg/day)		
		Northern Catchment	Southern Catchment	Total	Northern Catchment	Southern Catchment	Total
BOD	15	4,620	3,960	8,580	12.7	10.8	23.5
COD	140	43,120	36,960	80,080	118	101	219
Suspended Solids	300	92,400	79,200	171,600	253	217	470
Lead	0.350	108	92	200	0.30	0.25	0.55
Zinc	0.500	154	132	286	0.42	0.36	0.78
Copper	0.093	29	25	54	0.08	0.07	0.15

6.3.8 Based on the assumption that 100% of the surface runoff from the development site would be carried by the surface water drainage system and discharged to the Victoria Harbour, the proposed development may result in an additional 23.5 kg of BOD per day discharged to the Victoria Harbour.

6.3.9 The estimated loading inventory presented in the EIA of the South East Kowloon Development Feasibility Study for the South East Kowloon Area for years 2006 and 2011 is shown in Table 6.7. It should be noted that subsequent to the reclamation of the South East Kowloon Development, the pollutant load indicated in the table will be discharged to the Victoria Harbour.

Table 6.7 Estimated Loading Inventory of Major Drainage Channels in South East Kowloon Area

Source	BOD Loading (kg/day)	
	Year 2006	Year 2011
Kai Tak Nullah	8,459	11,382*
Kowloon Bay Box Culvert	1,585	
Kwun Tong Nullah	1,306	1,539
Total	11,350	12,921

* Due to the reclamation of Kowloon Bay North, the flow of Kowloon Bay Box Culvert would be diverted and connected to the Kai Tak Nullah by 2006. The combined flow of Kai Tak Nullah and Kowloon Bay Box Culvert would ultimately discharge into open waters at a point on the reclamation site boundary.

6.3.10 As presented in Table 6.7, the total BOD loading from the three major channels is estimated to be about 11,350 kg/day and 12,921 kg/day for years 2006 and 2011 respectively. This indicates that the additional BOD load from the proposed development of 23.5 kg/day will only contribute to less than 0.21% and 0.18% for years 2006 and 2011 respectively. The surface runoff from the development site would thus not be a major contributor to the pollutant load of the Victoria Harbour. Nevertheless, water quality pollution due to non-point sources within the development site should be minimised by the implementation of the mitigation measures proposed in the following section to reduce the

cumulative water quality impacts on the Victoria Harbour.

6.4 Proposed Mitigation Measures

Construction Phase

6.4.1 All active working areas should be bunded to retain stormwater with sufficient retention time to ensure that suspended solids are not discharged from the site in concentrations above those specified in the TM for the Victoria Harbour (Phase I) WCZ. All fuel storage areas should be bunded with drainage directed to an oil interceptor.

6.4.2 Separate treatment facilities may be required for effluent from site offices, toilets (unless chemical toilets are used) and canteens.

6.4.3 Discharged wastewater from the construction sites to surface water and/or public drainage systems should be controlled through licensing. Discharges should follow fully the terms and conditions in the licences.

6.4.4 Practice for dealing with various type of construction discharges provided in EPD's ProPECC Note PN1/94 *Construction Site Drainage* should be adopted. Practices relevant to this project are reproduced in the following paragraphs.

Surface Runoff

6.4.5 Surface runoff from construction sites should be discharged into storm drains via separately designated sand / silt removal facilities such as sand traps, silt traps and sediment basins. Channels or earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Perimeter channels at site boundaries should be provided where necessary to intercept storm runoff from outside the site so that it will not wash across the site. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.

6.4.6 Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.

6.4.7 Construction works should be programmed to minimize soil excavation works in rainy seasons (April to September). If excavation in soil could not be avoided in these months or at any time of year rainstorms are likely, for the purpose of preventing soil erosion, temporarily exposed slope surfaces should be covered, for example, by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (for example, along the crest / edge of excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

6.4.8 Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.

6.4.9 Measures should be taken to minimize the ingress of rainwater into trenches. If excavation of trenches in wet seasons is necessary, they should be dug and backfilled in short sections. Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.

6.4.10 Open stockpiles of construction materials (for example, aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.

6.4.11 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm runoff from getting into foul sewers. Discharge of surface runoff into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.

6.4.12 Precautions listed below should be taken at any time of year when rainstorms are likely. Actions listed below should be taken when a rainstorm is imminent or forecast and actions to be taken during or after rainstorms.

- Precautions to be taken at any time of year when rainstorms are likely:
  - Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly.
  - Temporarily exposed slope surfaces should be covered, for example, by tarpaulin.
  - Temporary access roads should be protected by crushed stone or gravel.
  - Intercepting channels should be provided (fro example, along the crest / edge of excavation) to prevent storm runoff from washing exposed soil surfaces.
  - Trenches should be dug and backfilled in short sections. Measures should be taken to minimize the ingress of rainwater into trenches.
- Actions to be taken when a rainstorm is imminent or forecast
  - Silt removal facilities, channels and manholes should be checked to ensure that they can function properly.
  - Open stockpiles of construction materials (for example, aggregates, sand and fill materials) on site should be covered with tarpaulin or similar fabric
  - All temporary covers to slopes and stockpiles should be secured.
- Actions to be taken during or after rainstorms
  - Silt removal facilities, channels and manholes should be checked and maintained to ensure satisfactory working conditions. Attention should be given to safety when carrying out this work.

Groundwater

6.4.13 Groundwater pumped out of wells, etc. for foundation construction or other activities should be discharged into storm drains after the removal of silt in silt removal facilities.

Boring and Drilling Water

6.4.14 Water used in ground boring and drilling for site investigation or rock / soil anchoring should as far as practicable be recirculated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.

Wastewater from Concrete Batching and Precast Concrete Casting

6.4.15 Wastewater generated from the washing down of mixer trucks and drum mixers and similar equipment should wherever practicable be recycled. The discharge of wastewater should be kept to a minimum.

6.4.16 To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices.

6.4.17 Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal and pH adjustment facilities (to within the pH range of 6 to 10). Disposal of wastewater into storm drains will require more elaborate treatment. Surface runoff should be segregated from the concrete batching plant and casting yard area as much as possible, and diverted to the stormwater drainage system. Surface runoff contaminated by materials in a concrete batching plant or casting yard should be adequately treated before disposal into stormwater drains.

Wheel Washing Water

6.4.18 All vehicles and plant should be cleaned before they leave a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site runoff from entering public road drains.

Bentonite Slurries

6.4.19 Bentonite slurries used in diaphragm wall and bore-pile construction should be reconditioned and reused wherever practicable. If the disposal of a certain residual quantity cannot be avoided, the used slurry may be disposed of at the marine spoil grounds subject to obtaining a marine dumping licence from EPD on a case-by-case basis.

6.4.20 If the used bentonite slurry is intended to be disposed of through the public drainage system, it should be treated to the respective effluent standards applicable to foul sewers, storm drains or the receiving waters as set out in the TM on Effluent Standards.

Water for Testing and Sterilization of Water Retaining Structures and Water Pipes

6.4.21 Water used in water testing to check leakage of structures and pipes should be reused for other purposes as far as practicable. Surplus unpolluted water could be discharged into storm drains.

6.4.22 Sterilization is commonly accomplished by chlorination. Specific advice from EPD should be sought during the design stage of works with regard to the disposal of the sterilizing water. The sterilizing

water should be reused wherever practicable.

Wastewater from Building Construction

6.4.23 Before commencing any demolition works, all sewer and drainage connections should be sealed to prevent building debris, soil, sand, etc. from entering public sewers / drains.

6.4.24 Wastewater generated from building construction activities including concreting, plastering, internal decoration, cleaning of works and similar activities should not be discharged into the stormwater drainage system. If the wastewater is to be discharged into foul sewers, it should undergo the removal of settleable solids in a silt removal facility, and pH adjustment as necessary.

Wastewater from Site Facilities

6.4.25 Sewage from toilets, kitchens and similar facilities should be discharged into a foul sewer. If there is no foul sewer in the vicinity, a septic tank and soakaway system or for large flows, a sewage treatment plant will have to be provided. For sites where there are only toilet wastes arising, the use of chemical toilets may also be considered if a septic tank and soakaway system is found to be not feasible.

6.4.26 Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into foul sewers via grease traps capable of providing at least 20 minutes retention during peak flow.

6.4.27 Drainage serving an open oil filling point should be connected to storm drains via a petrol interceptor with peak storm bypass.

6.4.28 Vehicle and plant servicing areas, vehicle wash bays and lubrication bays should as far as possible be located within roofed areas. The drainage in these covered areas should be connected to foul sewers via a petrol interceptor. Oil leakage or spillage should be contained and cleaned up immediately. Waste oil should be collected and stored for recycling or disposal in accordance with the Waste Disposal Ordinance.

Operational Phase

6.4.29 Modification of the existing drainage system has been proposed to cope with an increased drainage flow. Two storage tanks for the Rehabilitated Quarry and one storage tank for the Development at Anderson Road (Figures 6.2 and 6.3) are described below to attenuate the peak runoff. Thus no downstream upgrading is required.

6.4.30 Rehabilitated Quarry site: A stormwater tank with indicative size of 75m x 55m x 3m deep for the northern catchment and another tank of indicative size of 110m x 60m x 3m deep for the southern catchment are proposed to attenuate the peak flow runoff from respective catchment. These two storage tanks will control the runoff crossing under Anderson Road and piped through the Development site to the downstream drainage.

6.4.31 Development site: An underground storage tank of 100 m x 45 m x 5 m deep is proposed. The tank will attenuate the peak discharge during the rising phase of the runoff hydrograph by locally storing excess runoff and later discharging it into the drainage system during the receding phase of the hydrograph.

6.4.32 It is estimated that with the installation of these tanks, the discharge flow rates at proposed discharge points will be controlled within the existing drainage capacities (Table 6.8).

Table 6.8 Proposed Peak Runoff at Discharge Points for a 1 Year Rainfall, including Stormwater Attenuation for Developments (in m^3/s)

Discharge Point	Q_A (merge with Q_B)	Q_B	Q_C	Q_D
Node	Y1.080	Y1.110	A51.10	Y1B.050
Rehabilitated Quarry Site	4.5	-	-	19.7
Development at Anderson Road	-	7.2	3.2	10.8
Total Peak Runoff (including areas in the vicinity)		19.4	**8.6	**28.3
Existing Runoff		18.8	5.1	20.8
Current Capacity		21.1	*7.0	35.6

* Capacity will be increased to 25.8 m^3/s by HD's new culvert, but is only 5.3 m^3/s further downstream of the BC.
** Total peak flow includes non-simultaneous peak flows from the two sites.
Source: Table 6.2 of the *Final DIA Report.*

6.4.33 In terms of the flooding problem, modelling results in the *Final DIA Report* indicated flooded manholes and inadequate capacity drainage pipes in some locations for 1 in 200 Year rainfall as summarised in Table 6.9. With the attenuated drainage system associated with the Development, the locations of drainage impacts are similar to the existing situation, which is indicated in Table 6.3.

Table 6.9 Locations of Flooding and Inadequate Drainage Capacity for a 1 in 200 Year Rainfall with Modification of Existing Drainage System

Discharge Point	Node		Flooding Manhole	Inadequate Capacity	Location
	From	To			
2(Q_B)	Y1.110	Y1.120	Yes	No	Sau Mau Ping Road
	Y1.140	Y1.150	Yes	No	Hip Wo Street
	Y1.150	Y1.170	No	Yes	
	Y1.230	Y1.240	Yes	No	
	Y1.260	Y1.290	No	Yes	Tsui Ping Road
	Y1.350	Y1.450	No	Yes	
	Y1.470	Y1.471	Yes	No	
	Y1.471	Y1.481	Yes	Yes	Decked Nullah Section of Existing Footbridge
	Y1.482	Y1.483	No	Yes	
	Y1.484	Y1.485	No	Yes	
	Y1.490	Y1.510	No	Yes	
	Y1.511	Y1.512	No	Yes	
	Y1.513	Y1.514	No	Yes	
3 (Q_C)	A51.70	Y61.080	No	Yes	Sau Ming Road
	Y61.080	Y61.100	No	Yes	
	Y61.120	Y61.130	No	Yes	
	Y61.160	Y61.170	No	Yes	
4 & 5 (Q_D)Trunk Drain upstream of Y1.470	Y1D.200	Y1.210	Yes	No	Kai Lim Road

Source: Table 6.1 of the *Final DIA Report.*

6.4.34 As presented in Section 6.3, the storm runoff from the development site would not be a major contributor to the pollutant load of the Victoria Harbour. Nevertheless, water quality pollution due to non-point sources within the development site should be minimised by the implementation of the mitigation measures discussed in the following paragraphs.

6.4.35 In this development site, up to about 50% of the site area including the slopes will be planted. This includes restoration of grassland, scrub and woodland on slopes around the development platforms and access road, screen planting along the access road and limited planting on shotcrete slopes. The planting areas will reduce the impact of surface runoff by reducing the impervious surface of the development site.

6.4.36 In order to further reduce the impacts of suspended solids from surface runoff on the receiving waters, sand traps designed to DSD and EPD's requirements are recommended for each land lot. The configuration and numbers of sand traps will be dependent on the individual site and drainage layouts.

For sites with areas up to approximately 1ha and pipe sizes less than 900mm diameter, sand traps based on the standard details described in EPD's ProPECC Note PN1/94 can be used. The typical sand trap size will be 3m wide x 4.5m long x 0.745m retained depth. The sizing allows a half hour retention time for a 2mm/hour rainfall. The sand traps can be located within the open space areas of the development where access for maintenance is available.

6.4.37 For site areas greater than 1ha, individual sand traps could be provided along the branch drainage which serves the smaller site areas. The number of typical sand traps required for each land lot are estimated and presented in Table 6.10 below. For example the residential development on Platform E, which has an area of approximately 3ha could be provided with 3 sand traps serving the individual drainage systems. Alternatively, the developers / users may prefer to design a special sand trap to serve the area as a whole.

Table 6.10 Estimated Number of Typical Sand Traps Required for Each Land Lot

Platform	Land Use	Approximate Area (m^2)	Approximate Number of Typical Sand Traps
A	R1	10,125	1
	E (School S1)	6,330	1
B	R1	41,080	4
C1	R1	10,170	1
C2	E (School S2)	8,000	1
	E (School S3)	7,000	1
	E (School S4)	4,500	1
C3	DO	15,170	2
D	HOS/PSPS	31,250	3
E	HOS/PSPS	32,250	3
	E (School S5)	6,250	1

Note: Refer to Figure 1.2 for the locations of the platforms.

6.4.38 To minimise the potential for contamination of the receiving waters from road surface runoff, drainage from road surfaces including open bus bays should be directed through oil interceptors. Such oil/water separators will also allow suspended sediment to settle and must therefore be of sufficient size to accommodate storm events. Maintenance of the interceptors, including periodic condition checks and emptying of oil and sludge, is essential to maintain an adequate retention time. Additional protection can be gained by the use of oil absorbent media to trap oil and grease on entry to, or exit from, the drainage system. Special precautions for the correct disposal of all intercepted material will be required.

6.4.39 It is considered that the combination of the above control measures will effectively reduce the water quality impacts on receiving waters due to the surface runoff. Significant increase in pollutant load of the Victoria Harbour due to non-point sources within the development site is therefore not expected.

6.4.40 No potential adverse environmental effects of recommended mitigation measures from construction

and operational phases would be expected as well as residual impacts from proposed mitigation measures.

7 SEWERAGE IMPACT

7.1 Legislation, Policies, Plans, Standards and Criteria

7.1.1 Legislation regarding domestic sewage discharge has been discussed in Section 6.1 of this report. Domestic sewage discharge to public sewers is exempt from licensing control.

7.2 Baseline Conditions

7.2.1 The Development site is located at the periphery of Sewerage Basin No.2 and will discharge sewage to the existing sewerage system which connects to downstream through Sewerage Basin No.3 to the Kwun Tong Sewage Treatment Plant (KTSTP) (Figure 7.1). KTSTP serves the flows from seven Sewerage Basins Nos.1 to 6 and 8. The existing capacity of the KTSTP is 10.93 m^3s^{-1}.

7.3 Sewerage Impact Assessment during Construction

7.3.1 A small amount of sewage arising from the construction sites is expected. There should not be significant impact on the sewerage of East Kowloon. It is recommended that chemical toilets or sewage holding tanks should be provided on site. Collected sewage should be retreated prior to being hauled off site for disposal and should be transported to a sewerage treatment facility. No significant environmental impact is expected.

7.4 Sewerage Impact Assessment during Operation

Estimated Additional Flow and Proposed Sewerage System

7.4.1 The proposed population growth for Development will generate additional sewage which will require discharge to government foul sewers for treatment at KTSTP. It is estimated that the Development will generate an additional peak flow of 0.568 m^3s^{-1}. With the additional sewage flow, new sewage collection will be required. It has been proposed that the new sewerage system within Development will consist of two northern systems and a southern system (Figure 7.2) as described in the following paragraphs.

7.4.2 One of the northern systems collects the sewage from the private and sandwich class housing lots together with 50% of existing Anderson Road Quarry sewage flow and discharges to the existing downstream sewerage system at Lee On Road.

7.4.3 The other northern system collects the sewage from the private housing lots which discharges to the existing downstream sewerage system at Sau Mau Ping Road at Po Lam Road.

7.4.4 The southern system collects the sewage from the public housing lots together with 50% of existing Anderson Road Quarry sewage flow and discharges to the existing sewerage system at Po Lam Road.

Impact to the Existing Sewerage System

7.4.5 The additional flow from Development will inevitably cause impact to existing sewerage system. In accordance with the *Final Sewerage Impact Assessment (SIA) Report*, surcharging and flooding conditions will occur in some sections of the sewerage system in year 2009 due to additional flows from local development areas. Those sections closer to the Development are listed in Table 7.1 and indicated in

Figures 7.3 and 7.4.

Table 7.1 Surcharged Main Sewer with Less Than 1m Freeboard for 4 Times the Dry Weather Flow (Year 2009)

Section*	Node Reference	Pipe Size (mm)	Location	Remark
5	290-040 to 290-060	375 Ø	Tsuen Kwan O Road	Surcharging sewer with less than 1m freeboard
6	200-330 to 200-360	1275 Ø to 1350 Ø	Tsui Ping Road Upstream	
7	200-375 to 200-410	1350 Ø	Tsui Ping Road Downstream	

* Seven sections are identified in the *Final SIA Report* with Sections 5 to 7 are closer to the Proposed Development at Anderson Road.

Source: Table 5.2 of the *Final SIA Report*

7.4.6 Upgrading works for Section 7 of Table 7.1 are required to mitigate sewer surcharging. The surcharging condition for this particular section of sewer is mainly caused by the increase in population from the Development and other committed developments /redevelopments within the sewerage basins. Upgrading downstream existing sewers is therefore required to mitigate the additional sewer discharge.

Impact on KTSTP

7.4.7 Similarly, the additional sewage flow from the Proposed Development at Anderson Road can potentially cause a constraint on the KTSTP. However, as mentioned earlier, KTSTP serves the flows from seven Sewerage Basins Nos.1 to 6 and 8. The existing capacity of the KTSTP is 10.93 m^3s^{-1}. KTSTP will be affected by the cumulative flows from the catchment areas. Table 7.2 shows the total sewage flow which connects to the KTSTP for 1997, 1999, 2006 and 2009.

Table 7.2 Summary of Sewage Loading at Kwun Tong Sewage Treatment Plant (2.5 Times the Dry Weather Flow)

Basin No.	1997 (m^3/s)	1999 (m^3/s)	2006 (m^3/s)	2009 (m^3/s)
1	1.85	1.85	1.85	1.85
2/3	3.19	3.44	4.32	4.61
4	1.20	1.20	1.20	1.20
5	1.53	1.53	1.53	1.53
6	1.60	1.60	1.60	1.60
8	1.00	1.00	1.00	1.00
Total Flow	10.37	10.62	11.50	11.79
Plant Capacity	10.93	10.93	10.93	10.93
Spare Capacity	0.56	0.31	*-0.57	*-0.86

* indicate the sewage treatment plant overloaded.
Source: Table 5.3 of the *Final SIA Report*

7.4.8 As indicated in Table 7.2, the KTSTP will be overloaded by 2006. The sewage treatment plant will have insufficient capacity to accommodate flows from the catchment areas. Upgrading of the KTSTP will be necessary regardless of the proposed Anderson Road Development. When the Development is fully completed in 2009, a slight increase in overloading to the sewage treatment plant is expected. The upgrading works to the KTSTP and the regional system will form part of a Sewerage Master Plan to be initiated by the Government.

7.5 Proposed Mitigation Measures

Proposed Sewer Connections

7.5.1 New sewers will be required to connect the development area to the existing sewerage system to accommodate the Development as indicated in Figure 7.2. A summary of the proposed sewer connections is presented in Table 7.3. The proposed connection points to the existing sewerage system are shown in Figure 7.2.

Table 7.3 Proposed Sewer Connections for Development

Connection Point	Location	Pipe Size Diameter (mm)	Model Node
3	Po Lam Road	600	610-035
4	Lee On Road	600	200-075
5	Sau Mau Ping Road	225	210-025
6	Hiu Kwong Street	600	220-035

Source: Table 6.1 of the *Final SIA Report*

Proposed Upgrading Work

7.5.2 As mentioned earlier, upgrading of downstream existing sewerage system will be required to mitigate the surcharging sewers due to the population growth in proposed Development at Anderson Road. Table 7.4 and Figure 7.5 illustrate the extent of the proposed upgrading of the existing sewerage system for year 2009.

Table 7.4 Proposed New Sewer and Upgrading Works (2009)

U/S Node	D/S Node	Existing Size (mm)	Proposed Size (mm)	Length (m)	Location	Notes
610-035	200-035	-	600 Ø	427	Po Lam Road /Sau Mau Ping Road	New sewer between Connection Points 3 & 6
200-423	200-426	3000W x 375H	4300W x 375H	9	Tsui Ping Road /Kwun Tong Road	Upgrading Works
			Total	436		

Source: Table 6.3 of the *Final SIA Report*

8 SOLID WASTE MANAGEMENT

8.1 Legislation, Policies, Plans, Standards and Criteria

8.1.1 The principal legislation controlling waste materials in Hong Kong is the Waste Disposal Ordinance [Cap.354] (WDO). Enacted in 1980, this ordinance generally encompasses all stages of the waste management chain, from place of arising to final disposal point.

8.1.2 There are a number of provisions under the WDO for dealing with certain types of waste. These include the Waste Disposal (Chemical Waste) (General) Regulation, which is relevant to this project. Enacted in 1992, this regulation controls all aspects of chemical waste disposal, including storage, collection, transport, treatment and final disposal.

8.1.3 Another existing ordinance pertaining to hazardous materials is the *Dangerous Goods Ordinance* [Cap.295] (DGO). This ordinance provides for the definition of dangerous goods by category and controls of their storage and transport.

8.1.4 Guidelines which provide additional information on compliance with regulations are:

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

8.1.5 Besides, Annex 7 of the *Technical Memorandum on Environmental Impact Assessment Process* specifies the assessment criteria for evaluating waste management implications.

8.2 Existing Conditions

8.2.1 Currently, the site is mostly covered by natural vegetation. In some places, there are a number workshops, concreted slopes, as well as abandoned and existing squatters.

8.3 Potential Impacts

Construction Phase

8.3.1 Construction activities will result in the generation of various types of wastes including:

- soft and rock spoil derived from site clearance and slope cutting for platform formation works;
- waste derived from construction materials and processes;
- general refuse from workforce; and
- plant and equipment maintenance.

Waste from Site Clearance and Excavation

8.3.2 During development of the site, construction activities would include site clearance and slope cutting to form platforms. These activities will generate soft and rock spoils. Volumes of cut and fill estimated by the geotechnical engineer are summarized in Table 8.1.

Table 8.1 Summary of Spoil Generation and Re-use On-Site

		Cut Volumes (1,000 m^3)			Fill Volumes (1,000 m^3)
		Soft	Rock	Total	
WSD Facilities	Southern Pumping Station	3	1	4	-
	Reservoir Access Road	7	-	-	1
Main Development Site		3,943	2,965	6,908	306
Northern Access Road		201	70	271	1
Quarry Access Road		5	-	5	-
Po Lam Road Widening		3	-	3	-
Southern Access Road		60	7	67	2
Total (in-situ)		**4,222**	**3,042**	**7,265**	**310**
Total (bulk)		**5,066**	**3,955**	**9,023**	**373**

Note: Bulking Factors are applied to in-situ volumes to determine realistic volumes which will actually be transported and either compacted as fill or disposed off-site.

8.3.3 As indicted in the table, a total bulk volume of 4.0 Mm^3 of rock spoil and 5.1 Mm^3 of soft spoil would be generated. Of the soft spoil, 0.4 Mm^3 will be re-used on site as fill material. Thus, in total about 8.7 Mm^3 of excavated spoil (4.0 Mm ^{3}of rock spoil and 4.7 Mm ^{3}of soft spoil) will be required to dispose off-site.

8.3.4 It is estimated that total excavation time will be three years between 2001 and 2004, soft cut with 2.8 years and rock-cut with 2.4 years. The former will start 7 months earlier than the latter. The daily generation rate of each kind of spoil is approximately 5,400m^3 (assuming 6 working days per week).

8.3.5 Two options of off-site material disposal were proposed by the Engineer and they are:

Option 1 Both soft and rock spoils would be transferred to the South East Kowloon Development site by trucks for reclamation.

Option 2 The soft soil would be transferred to the South East Kowloon Development site by trucks for reclamation while the rock spoil would be transferred to the Anderson Road Quarry site to the north of the site by conveyor belts or trucks for quarry products.

8.3.6 The impacts of the construction traffic of the two disposal options were assessed by the traffic engineer. In order to assess the amount of construction traffic, the following parameters have been assumed:

Truck available:	50 no. 15 m^3 trailer trucks
Working hours:	9 working hours per day
Average round trips/day:	12 trips/truck/day (average 45min./trip)
Construction period:	3 years

8.3.7 In Option 1, it is anticipated that on average 135 trucks/hour (including both the inbound and

outbound trips) would be generated / attracted. In order to take into account of the variations in trips generated at different times of the day and the peak excavation effect due to construction programme, a design factor of 1.5 would be used. The estimated total peak generation for both inbound and outbound direction during the peak excavation period would therefore be 200 trucks/hour.

8.3.8 Based on the assumptions obtained from the Choi Wan Road and Jordan Valley Development, it is noted that the excavation period for that development will overlap with that of the Anderson Road Development.

8.3.9 Although both development sites have proposed to transfer and dispose of the excavated material to the South East Kowloon Development site, it is noted that the construction traffic from Choi Wan Road and Jordan Valley Development would most likely take the route through Choi Ha Road, Jordan Valley North Road, Ngau Tau Kok Road and Kai Cheung Road whereas the construction traffic from the proposed Development at Anderson Road will take two routes to the South East Kowloon Development site via New Clear Water Bay Road for excavation of the northern part of the site, and via Kwun Tong Bypass for excavation of the southern part of the site. As the trucking activities from the Choi Wan Road and Jordan Valley Development and Anderson Road Development would take separate routes to the South East Kowloon Development filling site, the assessment for construction traffic is therefore based on the traffic generated by the Development only.

8.3.10 The key junctions that would most likely be affected by the construction traffic have been assessed. The performance of these junctions during the peak excavation period in year 2003 is tabulated in Table 8.2.

Table 8.2 Junction Capacity Analysis During Construction

Location	Peak Period	Capacity	
		Without Construction Traffic	With Construction Traffic (Option 1)
Sau Mau Ping Road / Po Lam Road	AM PM	38% 86%	34% 79%
Clear Water Bay Road / Anderson Road	AM PM	0.543 0.254	1.033 0.444
New Clear Water Bay Road / Lee On Road	AM PM	19% 96%	15% 85%

Note: For signalised junction (e.g Sau Mau Ping Road / Po Lam Road), the figures show the reserve capacity in percentage. For priority junction (e.g. Clear Water Bay Road/ Anderson Road), the figures show the ratio of flow to capacity for the critical approach.

8.3.11 From Table 8.2, it can be observed that in Option 1, the junction of Sau Mau Ping Road / Po Lam Road and New Clear Water Bay Road / Lee On Road would operate satisfactorily, whereas the junction of Clear Water Bay Road / Anderson Road would experience capacity problem. A temporary construction access road from Lee On Road to Platform B is therefore suggested to be provided prior to the excavation period. This would allow construction vehicles to carry excavated materials via New Clear Water Bay Road towards the South East Kowloon Development site, thus minimising the construction traffic demand at the existing junction of Clear Water Bay Road /

Anderson Road.

8.3.12 In Option 2, the rock spoil would be transferred to the Anderson Road Quarry site to the north of the development site by conveyor belts or trucks for quarry products. This would reduce the truck generation (inbound and outbound) by almost 45% and would limit the traffic disruption in the surrounding network.

8.3.13 Table 8.3 shows the capacity of the affected junctions with the implementation of the proposed traffic improvement scheme in the two disposal options.

Table 8.3 Junction Capacity Analysis During Construction (With Implementation of Proposed Traffic Improvement)

Location	Peak Period	Capacity	
		Option 1	Option 2
Sau Mau Ping Road / Po Lam Road	AM PM	34% 79%	35% 83%
Clear Water Bay Road / Anderson Road	AM PM	0.625 0.275	0.598 0.275
New Clear Water Bay Road / Lee On Road	AM PM	14% 81%	17% 89%

Note: For signalised junction (e.g Sau Mau Ping Road / Po Lam Road), the figures show the reserve capacity in percentage. For priority junction (e.g. Clear Water Bay Road/ Anderson Road), the figures show the ratio of flow to capacity for the critical approach.

8.3.14 It can be seem from Table 8.3 that, in both disposal options, all junctions would operate satisfactorily with the implementation of the proposed traffic improvement scheme. There would be ample capacity to cater for the construction traffic in both options. It is quite understandable that Option 2 would generate less construction traffic and would always be more preferable from a traffic point of view. It is anticipated that the impact of construction traffic to the adjacent road network, with the implementation of the proposed traffic improvement scheme, would not be significant. Option 1 and Option 2 are therefore considered feasible in construction traffic point of view.

8.3.15 The major environmental impacts associated with the construction traffic and the handling of excavated material would be dust and noise impacts. The assessment of dust and noise impacts from the activities within the construction sites are presented in Sections 2 and 3 of this report respectively. Dust and noise mitigation measures proposed during the construction phase of the project are also presented in Sections 2.7 and 3.7 of this report respectively.

8.3.16 It is anticipated the dust impacts associated with the construction traffic between the proposed Development at Anderson Road and the South East Kowloon Development site would be minimal with effective implementation of the mitigation measures proposed in Section 2.7 of this report for construction traffic. Mitigation measures proposed include tarpaulin covering of all dusty vehicle loads transported to and from the site and the establishment and use of vehicle wheel and body washing facilities at the exit points of the site, combined with cleaning of public roads where necessary.

8.3.17 Two routes are proposed for the construction traffic between the Development site and the South East Kowloon Development site. The northern route will via Lee On Road and New Clear Water Bay Road whereas the southern route will via Po Lam Road, Sau Mau Ping Road, Tseung Kwan O Road and Kwun Tong Bypass. Based on the parameters listed in Para.8.3.6 above, a total of 1200 trucks per day will be generated from the Development site during construction phase. Assuming even distribution between the northern and southern routes, 600 trucks per day will be using each of the routes. Comparing this construction traffic flow with the 1996 Annual Average Daily Traffic flow (Source: *Annual Traffic Census 1996*, Transport Department) of the above listed roads (Table 8.4), the percentage increase in flow on the roads is range from 3.9% to 0.6%. The associated increase in traffic noise impacts as a result of the construction traffic is therefore considered minimal.

Table 8.4 1996 Annual Average Daily Traffic (AADT) of Selected Roads

Road	1996 AADT	% Increase Due to Construction Traffic (As Compared with 1996 AADT)
Lee On Road	15,520	3.9%
New Clear Water Bay Road	44,320	1.4%
Po Lam Road	23,540	2.5%
Sau Mau Ping Road	26,680	2.2%
Tseung Kwan O Road	75,360	0.8%
Kwun Tong Bypass	102,010	0.6%

Waste from Construction Material and Process

8.3.18 Waste will arise from a number of different activities carried out by the contractor during construction and maintenance activities; these may include:

- wood from framework;
- bitumen; and
- cement and grout from on site concrete activities.

8.3.19 The generation rate of this waste depends on the contractors' material consumption rates, which are difficult to predict at this stage of the project. Nevertheless, waste management practices should be adopted to reduce waste generation. Waste generation may be avoided or minimized through refinement of the design and construction methods in the detailed design stage. Waste materials can be reused or recycled in other construction activities and better management practices can be adopted on site to reduce cross contamination and promote waste segregation during construction stage.

Workforce Waste

8.3.20 Throughout the period of construction, the workforce will generate general refuse, including food scraps, paper, and empty containers. The waste generation rate will be determined by the number of staff on site at one time, which is subject to the contractors' own arrangements. With reference to a public-collected waste load factor of 0.9 kg/day, stated in the *Waste Disposal Plan* (1989), and assuming that the workforce is present on site for one shift only, a load factor of 0.2 kg/day can be used for

predicting refuse generation.

8.3.21 In addition to this refuse, human waste will be generated on the construction sites by the workforce.

Maintenance Waste

8.3.22 Construction plant and equipment will require regular maintenance and servicing, which will require the use of chemical substances such as cleaning fluids, solvents, lubrication oil, and fuel. Thus chemical waste will be generated on site. It is anticipated that this waste will mainly arise at the worksyard, where equipment storage and maintenance facilities are located. The generation rate is difficult to predict and depend on the contractors' consumption requirements. Some of the chemical substances, such as fuel and lubrication oil, are dangerous goods. Thus proper material and waste storage and handling must be adopted at those major work sites.

Operational Phase

8.3.23 In the future, as a result of both private and public housing developments, the main waste type will be domestic waste. Its waste generation rates at any given time will depend on the population.

8.3.24 The estimated population would be 40,883 persons when the development reaches its peak capacity after 2009. Based on the population estimates together with waste generation rate, the predicted municipal solid waste daily generated in the development area would be 54 tonnes after 2009. Details of the calculations are presented below.

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1) Per capital waste generation rate at t year, $y_t = 0.0243t - 47.5$[1]
Where t = year

2) Assuming:
- *residential population by the end of 2009= 40,883*
- *t = 2009*

3) Therefore,
Future domestic waste arising = *population in 2009 x* y_t
= *40,883 x (0.0243 x 2009 - 47.5)*
= *approx 54 tpd*

8.3.25 Currently, the study area is within the catchment of Kowloon Bay Refuse Transfer Station (RTS), which is scheduled to decommission in 2005. However, a new South East Kowloon RTS has been proposed and is scheduled to be in operation by mid 2005. Thus, municipal solid waste generated from the site can be delivered and handled at the South East Kowloon RTS.

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[1] *Monitoring of Solid Waste Hong Kong, 1996.* Facilities Planning Group, Environmental Protection Department, 1997.

8.4 Proposed Mitigation Measures

Construction Phase

Waste Disposal

8.4.1 Generally, different types of wastes should be segregated, stored, transported and disposed of separately in accordance with the relevant legislative requirements and guidelines as proper practice of waste management.

8.4.2 It is important that the sorting of wastes should be done on-site. Different types of wastes should be segregated and stored in different stockpiles, containers or skips to enhance recycling of materials and proper disposal of wastes.

8.4.3 It will be the contractors' responsibility to dispose of excavated spoil and construction wastes. The contractors should make use of excavated spoil as much as possible to minimise off-site fill material requirements and disposal of spoil. During road transportation of excavated spoil, vehicles should be covered to avoid dust impact. Besides, the northern and southern temporary access roads should be paved to reduce dust impacts from truck movements. Wheel washing facilities should be installed at all site exits together with regular watering of the site access roads.

8.4.4 Chemical waste should be recycled on-site or removed by licenced companies. It should be handled according to the *Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes*. When off-site disposal is required, it should be collected and delivered by licenced contractors to Tsing Yi Chemical Waste Treatment Facility and disposed of in accordance with the Chemical Waste (General) Regulation.

8.4.5 The contractor should adopt the necessary mitigation measures to prevent the uncontrolled disposal of chemical and hazardous waste into air, soil, surface waters and ground waters.

Waste Storage

8.4.6 Chemical material storage areas should be bunded, constructed of impervious materials, and have the capacity to contain 120 percent of the total volume of the containers. The area should be enclosed on at least three sides by a wall, partition or fence with a height of not less than two metres or the total height of stacked containers, whichever is less. Leakage, spill or discharge can be contained more effectively in these specially prepared areas. Indoor storage areas must have sufficient ventilation to prevent the build-up of fumes, and must be capable of evacuating the space in the event of an accidental release. Outdoor storage areas must be covered with a canopy or contain provisions for the safe removal of rainwater. In both cases, storage areas must not be connected to the foul or stormwater sewer system.

8.4.7 Dangerous materials as defined under the DGO, including fuel, oil and lubricants, should be stored and properly labelled on site in accordance with the requirements in the DGO. If transportation of hazardous materials is necessary, the contractor should ensure that hazardous materials, chemical wastes and fuel are packed or stored in containers or vessels of suitable design and construction to prevent leakage, spillage or escape.

8.4.8 Human waste should be discharged into septic tanks provided by the contractors and be removed

regularly by a hygiene services company. Refuse containers such as open skips should be provided at every work site for use by the workforce. On-site refuse collection points must also be provided.

9 CONTAMINATED LAND

9.1 Introduction

9.1.1 Past and present activities or landuses may cause land contamination problems which may affect the potential of future development. The overall objectives of contaminated land study are i) to carry out a site assessment to determine whether the site is contaminated and assess the extent of any contamination, and ii) if necessary, to propose for remedial measures to restore the land to an acceptable condition for future developments.

9.2 Legislation, Policies, Plans, Standards and Criteria

9.2.1 Relevant to this assessment is the *Environmental Impact Assessment Ordinance Cap. 499* which covers the requirement for and approach to environmental impact assessment. The guidance for land contamination assessment is given in the *Section 3 Potential Contaminated Land Issues* of *Annex 19 Guidelines for Assessment of Impact on Sites of Cultural Heritage and Other Impacts* of the *Technical Memorandum on Environmental Impact Assessment Process*. The historical land uses of the site should be considered and reviewed for the potential to cause or to have caused land contamination. Once suspected land uses are found, a Contamination Assessment Plan (CAP) as a part of the EIA report is required for DEP endorsement before conducting a contamination assessment. Results will be compiled in a Contamination Assessment Report (CAR). If land contamination is confirmed, a Remediation Action Plan (RAP) is to be prepared. Any contaminated site should be cleaned up according to the approved RAP prior to any development or redevelopment.

9.2.2 The Practice Note for Professional Persons ProPECC PN3/94 *Contaminated Land Assessment and Remediation* issued by the Environmental Protection Department (EPD) provides the technical guidance on the preparation of CAP, CAR and RAP. It sets out the requirements for proper site assessment and management of contaminated sites, the guidelines on site assessments and outlines of the practical remedial measures. This Practical Note also makes reference to criteria used for soil and groundwater in the Netherlands for contaminated land "Dutch List".

9.3 Baseline Conditions

9.3.1 The development site is generally made up of hill slopes with vegetation cover. Scattered village housings and farmland are found at the valleys. The site is surrounded by residential developments at three sides and the Anderson Road Quarry located immediately northeast to the site. During a recent site visit on 24 October 1997, vehicles maintenance and repair activities were observed along the southwestern side of Anderson Road (the northeast boundary of the site). A few metal workshops and open storage sites were found in the valley in the eastern part of the site. Furthermore, there were also a few piles of wastes found (probably unauthorised dumping of used tires, drums and construction materials) within the site area. It would be required to assess the potential contamination caused by these activities and the surrounding land uses in more details.

9.4 Assessment Methodology

9.4.1 The assessment methodology is referenced to the Practice Note ProPECC PN3/94 *Contaminated Land Assessment and Remediation* issued by EPD. The approach of the assessment basically involves a site history review including an account of the past and present land uses. If any potential contamination is identified, further surveys and detailed investigations to characterise the

contaminated area will be formulated. The assessment will comprise the followings:

a) Environmental information survey

to compile existing and available information on previous land uses, pertinent regulations, government records and site specific data.

b) Review of previous land use

to review the known history of the site to identify potential contamination problems arising from past on-site activities. Historical land use maps and aerial photographs (when available) will be reviewed. Building owners, neighbours and government officials will be interviewed if possible for previous land uses.

c) Regulatory review

to identify applicable regulatory issues, both locally or nationally, and recognised environmental conditions relevant to the site.

d) Review of site physical data

to identify any additional potential site usage restrictions, and as a verification of physical environmental conditions, e.g. geology, hydrology, nearby wells and sensitive waters.

9.4.2 The potential contamination and associated impacts, risks or hazards will be identified based on the collected and reviewed information.

9.5 Site History

9.5.1 Site history review was based on the observations and analysis of available historical aerial photographs and survey map. Historical aerial photographs taken in 1956, 1967, 1977 and 1987 together with a survey map compiled in 1974 were collected and examined. They are shown in Figures 9.2 to 9.5 and Figure 9.1 respectively. The followings summarize the observations and findings:

Year	Observations
1956	Most of the site area was vegetated hills and slopes. The area to the southeastern part of the site was occupied by terraced fields where agricultural activities and squatter huts were found.
1967	The farming area to the southwestern area of the site had disappeared. Many squatter huts appeared over the site, mostly concentrated near the central area. Some workshop-type structures were found among the squatter huts. Quarrying along Anderson Road was noted.
1974	Not much difference from those of 1967. There were still some workshop type structures near the central area of the site.
1977	More squatter huts were found at the southern area of the site, bridging the central and southern areas of the site. A number of workshop-type structures remained among the squatter huts.

1987 Probably due to the construction of Po Lam Road, the squatter huts previously built at the southern area of the site were shifted near to the central area of the site. A number of squatter huts and factories/workshops were found at the northern area of the site.

9.5.2 Historically, the site was mostly comprised of vegetated hills and slopes. Scattered squatters and huts were found at valleys. After 1960's, workshop-type structures were found and they were probably workshop-scale factories at the central part and the southeastern part of the site. Although the nature of these structures were not known, the operations were probably small and of transient type. Moreover, there had not been any large scale industrial activities present in the site.

9.6 Site Inspection

9.6.1 In additional to the site visit on 24 October 1997, another visit was arranged on 8 January 1998 to collect more detailed information on existing site conditions. The visit has been carried out in a systematic way and specific features are marked with a location number as shown in Figure 9.6. The findings are summarized as in the following paragraphs.

9.6.2 The visit started from the northeastern boundary of the site down along the Anderson Road to Location 1 (Figure 9.6), there was a refuse collection point found at roadside and it was basically dumped with wooden wastes, construction wastes and other wastes (Figure 9.7).

9.6.3 Further down to Location 2 (Figure 9.6), it was found that quite a large number of used tyres were left over a vegetated slope (Figure 9.8). It was likely to be an illegal/or unauthorised disposal.

9.6.4 A truck repair and maintenance unit (Figure 9.9) was found at Location 3 (Figure 9.6) opposite to the entrance of K. Wah Concrete Co. Ltd's Anderson Road Batching Plant. The main activity was observed to be repair and maintenance of concrete mixing trucks that were owned by K. Wah Concrete Co. Ltd. A personnel working in that unit was interviewed. It was noted that engine oil changing, lubricating and painting services were provided in the unit. The surface was paved with concrete and some black colour stains were observed at the area where maintenance work was carried out. There was a designated area for storage of used oils and new products. All chemical wastes were claimed to be collected by a licensed collector.

9.6.5 At Location 4 (Figure 9.6), there was an access road which the entrance was now being occupied as a storage area of tyres. The storage area was operated by a man who repair tyres of trucks. The access road led to an abandoned factory/workshop site (Location 5)(Figure 9.10). There were some wastes dumped within the concrete-paved abandoned factory/workshop site including used tyres, water pipes, and used cylinders of gas for welding. Further down the access road, a squatter hut was found (Location 6). However, approach to the hut was impossible due to the presence of some guarding dogs. It could only be seen that there were some drums/buckets placed outside the hut.

9.6.6 Trucks were observed parking along western side of Anderson Road between Locations 3 and 4. Some used air filters, lubricant cans and oil drums were found along the roadside revealing that there might be some maintenance work and fuel refilling being done. Localised discolouration of surface soil presumably caused by lubricant or fuel oil was observed along the roadside.

9.6.7 Photos along Locations 7 to 11 are given in Figures 9.11 to 9.13.

9.6.8 There was a large open storage area found at Location 16. A photo (Figure 9.14) taken at Location 13

gives an overall view of the area. Part of the open storage area was operated by Wing Tai Pilonner Co. Ltd (Figure 9.15). Some plastics containers containing unknown liquid were found placed near the entrance of the area (Figure 9.16). There were also about 80 new small barrels (about 20 litres each) of styrene butadiene polymer (labelled as for building applications) placed on an open area. There are also found some dumped materials of wood, metals etc. (Figure 9.16). The security guard of the property was interviewed and revealed that the property had been there for over 10 years and the area was generally used as a temporary storage area for metal structures and other construction related materials.

9.6.9 Next to Wing Tai Pilonner Co. Ltd was another company called Man Hing Lung Steel and Concrete (translated from the Chinese name) (Location 17). Some used wine vats were dumped near the entrance area of the property. Within the property area of Man Hing Lung, there were some used plastic drums and chemical containers (Figure 9.17).

9.6.10 Figures 9.18 to 9.20 presents the existing site conditions along the southwestern side of the site. Most of the southwestern boundary of the subject site was steep slope on which landslip preventive measures were being undertaken. Visual signs of contamination were not found along nearby drainage channel and street corner.

9.7 Potential Impacts

9.7.1 Past and present study of the site condition reveals that there have not been any large scale activities inside the site. Over 75% of the site area was vegetated hills and slopes with little development and usage. Residents in form of small quarters and huts were found in valleys. There were a few workshop-scale factories and storage areas present inside the site. Generally, the land contamination issue should not be a major issue in the overall development plan. However, a few minor issues concerning localised small sites with potential contamination problem need to be addressed and they are listed below:

i) The truck maintenance and repair unit at Anderson Road (Location 3)
Owing to the nature of business and the involvement of chemical wastes, the unit is considered a potential contaminated site. Further quantitative assessment involving intrusive sampling and testing of soil and groundwater samples should be carried out prior to the development.

ii) The open storage area in the southeast (Locations 15, 16 & 17)

The area is now being operated by two construction-related companies as temporary storage of construction materials and some related chemicals. Materials are stored in open areas with bare soil surface. Accidental spillage or leakage may directly cause contamination of underneath soil. Quantitative contamination assessment is required to assess the area.

iii) Inactive or abandoned workshop sites in the central part (between Locations 4 and 21)

These sites are either previously or currently used for industrial purpose. Information regarding these sites is not available. It is suggested to carry out intrusive assessment to screen the potential contamination.

iv) Vehicle maintenance and repair activities along Anderson Road (between Locations 2 to 4)

It is observed during site visits that there were individual maintenance and repair activities for trucks along the roadside of Anderson Road. Maintenance wastes such as air filters, empty lubricant oil cans and other vehicle's parts were found along the road side. There was even some fuel refilling activities observed. The narrow strip of roadside and the immediate hill slope is identified to be contaminated by these wastes. These wastes and small amount of contaminated soil need to be handled with proper chemical waste handling procedures.

v) Unauthorised or illegal dumping of wastes inside the site

There are a few spots inside the site with presumably unauthorised/illegal dumping wastes such as used tyres, chemical cans and construction materials. These site will need to be cleared during site clearance. Special attention concerning health, safety and disposal of hazardous wastes is needed while handling these wastes.

9.8 Contamination Assessment Plan

Introduction

9.8.1 Further assessment of land contamination within the subject site is required for the potentially contaminated sites: the truck maintenance and repair unit, the open storage area and Inactive/abandoned workshop sites. This Contamination Assessment Plan (CAP) describes the approach and methodology outline for the contamination assessment.

9.8.2 In conducting the assessment, reference should be made to the *ProPECC PN 3/94 Contaminated Land Assessment and Remediation*, particularly the *Appendix II Guidelines on Sampling and Analysis.*
Concerned Areas Identified

9.8.3 The concerned areas with potential to cause or have caused land contamination identified in this EIA report are listed below and respective locations are graphically presented in Figure 9.6.

i) The truck maintenance and repair unit at Anderson Road (Location 3)
ii) The open storage area in the southeast (Locations 15, 16 & 17)
iii) Inactive or abandoned workshop sites in the central part (between Locations 4 and 21)
iv) Vehicle maintenance and repair activities along Anderson Road (between Locations 2 to 4)
v) Unauthorised or illegal dumping of wastes inside the site

Sampling and Analysis Plan

9.8.4 Table 9.2 presents the outline of the assessment plan. A site visit should be carried out in order to determine the exact locations of sampling prior to all site works. Sampling locations should be determined on site based on prevailing site conditions, signs of discolouration or spillage, "hot-spots" of contaminations and suspected wastes storage/handling sites.

Sampling Method

9.8.5 Samples can be taken using any combination of the following 3 methods:

i) Trial Pit

Trial pit is recommended for depths up to 3 metres. A light weight back-hoe excavator is suitable for pits up to 3 metres deep. Below this depth a heavy duty excavator will be necessary. The advantage of trial pits is that an investigator can look into the subsurface. Trial pits should not be entered if deeper than 1.2 m due to the risk of pit collapsing. The back-hoe operator should be asked to deposit soil formation from the required depth onto the surface so that sample can be taken without entering the trial pit.

ii) Borehole

Borehole may be used for sampling. It is beneficial when sampling from depths greater than 3 m and when disruption to a site is not allowed. However there may be uncertainties of the depth at which samples are taken and it is very difficult for an investigator to look into the subsurface.

iii) Surface Sampling

Surface samples may be taken using hand tools such as stainless steel scoops and hand cores.

9.8.6 As the development site is downhill from the northeast to southwest, it is anticipated that the water table along the northeast side of the site is relatively deep, borehole is more appropriate than the other two as a means of sampling for depths greater than 3 m.

9.8.7 In addition to taking samples for analysis, the strata log should be recorded. That means the general structure of soil formations at each depth interval down to the bottom of the trial pit/borehole are noted.

9.8.8 The depth at which samples are taken should be recorded with a description of the sample including colour and odour. The presence of foreign material such as metal, wood, and plastics should also be recorded. If trial pits are employed, photographic records should be taken.

9.8.9 It is important to ensure that any underground service is not damaged during the sampling exercise.

Sample Size and Handling Procedures

9.8.10 The laboratory responsible for chemical analysis should be consulted regarding the sample size and any storage specifications before sampling commences.

9.8.11 Soil samples should be taken using stainless steel hand tools which should be cleaned between taking samples. Samples of at least 1 kg should be taken. These should be stored in containers of at least 1 litre capacity. The containers should be sealable, water-tight and should not react with the sample. The containers should be marked with the sampling point code and the depth at which they were taken. If the contents are hazardous, this should be clearly marked on the container and precautions taken during transport to comply with the relevant legislation. Samples should be stored at temperature below 4°C.

9.8.12 Groundwater samples are taken from the boreholes using a bailer or pump. The handling procedures should be the same as those for soil samples.

Safety

9.8.13 Health and safety aspects are of primary importance at site investigation and during remedial action. As a precaution the site should be assumed to be contaminated. In the remediation action plan, information concerning safety aspects (e.g. anticipated events and measures) should be covered. The specific measures depend on the nature and content of contaminants, the local situation of the site and the regulations concerning safety.

Laboratory Analysis

Table 9.1 Key Parameters and Methods of Analysis for Soil Samples

Parameter	Abbreviation	Analytical Methods Code
Chromium Nickel Copper Zinc Cadmium Tin Lead Arsenic Selenium	Cr Ni Cu Zn Cd Sn Pb As Se	Sample preparation: Microwave Digest (USEPA 3051) for metals USEPA SW846, Method No. 6020; Analysis by ICPMS
Mercury	Hg	USEPA SW7471 Cold Vapor AAS
Volatile Organic Carbons	VOCs	Leaching procedure: TCLP-ZHE (USEPA 1311) Extraction: USEPA 5030A; Methanol Extraction, Purge-and-Trap Analysis: USEPA 8260A; GC/MS
Semi-volatile Organic Carbons	SVOCs	Leaching procedure: TCLP-ZHE (USEPA 1311) Extraction: USEPA 5030A; Methanol Extraction, Purge-and-Trap Analysis: USEPA 8270; GC/MS
Polynuclear Aromatic Hydrocarbons	PAHs	USEPA 8310 HPLC
Cyanide	CN	USEPA Reactivity
Polychlorinated biphenyls	PCBs	USEPA 8080 GC/ECD
Mineral Oil (Total Petroleum Hydrocarbons (TPH))	TPHs	USEPA 8015 (modified)/GCMS/FID

Note: Alternative internationally recognised methods can also be used.

Table 9.2 Outline of the Contamination Assessment Plan

Site/Area of Concern*	Nature	Sampling		Laboratory Analysis
		Location**	Method	
Truck maintenance and repair unit (at Location 3)	Vehicle maintenance and repairing	5 locations be chosen at 'hot spots' e.g. chemical wastes storage site, general working area, oil exchange area, points with discolouration or other signs of contamination.	Borehole drilling, soil to be sampled at depths 0.5m, 1.5m & 3.0m or immediately above groundwater level	TPH, BTEX, VOCs, SVOCs
Open Stage Area in the southeast of the Study Area (at Locations 15, 16 & 17)	Construction materials and metals storage	8 locations selected at 'hot spots' and points with discolouration or other signs of contamination.	5 borehole drillings, soil to be sampled at depths 0.5m, 1.5m & 3.0m or immediately above groundwater level 3 trial pits, soil to be sampled at depths 0.5 m & 1.5 m	Metals, VOCs, SVOCs, CN, PAHs, PCBs
Inactive or abandoned workshop (in between Locations 4 and 21)	Workshops (activities not clear)	8 locations selected over the area at 'hot spots' and points with discolouration or other signs of contamination.	8 borehole drillings, soil to be sampled at depths 0.5m, 1.5m & 3.0m or immediately above groundwater level	Metals, PCBs, VOCs, SVOCs, PAHs, CN
Vehicle maintenance and repair activities along Anderson Road (Anderson Road section from Locations 2 to 4)	Vehicle maintenance and repairing	5 locations along the roadside of Anderson Road with discolouration or other signs of contamination.	Surface soil sampling and sampling at 1 m by trial pit at 5 locations .	TPH, BTEX, VOCs, SVOCs
Unauthorised or illegal dumping of wastes inside the site (Location 2)	Waste dumping	3 locations inside the dumping ground.	Surface soil sampling and sampling at 1 m by trial pit at 5 locations.	Metals, PCBs, VOCs, SVOCs, PAHs, CN

Note: * please refer to Figure 9.6
** exact sampling location to be confirmed before sampling

Interpretation of Results

9.8.14 There are a number of international references including those from UK, US, Canada, the Netherlands and Australia on criteria for contaminated sites which can be used for interpretation of the assessment results. Since the Dutch Indicative Index is considered more comprehensive in terms of its coverage of parameters and is the most commonly used reference worldwide, it has been adopted as a general criteria for most of the cases in Hong Kong.

Timing for Contamination Assessment

9.8.15 Attention is drawn to the timing of the intrusive contamination assessment. Some of the sites may be still in operation and assessment at present may not truly reflect the site condition immediately before the construction of the development starts more than 3 years later. It is therefore recommended that a detailed contaminated land study including the preparation of a Contamination Assessment Report (CAR) and a Remediation Action Plan (RAP) should be carried out during the land resumption stage or the detailed design stage.

Contamination Assessment Report and Remediation Action Plan

9.8.16 A factual Contamination Assessment Report (CAR) shall be compiled based on the results of contamination assessment and submitted to the DEP for review and approval. Once contamination is found, a Remediation Action Plan (RAP) shall be prepared to formulate practical remedial measures that can be adopted for the clean-up of a contaminated site. The RAP and CAR shall be submitted as a combined report to the DEP for approval, referencing the corresponding CAP.

9.8.17 The preparation of CAR or CAR/RAP reports shall be based on the relevant published Practice Note for Professional Persons ro guidelines issued by the DEP.

10 LANDFILL GAS

10.1 Introduction

10.1.1 Landfill gas is a generic term used to describe the mixture of gaseous product generated as a result of the waste decomposition in landfills. It is both flammable and asphyxiating, and, as a consequence, it has the potential to cause fire, explosion or asphyxiation. In view of the very nature of landfill gas, it might pose potential hazards to developments adjacent to landfills.

10.1.2 In view of the fact that the proposed development site is located in the East Kowloon Area and there are a number of landfills located in the area, a review of the situation was undertaken in this study to determine the potential landfill gas hazard.

10.2 Legislation, Policies, Plans, Standards and Criteria

10.2.1 The Practice Note for Professional Persons ProPECC PN3/96 *Landfill Gas Hazard Assessment for Developments adjacent to Landfills* issued by the Environmental Protection Department (EPD) set out the conditions under which a landfill gas hazard assessment may be required; provides some general guidelines on how a proper hazard assessment should be conducted; and outline some typical protection measures that are commonly adopted for protection of developments adjacent to landfills.

10.2.2 As stated in the Note, a Consultation Zone around each of the landfills has been established. The Consultation Zone represents the area of land surrounding the landfill boundary as defined by a line running parallel to and 250m away from the edge of the waste if this can be identified or, if not, the recognized landfill site boundary. It is advisable that attentions should be given to the procedures, requirements and guideline set out in the Note if any development projects fall in whole or in part within the Consultation Zones, so that potential hazards associated with landfill gas for the proposed development can be minimized or avoided at an early stage.

10.3 Baseline Conditions

10.3.1 There are a number of landfills located in the East Kowloon Area and three are close to the proposed development site at Anderson Road. They are the Jordan Valley landfill, Ma Yau Tong (West) landfill and Ma Yau Tong (Central) landfill located to the west, south and southeast of the development site respectively. The proposed development site is located outside the Consultation Zones of these three landfills.

10.4 Potential Impacts

10.4.1 Three landfills at Jordan Valley, Ma Yau Tong West and Ma Yau Tong Central are located at 610m, 550m and 760m respectively away from the proposed development. As such, the development is located outside the Consultation Zones of the three landfills in accordance with the guidelines note issued by EPD (ProPECC Note 3/96 Landfill Gas Hazard Assessment for Developments Adjacent to Landfills). In addition, active gas extraction systems have been installed at Jordan Valley and Ma Yau Tong Central landfills to prevent or reduce off-site landfill gas migration and passive wells have been installed at Ma Yau Tong West Landfill because of limited landfill gas generation at the latter landfill. Regular gas monitoring is being carried out by EPD's restoration contractor at these landfills and no sign of significant landfill gas migration is detected according to the Monthly Environmental Monitoring Report submitted by the contractors.

10.4.2 Field mapping, site investigation and desk-top studies have been carried out to identify any potential preferential pathway which may cause landfill gas migration from these landfills to the site. The relevant geological map has been examined and indicates a potential fault line extending along the northern site boundary line, and crossing the site near its centre toward the southwest. As shown on Figure 10.1, the fault line is closest to Ma Yau Tong West Landfill (i.e. 120m from the landfill). Other landfills are at least 600m away from the fault line. However, the elevation of the proposed platforms on the site ranges from 140m to 200m PD, while the Ma Yau Tong West Landfill is located below 65mPD. A Site Investigation (SI) has been carried out, showing that the groundwater table is located at 154 mPD. In full consideration of the vertical separation of over 80m and horizontal separation of over 120m and the elevation of the groundwater table at the site, it is very unlikely that there would be a preferential pathway for migration of landfill gas from Ma Yau Tong West landfill to the proposed development.

10.4.3 The existing land use of the development site is Green Belt. Historically, the area was occupied by squatters, small car yards and small industrial use with no permanent infrastructure connecting to these premises.

10.4.4 On the other hand, no man-made preferential pathway can be established. An old stormwater drain from the site runs at least 50 m above the Ma Yau Tong Landfill (see Figure 6.3). The proposed stormwater system for this development would connect into the existing system at the Po Lam Road and Sau Mau Ming Road junction and therefore would have no direct link with the landfill.

10.4.5 The existing and proposed sewerage systems in the study area are shown in Figure 7.5. Similarly, they connect to two existing sewers:

(a) along Sau Mau Ping Road and Tseng Kwan O Road to the south of the Ma Yau Tong West Landfill.
(b) along Hoi Kwong Street to the north of the Ma Yau Tong West Landfill.

10.4.6 Based on the above, it is concluded that no landfill gas hazard can be identified and landfill gas hazard is not considered to be an insurmountable environmental constraint to the Anderson Road development site. Further site investigation is recommended for the detailed design stage to measure landfill gas around the perimeter of the site, to re-confirm that there is no preferential pathway for landfill gas migration and to assess the potential for landfill gas hazards on the future development. In the unlikely event that landfill gas hazard is identified, the proponent should be required to propose and implement mitigation measures to address the hazard issue.

11 DISCUSSIONS ON SCHEDULE 2 DESIGNATED PROJECTS

Introduction

11.0.1 In this study, a number of infrastructure improvement schemes have been proposed, some within the development and some outside the development. The following paragraphs discuss whether any of the proposed infrastructure improvement schemes is/are considered as Schedule 2 Designated Project(s) in accordance with the EIAO.

Discussions

Proposed Salt Water and Fresh Water Service Reservoirs

The Water Supplies Report WS-1 in this Feasibility Study recommended a salt water and a fresh water service reservoir to be constructed to provide the supply to this development as well as the nearby Choi Wan Road and Jordan Valley Development, which is currently undergoing a separate feasibility study commissioned by CED. The locations of the two proposed service reservoirs are shown in the Project Layout Plan (Figure 1.2).

Since the two service reservoirs are not located partly or wholly in an existing or gazetted conservation area, or other similar environmental sensitive area, they are ***not*** considered a ***Designated Project*** under Item Q.1 or Item E.1 in *Schedule 2* of the EIA Ordinance.

Proposed Internal Road and Access Roads of the Development

11.0.2 Representative from Transport Department confirmed at the Third Steering Group Meeting held on 3 July 1998 that the proposed internal road and access roads of the development site are classified as local distributors and are thus ***not Schedule 2 Designated Projects***.

Junction of Southern Access Road / Po Lam Road

11.0.3 The proposed widening of Po Lam Road, a District Distributor road, at this junction will inevitably alter part of the noise barriers to be installed at the boundary of Po Lam Road Platform Development. About 268m of the 365m long 7m high cantilevered noise barrier will be removed as a result of the proposed widening. The proposed improvement works at this junction is considered a major improvement to an existing District Distributor Road and is as a ***Schedule 2 Designated Project*** as it is expected to have adverse environmental impact on surrounding sensitive receivers by fulfilling the following noise criteria:

1. With the removal of part of the 7m high cantilevered noise barrier, it is predicted the noise levels at some of the NSRs in Po Lam Road Platform Development will exceed 70 dB(A) in year 2011 (see Table A6.8).
2. By comparing the predicted noise levels of year 2004 with the 7m high cantilevered noise barriers installed at the boundary of Po Lam Road Platform Development (Table A6.9), the predicted noise levels of year 2011 (Table A6.8) are greater than those predicted for year 2004 by more than 1 dB(A).
3. The noise contribution to the increase in the predicted overall noise level from the new road must be at least 1.0 dB(A).

Junction of Northern Access Road / Clear Water Bay Road

11.0.4 The proposed Northern Access Road will be connected to the Clear Water Bay Road at a new signal-controlled T-junction. There will be no widening or major improvement along the existing Clear Water Bay Road as part of this modification. Adverse environmental impacts from the Clear Water Bay Road due to the proposed modification is not expected. The proposed modification work at this junction is therefore considered ***not a Schedule 2 Designated Project***.

Other Junction Improvement

11.0.5 A number of junction improvement schemes as listed below have been proposed by the traffic engineer and presented in the *Final TIA Report*. The proposed improvement schemes will not be considered in this report if they required further investigation in the future.

- Scheme A1 New Clear Water Bay Road / Lee On Road (*Refer to Figure 11.5*)
- Scheme A2 Sau Mau Ping Road / Hip Wo Street (*Refer to Figure 11.6*)
- Scheme A5 Sau Mau Ping Road / Hiu Kwong Street (*Refer to Figure 11.7*)
- Scheme A6 Sau Mau Ping Road / Lin Tak Road (*Refer to Figure 11.8*)
- Scheme A8 Hip Wo Street / Hiu Kwong Street (*Refer to Figure 11.9*)

11.0.6 These proposed junction improvement schemed only involve construction of waiting pockets and do not require additional lane for the main carriageway. Adverse environmental impacts due to the improvement schemes are not anticipated. The proposed junction improvement schemes are therefore considered ***not Schedule 2 Designated Projects.***

Conclusions

11.0.7 As discussed above, only the proposed road improvement scheme at the junction of Southern Access Road / Po Lam Road is considered as a Schedule 2 Designated Project and would cause adverse environmental impacts to nearby sensitive receivers without proper mitigation measures. Apart from this, no other works arising from this project are considered as a designated project work accordance with Schedule 2 of EIAO.

11.0.8 The assessment of the environmental impacts and the recommended mitigation measures for the Schedule 2 Designated Project identified in this section, that is, junction improvement scheme at the junction of Southern Access Road / Po Lam Road are included in Section 12 of this report.

12 ENVIRONMENTAL REVIEW OF PROPOSED JUNCTION IMPROVEMENT AT THE JUNCTION OF SOUTHERN ACCESS ROAD / PO LAM ROAD

12.1 Introduction

12.1.1 As discussed in Section 11 of this report, the improvement works at the junction of Southern Access Road / Po Lam Road proposed in the *Final TIA Report* is considered as a Schedule 2 Designated Project. An environmental review of the proposed junction improvement works is presented in this section. It is anticipated that the major environmental issues related to the junction improvement are air and noise impacts during the construction and operational phases .

12.2 Air Quality

Construction Phase Dust Impact

12.2.1 Dust impacts will arise from various construction activities including haul road emission, open site erosion, excavation and filling activities. As the junction improvement works will involve only minor cut and fill operations and the buffer distance from nearby sensitive receivers are more than 50 m, adverse dust impacts at nearby sensitive receivers are not expected. It is expected that the dust impacts will mostly be short-term and confined to the close proximity of the construction activities. With the implementation of effective dust reduction measures as stipulated in the Air Pollution Control (Construction Dust) Regulation, dust impacts at nearby sensitive receivers should be reduced to an acceptable level.

Traffic Air Quality Impact

12.2.2 The junction improvement at South Access / Po Lam Road would result in an increase in traffic flows and hence an increase in traffic air quality impacts. A traffic air quality assessment was undertaken to predict the impacts at a number of representative locations in the Po Lam Road Platform Development and the results are given in Table 12.1.

Table 12.1 Predicted Worst Case 1-hour Average NO_2 Concentrations Based on 2011 AM Peak Hour Traffic Flows and 2011 Emission Factors

ASR No.	NO_2 ($\mu g/m^3$)
2079	88
2083	90
2086	91
2091	95
2095	92
2099	82
2101	112
2102	59

Note: Background NO_2 concentration of 50 $\mu g/m^3$ was included. This figure was adopted in EIA Study of South East Kowloon Development. The assessment points are at the locations of the noise sensitive receivers presented in Figure 3.3 of this report and are at 1st floor level for residential receivers, at ground floor for school receiver.

12.2.3 It is predicted that the worst-case 1-hour average NO_2 concentrations at the representative locations of sensitive receivers in Po Lam Road Platform Development would comply with the AQO. The predicted 1-hour average NO_2 concentrations at the receivers would be only 20-37% of the 1-hour average AQO for NO_2. Adverse traffic air quality impacts at sensitive receivers due to the junction improvement works would not be expected.

12.3 Noise

Construction Phase Noise Impact

12.3.1 Noise from construction activities will mostly be generated from the associated powered mechanical equipment. Between the hours of 7:00 to 19:00 hours on normal weekdays, the EIAO-TM sets a daytime noise limit of 75 dB(A) $L_{eq\ (30\ min)}$ at the facades of dwellings, and 70 dB(A) at the facades of schools (65 dB(A) during examinations) for the noise generated by construction activities (other than percussive piling). Outside the hours of 07:00 to 19:00, the Noise Control Ordinance applies, and contractors are required to obtain a Construction Noise Permit to carry on works involving powered mechanical equipment. Thus the construction phase impacts may results in works being limited to the day-time period only but this is not considered to be an insurmountable environmental constraint.

12.3.2 During the construction phase of the junction improvement, the noise sensitive receivers on Po Lam Road Platform Development facing Po Lam Road would probably be affected by the construction noise.

12.3.3 The predicted total sound power levels (SWLs) of roadworks are 117.3 and 118.0 dB(A) for roadway levelling and road paving respectively. The detailed calculations are given in Tables A4.6 and A4.7 in Appendix 4A. The SWL of bored piling work is given in Table 12.2 below.

Table 12.2 Powered Mechanical Equipment Required for Bored Piling

Item	TM Ref.	No. of Item	SWL/Item, dB(A)
Piling, large diameter bored, oscillator	CNP 165	1	115
		Total SWL	115

12.3.4 Two receiver points (2096 at the residential block and 2101 at the school, Figure 3.3) were selected for the construction noise assessment. The estimated horizontal distances from the construction noise source (the nearest point) to NSR Nos 2096 and 2101 are 64 m and 72 m respectively. So, the distance attenuations for NSR Nos 2096 and 2101 are estimated to be 44 and 45 dB(A) respectively.

12.3.5 The predicted noise levels at NSR No. 2096 during bored piling, roadway levelling and road paving works are 73.9, 76.2 and 76.9 dB(A) respectively. Non-compliance of daytime construction noise criteria at the residential receivers in Po Lam Road Platform Development is expected for roadway levelling and road paving. The predicted noise levels at NSR No. 2101 during bored piling, roadway levelling and road paving works are 72.9, 75.2 and 75.9 dB(A) respectively. Since the daytime construction noise criteria for school receiver is 70 dB(A), there would be non-compliance at the school receiver at Po Lam Road Platform Development during bored piling, roadway levelling and road paving.

12.3.6 Quieter powered mechanical equipments (PME) are recommended to use in order to alleviate the construction noise impacts to affected NSRs. Tables 12.3 & 12.4 list the quieter PME used in the assessment.

Table 12.3 Quieter PME Required for Roadway Levelling

PME	SWL dB(A)	% on time usage	Number of equipment	Total SWL dB(A)
Grader *	110.0	50	1	107.0
Bulldozer *	104.0	50	1	101.0
Dump truck *	110.0	50	1	107.0
Roller, vibratory	108.0	50	1	105.0
			Total	111.6

Note : * Information from BS 5228 : Part 1 : 1997, Table C9

Table 12.4 Quieter PME Required for Roadway Paving

PME	SWL dB(A)	% on time usage	Number of equipment	Total SWL dB(A)
Grader*	110.0	50	1	107.0
Bulldozer*	104.0	50	1	101.0
Asphalt paver	109.0	50	1	106.0
Dump truck*	110.0	50	1	107.0
Lorry*	108.0	50	1	105.0
			Total	**112.7**

Note : * Information from BS 5228 : Part 1 : 1997, Table C8 & C9

12.3.7 After the implementation of the quieter PME, the predicted noise levels at NSR No. 2096 during roadway levelling and road paving works are 70.5 and 71.6 dB(A) respectively. Non-compliance of daytime construction noise criteria is not expected. The mitigated noise levels at NSR No. 2101 during roadway levelling and road paving works are 69.5 and 70.6 dB(A) respectively. Noise exceedance is still predicted at bored piling and road paving works. However, according to the Final Environmental Assessment Report of " Proposed Public Housing Development at Po Lam Road, Sau Mau Ping, Kowloon", 6mm window pane and air conditioner would be provided for the primary school from 1/F to 5/F to alleviate traffic noise.

12.3.8 All practical mitigation measures should be implemented to reduce the noise impacts at nearby sensitive receivers though the residential receivers are complying with the noise standard. All plant and equipment used on the construction works should be routinely maintained in good working condition and effectively 'sound-reduced' by means of silencers, mufflers, acoustic linings or with the use of screens where feasible. It is important that the operation of noisy equipment near school receivers should be kept to minimum and should be avoided during examinations. The operation of noisy equipment for road levelling and road paving should be carried out during non-school hours. With the implementation of the above noise mitigation measures, the noise levels at the noise sensitive receivers should comply with the noise limit.

Operational Phase Noise Impact

12.3.9 The proposed widening of Po Lam Road at this junction will inevitably alter part of the noise barriers that will be installed at the boundary of the Po Lam Road Platform Development. About 268 m of 365 m long 7 m high cantilevered noise barrier wall will be removed as a result of the proposed widening. The traffic noise impacts at the NSRs in Po Lam Road Platform Development during and after widening of Po Lam Road are discussed in the following paragraphs.

12.3.10 Provisioning of a 7 m high cantilevered noise barrier wall (6 m vertical barrier with 1.4m cantilever length at 45 degree to the horizontal) (same configuration as those being removed), along the footpath of the widened Po Lam Road is proposed. The predicted residual traffic noise impacts at the Po Lam Road Platform Development after the implementation of the proposed mitigation measure are listed in Table 12.5. The detailed assessment results are tabulated in Table A6.7 of Appendix 6. The locations of the NSRs are presented in Figure 3.3 of this report.

Table 12.5 Predicted Traffic Noise Results at Po Lam Road Development after the Implementation of the Proposed Mitigation Measure

Total number of NSRs with residual impacts*	NSRs with residual impacts	Noise Level (dB(A))
4 flats 25 classrooms	No. 2091 (39/F - 40/F)** No. 2100 & 2101 (1/F - 5/F)	70.5 69.1 - 73.7

* Noise levels exceeded HKPSG traffic noise criteria of 70dB(A) for residential flats and 65dB(A) for classrooms.
** Each receiver point of residential NSRs represents 2 residential flats.

12.3.11 According to the final report of "Proposed Public Housing Development at Po Lam Road, Environmental Assessment Study Report" and confirmed with the architect of the Po Lam Road Platform Development, indirect noise mitigation measures will be provided for some of the residential flats and classrooms to reduce the traffic noise impacts. The noise sensitive receivers listed in the above table with residual impacts will all be provided with indirect noise mitigation measures as part of the Po Lam Road Platform Development. The indirect noise mitigation measures are the provision of 6 mm thick window pane for the affected residential flats and the provision of 6mm thick window pane and air-conditioning for the affected classrooms.

12.3.12 With the implementation of the proposed noise mitigation measure, traffic noise impacts at the Po Lam Road Platform Development due to the proposed improvement at Southern Access Road / Po Lam Road junction will be mitigated to meet the traffic noise criteria of EIAO-TM at most of the noise sensitive receivers. Noise sensitive receivers with residual traffic noise impacts from the widened Po Lam Road will be protected by indirect noise mitigation measures to be provided as part of the Po Lam Road Platform Development.

12.3.13 As part of the Po Lam Platform Development, the Housing Department will be erecting a 7m high noise barrier along the south side of Po Lam Road by 2001. In 2004 this project requires Po Lam Road to be widened over about 268m for the new junction with the Southern Access Road as discussed above. As this section of barrier will be relocated on a new bored pile retaining wall to be provided under this project as part of the road widening, it has been agreed with Housing Department and Highways Department that the section of barrier to be relocated on the retaining wall as proposed in this report together with the retaining wall will be maintained by Highways Department. During the detailed design of the retaining wall by CED and the barrier by Housing Department, approvals will be required from the following authorities:

- Highways Department Structures Division - to ensure adequate connection between the barrier and the wall;
- ACABAS - to ensure that the visual aspects of the barrier and the retaining wall are acceptable as a roadside structure; and
- Housing Department - to ensure that the visual aspects of the retaining wall are acceptable to the Po Lam Road Platform Development.

12.4 Visual

12.4.1 In view of the fact that the original 7m high noise barriers are part of the Po Lam Road Platform Housing Project and the proposed road widening work along Po Lam Road will not need to increase the height or alter the shape of the original 7m high barrier, it is advised by Planning Department that a visual impact assessment from the proposed provision of noise barrier onto the surrounding will not

be required.

13 ENVIRONMENTAL MONITORING AND AUDIT

13.0.1 The project is not situated in an area of high conservation value. It involves no unproven technology and mitigation measures, no uncertainty about design assumption and conclusion. However, the EIA study concluded that the construction project has the potential of causing environmental impacts which are likely to be prejudicial to the well being of people and ecosystem. Mitigation measures had been proposed to minimise the effect on the environment during the construction phase and after the completion of existing Po Lam Road widening.

13.0.2 In order to oversee the environmental performance of the project during construction phase, to evaluate the effectiveness of the mitigation measures, to identify potential adverse impacts and apply appropriate measures to ameliorate them and to verify the assumptions implicit to and accuracy of EIA study prediction, an Environmental Monitoring and Audit programme has been recommended to implement during construction phase and after the completion of widening Po Lam Road.

13.0.3 An EM&A Manual is produced as a separate document and submitted at about the same time as this Final Assessment Report. Details of the proposed environmental monitoring and audit requirements together with proposed schedules and programmes are included in the manual.

13.0.4 The EM&A programme mainly includes the aspects shown below.

- The mitigation measures required in the aspects of construction dust, construction noise, quarry noise, traffic noise, landscape and visual, ecology, water quality, construction waste and contaminated land.
- The project organization and programming of construction activities for the project.
- Air quality monitoring during baseline and construction phase.
- Construction noise level monitoring during baseline and construction phase.
- Traffic noise monitoring after the completion of widening Po Lam Road.
- Construction site environmental audit during construction phase.
- Recording and handling environmental complaints.

14 CONCLUSIONS AND RECOMMENDATIONS

14.0.1 Environmental impact assessments were undertaken for the proposed development in the site. In accordance with the environmental view, the site is suitable for the proposed development after the implementation of recommended mitigation measures. Detailed conclusions and recommendations for each kind of pollution are described as following paragraphs.

14.1 Air quality

Construction Phase

14.1.1 The major potential air quality impact during the construction phase of the project will result from dust arising from various construction activities including haul road emission, open site erosion, excavation and filling activities, drilling and blasting. Vehicle and plant exhaust emissions from the site are not considered to constitute a significant source of air pollutants. Blasting and crushing of rock may be allowed on the site.

14.1.2 Two construction cases were considered for dust impact assessment. The excavated soft-cut materials will be disposed at the South East Kowloon Development site by dump trucks in both cases, whereas the rock-cut materials will be transferred to Anderson Road Quarry for crushing in the first case, and crushed on-site and disposed at the South East Kowloon Development site in the second case. The predicted dust levels at nearby sensitive receivers are generally higher for the second case due to additional dust emissions from trucks travelling to and from the South East Kowloon Development site and from on-site crushing of rock-cut materials.

14.1.3 The modelling results showed that with the implementation of practicable mitigation measures, dust levels at sensitive receivers will comply with the 1-hour average total suspended particulates (TSP) guideline and 24-hour average Air Quality Objectives (AQO) in both construction cases. Recommended dust mitigation measures include good site practices, suitable drilling and blasting techniques, and effective dust suppression measures at crushing plant and material handling points.

Operational Phase

14.1.4 For the purpose of air quality impact assessment, the operational phase is divided into 2 stages. Stage 1 starts from the occupation of the development site (estimated to be 2008/09) to 2012 (the end of quarry operation). Stage 2 is from 2013 onwards. In Stage 1, air quality impacts due to both quarry operations and traffic emissions were considered in the assessment. In Stage 2 of the operational phase, Anderson Road Quarry is rehabilitated and only traffic emissions impact was assessed.

Quarry Dust

14.1.5 The major potential dust impacts from the on-going operation of Anderson Road Quarry will result from dust arising from various quarrying activities including haul road emissions, open site erosion, excavation and filling activities, as well as dust emissions from blasting and quarry plants.

14.1.6 The highest worst case 1-hour and 24-hour average TSP concentrations were predicted at the back of the quarry with the most intensive quarrying activities and haulage of excavated materials. High TSP concentrations were also predicted around the two plants located adjacent to the development site at the northern and southeastern sides of the development site.

14.1.7 The modelling results showed that exceedances of the 1-hour average TSP guideline level of 500μgm^{-3} would not be expected within the development site. Exceedances of the 24-hour average AQO for TSP of 260 μgm^{-3} would be expected within part of the development site in close proximity to the plants at the northern and southeastern sides of the development site. Nevertheless, a buffer distance is planned between the plants and the future sensitive receivers on the development site. The modelling results showed that exceedances of the 24-hour average AQO for TSP at the sensitive receivers would not be expected.

Traffic Emissions

14.1.8 Traffic emission impact on the development site is not considered significant in view of the density of road network in the area and the higher elevation of the development site. The modelling results showed that the predicted worst-case 1-hour average nitrogen dioxide concentrations at the future air quality sensitive receivers within the development site are all well below the 1-hour average AQO for nitrogen dioxide. It is predicted that the 1-hour average NO_2 concentrations at all the selected receivers at both 1.5m and 5.8m heights would be less than 50% of the 1-hour average NO_2 AQO.

14.2 Noise

Construction Phase

14.2.1 The construction phase noise impacts are likely to arise from construction traffic and the use of heavy plants during the formation of the platforms. Construction activities will include rock drilling and blasting, material transfer to trucks, transport within or off site for crushing and redistribution of material on the site. Following platform formation, there will be construction of the residential blocks and schools. Impacts from this phase are outside with the remit of this study.

14.2.2 It is predicted that the unmitigated noise levels would exceed the *Criteria for Evaluating Noise Impact of TM on Environmental Impact Assessment Process* when construction activities occur in close proximity to noise sensitive receivers or when a number of heavy construction activities taking place concurrently. Noise mitigation measures will be required for the construction works to comply with the noise criteria.

14.2.3 It is anticipated that the construction noise impacts would be highest during the site formation period of the development when rock drilling and rock breaking would be carried out for rock-cut excavation. Therefore proper noise mitigation measures including the use of quieter equipment and scheduling of works should be implemented to prevent adverse noise impacts at sensitive receivers. By applying the mitigation measures in areas close to NSRs, exceedance of the day-time noise criteria would not be expected at the NSRs.

14.2.4 An environmental monitoring and audit programme is essential to ensure that compliance of the noise criteria is maintained at sensitive receivers and to ensure the effective implementation of noise mitigation measures.

Operational Phase

14.2.5 Similar to air quality impact assessment, the operational phase is divided into 2 stages. In Stage 1, noise impacts due to both quarry operations and road traffic were considered in the assessment. In Stage 2 of the operational phase, Anderson Road Quarry is rehabilitated and only road traffic noise impact

was assessed.

Quarry Noise

14.2.6 For quarry noise (excluding plant noise from the quarry), the predicted noise levels at the selected receiver locations are all below daytime construction noise standard stipulated in *Annex 5 : Criteria for Evaluating Noise Impact of TM on Environmental Impact Process*. Adverse noise impacts at the development site from quarry operations other than plant noise from the quarry are therefore not expected.

14.2.7 During the course of this study, the noise impacts from the plants within the Anderson Road Quarry at the future noise sensitive receivers on the proposed Anderson Road Development area were examined with possible the rearrangement of the building elements on Platform E. In the original layout, it is predicted that some of NSRs closer to the plants will exceed the day-time noise limit of 65 dB(A) as stipulated in Annex 5 of the TM on EIA Process and marginal exceedance of the day-time ANLs under the Noise Control Ordinance are predicted at one residential block. Additional mitigation measures at the quarry to further reduce the noise level at the future noise sensitive receivers on the Development have been considered. Such measures would be in the form of very large enclosures for four items of plants which have been identified as the dominant noise sources. However, building these enclosures to building regulations for industrial safety would be extremely expensive under the existing quarry rehabilitation contract and not cost-effective for use only during the two years and ten months of the quarry operations to January 2012. In addition, the construction noise arising from construction works for these enclosures, in particular the foundation work which would involve rock breaking and drilling work, would affect the surrounding existing NSRs. Therefore, another mitigation option of refining Platform E of the development was considered. Several alternative layouts of Platform E have then been examined. Of these, the one that meets the minimum requirements for the width of school site as stated in Hong Kong Planning Standards and Guidelines (HKPSG) has been adopted.

14.2.8 It is predicted that all the residential flats in the preferred alternative layout will be exposed to noise levels not exceeding 70dB(A). Noise constraint is identified for the northern corner of Platform E with predicted plant noise level exceeding 70 dB(A) at the worst affected elevation of about 204mPD. It is recommended that noise sensitive uses should not be planned within the corner. In order to comply with the day-time NCO noise limit of 70 dB(A), noise sensitive uses, if any, planned within the corner should not exceed the elevation of 190mPD until quarry operation ceases in January 2012.

Traffic Noise

14.2.9 Traffic noise was predicted using the methodology provided in the UK, Department of Transport Calculation of Road Traffic Noise (CRTN), 1988, and is based on the traffic data for year 2011 (AM peak hour) provided by the traffic consultant and reviewed by the Transport Department and the Planning Department. Roads considered in the traffic noise model include Sau Mau Ping Road, Shun On Road, Lee On Road, Po Lam Road, the proposed main access roads to the development site and the local roads within the site.

14.2.10 With the given scenario, the modelling results showed that the compliance rate of the road traffic noise criteria would be 93% and 95% for the northern private housing site and the southern public housing site respectively. It is expected that the noise exposure could be reduced by proper detailed design of the development.

14.2.11 In order to reduce the road traffic noise impacts at the planned schools within the development site, 3 m high boundary walls are proposed. The location and extent of the proposed 3 m high boundary walls are shown in Figures 3.10 to 3.12 and 14.2 to 14.4.

14.2.12 It is recommended that those residential flats and school classrooms with residual noise impacts should be mitigated with indirect technical remedies such as window glazing with air conditioning.

14.3 Landscape and Visual

Landscape Impacts

14.3.1 The Project's impacts on landscape resources will be relatively low throughout its life. Impacts on vegetation will be moderate during construction, but with mitigation, residual impacts will be low/negligible. Impacts on the stream courses which cross the Site will be the most significant of impacts on landscape resources and residual impacts will be moderate.

14.3.2 The *Tai Sheung Tok Landscape Character Area (LCA)* is a fairly degraded urban fringe landscape, which has lost much of its sensitivity to further development. Impacts on the landscape character of Tai Sheung Tok will result largely from the scale of the development and impacts on this local landscape at all stages of the Project's life will be moderate/low.

14.3.3 The *Kowloon Coast LCA* is characterised to a large extent by the relationship between the intensely developed coastal plain and the relatively undeveloped, natural hillsides behind them. The Site lies at the edge of the urban area, on the ridge of hills which line the coast, and is therefore in a key location as regards this relationship between natural and the man-made landscape elements. The proposed Project is not characteristic of the topographical distribution of development in Kowloon nor the relationship between the texture and pattern of natural hillsides and that of the urban areas. Impacts on the character of the landscape will be limited by the scale of the change to the landscape, which is fairly small. However, impacts on the landscape character of Kowloon will be moderate at all stages in the life of the development.

14.3.4 Perhaps the key feature of the landscape of the *Hong Kong LCA* is the interaction, alluded to above, between low-lying urban areas, mountainous uplands, and the sea. It is the relative relationship of these three elements which in large part, determines the character of the sub-regional landscape. In particular, the proximate relationship between the low-lying and intensely developed urban areas and the natural hillsides behind them is typical of this wider landscape. These hills and ridges also serve to contain development in bays or pockets and prevent a coalescing of the urban fabric. This characteristic pattern is readily discernible by viewing any plan of the SAR. The proposed development, located on one of these coastal ridges, is not characteristic of the predominant pattern of development and will change, albeit to a small degree, this traditional set of landscape relationships. The Project is however, small in relation to the area of the SAR and this will limit its impacts. These impacts on the character of the wider sub-regional landscape will therefore be significant at all stages of the Project. However because of the scale of the wider Hong Kong landscape, impacts will be low.

14.3.5 In this regard, it should however be noted that if a number of Projects of this type were proposed, they would be liable to have a much more significant impact on the fabric and character of the Hong Kong landscape over the longer term.

Visual Impacts

14.3.6 The Site's prominent, elevated location at the mouth of Victoria Harbour means that its visual envelope is considerably larger than would be the case were it within the lower lying urban area.

14.3.7 A very large number of visual receivers will be affected daily by the Project (millions of people each day). However, effects of distance, poor visibility and mitigation measures will mean that for the vast majority of these receivers, visual impacts will be low or negligible. The Project will however, introduce a large number of new urban features into close and middle distance views of the landscape. These features will in a limited way, breach the ridgeline that forms a backdrop to the Harbour.

14.3.8 The most significant of these impacts will be upon a small number of residents of Sau Mau Ping and Shun Tin Estates, who will experience high residual visual impacts. In addition, a small number of residents in Tseung Kwan O and Tsui Lam will also experience high or moderate visual impacts throughout the life of the Project, as the new towers of the development will appear in views of the otherwise natural Tai Sheung Tok ridge.

14.3.9 A larger number of residents will experience moderate residual impacts in Quarry Bay, Wong Tai Sin, Sai Wan Ho, Hung Hom and Hang Hau. However, west of Wanchai and in the northwestern parts of the Kowloon Peninsula, residual impacts will be negligible or low.

14.3.10 Impacts on key views will result from the new urban features in these views and in particular, from the changing relationship between urban fabric and natural ridge line to the rear. High impacts will be evident during construction and the first 20 years of operation in views from Sau Mau Ping, Shun Tin, Lam Tin, and Tsui Lam. The only high residual impact will be on the key view from Tsui Lam.

Impacts on Special Interests and Designations

14.3.11 The design of the development maintains the strategic view corridor to the peak of Tai Sheung Tok and also specifically addresses its impact on the Tai Sheung Tok ridge. For these reasons, the Project substantially conforms to Metroplan policy on *Visually Prominent New Development Zone/Redevelopment Zones.*

14.3.12 Metroplan policy on *Citywide Landmark/Reference Points* suggests that buildings should be used to define and give identity to the peak of Tai Sheung Tok. In this regard, the development entirely conforms to Metroplan policy.

14.3.13 The Project does not accord with Metroplan policy on *Principal Ridgelines* in so far as at the northern and southern ends of the proposed development, where the ridge is much lower, it is breached by buildings (in views from east and west). However, it is evident that any practicable residential development on this Site will almost certainly not meet the requirements of Metroplan policy in this regard. It should also be noted that ongoing development next to the Site (named the 'Po Lam Road Platform') will also breach the ridgeline. A sensible and pragmatic approach to this issue is suggested in the Central and East Kowloon Development Statement, where it is proposed that development on this site should aim to achieve a harmonious composition with the ridge, rather than adhere strictly to a policy of maintaining a 20% clearance below the ridgeline itself.

14.3.14 Metroplan policy classifies the Site as *Degraded Landscape to be Reinstated.* Although it is difficult to understand in what sense the Site might really be considered "degraded" or should be "reinstated", the

proposals will certainly have the effect of obscuring the scar of Anderson Road Quarry and in this sense conforms to Metroplan policy. In addition, the layout of the development conforms almost exactly to the conceptual layout suggested in Metroplan.

14.3.15 Areas of natural hillside north and south of the development have been designated as *Conservation Area* under the Draft Tseng Lan Shue OZP. Designation of these areas is on the basis of their "significant landscape value". The development is likely to impact significantly on the landscape setting of these natural areas, by introducing large scale human features into the landscape.

Recommendations

14.3.16 Should the Project be taken forward to detailed design stage, further consideration should be given to the following:

- Colour and hue of rendering to tower blocks;
- Detailed planting design for slopes, streets and public open spaces;
- Appropriate colour additive to shotcrete on slopes to reduce glare and contrast;
- Careful integration into landscape of slope drainage features.

14.4 Ecology

14.4.1 Major habitats found within the proposed development site included woodland, grassland, agriculture, disturbed area and streams. The proposed development would cause a permanent and irreversible loss of all terrestrial and aquatic habitats within the site. These would include approximately 15 ha woodland, 14 ha grassland, 1 ha agriculture land, and 300 m stream course.

14.4.2 The woodland habitats found in the site are young, disturbed, fragmented, with a very open canopy, and of low or moderate diversity. Plant species recorded are common and widespread. However, the woodland sites consist of numerous tree and shrubs species providing extensive food sources for avifauna. These woodland patches serve as a refuge for avifauna in the urban environment. The sites also have moderate to high potential values to develop into mature woodland given time and continued protection from disturbance. Permanent loss of the woodland is considered to be of moderate impact.

14.4.3 In view of the limited size, commonness and fragmented nature of the grassland and agriculture habitats, permanent loss of the habitats are considered to be of minor ecological significance. The existing and potential ecological values of the main stream habitat are severely affected by the quarry operation, which is programmed to continue for the next 15 years. The potential ecological impacts due to permanent loss of the stream channels are considered minor

14.4.4 Permanent loss of the woodland habitat would constitute a moderate impact and will require mitigation. Revegetation using native tree and shrub species on soft cut slopes will mitigate the loss of woodland and impact to avifauna. Maximum available area on soft cut slopes (about 13.4 ha) would be less than the total area of woodland loss (15 ha). However, due to the nature of the woodland to be lost, compensatory planting with a ratio less than 1:1 in this case is considered to be sufficient. Should this mitigation measure be implemented, there will not be significant residual impacts from the project.

14.5 Water Quality and Drainage Impact

14.5.1 The construction work of the project will be land based, thus no direct impact on marine water in Victoria Harbour is anticipated. During construction phase, the major water quality impact will be related to runoff which could carry out high suspended solids. With the implementation of standard mitigation measures as recommended in EPD's ProPECC Note PN1/94 *Construction Site Drainage*, the actual residual impacts should in general be low.

14.5.2 During the operational phase, water quality in terms of quantity and quality will be affected due to the altered landuses. The major concern of water quality impact during operation is a substantial increase in surface runoff due to the increased impervious areas. Nevertheless, under the current design, about 50% of the development site area including the slopes will be planted with the remaining areas being effectively paved. Non-point source pollution will be controlled and maintained by the individual land users which include Housing Department, Education Department, Urban Services Department and private developers. Sand traps designed to DSD and EPD's requirements are recommended for each land lot . This will reduce the runoff impacts from the development to an acceptable level. Proposed modifications of the existing drainage system including the installation of drainage storage tanks are expected to maintain the existing drainage situation in the area.

14.6 Sewerage Impact

14.6.1 Sewage impact will occur during the construction and operational phase. During the construction phase, sewage will be generated from the workforce. However, this impact can be mitigated. During the operational phase, sewage will be generated from the proposed population. Thus, the installation of a new sewerage collection system will be required. The additional sewage flows will also impose constraints on the existing downstream sewerage system and the KTSTP. Thus, upgrading the existing sewerage system and the KTSTP will also be required to accommodate the population growth from the proposed Development at Anderson Road as well as other committed development in the sewerage catchment area.

14.7 Solid Waste

14.7.1 During the construction phase, various types of wastes will be generated including soft and rock spoil derived from site clearance and slope cutting, waste derived from construction materials and processes, general refuse from workforce, and waste generated from plant and equipment maintenance. It is anticipated that substantial construction waste, including soft and rock spoil as well as removed vegetation, will be generated due to site clearance and slope cutting activities. It was estimated that a total bulk volume of 4.0 Mm^3 of rock spoil and 5.1 Mm^3 of soft spoil would be generated. Of the soft spoil, 0.4 Mm^3 will be re-used on site as fill material. Thus, in total 8.7 Mm^3 of excavated spoil will require to be disposed of off-site. With the implementation of the proposed construction traffic improvement scheme, two options of off-site disposal are considered feasible. It is proposed that either both the surplus soft and rock spoils transferred to the South East Kowloon Development site for reclamation or the rock spoil transferred to the Anderson Road Quarry site for quarry products.

14.7.2 The study also identifies that approximately 57 tonnes per day of domestic waste would be generated from residents after the completion of the development. The waste should be delivered and handled at a refuse transfer station in the Kowloon area prior to its containerisation and disposed of at a landfill.

14.8 Contaminated Land

14.8.1 A review of site history and site condition concludes that land contamination should not be a major issue in the overall study. There have not been any large-scale industrial activities inside the site and over 75% of the site area is vegetated hills and slopes. There are only some localised small sites with suspected contamination requiring further quantitative intrusive contamination assessment.

14.9 Landfill Gas

14.9.1 As the proposed development site is outside the respective Consultation Zones of the Jordan Valley landfill as well as the Ma Yau Tong (West & Central) landfills, a Qualitative Risk Assessment is not required in accordance with the guidance note issued by EPD (ProPECC Note 3/96 Landfill Gas Hazard Assessment for Developments Adjacent to Landfills).

14.10 Implementation of Recommended Mitigation Measures

14.10.1 The schedule of implementation of the recommended mitigation measures for various environmental aspects are presented in Tables 14.1 to 14.9 for different environmental aspects.

Table 14.1 Summary of Proposed Construction Dust Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S2.7	S1, S2.8	*Site Practice* • Mean vehicle speed of haulage trucks at 10 $kmhr^{-1}$. • Twice daily watering of all open site areas. • Regular watering (once every 1.5 hours) of all site roads and access roads with frequent truck movement. • Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. • Establishment and use of vehicle wheel and body washing facilities at the exit points of the site, combined with cleaning of public roads where necessary. • Suitable side and tailboards on haulage vehicles. • Watering of temporary stockpiles. • Paved northern and southern temporary access roads. *Blasting* • Use of select aggregate and fines to stem the charge with drill holes and watering of blast face. • Use of vacuum extraction drilling methods. • Carefully sequenced blasting. • Blasting should not be carried out under unfavourable meteorological conditions with wind speed less than 2 ms^{-1}. *Crushing* • Fabric filters installed for the crushing plant. • Water sprays on the crusher.	All construction sites (late 2001 to late 2008)	CED	CED	N/A	✓	✓		TM on EIA Process, APCO, Air Pollution Control (Construction Dust) Regulation

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.1 Summary of Proposed Construction Dust Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (Duration/completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S2.7	S1, S2.8	*Loading and Unloading Points, and Conveyor Belt System* • Water sprays at all fixed loading and unloading points (at the crusher and conveyor belts). • The loading point at the crusher is enclosed with dust collection system installed. • When transferring materials from conveyor belt or crusher to the dump trucks, chutes or dust curtains are used for controlling dust. • Cover the conveyor belts with steel roof and canvas sides.	All construction sites (late 2001 to late 2008)	CED	CED	N/A	✓	✓		TM on EIA Process, APCO, Air Pollution Control (Construction Dust) Regulation

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D = Design, C = Construction, O = Operation

Table 14.2 Summary of Proposed Construction Noise Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3.7	S1, S3.7	Mitigation measures are included in the Action Plan as part of EM&A Manual .	All construction sites (During construction period)	CED	CED	N/A	✓	✓		TM on EIA Process,

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D = Design, C = Construction, O = Operation

Table 14.3 Summary of Proposed Quarry Noise Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3.7	S1	Noise sensitive uses including residential uses are not recommended within the shaded area shown in Figure 14.8. In order to comply with the NCO, noise sensitive uses, if any, planned within the shaded area should not exceed the elevation of 190mPD until quarry operation ceases in January 2012	Before occupation of Platform E (HOS/PSPS)	Developer	Developer	Lot owner	✓		✓	TM on EIA Process, NCO

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.4 Summary of Proposed Traffic Noise Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3.7	S1	Podium with a minimum effective height of 14m for all residential blocks within the Platform A	Before occupation of Platform A (R1)	Developer	Developer	Lot owner	✓	✓		TM on EIA Process
		School building orientation and 3m high boundary walls along the road to the south and west of School S1 (refer to Figure 14.2)	Before occupation of School S1	ED	Arch SD	Arch SD	✓	✓		
		Podium with a minimum effective height of 14m for all residential blocks within the Platform B	Before occupation of Platform B (R1)	Developer	Developer	Lot owner	✓	✓		

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.4 Summary of Proposed Traffic Noise Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3.7	S1	Podium of a minimum effective height of 12m for all residential blocks within the Platform C	Before occupation of Platform C1 (R1)	Developer	Developer	Lot owner	✓	✓		TM on EIA Process
		School S2 building orientation; window insulation and air conditioning for classrooms and other rooms for teaching purpose with residual impact	Before occupation of School S2	ED	Arch SD	Arch SD	✓	✓		
		School building orientation and 3m high boundary walls along the road to the south and west of Schools S3 and S4 (refer to Figure 14.3)	Before occupation of School S3 & S4	ED	Arch SD	Arch SD	✓	✓		

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D = Design, C = Construction, O = Operation

Table 14.4 Summary of Proposed Traffic Noise Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3/7	S1	The final development layouts should satisfy the site constraints (podium and blanked end facades) in Figures 14.7 and 14.8 or, depending on the layout finally adopted, provide measures of noise mitigation effect equivalent to those considered in this EIA report.	Before occupation of Platform D (HOS/PSPS)	Developer	Developer	Lot owner	✓	✓		TM on EIA Process
		The final development layouts should satisfy the site constraints (podium and blanked end facades) in Figures 14.7 and 14.8 or, depending on the layout finally adopted, provide measures of noise mitigation effect equivalent to those considered in this EIA report	Before occupation of Platform E (HOS/PSPS)	Developer	Developer	Lot owner	✓	✓		

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.4 Summary of Proposed Traffic Noise Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S3.7	S1	School building orientation and 3m high boundary wall along the roads to the south of School S5 (refer to Figure 14.4)	Before occupation of the corresponding residential block or School	ED	Arch SD	Arch SD	✓	✓		TM on EIA Process
		Window glazing *** with air-conditioning at the residential flats, school classrooms and other rooms for teaching purpose with residual traffic noise impacts		Developer	Developer	Arch SD for schools/ owner or tenant for residential premises	✓	✓		
S12	S1	7 m high cantilevered noise barrier along the widened section of Po Lam Road at the boundary of Po Lam Road Platform Development (refer to Figures 14.9 & 14.10)	Po Lam Road (During widening of Po Lam Road)	CED	CED	HyD	✓	✓		TM on EIA Process

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation
*** According to Table 2 in Annex 5 of TM on EIA Process

Table 14.5 Summary of Proposed Landscape and Visual Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S4.8	S1	*Design of Development* • Tower blocks are concentrated into two separate groups on either side of the peak of Tai Sheung Tok with the highest towers are at the centre of each group, and the lowest, at the edges, thus creating coherent forms echoing the shape of the ridge. • Location of towers in staggered rows such that views are available through the groups of towers to the ridge behind.	Whole development (completed by early 2009)	Developer	Developer	Lot Owner	✓	✓	✓	TM on EIA Process, Metroplan, HKPSG

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.5 Summary of Proposed Landscape and Visual Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S4.8	S1	*Additional Measures* • Planting and vegetation restoration (including transplanted trees) on soil slopes including restoration of grassland, scrub and woodland on slopes around the development platforms and access road. Restoration would be undertaken using predominantly native species.	Whole development (completed by early 2009)	CED+	CED+	+^	✓	✓	✓	TM on EIA Process, Metroplan, HKPSG
		• Screen planting along the access roads, to limit impacts of elevated structures and rock slopes.		CED+	CED+	+^	✓	✓	✓	
		• Colouring of shotcrete slopes.		CED	CED	HyD	✓	✓	✓	
		• Limited planting on shotcrete slopes.		CED	CED	^	✓	✓	✓	
		• Landscape buffers and planting in and around the development itself to screen partially close views of the site.		CED+	CED+	+^	✓	✓	✓	
		• Colour rendering of towers to minimise visual impacts.		Developer	Developer	Lot owner	✓	✓	✓	
		• Screen planting in front of retaining walls / granite cladding to those walls to reduce glare and visual impacts.		CED	CED	^	✓	✓	✓	
		• Careful design of road elevated structure and abutments, to limit visual impacts.		CED	CED	-	✓	✓		
		• Roadside landscape features/hardworks to limit visual impacts.		CED	CED	+^	✓	✓	✓	
		• Conservation of CDG or CDV recovered from the site for re-use in the landscape restoration		CED	CED	-	✓	✓		
		• Preservation (by transplanting if necessary) of any trees identified as being of particular landscape value.		CED	CED	-	✓	✓		

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.

** D=Design, C=Construction, O=Operation

\+ Where land may be leased, Funding Agent, Implementation Agent & Maintenance Agent to be Developer, Developer and Lot owner respectively.

^ Refer to WBTC No. 24/94 Tree Preservation (also known as PELB TC No. 3/94) and WBTC No. 18/94 Management and Maintenance of both Natural Vegetation and Landscape Works.

Table 14.6 Summary of Proposed Ecology Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S5.6	S1	• Woodland planting on soft cut slopes available (about 13.4 ha) within the development site. Native species, preferably with documented ecological utility, should be used. • Seeds of the native species when possible should be added into the hydroseeding mix. Seedlings should be pit planted with placement of slow release fertilizer. • Maintenance and service, including weeding, fertilizing, replacement of dead plants, etc. should be performed during the first 2 years of planting to enhance the survival rate of the plants. • Detailed planting specification and the cost of revegetation should be estimated and included in the detailed design phase.	Soft cut slopes (development completed by early 2009)	CED+	CED+	+^	✓	✓	✓	TM on EIA Process, HKPSG

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation
\+ Where land may be leased, Funding Agent, Implementation Agent and Maintenance Agent are Developer, Developer and Lot Owner, respectively.
^ Refer to WBTC No. 24/94 Tree Preservation (also known as PELB TC No. 3/94) and WBTC No. 18/94 Management and Maintenance of both Natural Vegetation and Landscape Works.

Table 14.7 Summary of Proposed Water Quality Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S6.4	S1	*Construction Phase* • All active working areas should be bunded to retain stormwater with sufficient retention time to ensure that suspended solids are not discharged from the site in concentrations above those specified in the TM for the Victoria Harbour (Phase I) WCZ. All fuel storage areas should be bunded with drainage directed to an oil interceptor. • Separate treatment facilities may be required for effluent from site offices, toilets (unless chemical toilets are used) and canteens. • Discharged wastewater from the construction sites to surface water and/or public drainage systems should be controlled through licensing. Discharges should follow fully the terms and conditions in the licences. • Relevant practice for dealing with various type of construction discharges provided in EPD's ProPECC Note PN 1/94 should be adopted.	All construction sites (late 2001 to late 2008)	CED	CED	N/A	✓	✓		TM on EIA Process, WPCO, ProPECC Note PN1/94

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.7 Summary of Proposed Water Quality Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S6.4	S1	*Operational Phase* • Sand traps designed to DSD and EPD's requirements to be provided for each land lot. One typical sand trap of size 3m wide x 4.5m long x 0.745m retained depth to be provided for each 1 ha site area.	Whole development site (late 2008)	Developer	Developer	Lot owner	✓		✓	TM on EIA Process, WPCO
		• Drainage from road surfaces including bus bays should be directed through oil interceptors.	All roads included in this project (late 2008)	CED	CED	DSD	✓		✓	

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.8 Summary of Proposed Construction Waste Mitigation Measures for Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S8.4	S1, S4	*Waste Disposal* • Different types of wastes should be segregated, stored, transported and disposed of separately in accordance with the relevant legislative requirements and guidelines as proper practice of waste management. • Sorting of wastes should be done on-site. Different types of wastes should be segregated and stored in different stockpiles, containers or skips to enhance recycling of materials and proper disposal of wastes. • Excavated spoil should be used as much as possible to minimise off-site fill material requirements and disposal of spoil. • During road transportation of excavated spoil, vehicles should be covered to avoid dust impact. Besides, the northern and southern temporary access roads should be paved to reduce dust impacts from truck movements. Wheel washing facilities should be installed at all site exits together with regular watering of the site access roads. • Chemical waste should be recycled on-site or removed by licenced companies. It should be handled according to the *Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes*. When off-site disposal is required, it should be collected and delivered by licenced contractors to Tsing Yi Chemical Waste Treatment Facility and disposed of in accordance with the Chemical Waste (General) Regulation. • Necessary mitigation measures should be adopted to prevent the uncontrolled disposal of chemical and hazardous waste into air, soil, surface waters and ground waters.	All construction sites (late 2001 to late 2008)	CED	CED	N/A	✓	✓		TM on EIA Process, WDO, DGO, Waste Disposal (Chemical Waste) (General) Regulation

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

Table 14.8 Summary of Proposed Construction Waste Mitigation Measures for Development at Anderson Road (con't)

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S8.4	S1, S4	*Waste Storage* • Chemical material storage areas should be bunded, constructed of impervious materials, and have the capacity to contain 120 percent of the total volume of the containers. Indoor storage areas must have sufficient ventilation to prevent the build-up of fumes, and must be capable of evacuating the space in the event of an accidental release. Outdoor storage areas must be covered with a canopy or contain provisions for the safe removal of rainwater. In both cases, storage areas must not be connected to the foul or stormwater sewer system. • Dangerous materials as defined under the DGO, including fuel, oil and lubricants, should be stored and properly labelled on site in accordance with the requirements in the DGO. If transportation of hazardous materials is necessary, hazardous materials, chemical wastes and fuel should be packed or stored in containers or vessels of suitable design and construction to prevent leakage, spillage or escape. • Human waste should be discharged into septic tanks provided by the contractors and be removed regularly by a hygiene services company. Refuse containers such as open skips should be provided at every work site for use by the workforce. On-site refuse collection points must also be provided.	All construction sites (late 2001 to late 2008)	CED	CED	N/A	✓	✓		TM on EIA Process, WDO, DGO, Waste Disposal (Chemical Waste) (General) Regulation

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
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Table 14.9 Summary of Proposed Contaminated Land Mitigation Measures for Development at Anderson Road

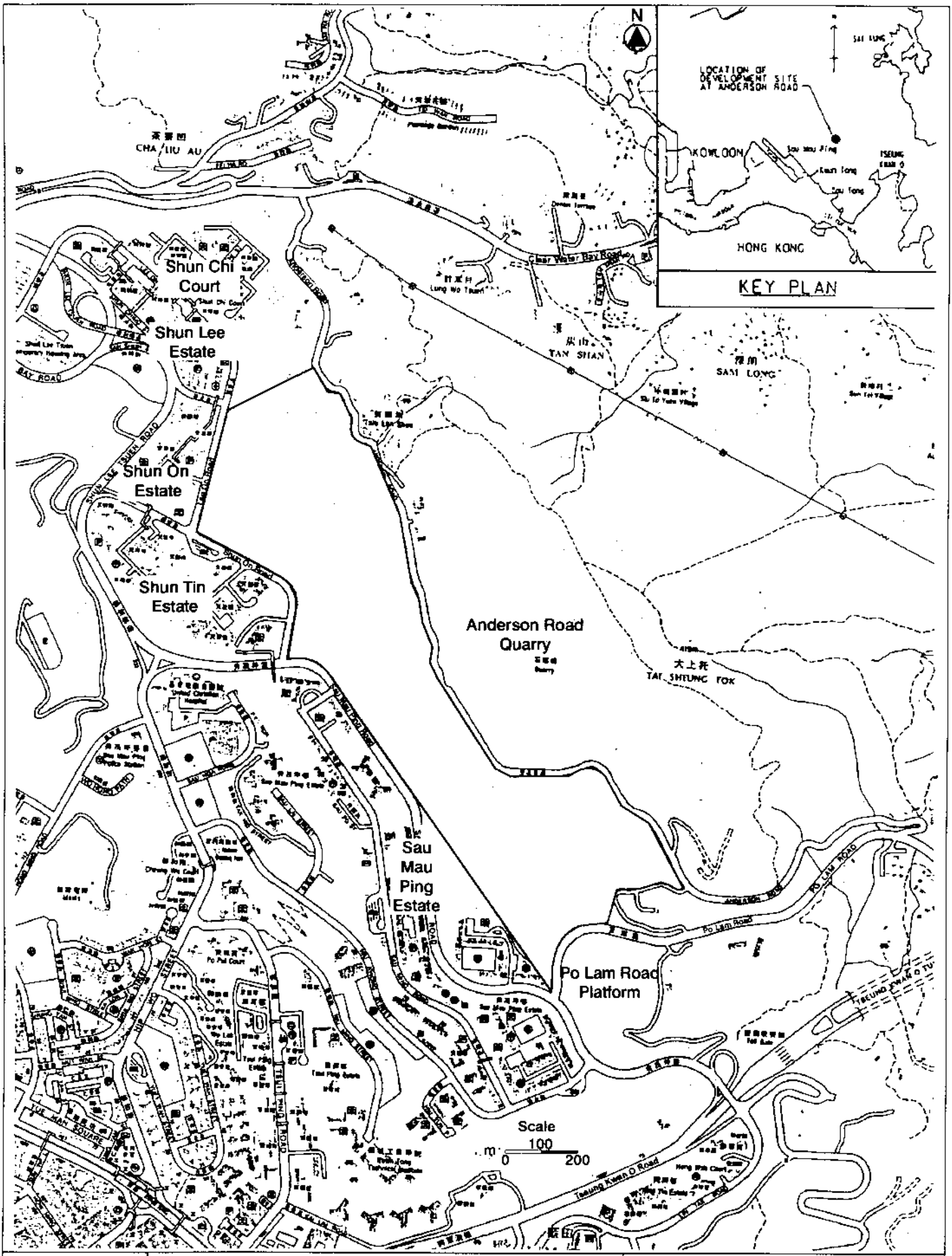
EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S9.8	S1	A detailed contaminated land study including the preparation of a Contamination Assessment Report (CAR) and/or a Remediation Action Plan (RAP) should be carried out during the land resumption stage or the detailed design stage.	Locations identified in Table 9.2 (1999-2000)	CED	CED	N/A	✓	✓		TM on EIA Process, ProPECC Note PN3/94

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation

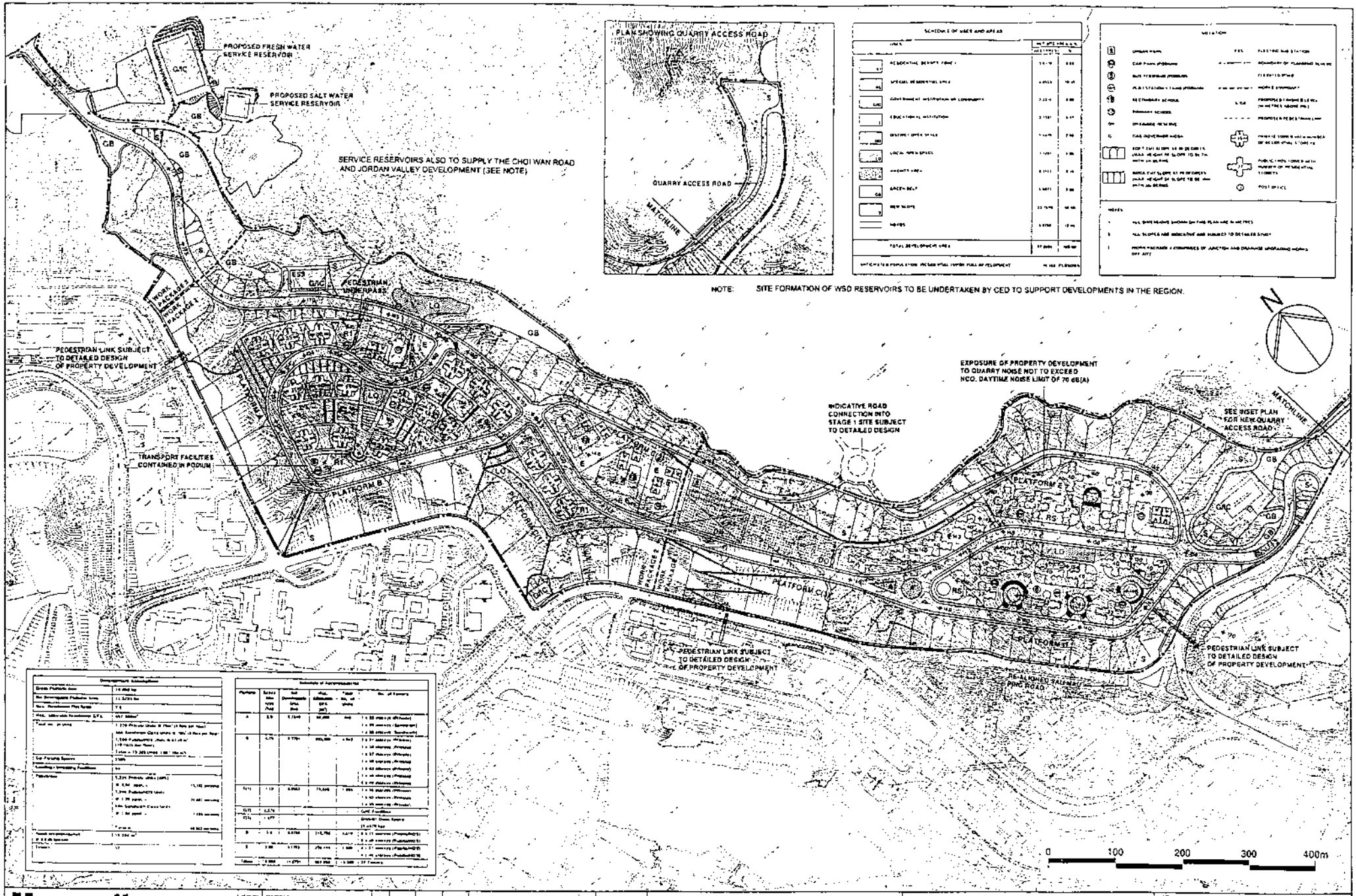
Table 14.10 Summary of Proposed Mitigation Measures for Landfill Gas Hazard on Development at Anderson Road

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location (duration / completion of measures)	Funding Agent	Implementation Agent	Maintenance Agent	Implementation Stages**			Relevant Legislation & Guidelines
							D	C	O	
S10.4.7	N/A	Further site investigation should be carried out during the detailed design stage in order to measure landfill gas around the perimeter of the site, to re-confirm that there is no preferential pathway for landfill gas migration and to assess the potential for landfill gas hazards on the future development. If a landfill gas hazard is identified, mitigation measures should be proposed and implemented to address the hazard.	The whole development site (during the detailed design stage)	CED	CED	N/A	✓			TM on EIA Process, ProPECC Note PN3/96

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.
** D=Design, C=Construction, O=Operation



環科 CES	TITLE: Location Plan of the Development Site	CES (ASIA) LIMITED	
		PROJECT NO: C210	DATE: January 1998
		DESIGNED: Suki Chung	DRAWING NO: Figure 1.1



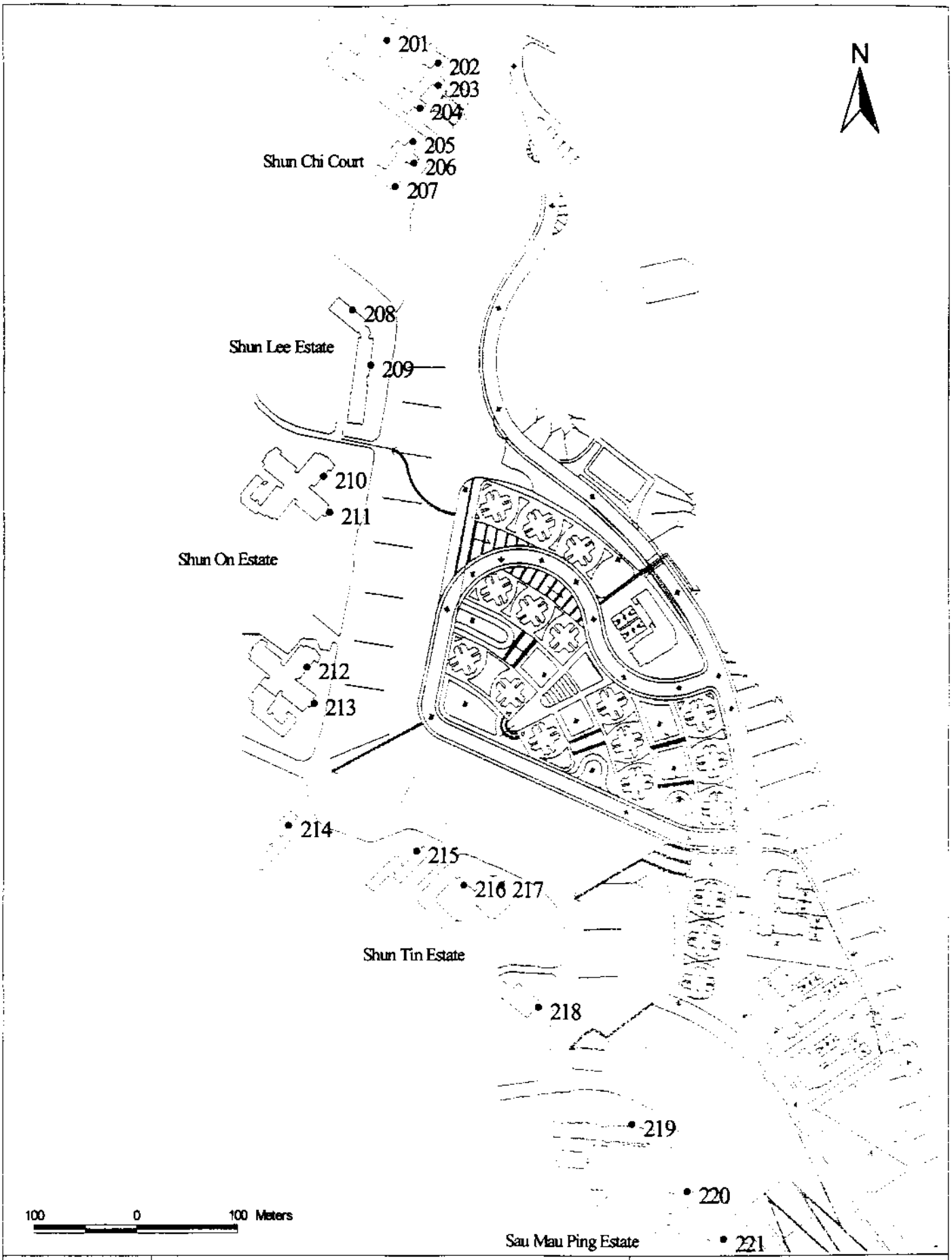
Maunsell
in association with
Urbis
CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

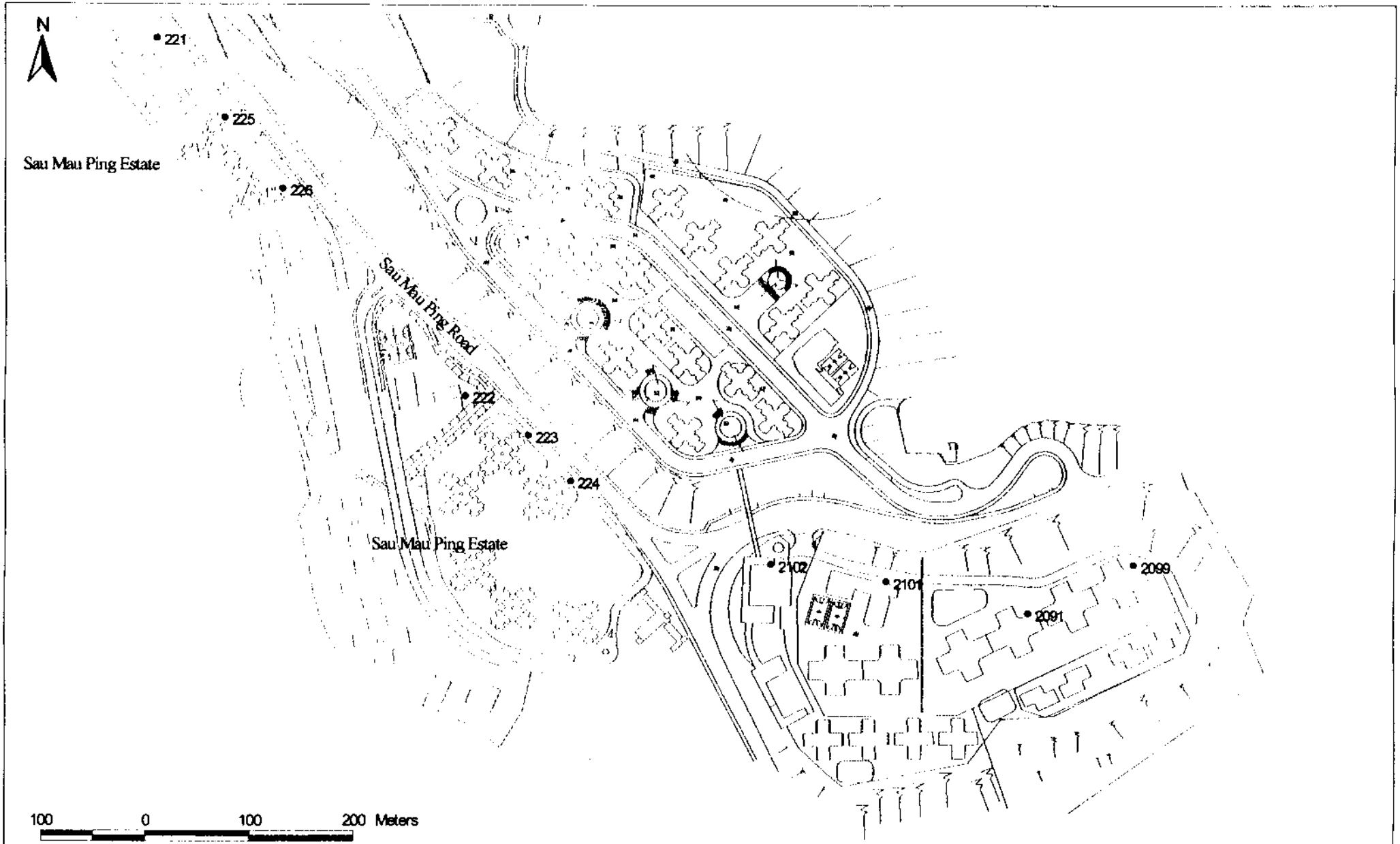
CIVIL ENGINEERING DEPARTMENT HONG KONG

PROJECT LAYOUT PLAN

Figure 1.2



環科 CES	TITLE: Location of the Air Sensitive Receivers	CES (ASIA) LIMITED	
		PROJECT NO. C210	DATE Sept. 1998
		DESIGNED Fanny Lau	DRAWING NO. Figure 2.1

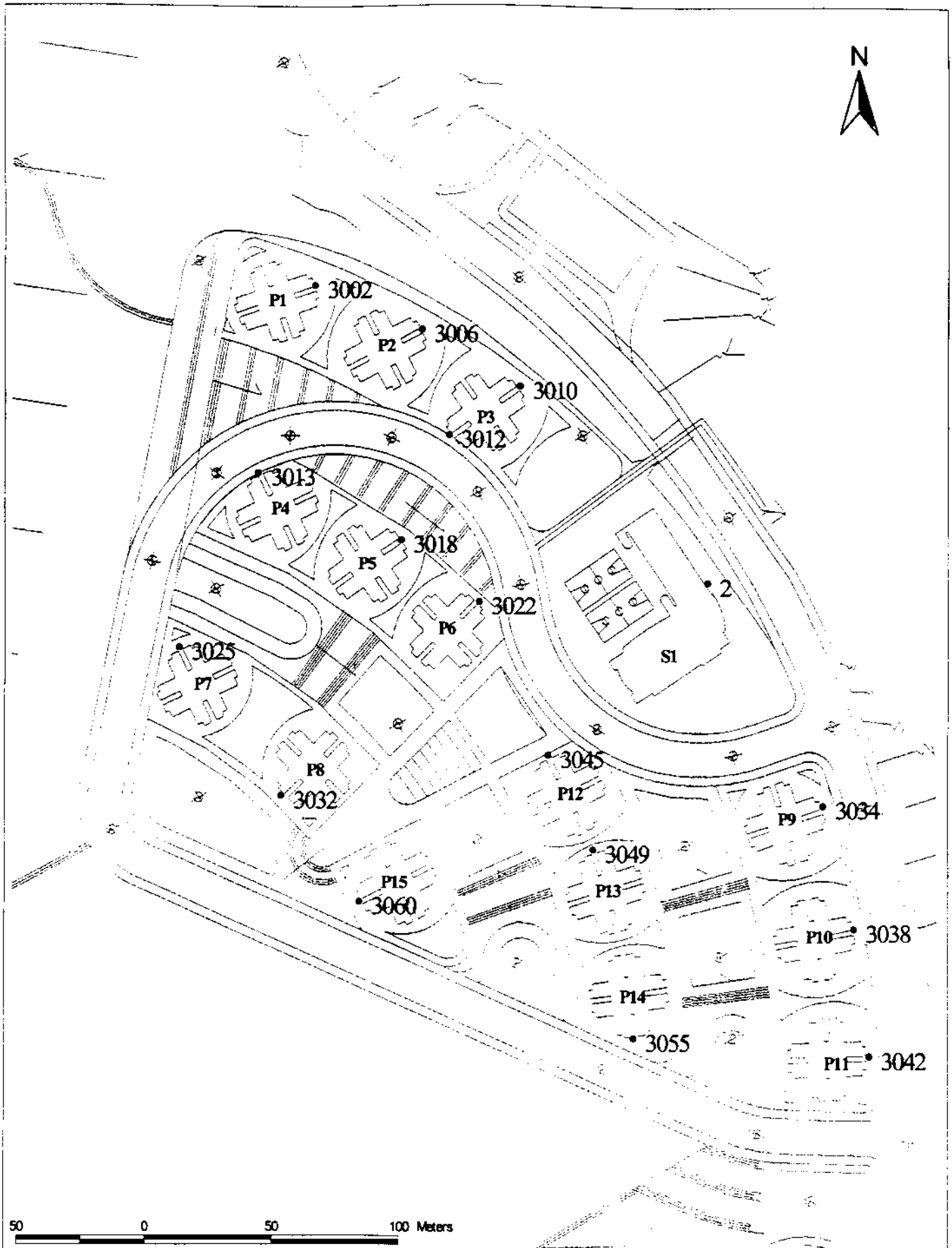


環科 CES

TITLE

Location of the Air Sensitive Receivers

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.2



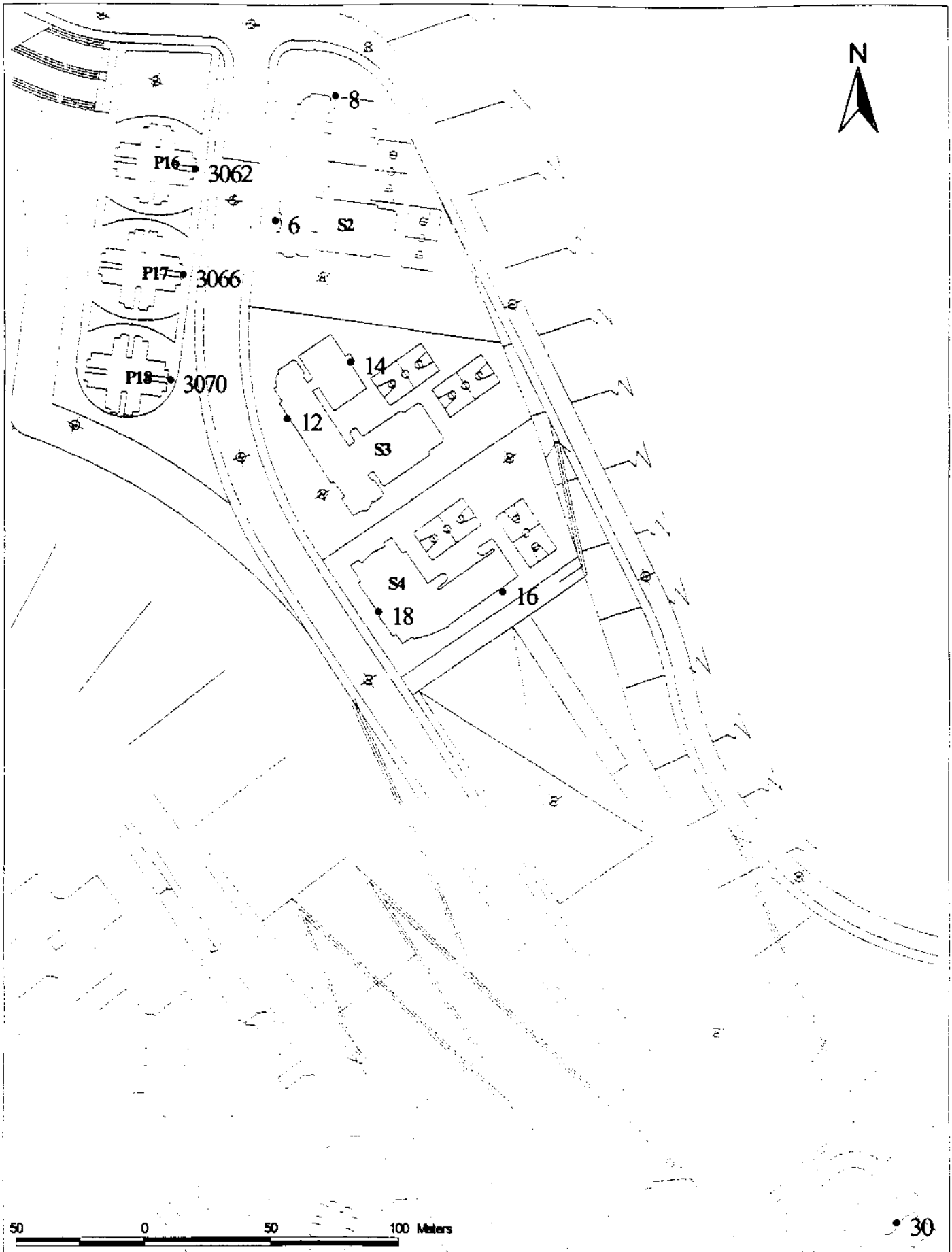
環科 CES

TITLE

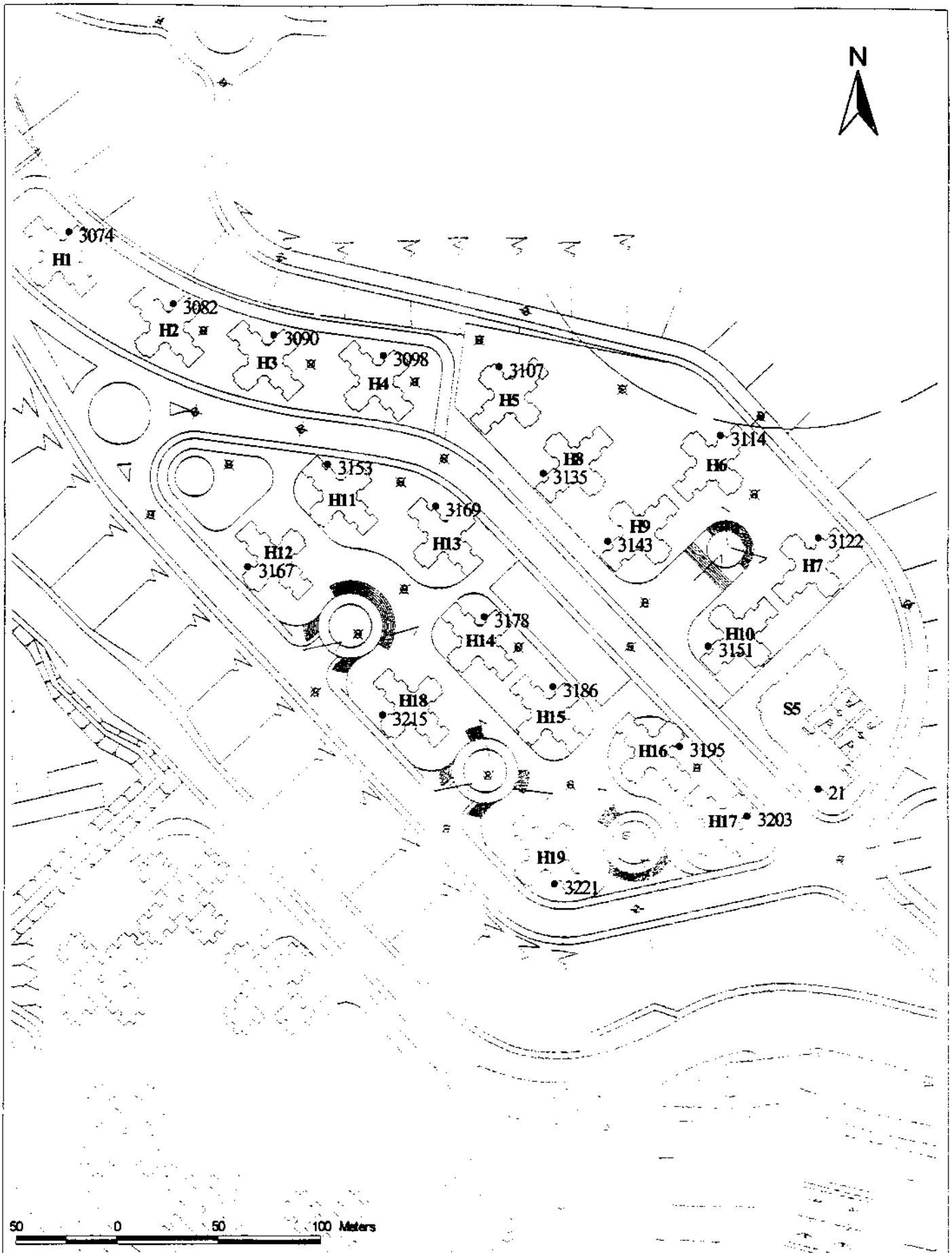
Location of the Future Air Sensitive Receivers of Anderson Road Development Site

CES (ASIA) LIMITED

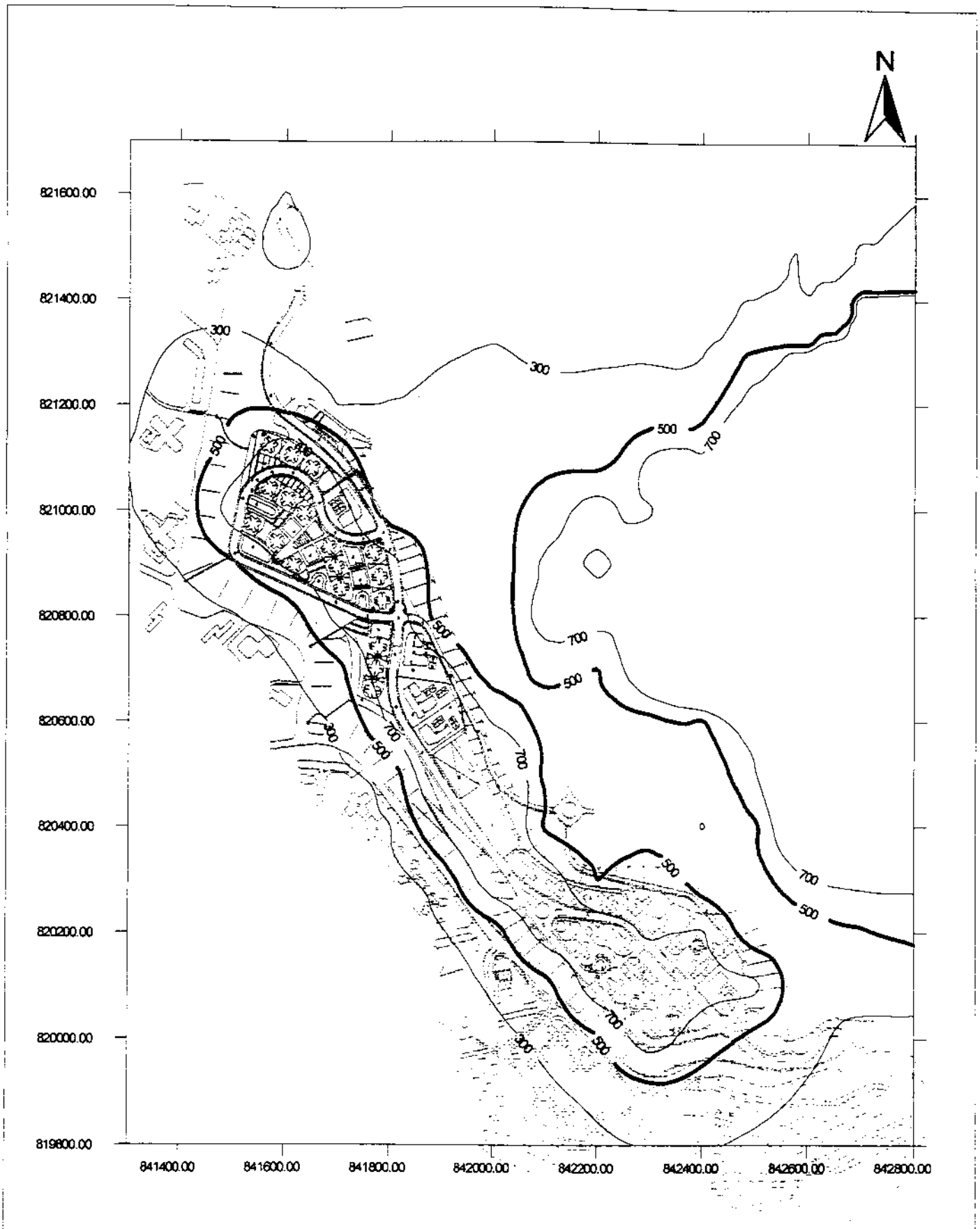
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.3



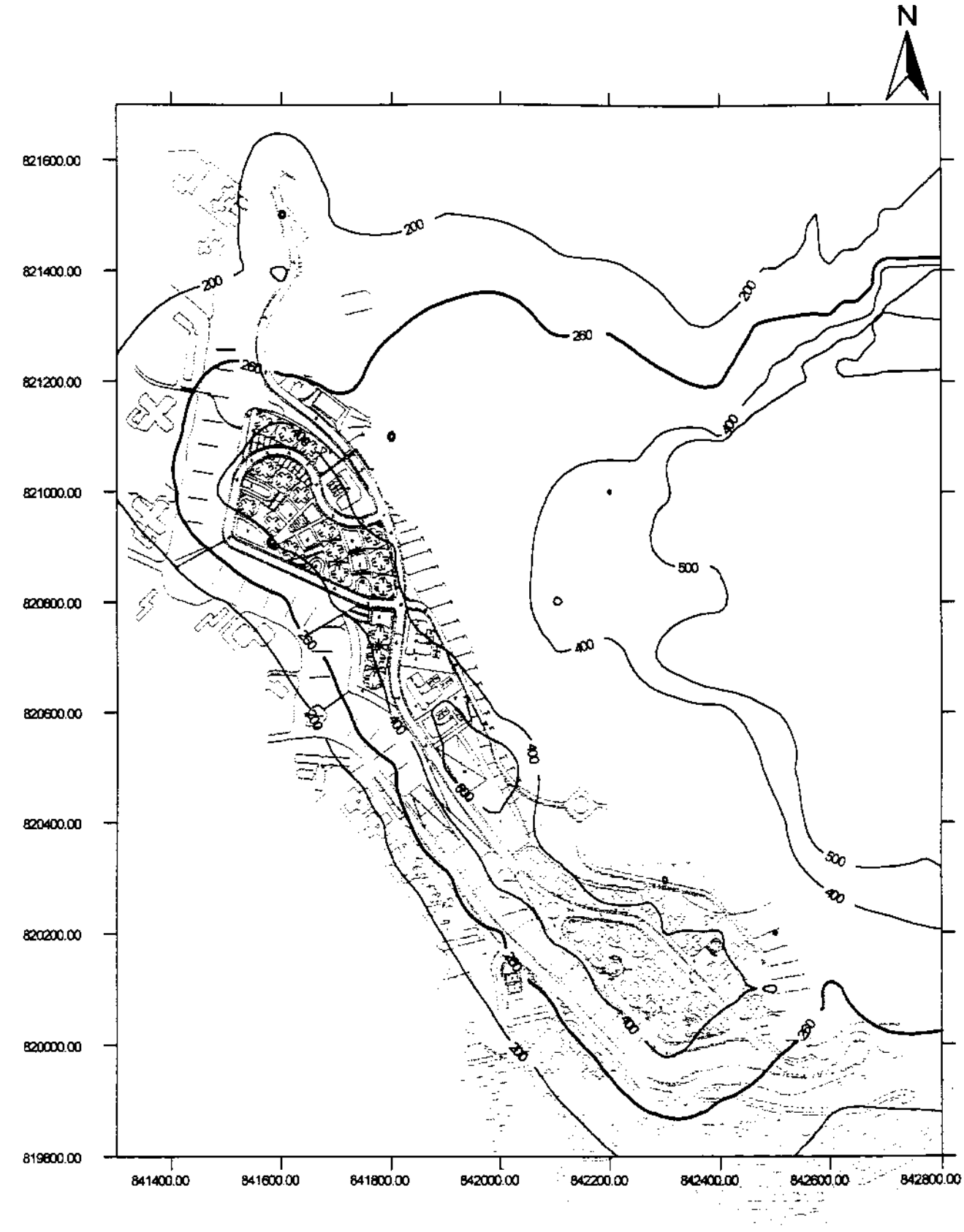
環科 CES	TITLE: Location of the Future Air Sensitive Receivers of Anderson Road Development Site	CES (ASIA) LIMITED	
		PROJECT NO. C210	DATE Sept. 1998
		DESIGNED Fanny Lau	DRAWING NO. Figure 2.4



環科 CES	TITLE: Location of the Future Air Sensitive Receivers of Anderson Road Development Site	CES (ASIA) LIMITED	
		PROJECT NO. C210	DATE Sept. 1998
		DESIGNED Fanny Lau	DRAWING NO. Figure 2.5



TITLE: Predicted Worst Case Maximum 1-hour Average TSP Concentration Contours (Case 1)	CES (ASIA) LIMITED		
	PROJECT NO. C210	DATE Sept. 1998	
	DESIGNED Fanny Lau	DRAWING NO. Figure 2.6	



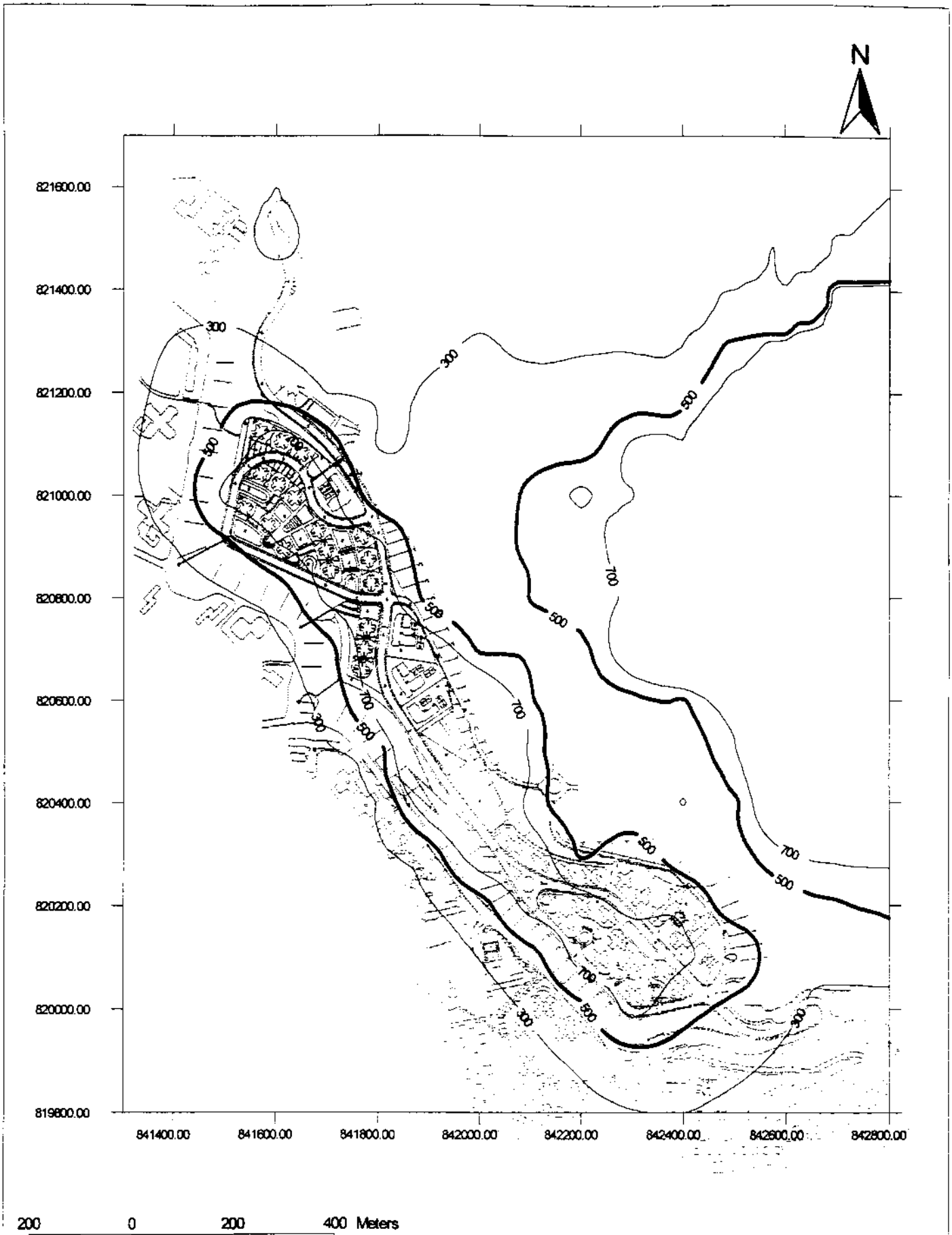
CES 環科

TITLE

Predicted Worst Case Maximum 24-hour Average TSP Concentration Contours (Case 1)

CES (ASIA) LIMITED

PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.7



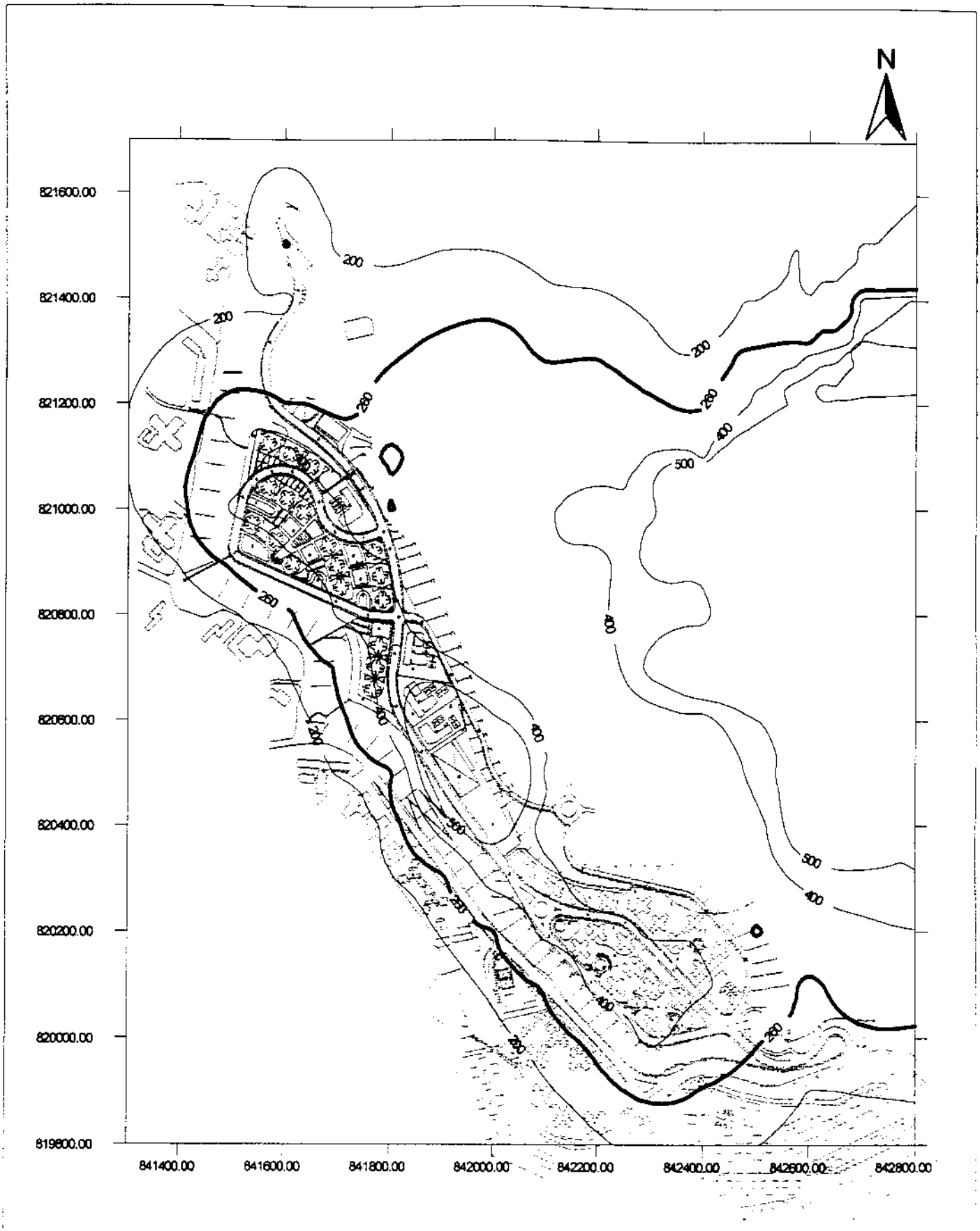
環科 CES

TITLE

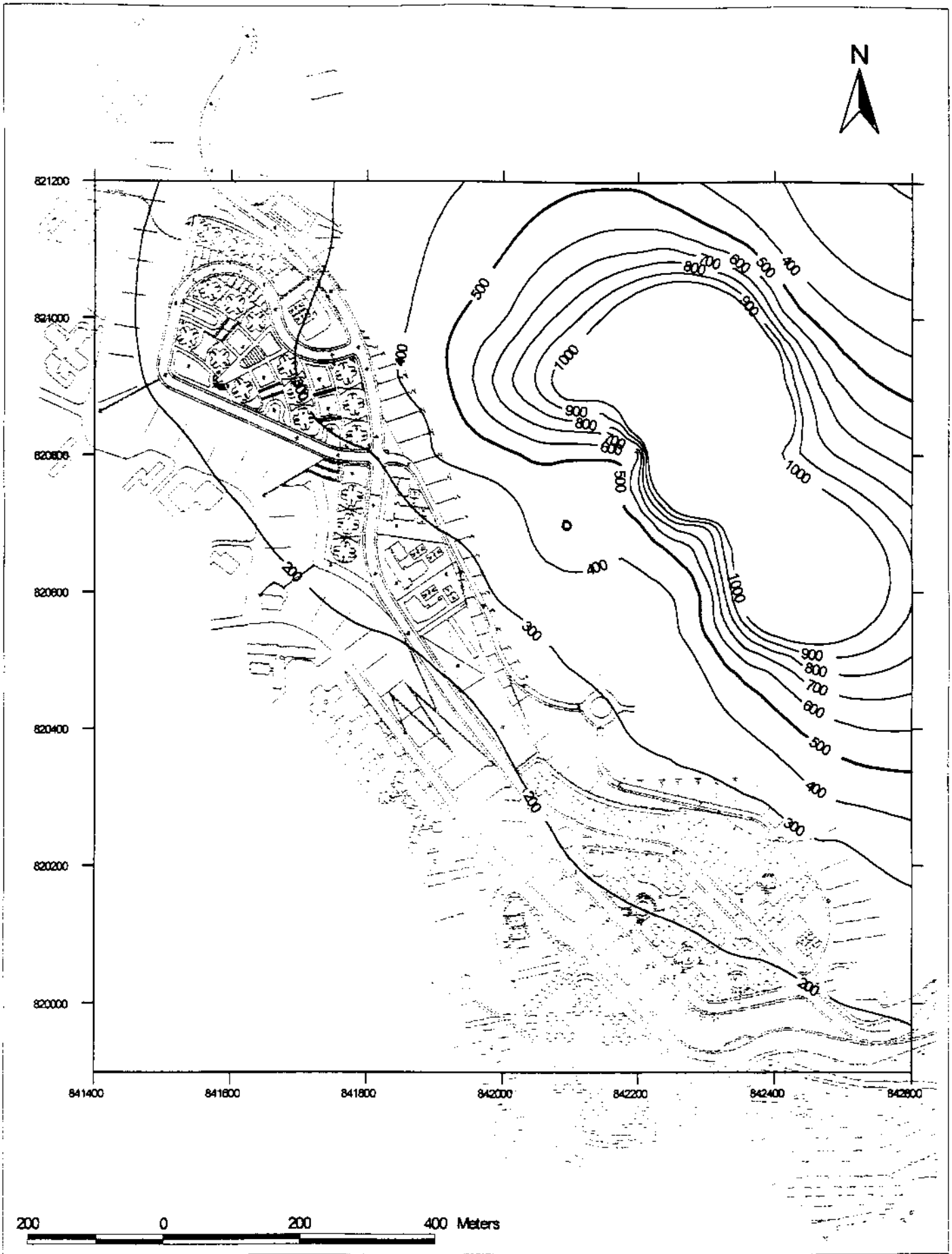
Predicted Worst Case Maximum
1-hour Average TSP Concentration
Contours (Case 2)

CES (ASIA) LIMITED

PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.8



TITLE: Predicted Worst Case Maximum 24-hour Average TSP Concentration Contours (Case 2)	CES (ASIA) LIMITED		
	PROJECT NO.: C210	DATE:	Sept. 1998
	DESIGNED: Fanny Lau	DRAWING NO.:	Figure 2.9

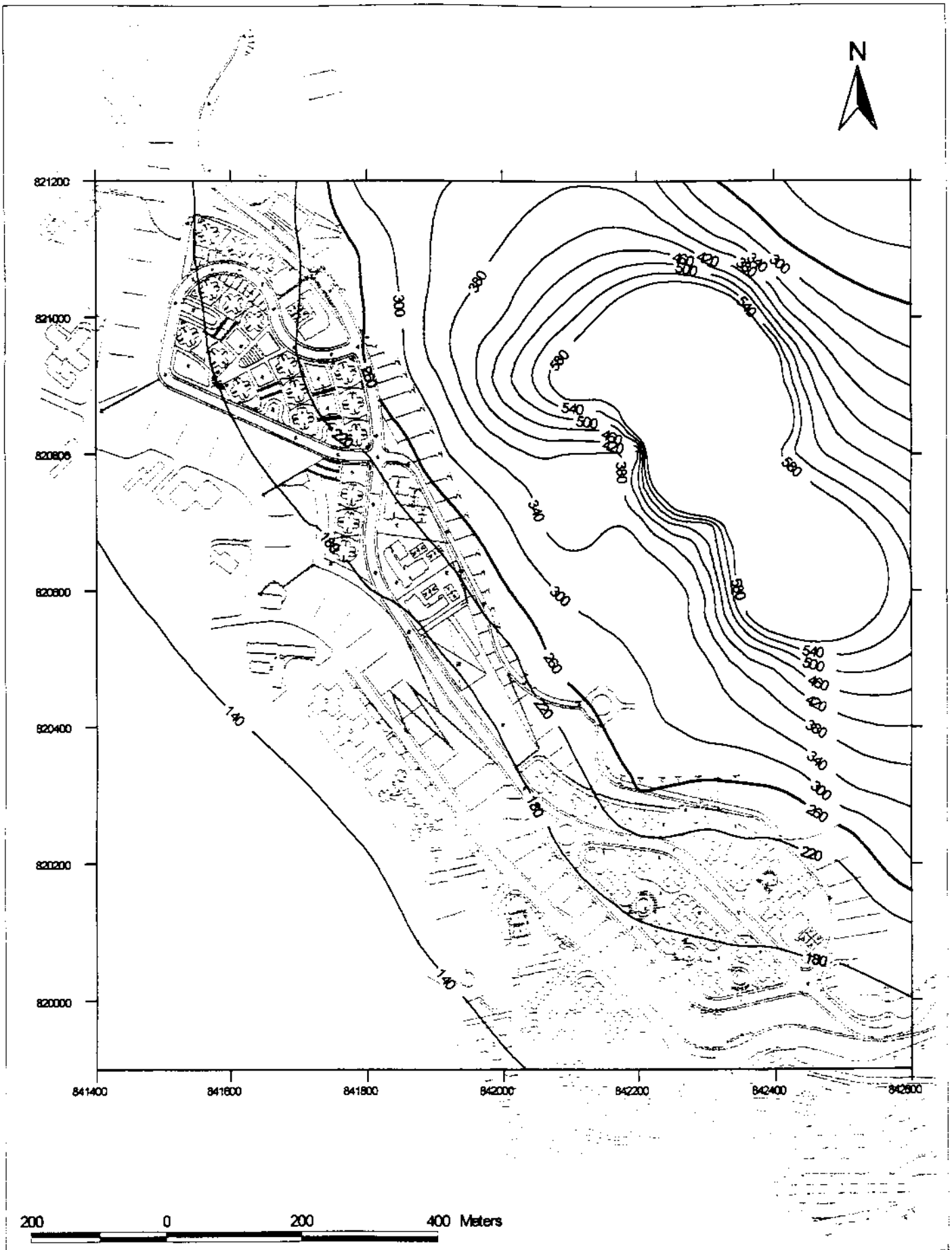


環科 CES

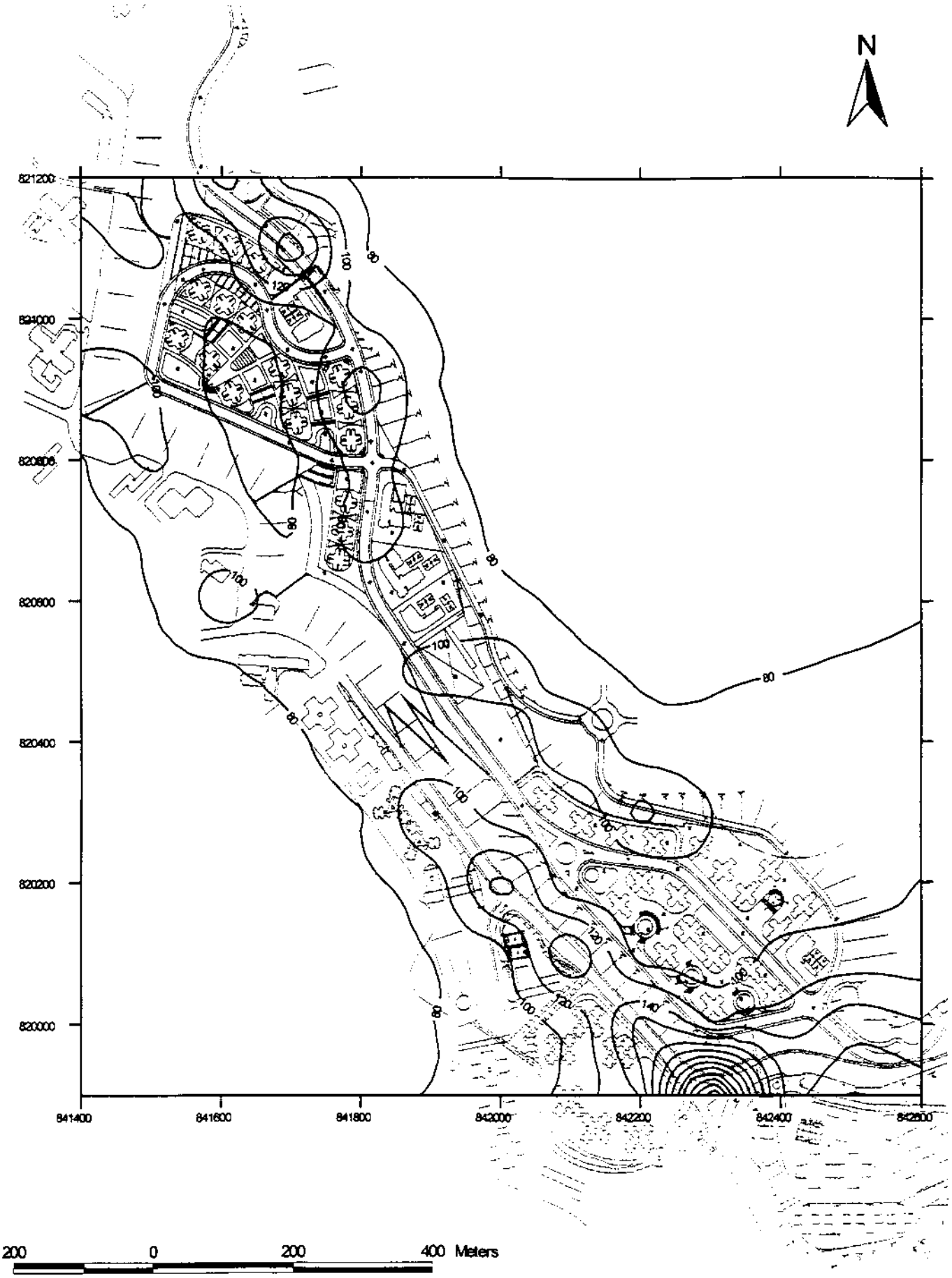
TITLE

Predicted Worst Case Maximum 1-hour Average TSP Concentrations During Operational Phase of the Development

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.10



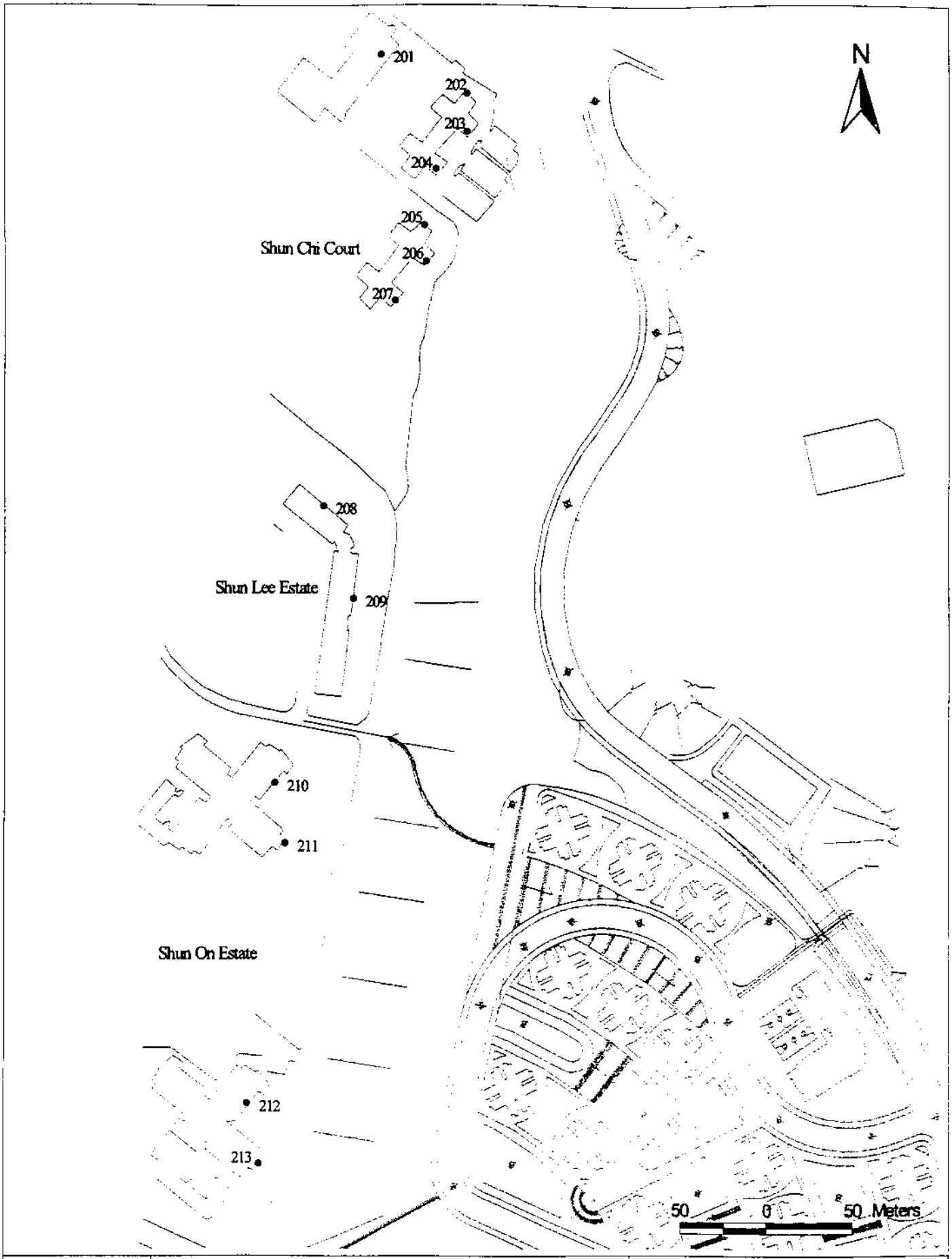
環科 CES	TITLE: Predicted Worst Case Maximum 24-hour Average TSP Concentrations During Operational Phase of the Development	CES (ASIA) LIMITED	
		PROJECT NO.: C210	DATE: Sept. 1998
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 2.11



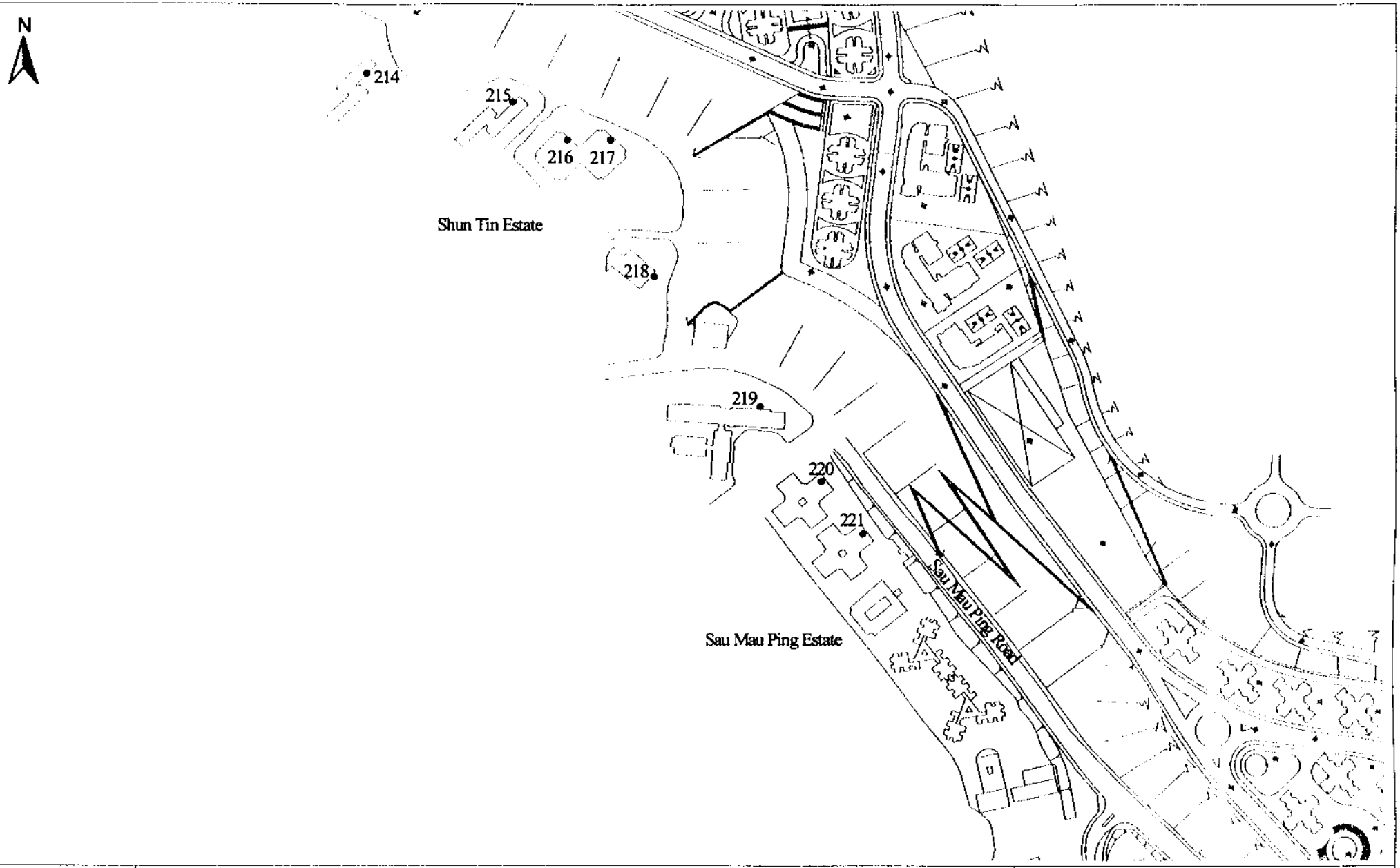
TITLE

Predicted Worst Case Maximum 1-hour Average NO2 Concentration Contours

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 2.12



環科 CES	TITLE: Location of Representative Noise Sensitive Receivers	CES (ASIA) LIMITED	
		PROJECT NO.: C210	DATE: Sept. 1998
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 3.1

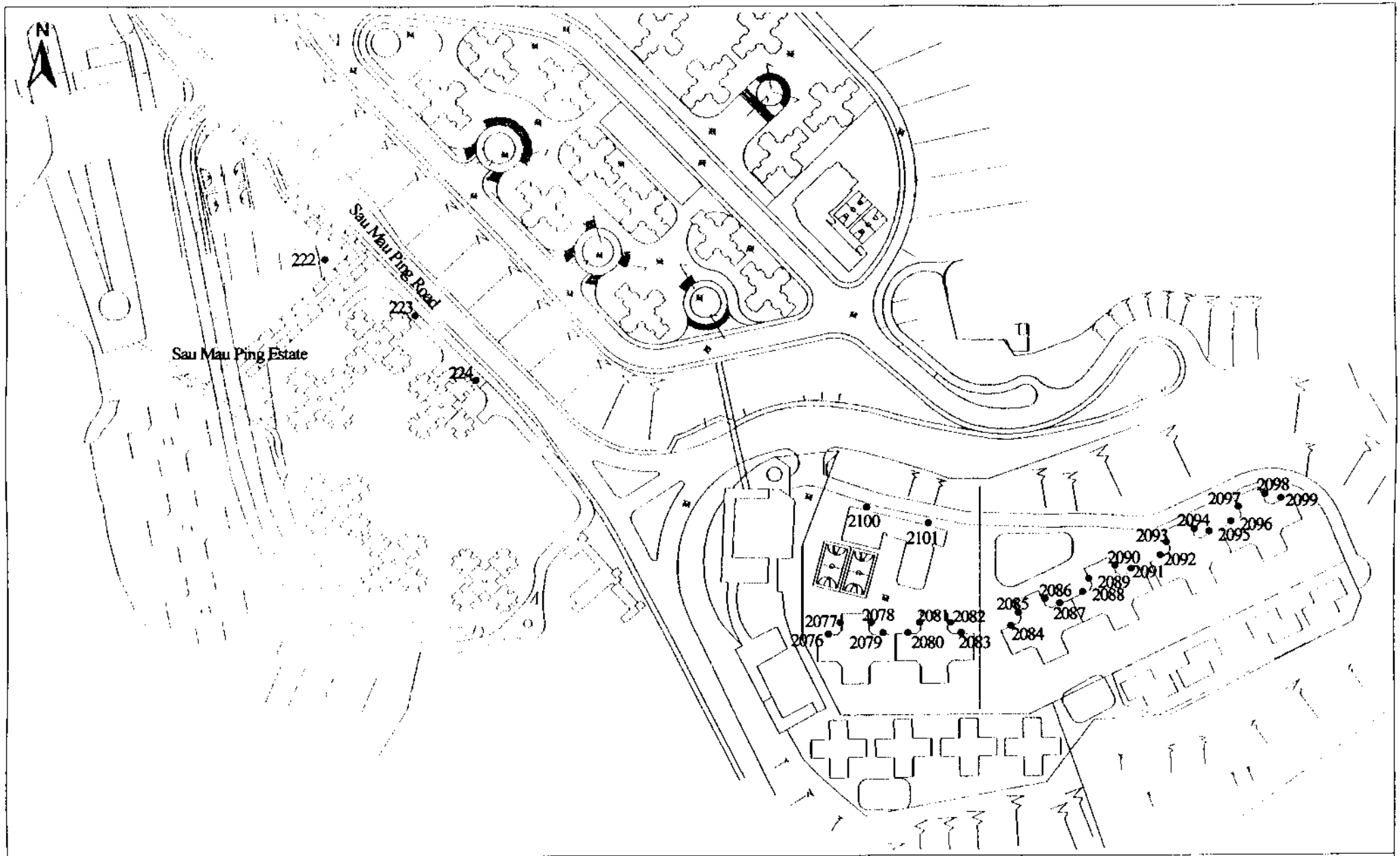


環科 CES

TITLE

Location of the Representative Noise Sensitive Receivers

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.2



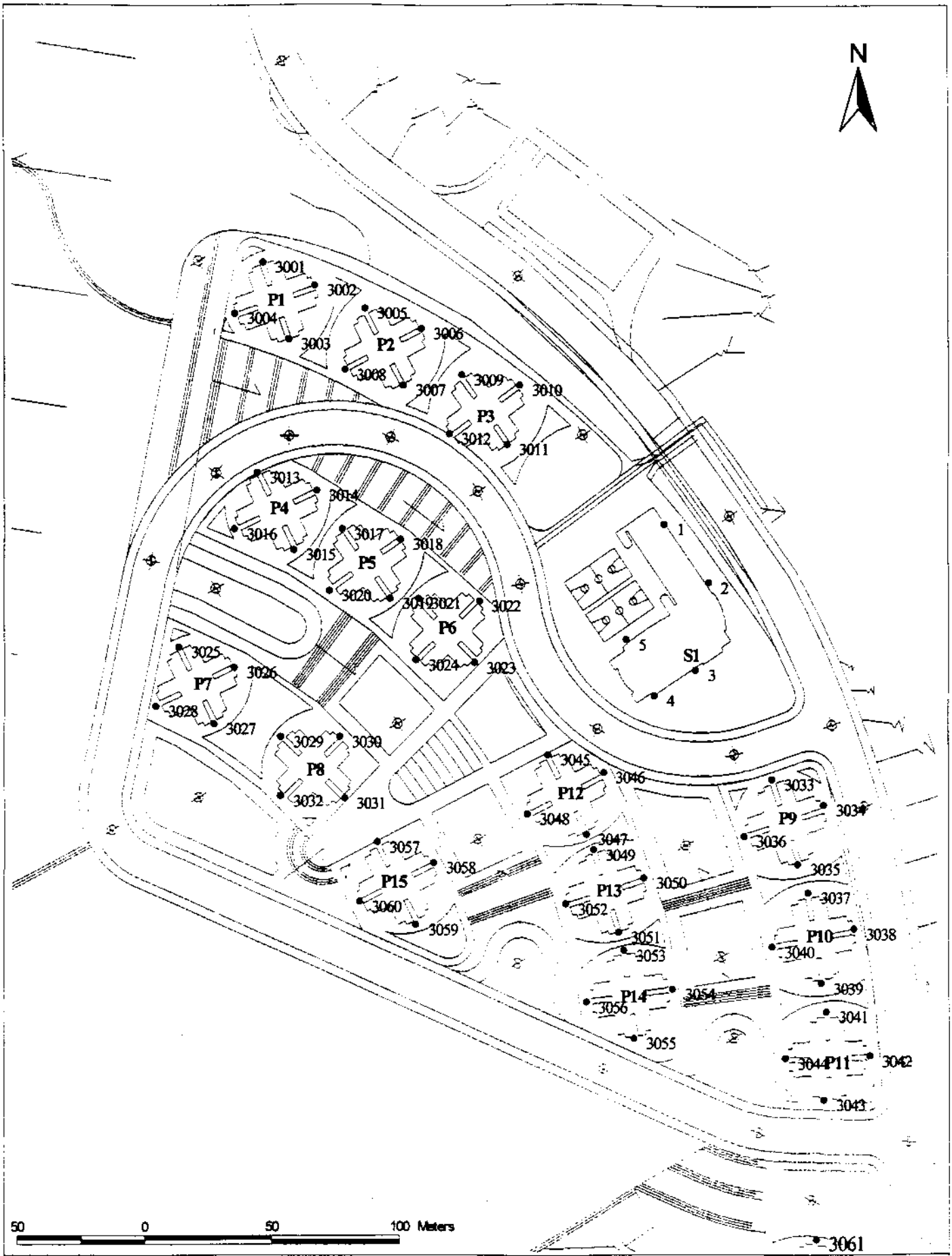
環科 CES

TITLE

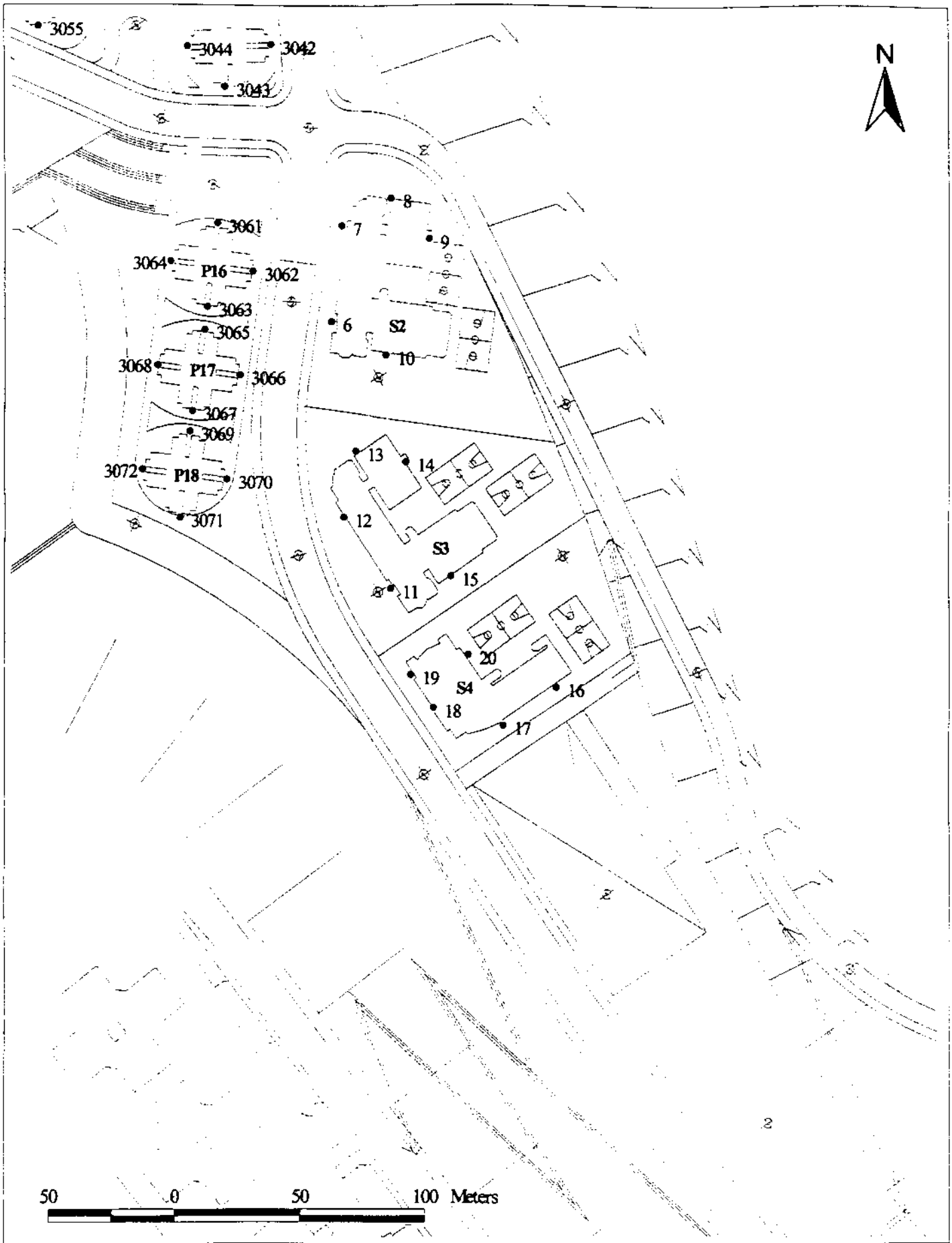
Location of the Representative Noise Sensitive Receivers

CES (ASIA) LIMITED

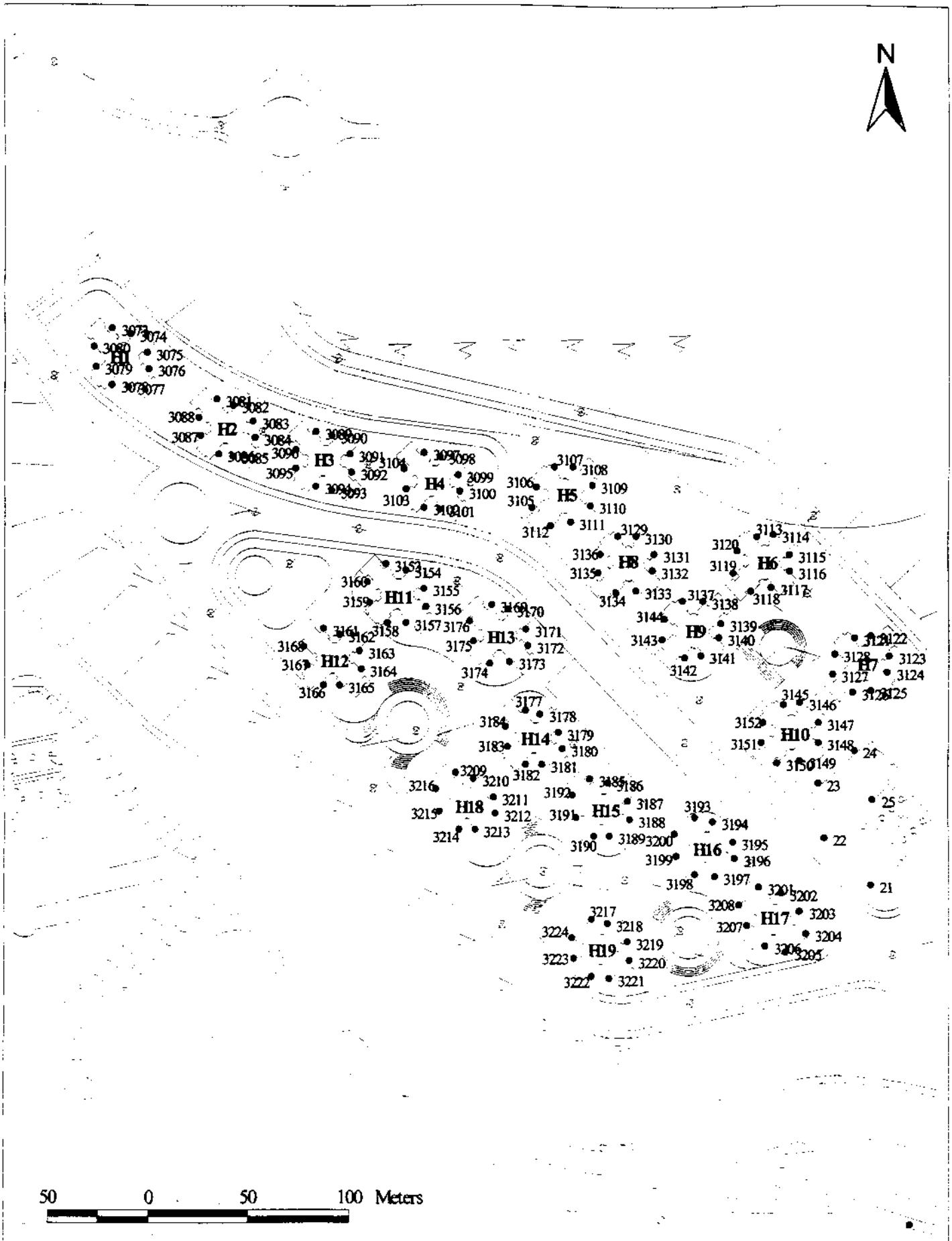
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.3



環科 CES	TITLE: Location of the Future Noise Sensitive Receivers of Anderson Road Development Site	CES (ASIA) LIMITED	
		PROJECT NO.: C210	DATE: Sept. 1998
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 3.4



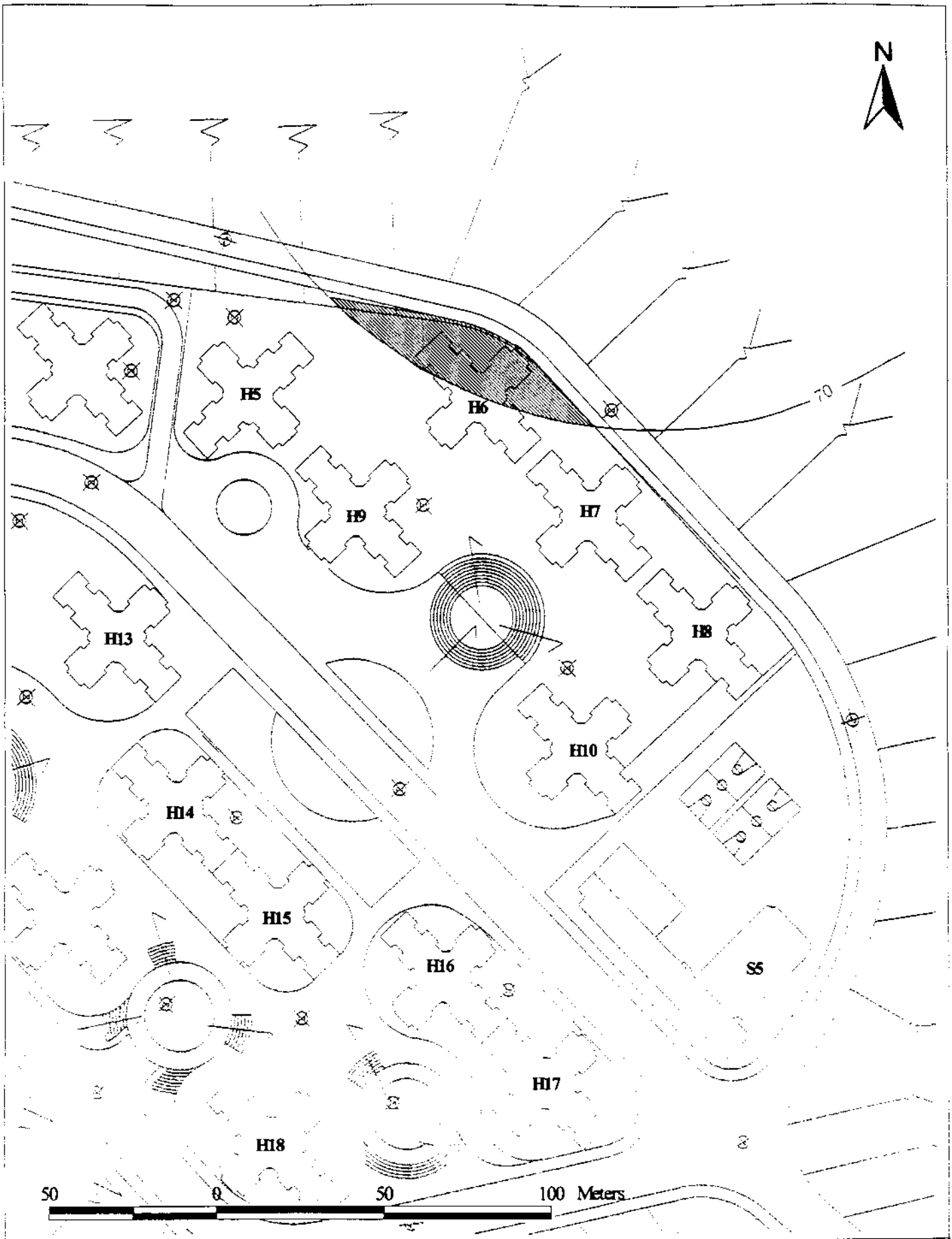
TITLE: Location of the Future Noise Sensitive Receivers of Anderson Road Development Site	CES (ASIA) LIMITED		
	PROJECT NO. C210	DATE Sept. 1998	
	DESIGNED Fanny Lau	DRAWING NO. Figure 3.5	



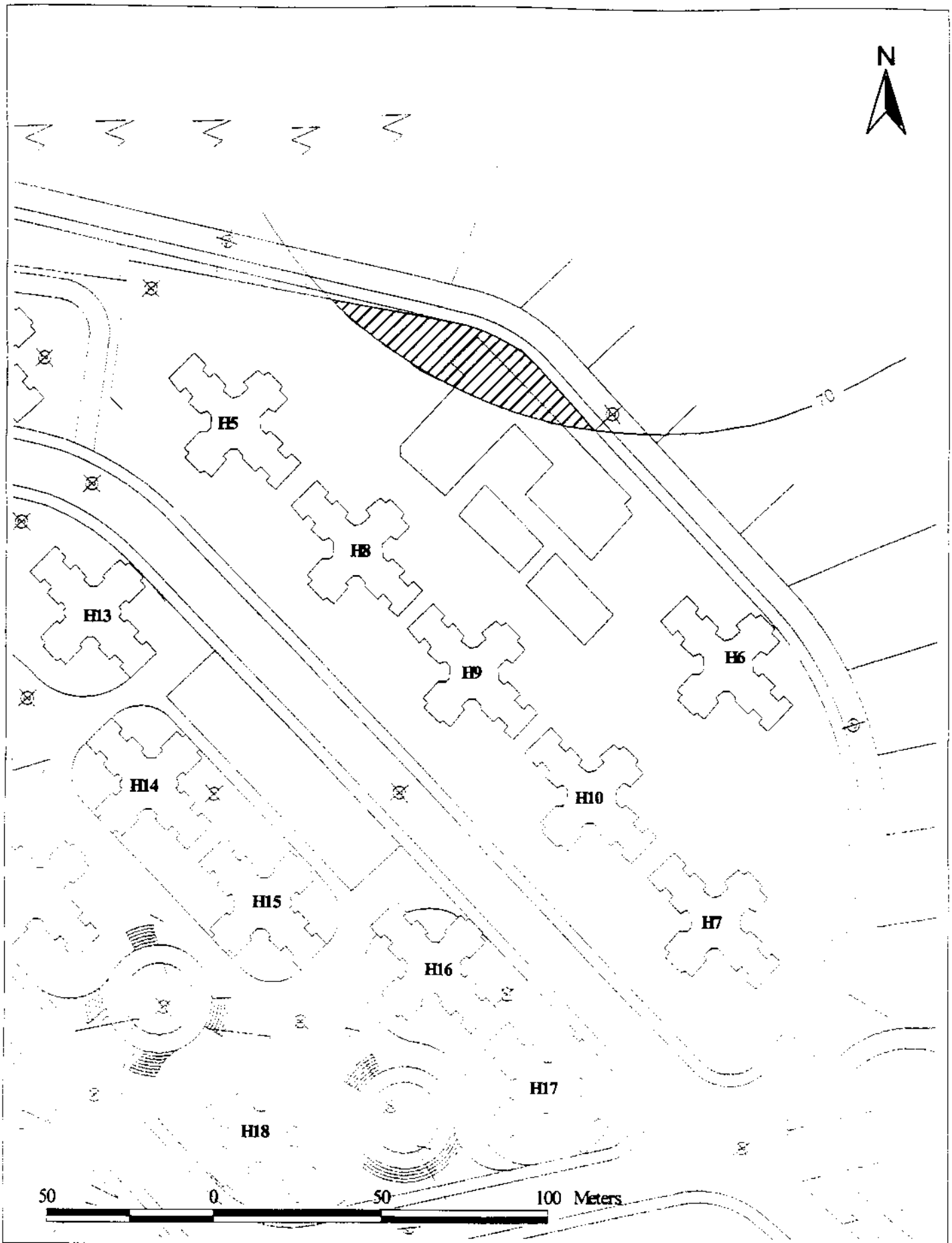
TITLE

Location of the Future Noise Sensitive Receivers of Anderson Road Development Site

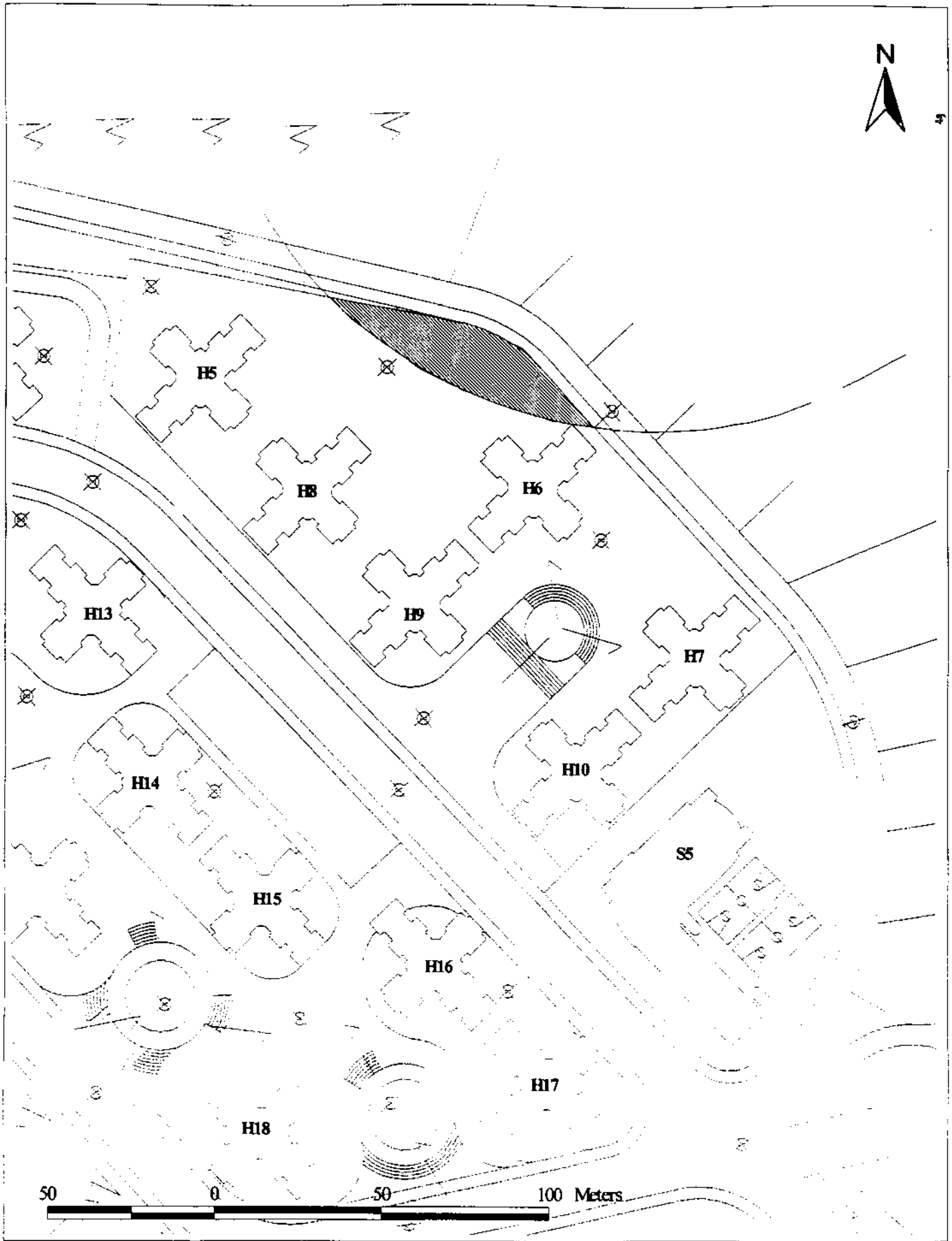
CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.6



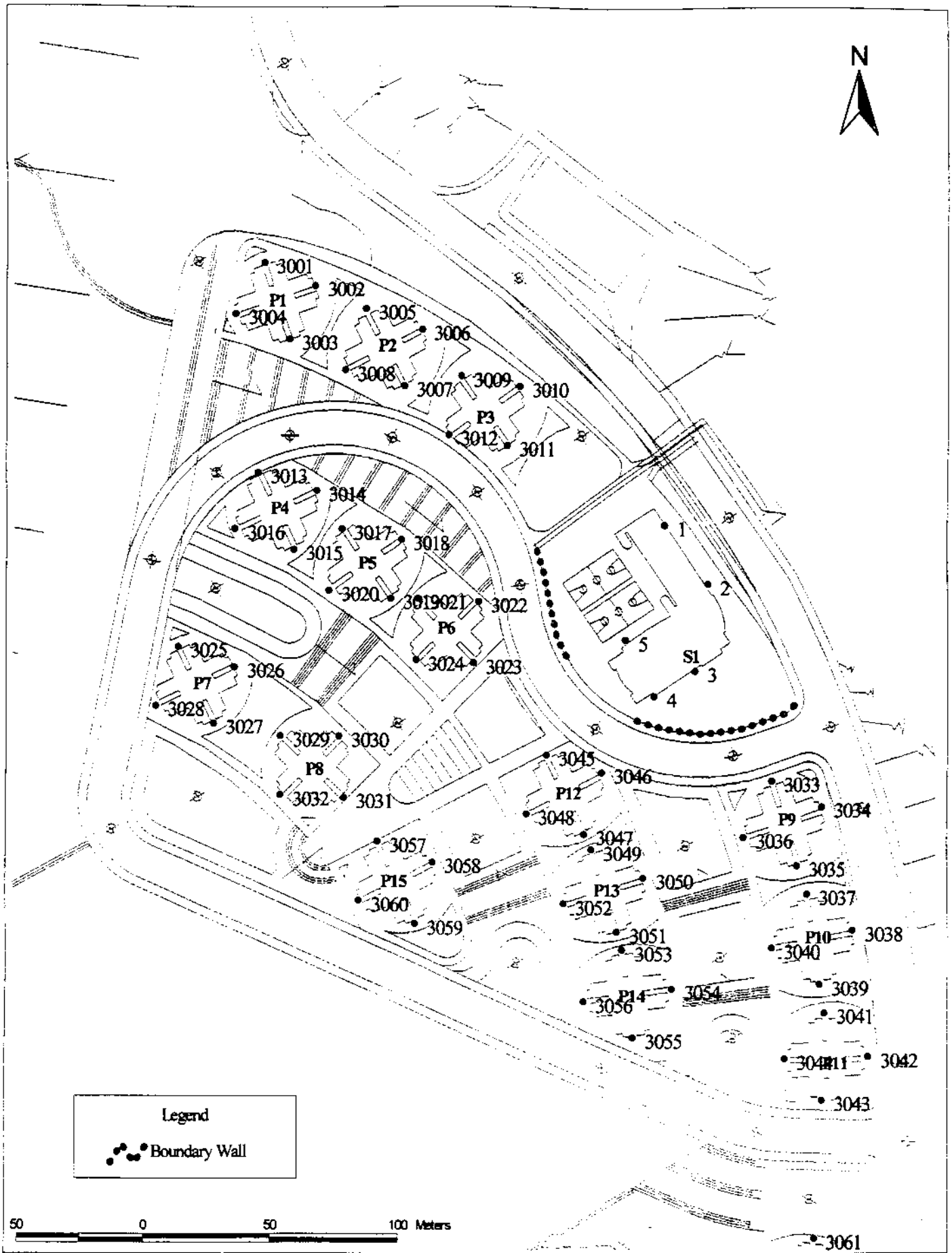
環科 CES	TITLE: Layout of Platform E - Original Layout	CES (ASIA) LIMITED	
		PROJECT NO. C210	DATE Sept. 1998
		DESIGNED Fanny Lau	DRAWING NO. Figure 3.7



環科 CES	TITLE: Layout of Platform E - Alternative A	CES (ASIA) LIMITED		
		PROJECT NO.: C210	DATE: Sept. 1998	
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 3.8	



環科 CES	TITLE: Layout of Platform E - Alternative B	CES (ASIA) LIMITED	
		PROJECT NO.: C210	DATE: Sept. 1998
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 3.9

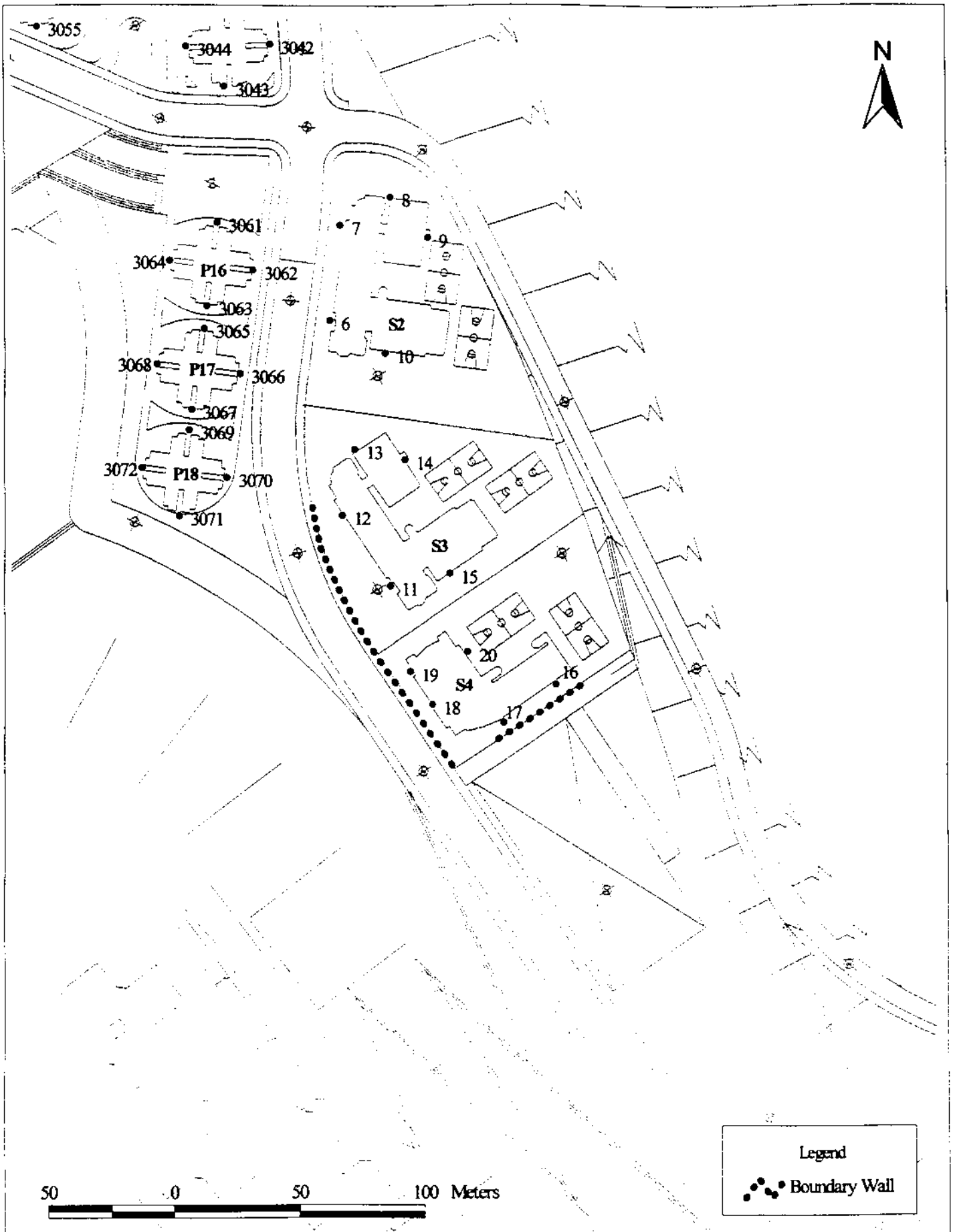


環科 CES

TITLE

Proposed Noise Mitigation Measures for Anderson Road Development Site

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Nov. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.10



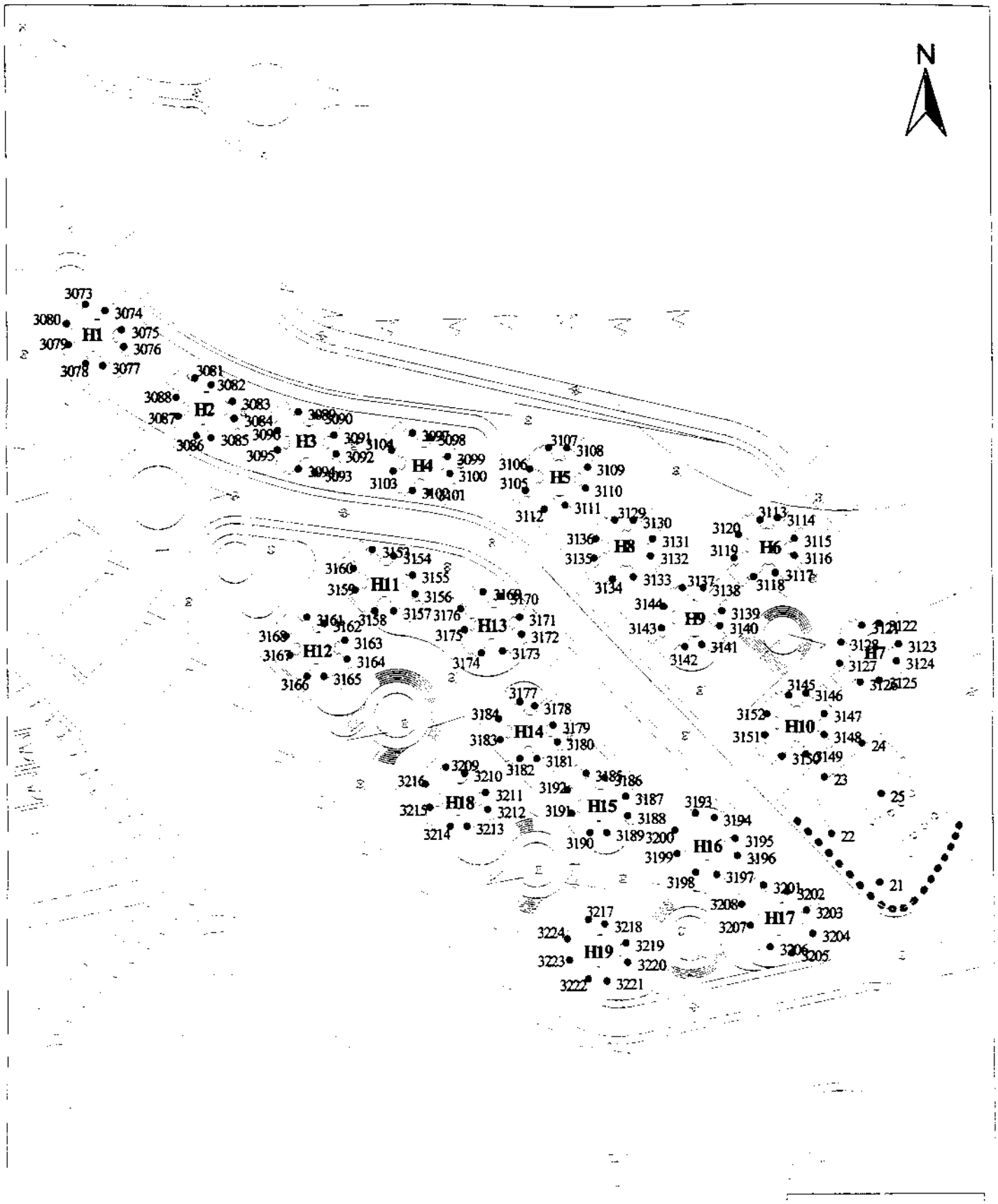
CES 環科

TITLE

Proposed Noise Mitigation Measures for Anderson Road Development Site

CES (ASIA) LIMITED

PROJECT NO.	C210	DATE	Nov. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.11

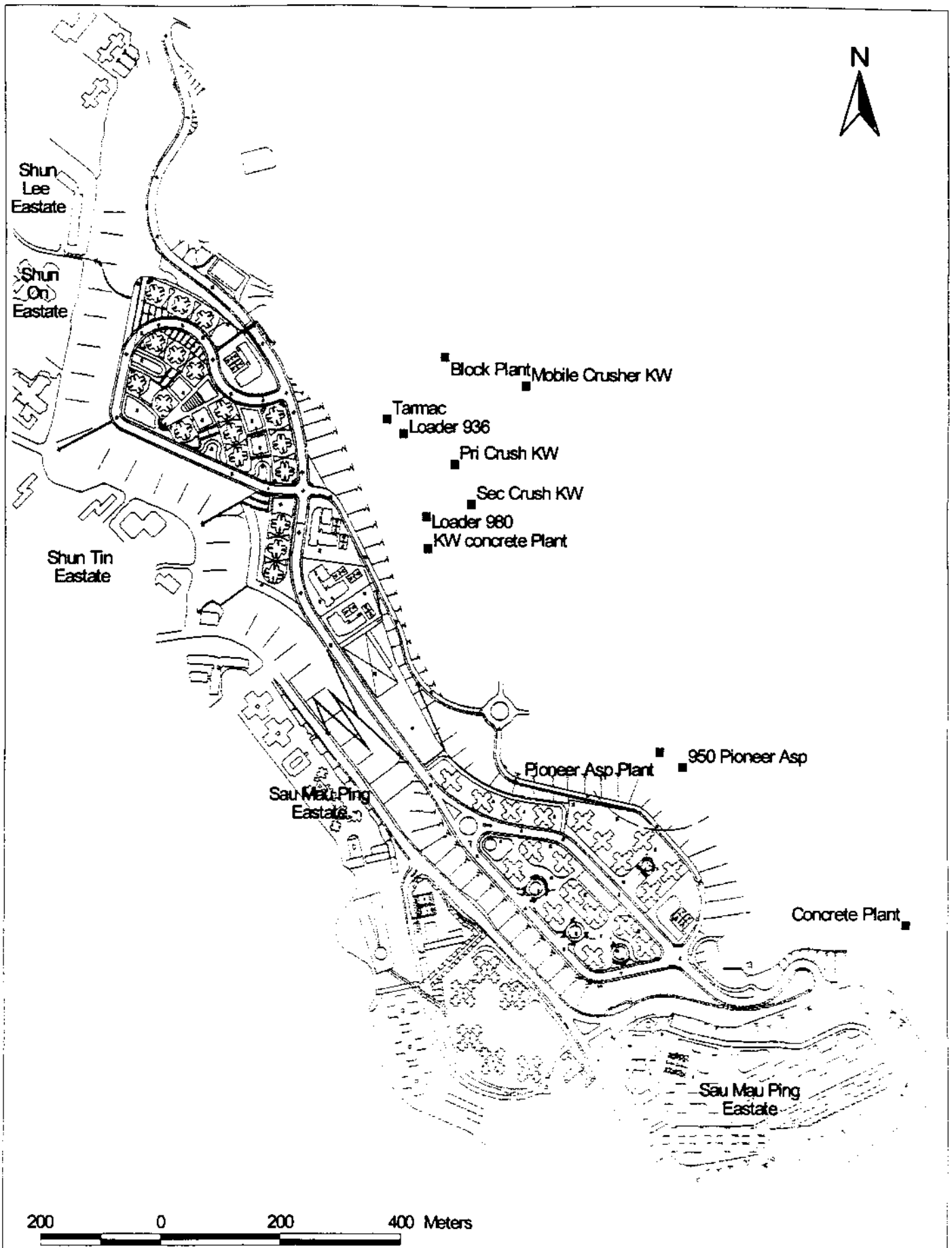


環科 CES

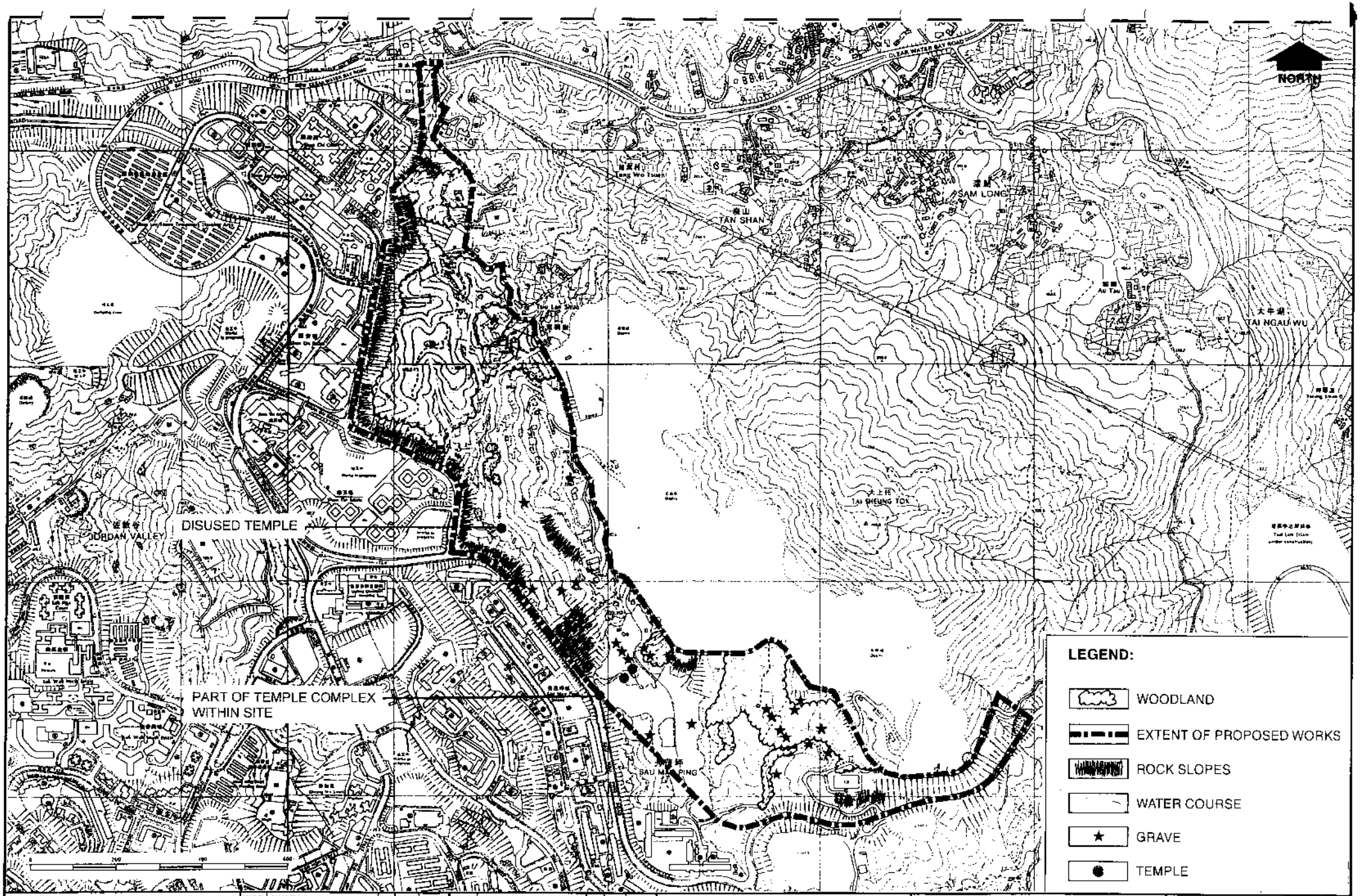
TITLE

Proposed Noise Mitigation Measures for Anderson Road Development Sites

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Nov. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 3.12



環科 CES	TITLE: Layout of the Quarry Plants	CES (ASIA) LIMITED	
		PROJECT NO.: C210	DATE: Nov. 1998
		DESIGNED: Fanny Lau	DRAWING NO.: Figure 3.13



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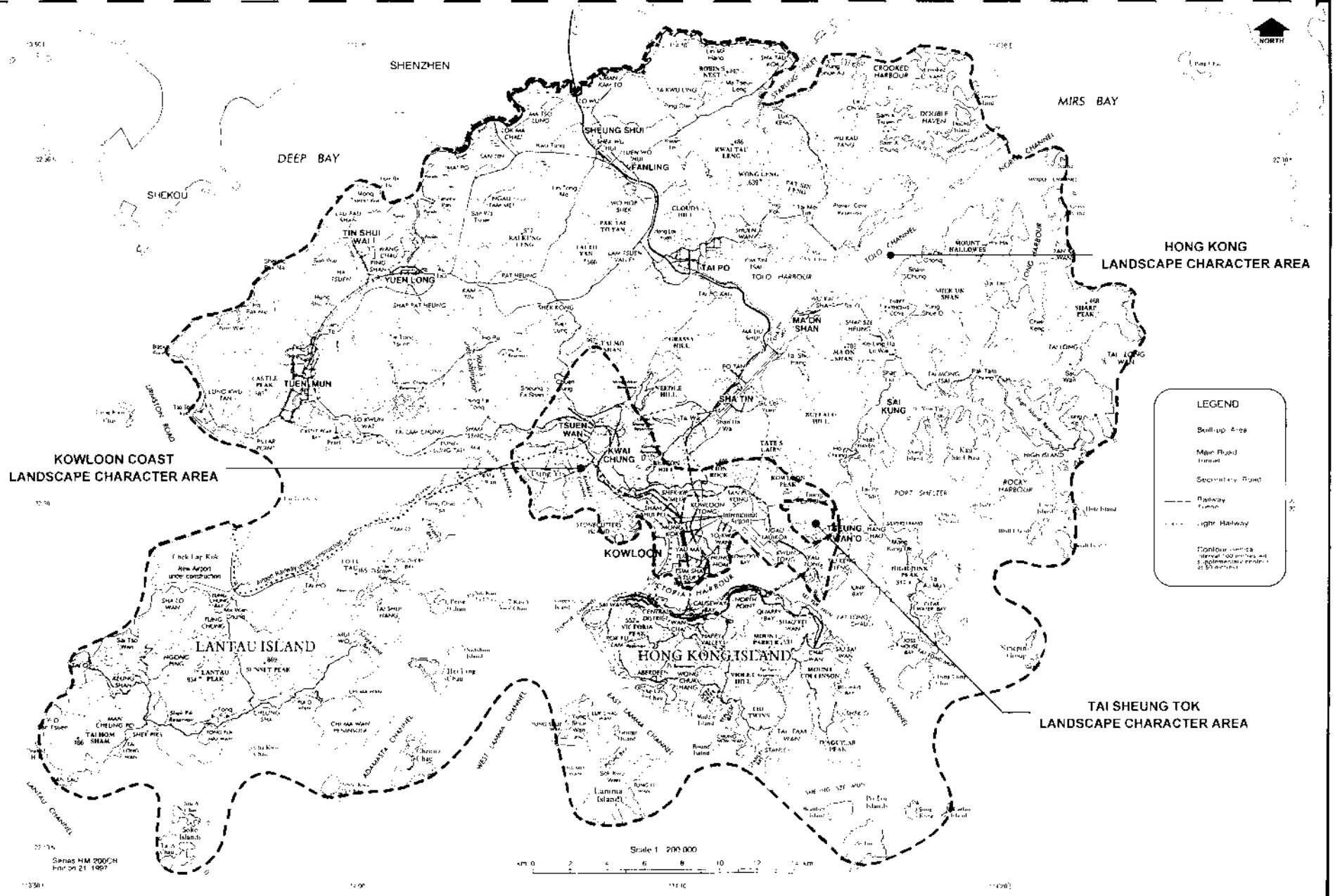
REVISION	DESCRIPTION	BY	DATE	REVIEWED	REVISION	DESCRIPTION	BY	DATE	REVIEWED

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

TITLE
LANDSCAPE RESOURCES

SCALE	AS SHOWN	DATE	NOV 98
DESIGNED		DRAWN	
CAD REF		DRAWING NO.	Fig 4.1
		REV.	



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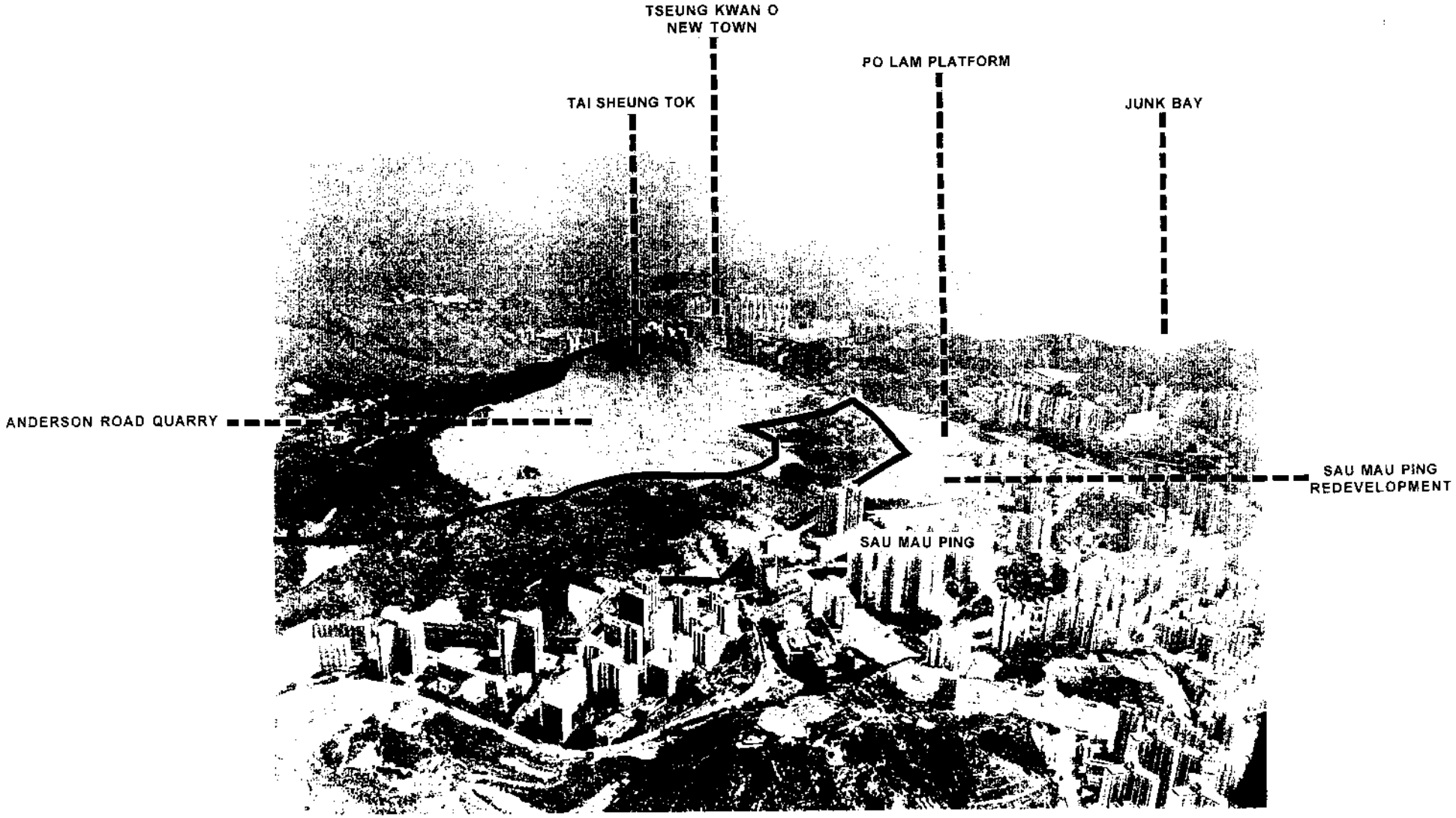
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT OF HONG KONG

LANDSCAPE CHARACTER AREAS

Fig. 4.2



LEGEND :

SITE OF PROPOSED
ANDERSON ROAD DEVELOPMENT

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CES

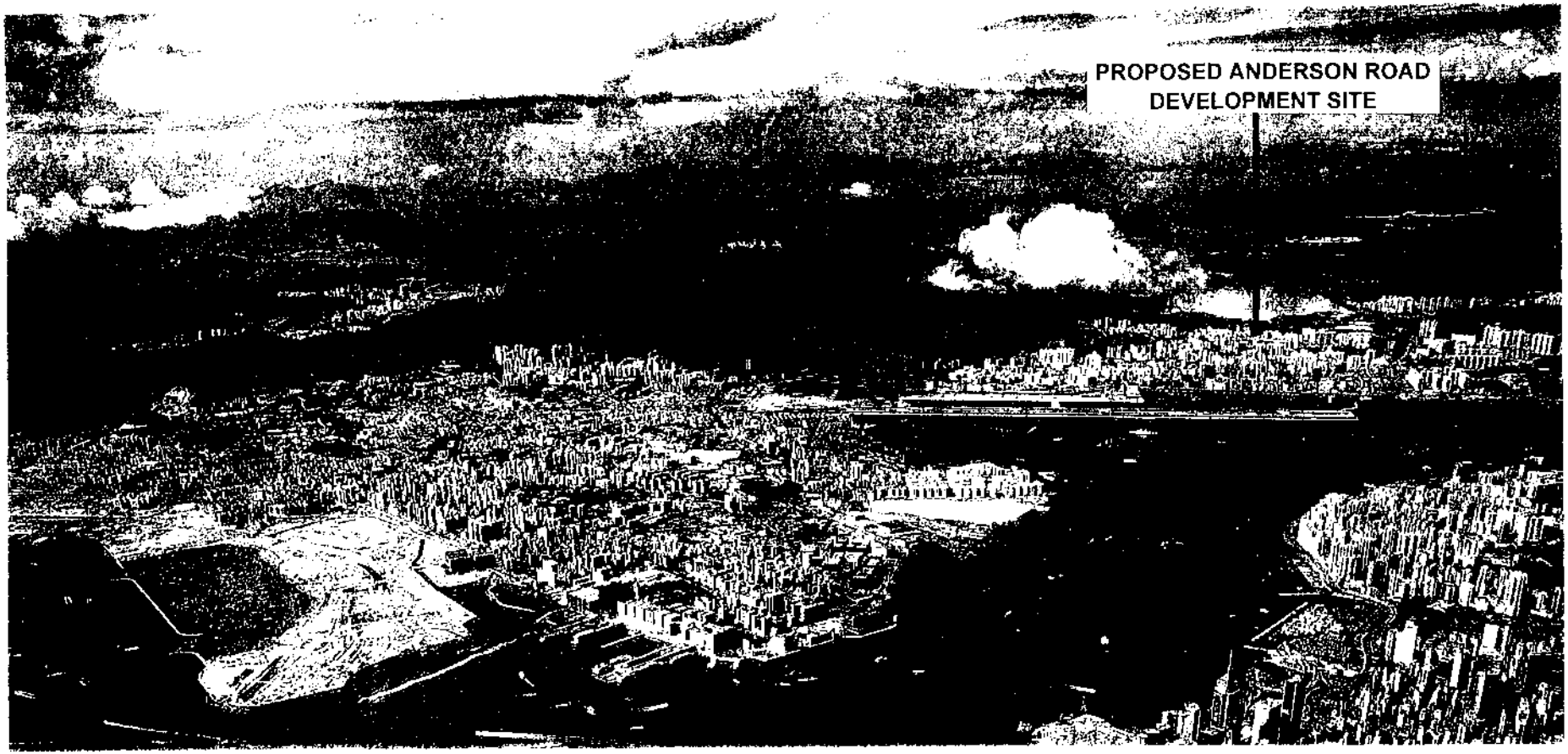
REVISION	DESCRIPTION	BY	DATE	REVIEWED	REVISION	DESCRIPTION	BY	DATE	REVIEWED

PLANNING AND ENGINEERING FEASIBILITY STUDY
FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

TITLE
TAI SHEUNG TOK
LANDSCAPE CHARACTER AREA

SCALE | DATE
DESIGNED | DRAWN
CAD REF | DRAWING NO. Fig. 4.3 | REV



The Kowloon coastal landscape is an intensely urban one, much disturbed by large scale development. However, a key characteristic in contrast to the coastal conurbation, is the natural backdrop of hills which separate Kowloon from other urban areas, and therefore, give it its identity as a place.

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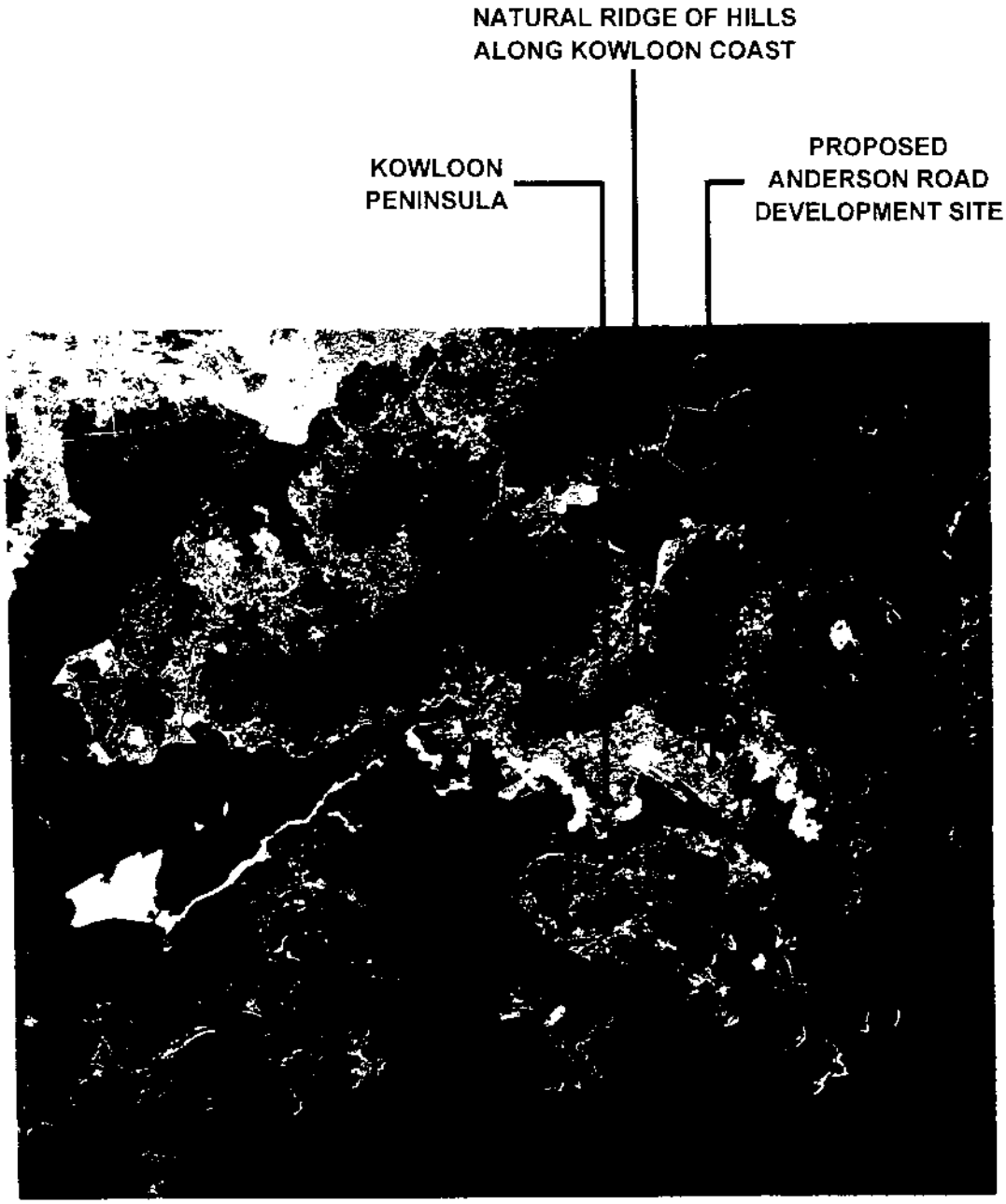
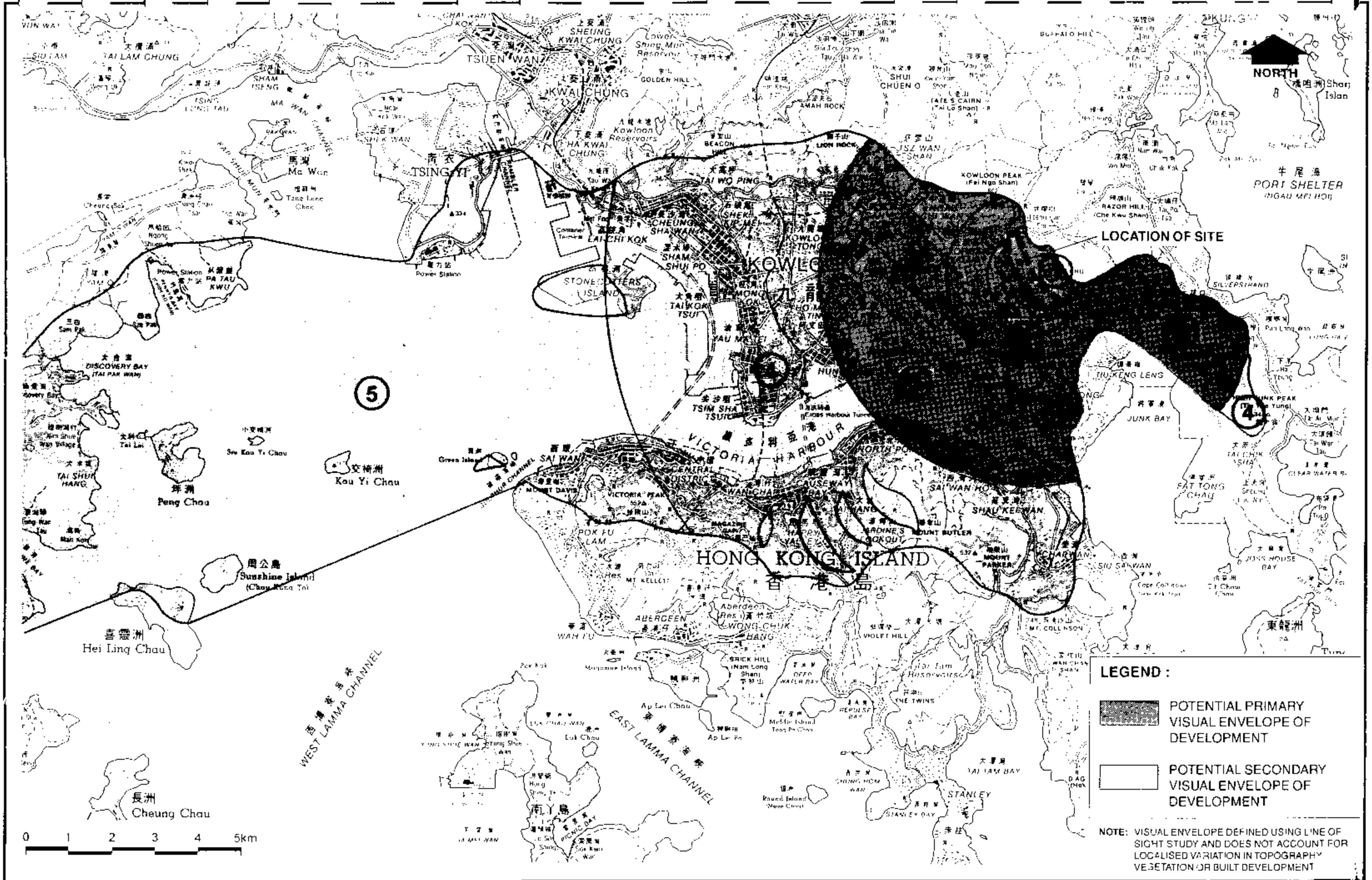
										KOWLOON COAST LANDSCAPE CHARACTER AREA	SCALE / DESIGNED / CHECKED / DATE / DRAWN / DRAWING NO. Fig. 4.4 / REV



A key characteristic of the Hong Kong landscape is the proximate relationship between intensely developed lowlands and the natural uplands. This means that most urban areas have an impressive natural backdrop.



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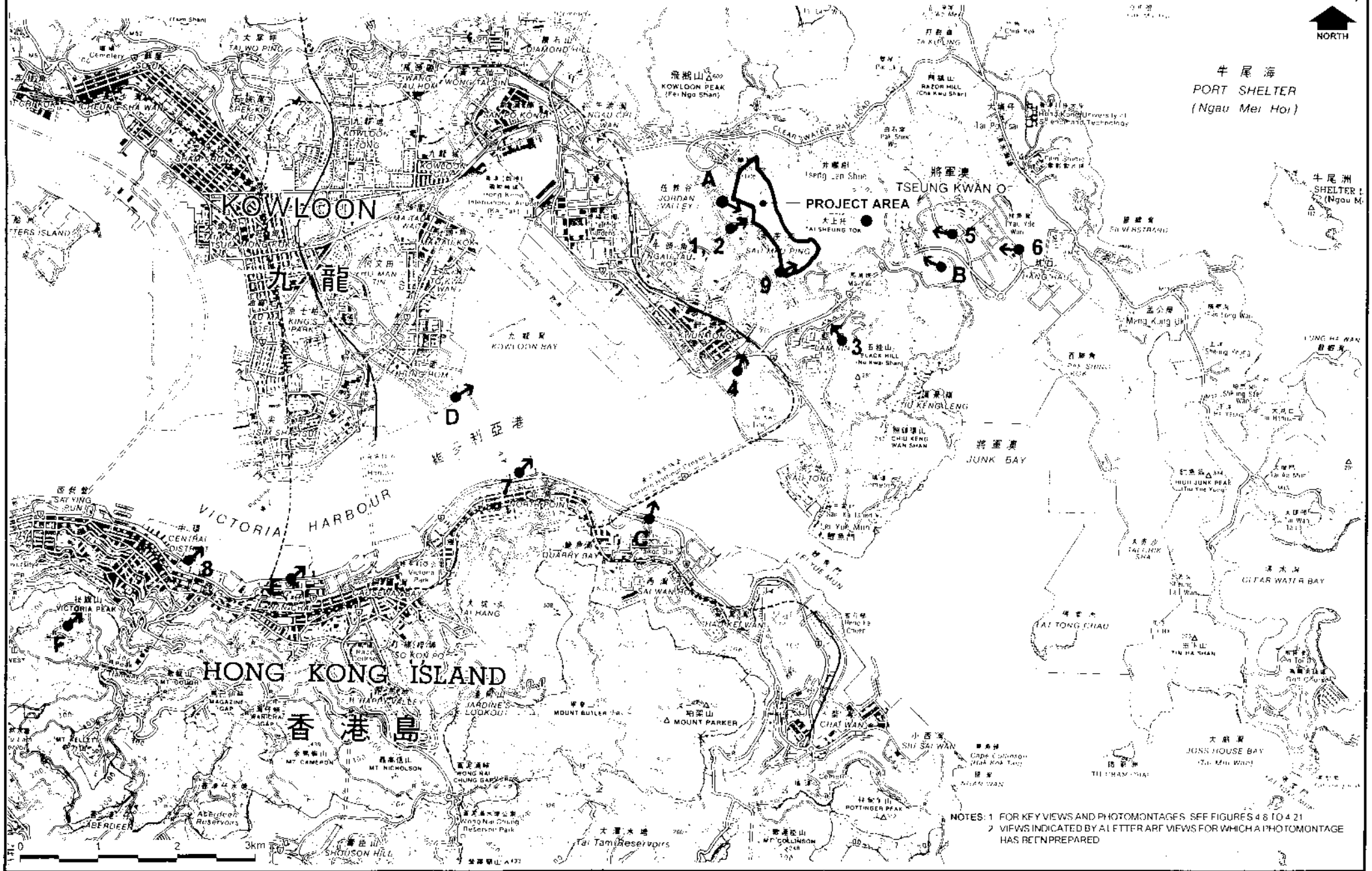
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

POTENTIAL VISUAL ENVELOPE OF DEVELOPMENT AND VISUAL ZONES

AS SHOWN

Fig 4.6



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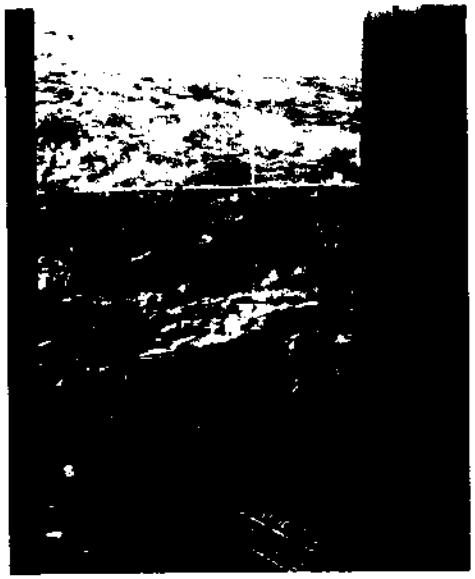
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

LOCATIONS OF KEY VIEWS OF SITE AND PHOTOMONTAGES

Fig 4.7

1. View from 36th floor of Sau Hong Estate



2. View from 3rd floor of Sau Hong Estate

3. View from Lam Tin Garden

4. View from Laguna City Garden

NOTE: LOCATION OF VIEWS SHOWN ON FIG. 4.7

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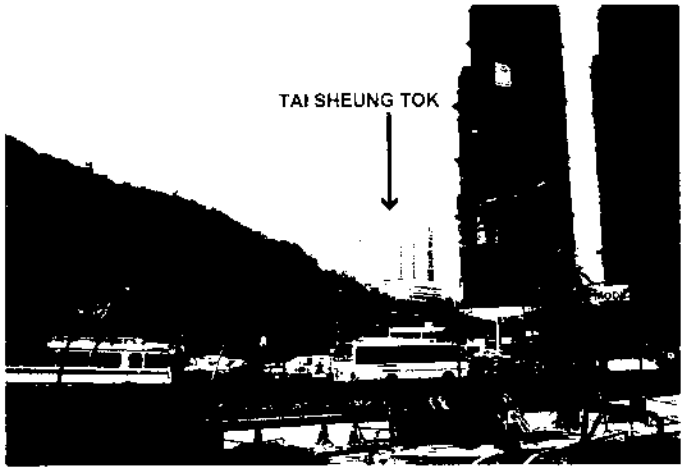
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

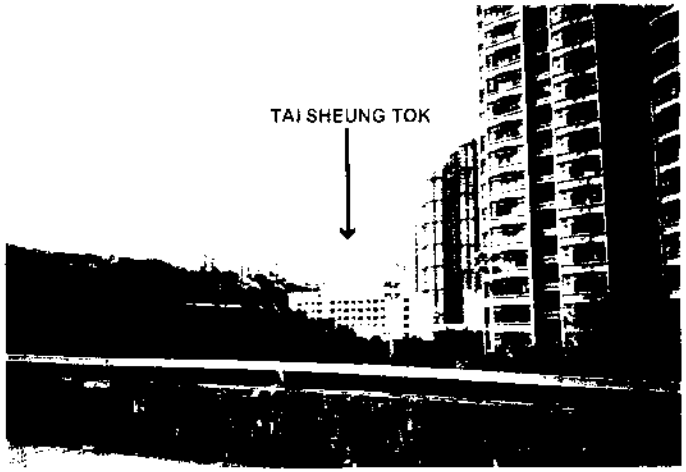
TITLE: KEY VIEWS OF SITE

SCALE | DATE
DESIGNED | DRAWN
CHECKED | DRAWING NO: Fig. 4.8 | REV

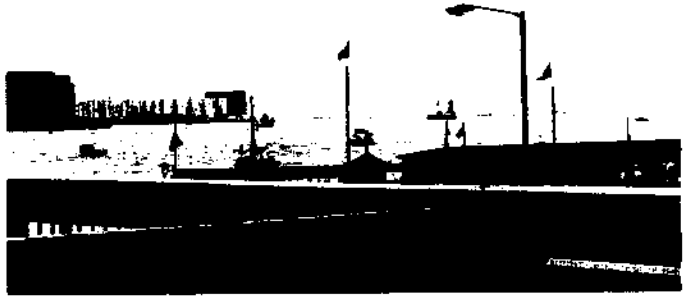


5. View from Tseung Kwan O New Town (Metro City)

7. View from North Point Ferry Pier



6. View from Tseung Kwan O New Town (Po Lam Road North)



8. View from Central Ferry Pier

NOTE: LOCATION OF VIEWS SHOWN ON FIG. 4.7

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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

TITLE: KEY VIEWS OF SITE

SCALE | DESIGNED | CADREF | DATE | DRAWN | DRAWING NO. Fig. 4.9 | REV

VIEW A

For Location of View, See Figure 4.7.

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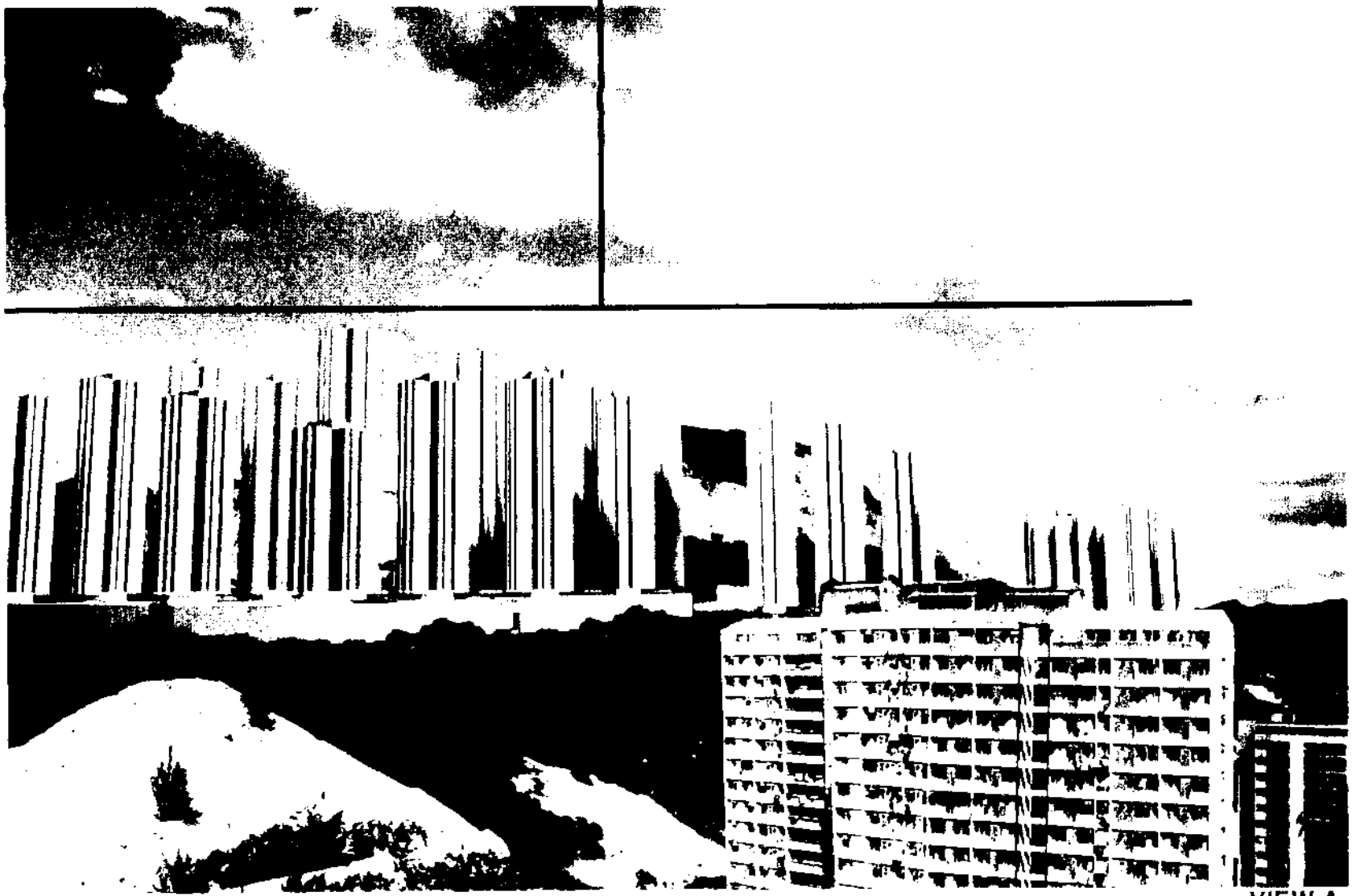
PLANNING AND ENGINEERING FEASIBILITY STUDY
FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

EXISTING VIEW OF SITE
FROM SHUN TIN ESTATE

SCALE
DATE
DESIGNED
DRAWN
CAD REF
DRAWING NO
Fig. 4.10
REV

Proposed Anderson Road Development



For Location of View, See Figure 4.7.

VIEW A

Maunsell in association with Urbis CES	PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT, HONG KONG	
	PHOTOMONTAGE VIEW FROM SHUN TIN ESTATE OF PROPOSED DEVELOPMENT	SCALE	DATE
		DESIGNED	DRAWN
		CHECKED	DRAWING NO: Fig. 4.11 REV:

For Location of View, See Figure 4.7.

VIEW B

Maunsell in association with Urbis CES		PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT, HONG KONG
		EXISTING VIEW OF SITE FROM TSUI LAM (HONG SING GARDEN)	DRAWING NO. Fig. 4.12

Proposed Anderson Road Development

For Location of View, See Figure 4.7.

VIEW B

Maunsell
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CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

PHOTOMONTAGE VIEW FROM TSUI LAM ESTATE (HONG SING GARDEN) OF PROPOSED DEVELOPMENT

SCALE
DESIGNED
DRAWN
DATE
CAD REF
DRAWING NO
Fig. 4.13
REV

For Location of View, See Figure 4.7.

VIEW C

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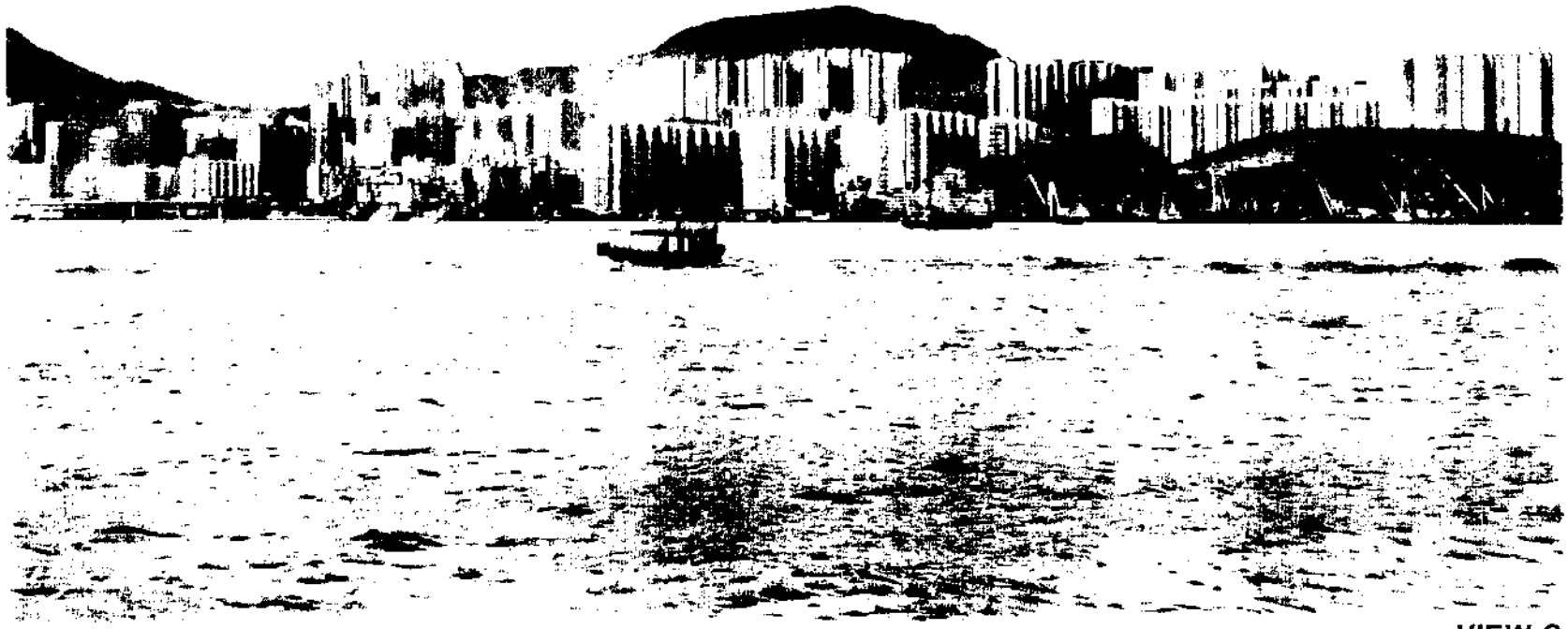
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

TITLE
EXISTING VIEW OF SITE FROM QUARRY BAY PARK

SCALE
DESIGNED
CAD REF
DATE
DRAWN
DRAWING NO
Fig 4.14
REV

Proposed Anderson Road Development



For Location of View, See Figure 4.7.

VIEW C

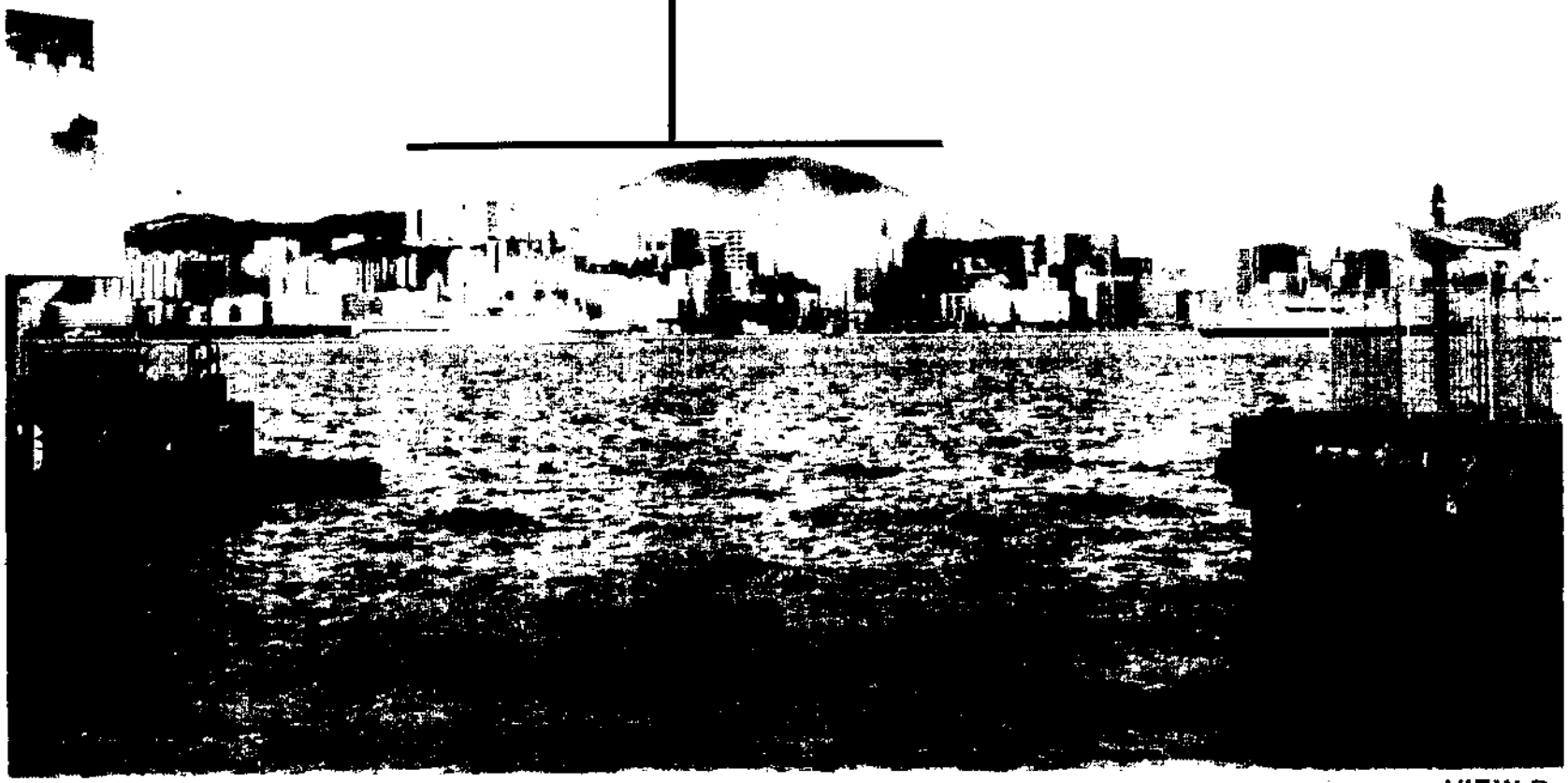
Maunsell in association with Urbis CES		PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT HONG KONG
		PHOTOMONTAGE VIEW FROM QUARRY BAY PARK OF PROPOSED DEVELOPMENT	SCALE / DESIGNED / CHECKED / DATE / DRAWN / DRAWING NO. Fig. 4.15 / REV

For Location of View, See Figure 4.7.

VIEW D

Maunsell in association with Urbis CES										PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD CIVIL ENGINEERING DEPARTMENT, HONG KONG TITLE: EXISTING VIEW OF SITE FROM HUNG HOM WATERFRONT SCALE / DESIGNED / CAD REF / DATE / DRAWN / DRAWING NO. Fig. 4.16 / REV

Proposed Anderson Road Development



For Location of View, See Figure 4.7.

VIEW D

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CES

REVISION	DESCRIPTION	BY	DATE	APPROVED

REVISION	DESCRIPTION	BY	DATE	APPROVED

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

TITLE: PHOTOMONTAGE VIEW FROM HUNG HOM WATERFRONT OF PROPOSED DEVELOPMENT

CIVIL ENGINEERING DEPARTMENT, HONG KONG

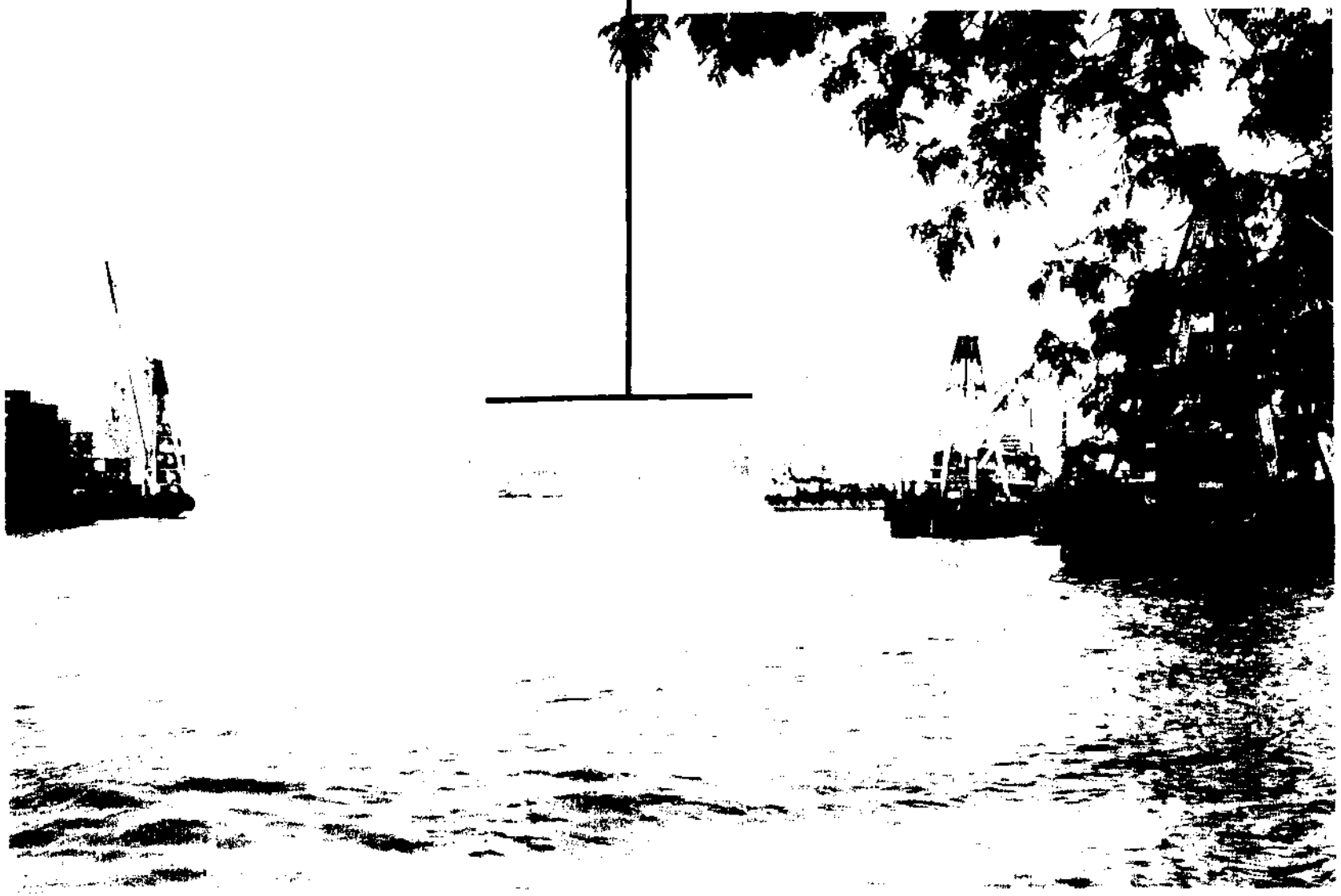
SCALE		DATE	
DESIGNED		DRAWN	
CAD REF		DRAWING NO.	REV.
		Fig. 4.17	

For Location of View, See Figure 4.7.

VIEW E

Maunsell in association with Urbis CES		PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT, HONG KONG
		EXISTING VIEW OF SITE FROM WANCHAI WATERFRONT	SCALE / DESIGNED / DRAWN / DATE / DRAWING NO. Fig. 4.18 / REV.

Proposed Anderson Road Development



For Location of View, See Figure 4.7.

VIEW E

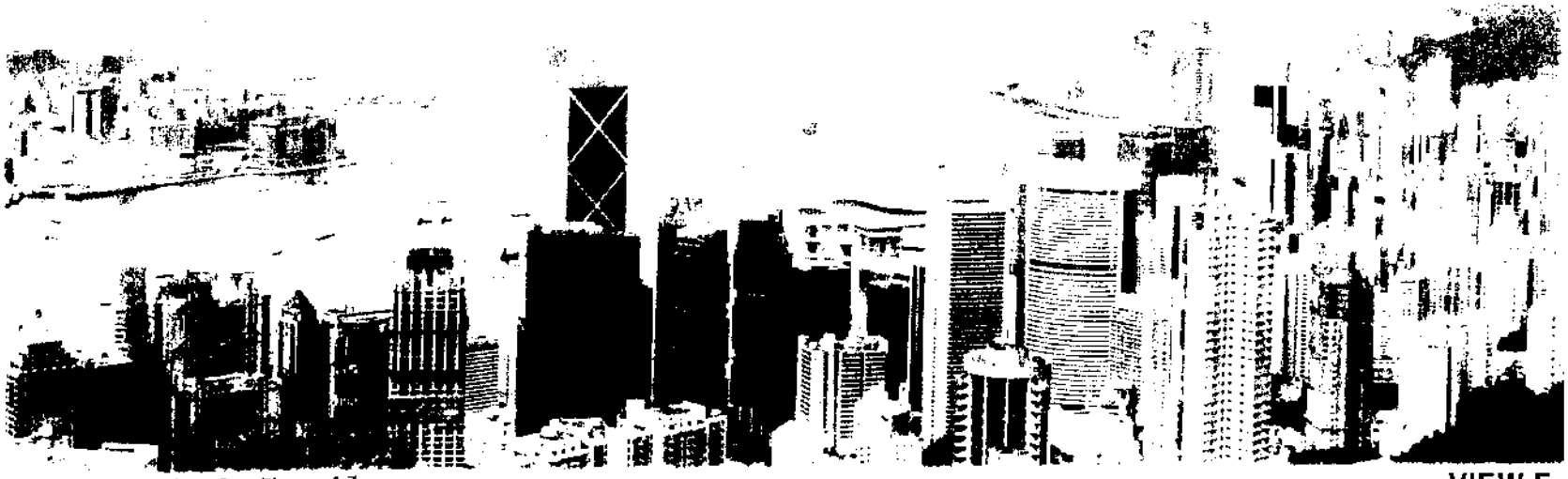
Maunsell
in association with
Urbis
CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT HONG KONG

TITLE: PHOTOMONTAGE VIEW FROM WANCHAI WATERFRONT OF PROPOSED DEVELOPMENT

SCALE | DATE
DESIGNED | DRAWN
CAD REF | DRAWING NO: Fig. 4.19 | REV

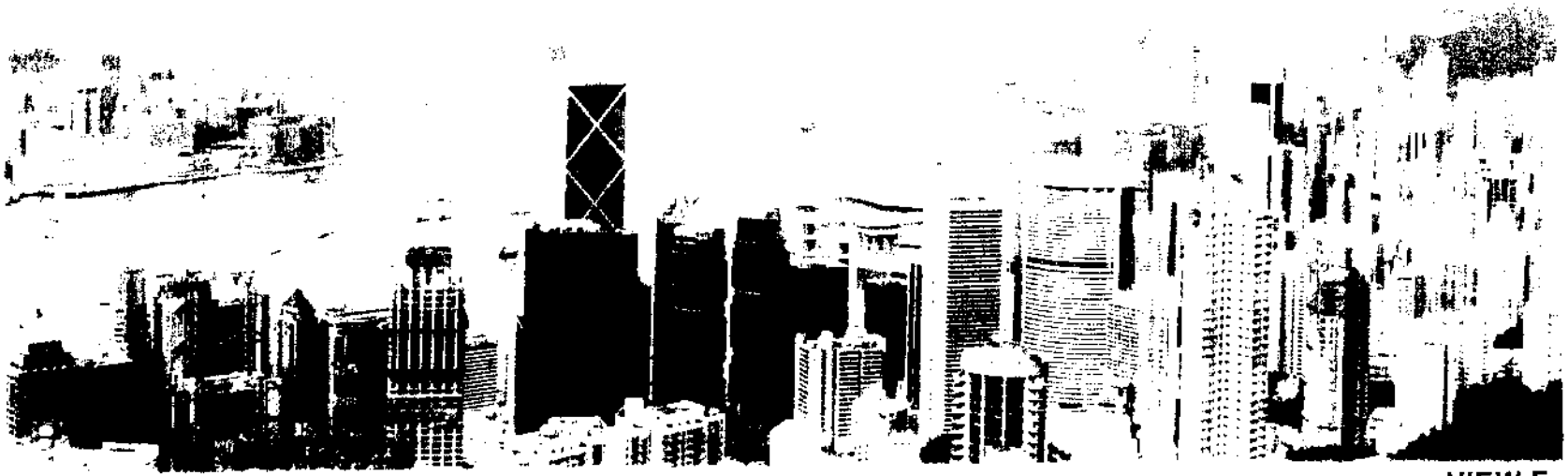


For Location of View, See Figure 4.7.

VIEW F

Maunsell in association with Urbis CES		PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT HONG KONG		
		EXISTING VIEW OF SITE FROM VICTORIA PEAK (GALLERIA)	SCALE	DATE	
			DESIGNED	DRAWN	
			PLAN REF	DRAWING NO. Fig. 4.20	REV

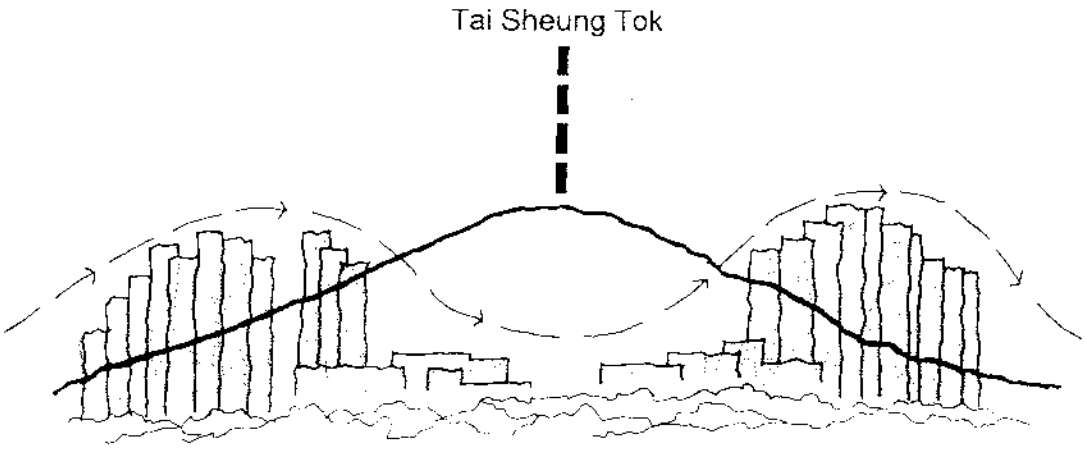
Proposed Anderson Road Development



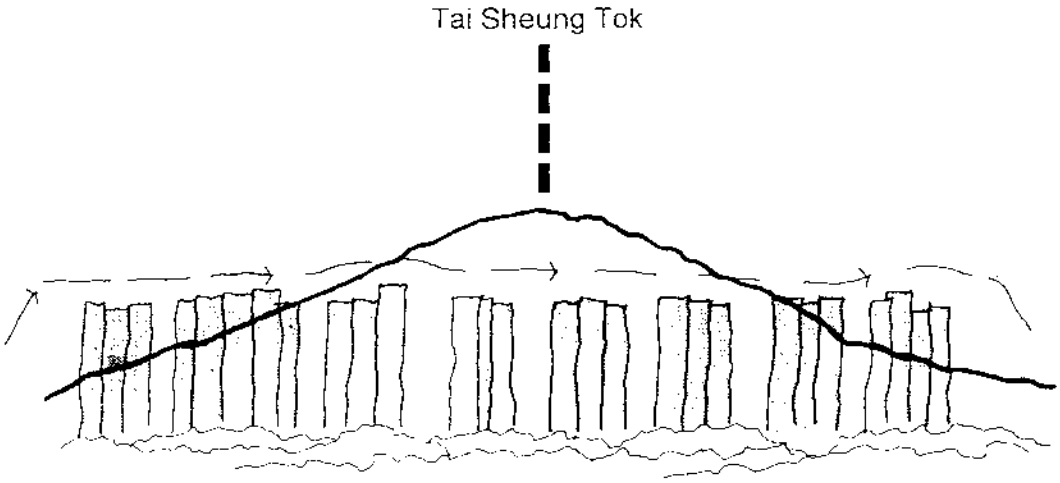
For Location of View, See Figure 4.7.

VIEW F

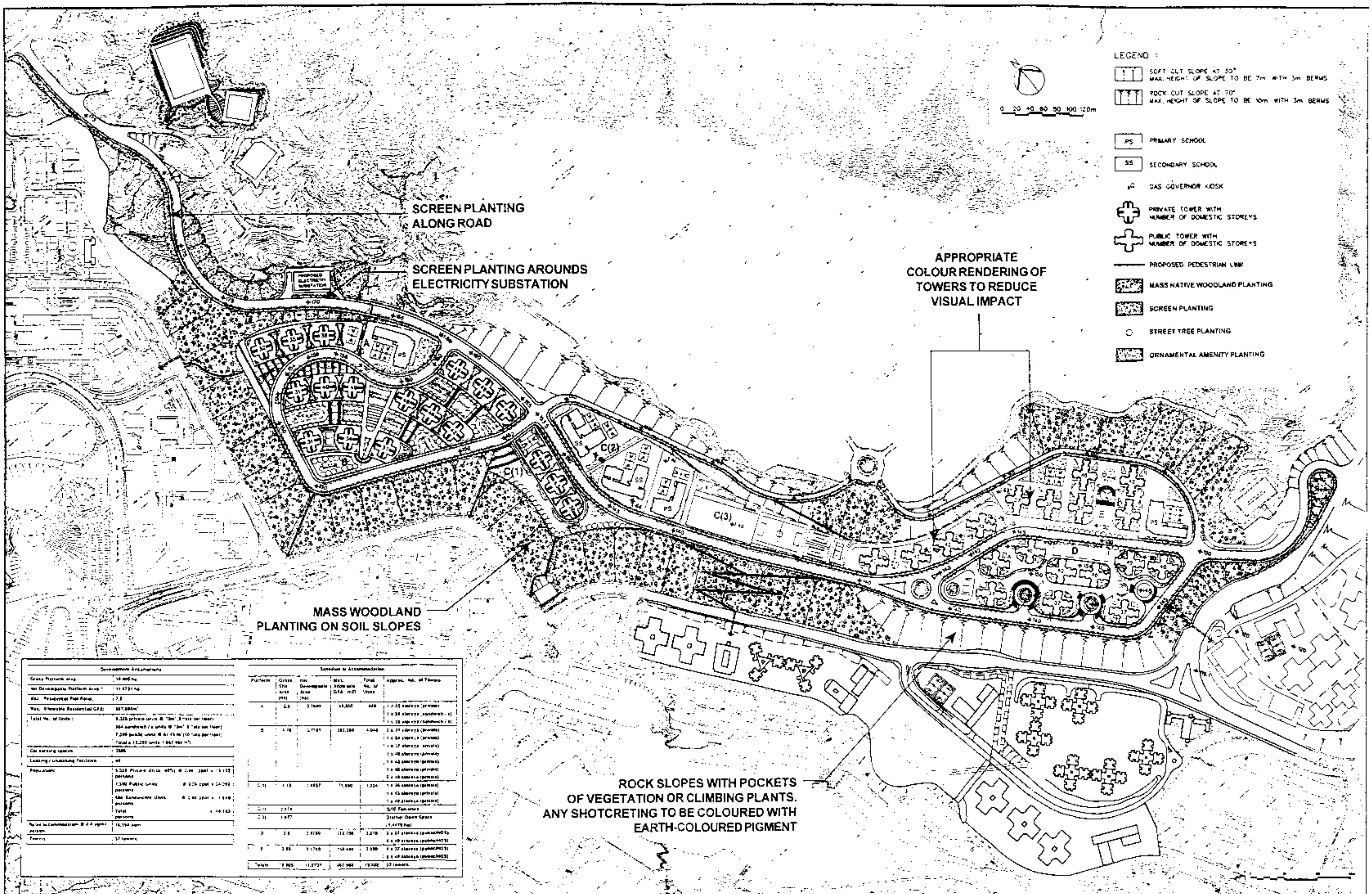
Maunsell in association with Urbis CES								PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD	CIVIL ENGINEERING DEPARTMENT HONG KONG
								TITLE: PHOTOMONTAGE VIEW FROM VICTORIA PEAK (GALLERIA) OF PROPOSED DEVELOPMENT	SCALE / DESIGNED / CAD REF / DATE / DRAWN / DRAWING NO. Fig. 4.21 / REV.



Towers Grouped in Two Clusters
This has the effect both of allowing views of the peak of Tai Sheung Tok, a landmark feature, but also of creating a compositional rhythm (see dashed line) in counterpoint to the curve of the ridge behind.



Towers Grouped in Single Tier
This has the effect of largely obscuring the ridge to the rear and also bears little relationship to the peak of Tai Sheung Tok. It creates a monotonous wall of development with little compositional rhythm (see dashed line).


LEGEND :
SOFT CUT SLOPE AT 30° MAX. HEIGHT OF SLOPE TO BE 7m WITH 3m BERMS
ROCK CUT SLOPE AT 70° MAX. HEIGHT OF SLOPE TO BE 10m WITH 3m BERMS
PS PRIMARY SCHOOL
SS SECONDARY SCHOOL
GAS GOVERNOR KIOSK
PRIVATE TOWER WITH NUMBER OF DOMESTIC STOREYS
PUBLIC TOWER WITH NUMBER OF DOMESTIC STOREYS
PROPOSED PEDESTRIAN LINK
MASS NATIVE WOODLAND PLANTING
SCREEN PLANTING
STREET TREE PLANTING
ORNAMENTAL AMENITY PLANTING
0 20 40 60 80 100 120m
SCREEN PLANTING ALONG ROAD
SCREEN PLANTING AROUNDS ELECTRICITY SUBSTATION
APPROPRIATE COLOUR RENDERING OF TOWERS TO REDUCE VISUAL IMPACT
MASS WOODLAND PLANTING ON SOIL SLOPES
ROCK SLOPES WITH POCKETS OF VEGETATION OR CLIMBING PLANTS. ANY SHOTCRETING TO BE COLOURED WITH EARTH-COLOURED PIGMENT
C(1)
C(2)
C(3)
D
Development Assumptions
Schedule of Accommodation

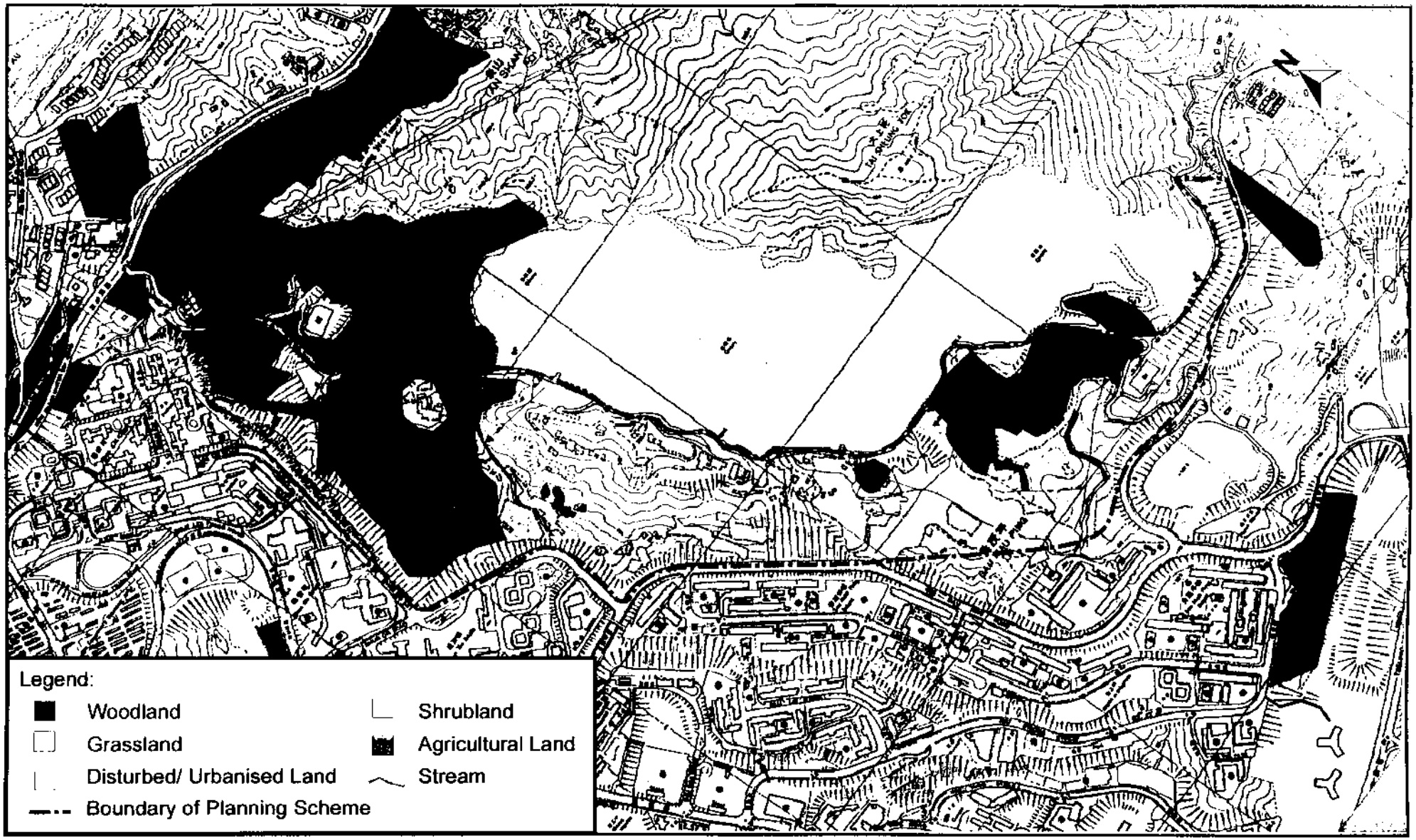
Maunsell
in association with
Urbis
CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

LANDSCAPE AND VISUAL MITIGATION PROPOSALS

CIVIL ENGINEERING DEPARTMENT, HONG KONG

SCALE	1:2 500 AT A1	DATE	MAY 98
		Drawing No.	Fig. 4.23

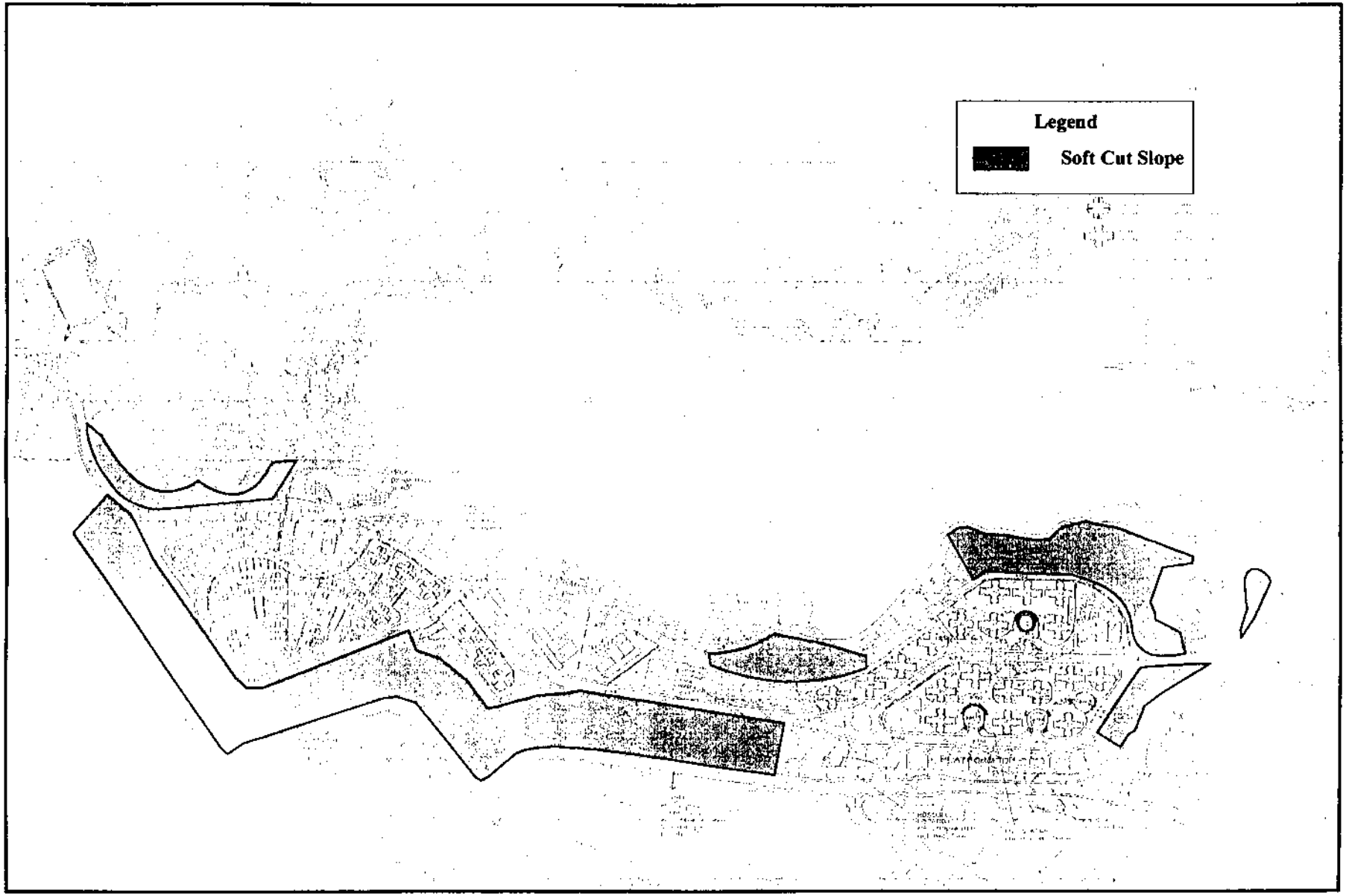


環科 CES

TITLE

Habitat Map, Anderson Road, 1998

CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	November 1998
DESIGNED	Ecosystem Ltd.	DRAWING NO	Figure 5.1

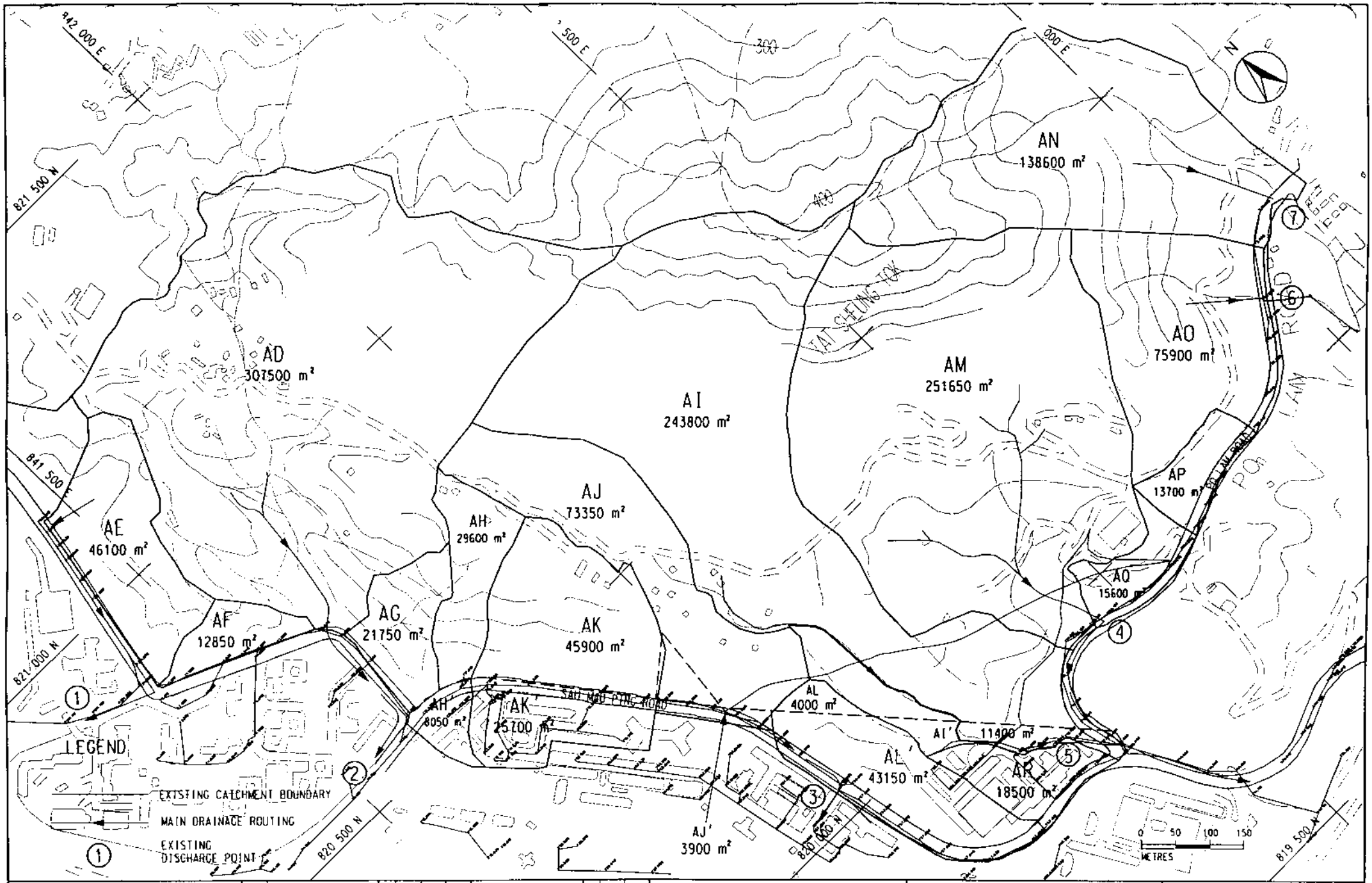


環科 CES

TITLE

Locations of the soft cut slopes potentially available for compensatory planting

CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	Sept. 1998
DESIGNED	Ecosystems Ltd	DRAWING NO	Figure 5.3



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

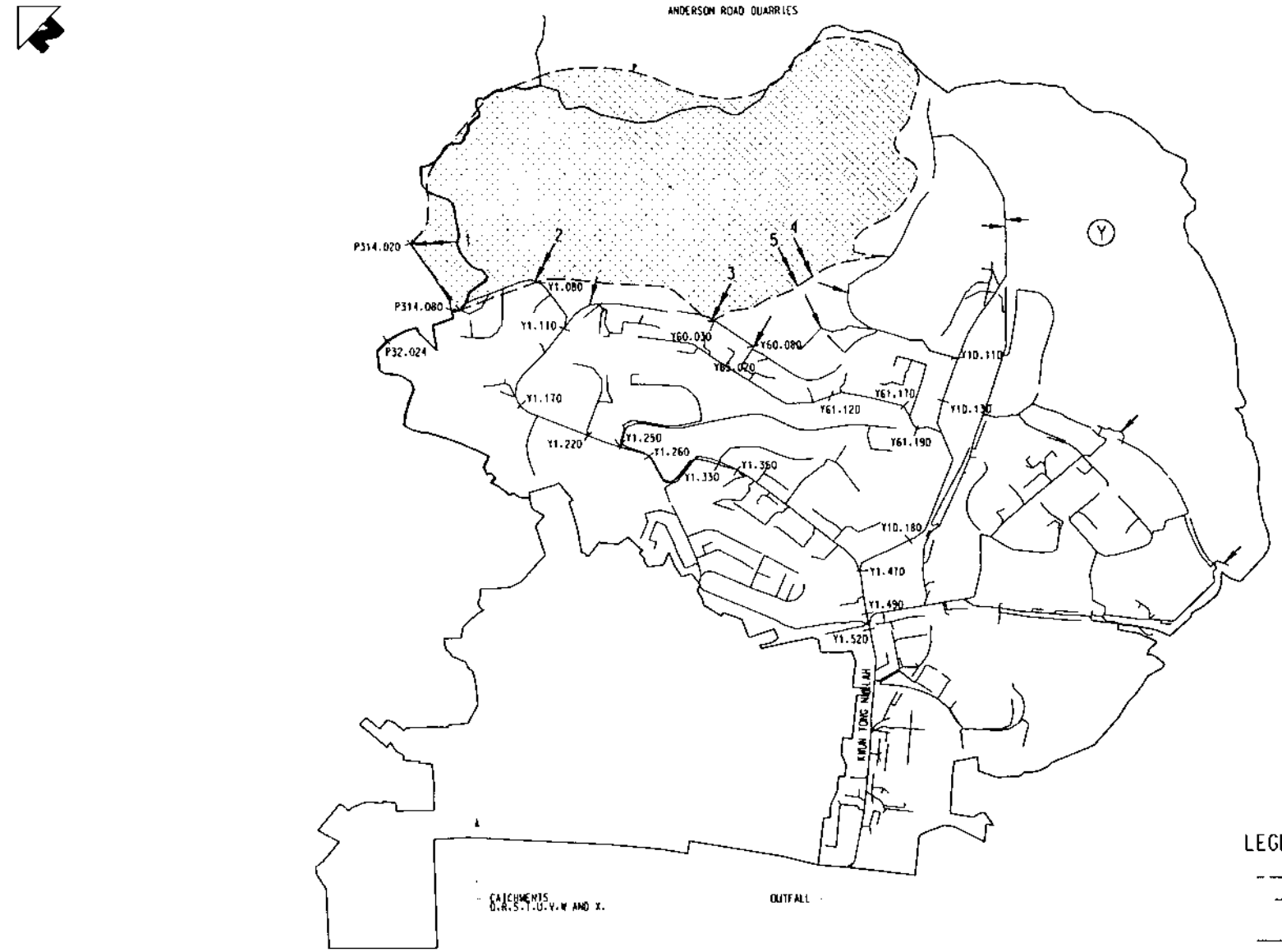
CIVIL ENGINEERING DEPARTMENT, HONG KONG

ANDERSON ROAD QUARRIES - EXISTING DRAINAGE CATCHMENT

1:5000 SEPTEMBER 98

YYH C.C.

Figure 6.1



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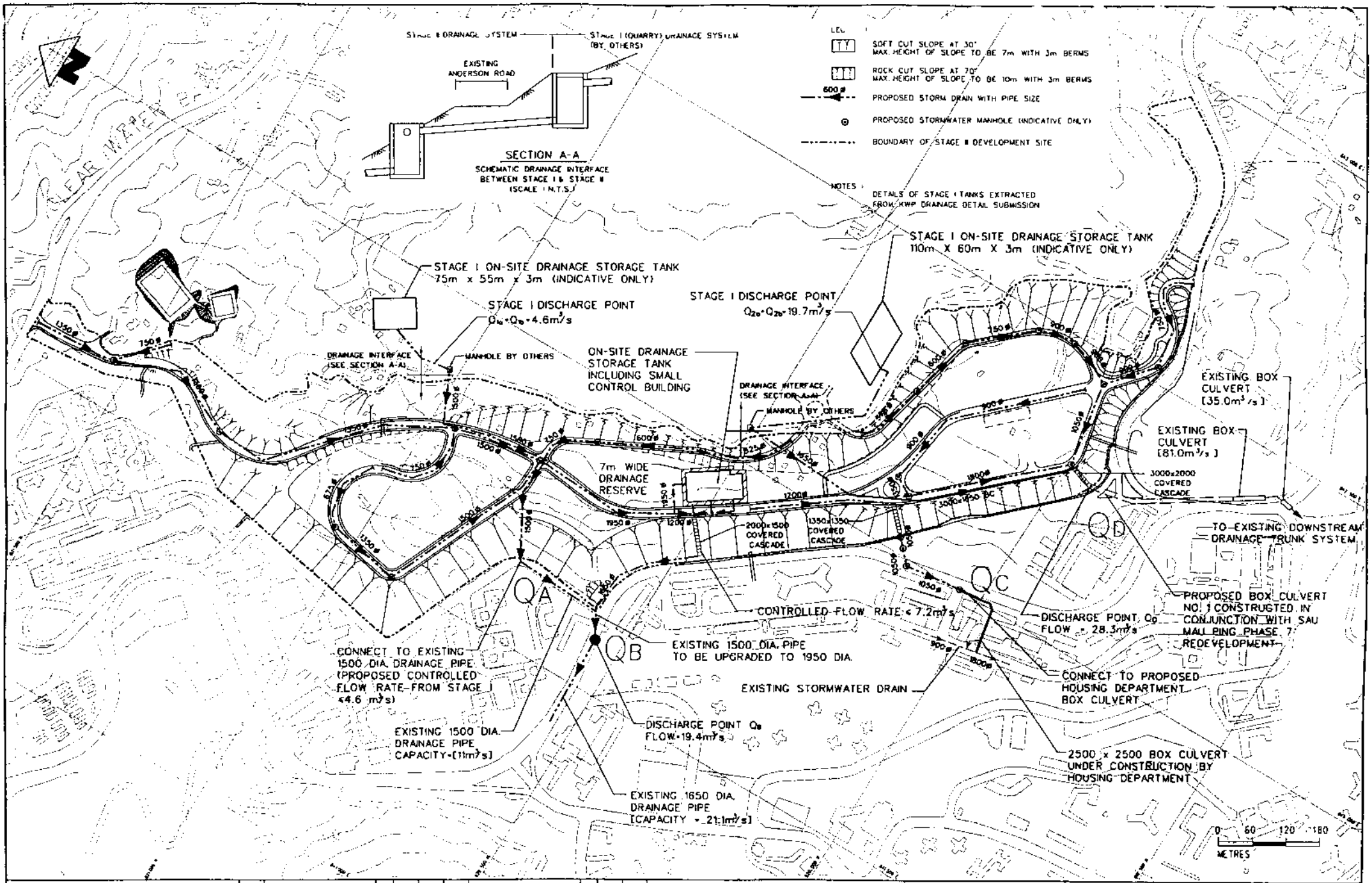
CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

MODEL NODE NUMBERING OF DRAINAGE SYSTEM

1:30000 | OCTOBER 98 | JRH | EW | FIGURE 6.2



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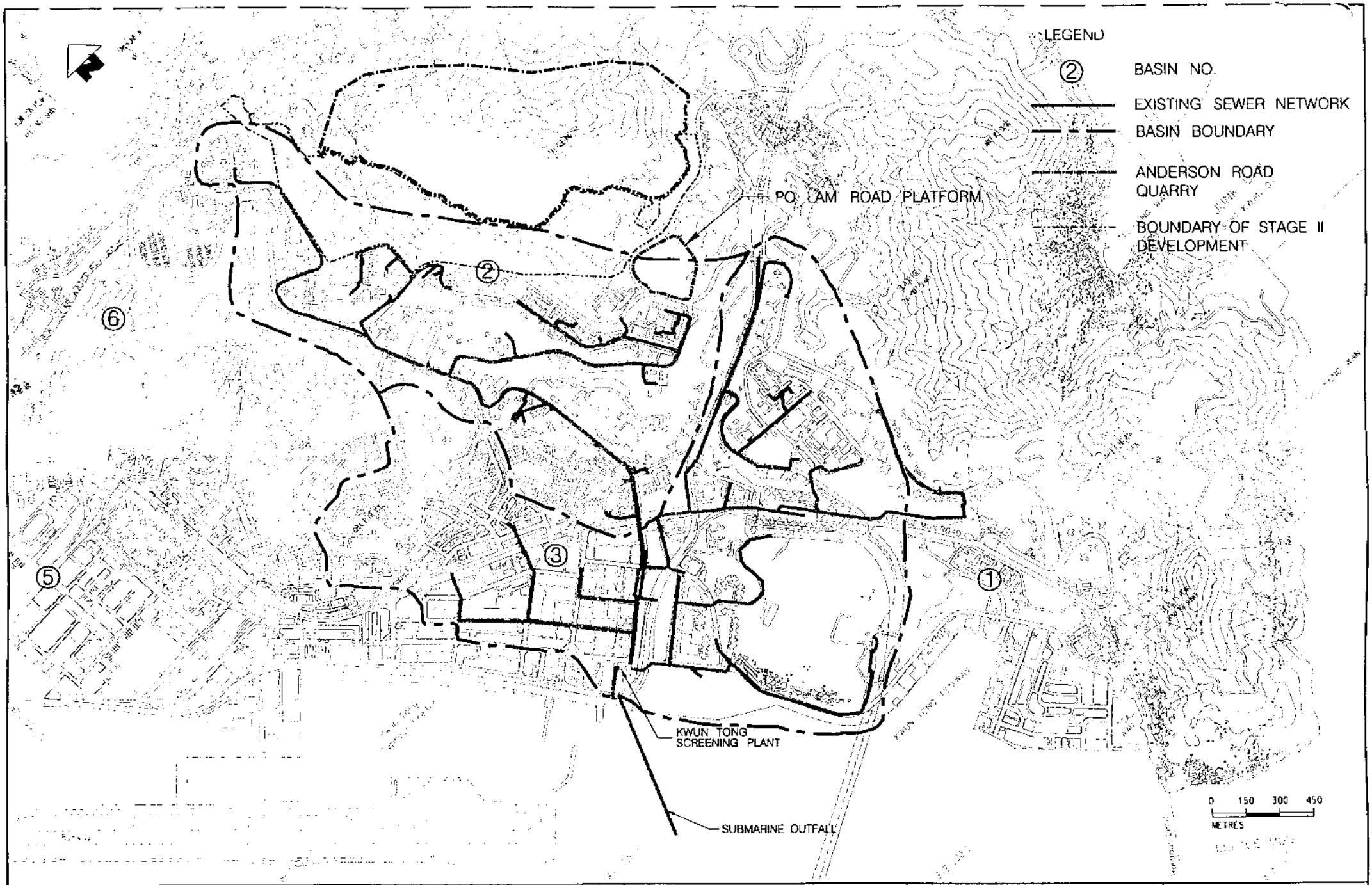
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

PRELIMINARY DRAINAGE SYSTEM WITHIN DEVELOPMENT-OPTION A

SEPTEMBER 98

Figure 6.3



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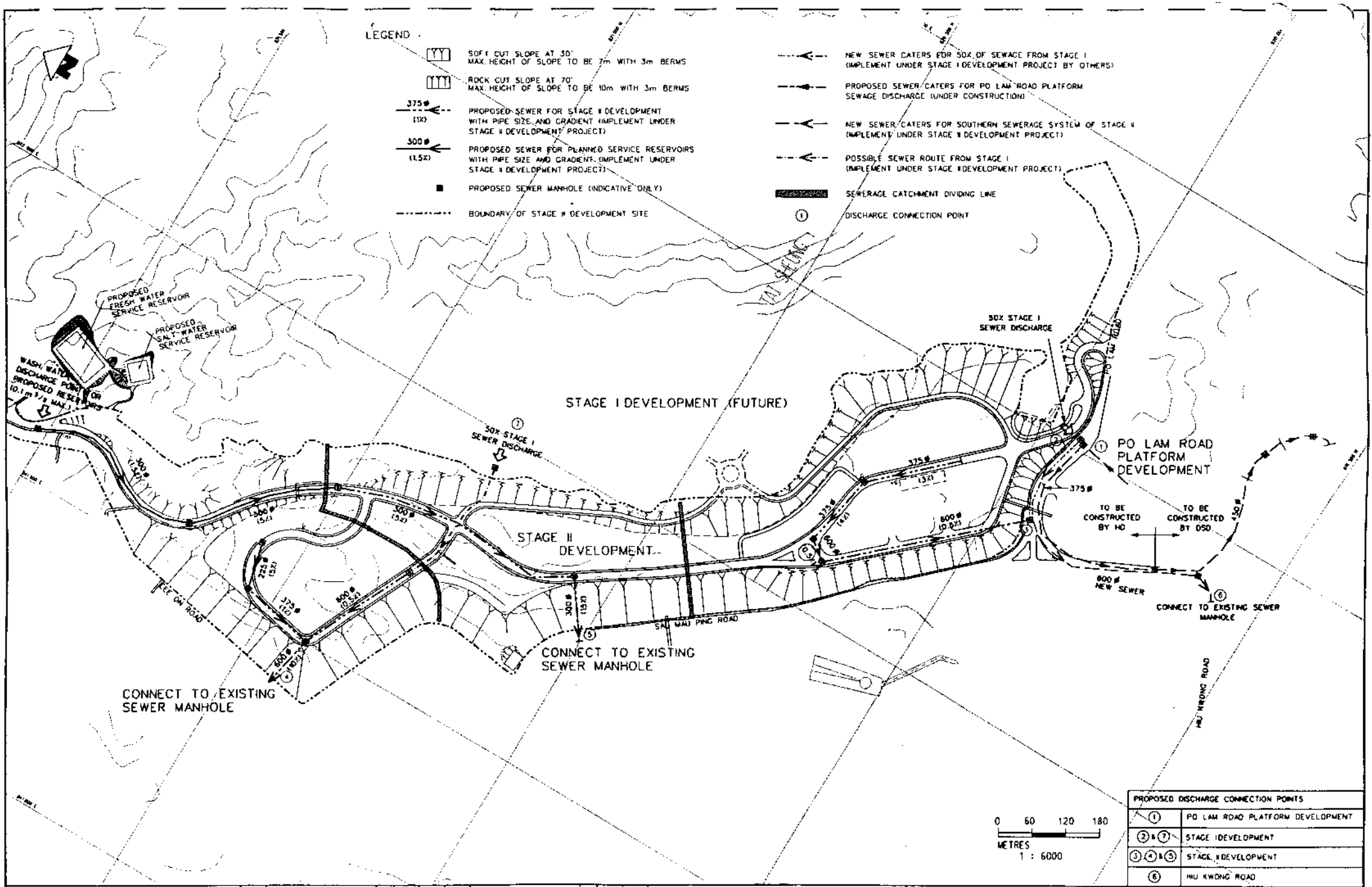
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

EAST KOWLOON EXISTING SEWERAGE BASIN NOS. 2 AND 3

1:5000 | OCTOBER 90 | TPH | EB | FIGURE 7.1



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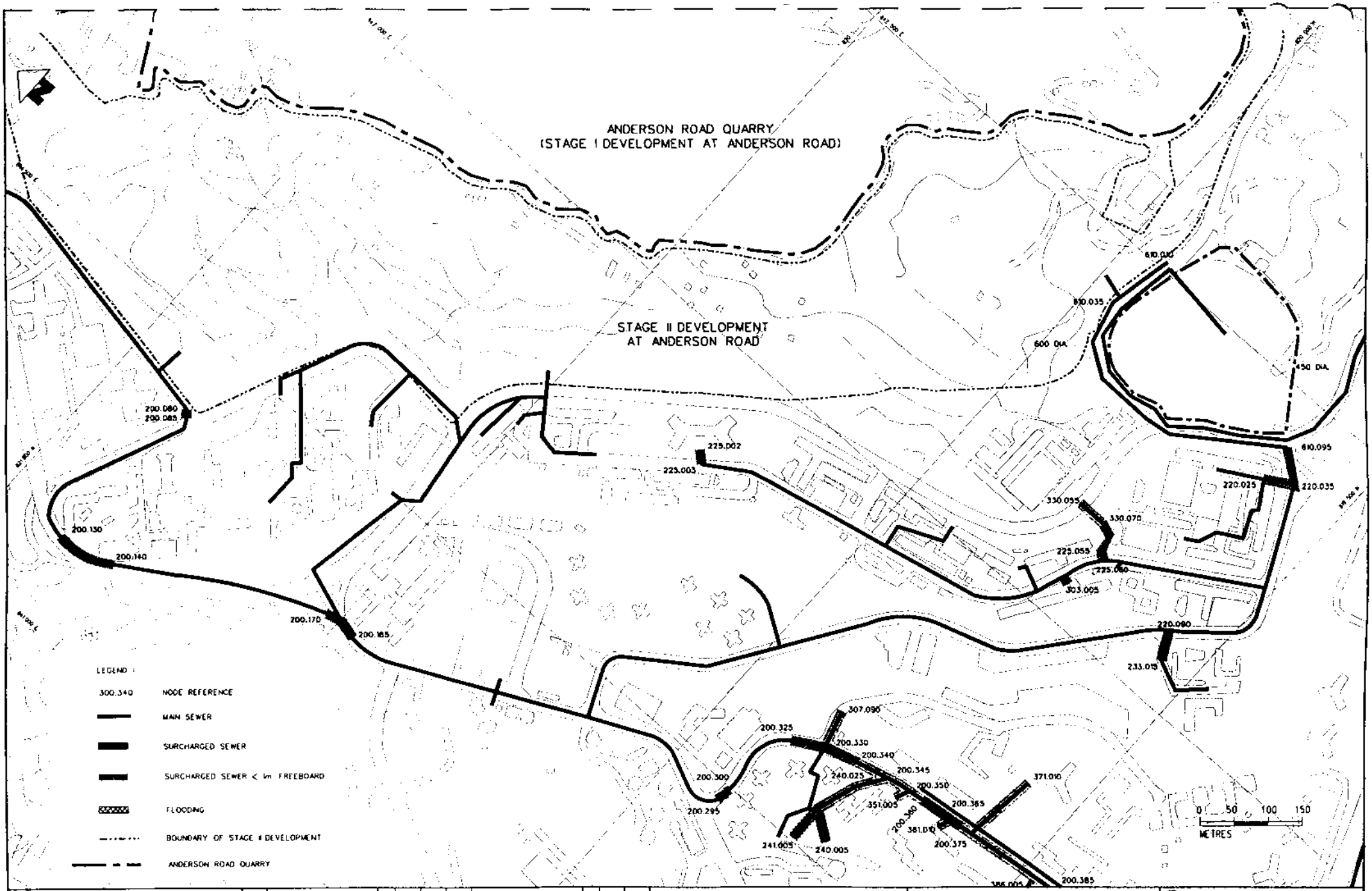
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

PRELIMINARY SEWERAGE SYSTEM WITHIN THE PROPOSED DEVELOPMENT

Figure 7.2



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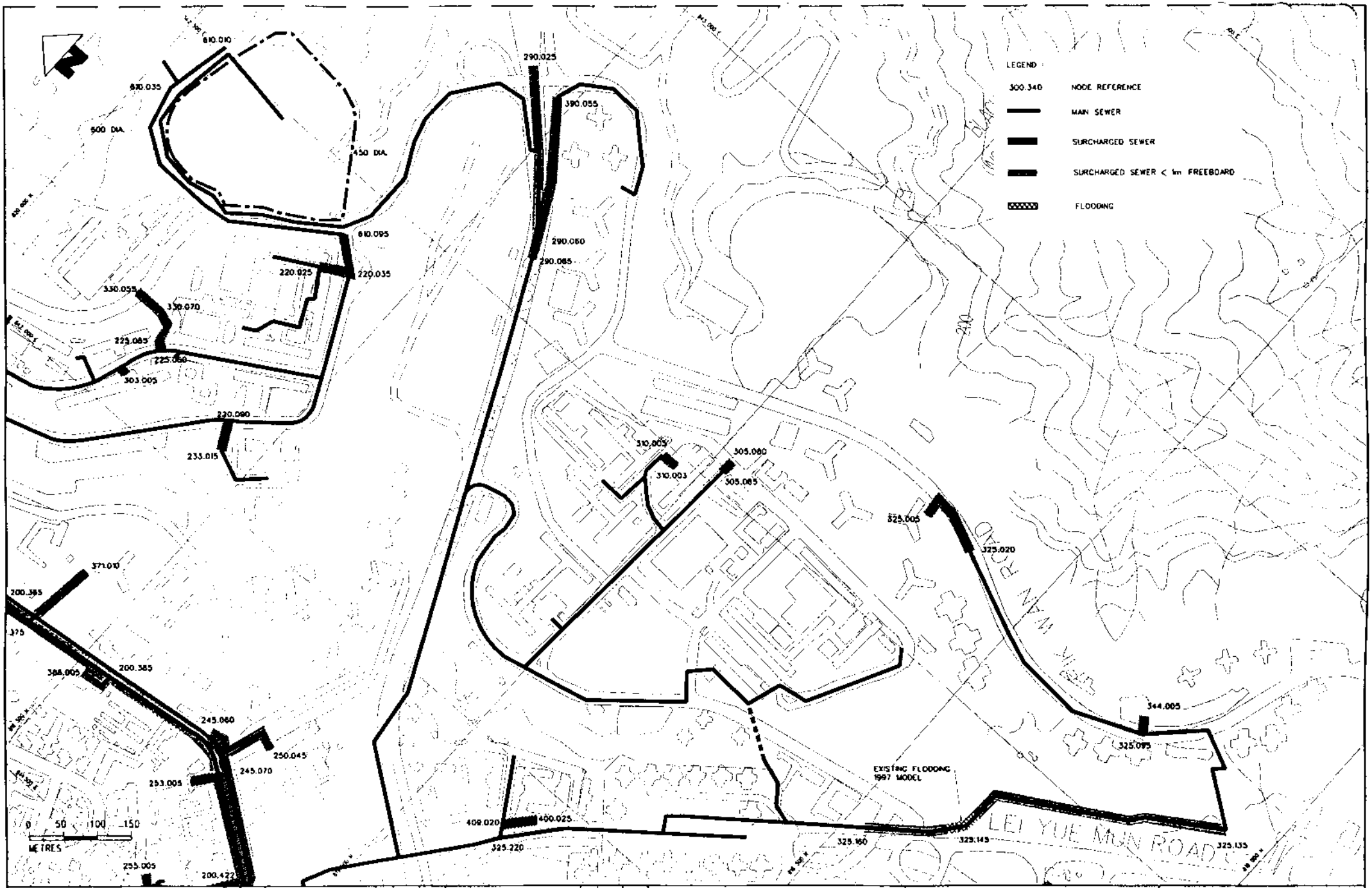
PLANNING AND ENGINEERING FEASIBILITY STUDY
FOR DEVELOPMENT AT ANDERSON ROAD

EXTENT OF SEWER SURCHARGING
2009 MODEL (4DWF)

SHEET 2 OF 3

CIVIL ENGINEERING DEPARTMENT, HONG KONG

FIGURE 7.3



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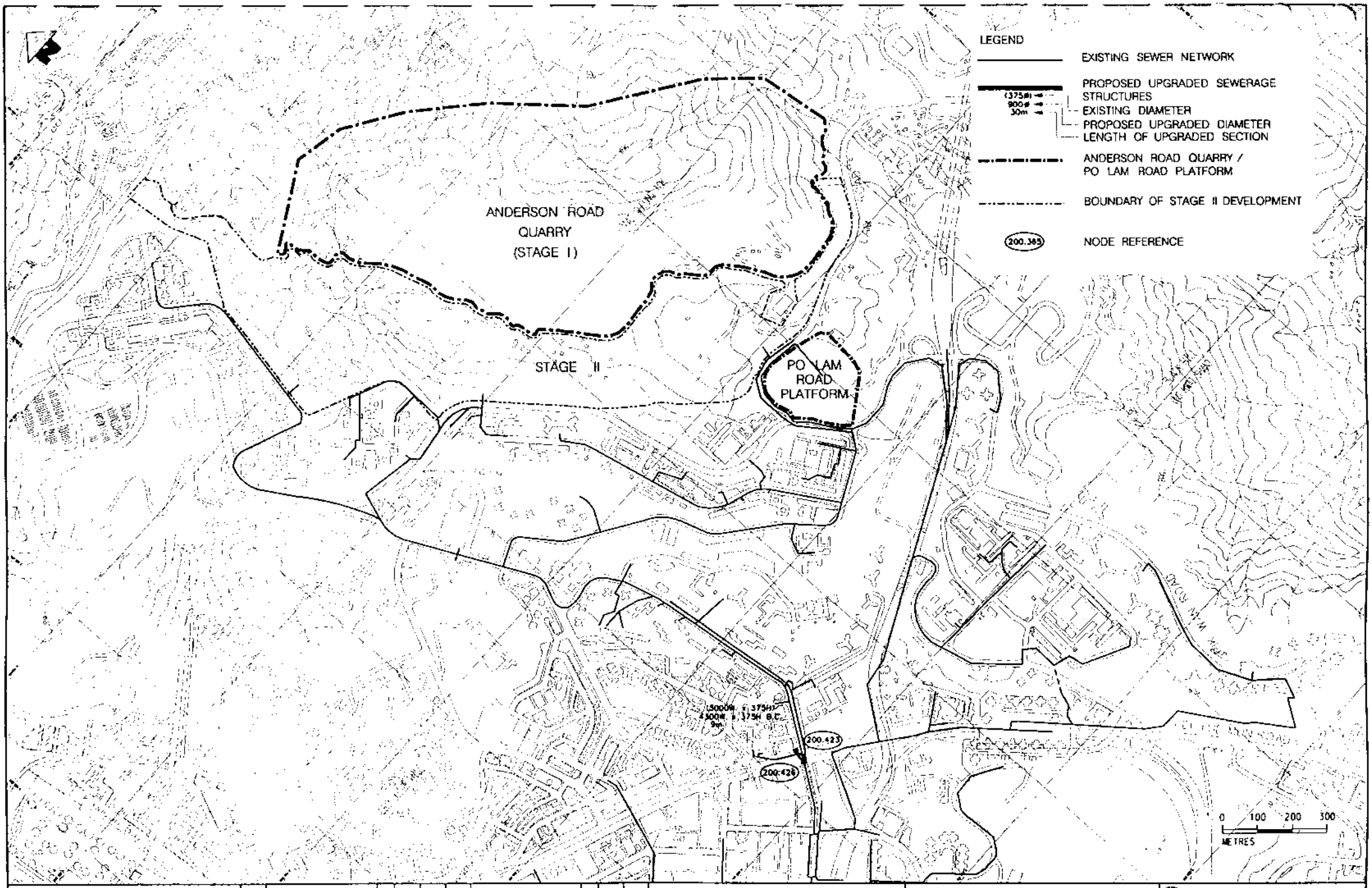
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

EXTENT OF SEWER SURCHARGING 2009 MODEL (4DWF)

SHEET 3 OF 5

CIVIL ENGINEERING DEPARTMENT, HONG KONG

	1:5000		OCTOBER 00
	CE		EW
			FIGURE 7.4



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CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

UPGRADING OF EXISTING SEWERAGE SYSTEM FOR 2009

OCTOBER 98

FIGURE 7.5

環科 CES	TITLE: Survey Map of the Development Site, July 1974	CES (ASIA) LIMITED		
		PROJECT NO: C210	DATE: Sept. 1998	
		DESIGNED: Peter Lee	DRAWING NO: Figure 9.1	

環科 CES

TITLE

Aerial Photo of the Development Site and its Surrounding
December 1956

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Peter Lee	DRAWING NO.	Figure 9.2

環科 CES

TITLE

Aerial Photo of the Development Site and its Surrounding
May 1967

CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	Sept. 1998
DESIGNED	Peter Lee	DRAWING NO	Figure 9.3

環科 CES

TITLE

Aerial Photo of the Development Site and its Surrounding
December 1977

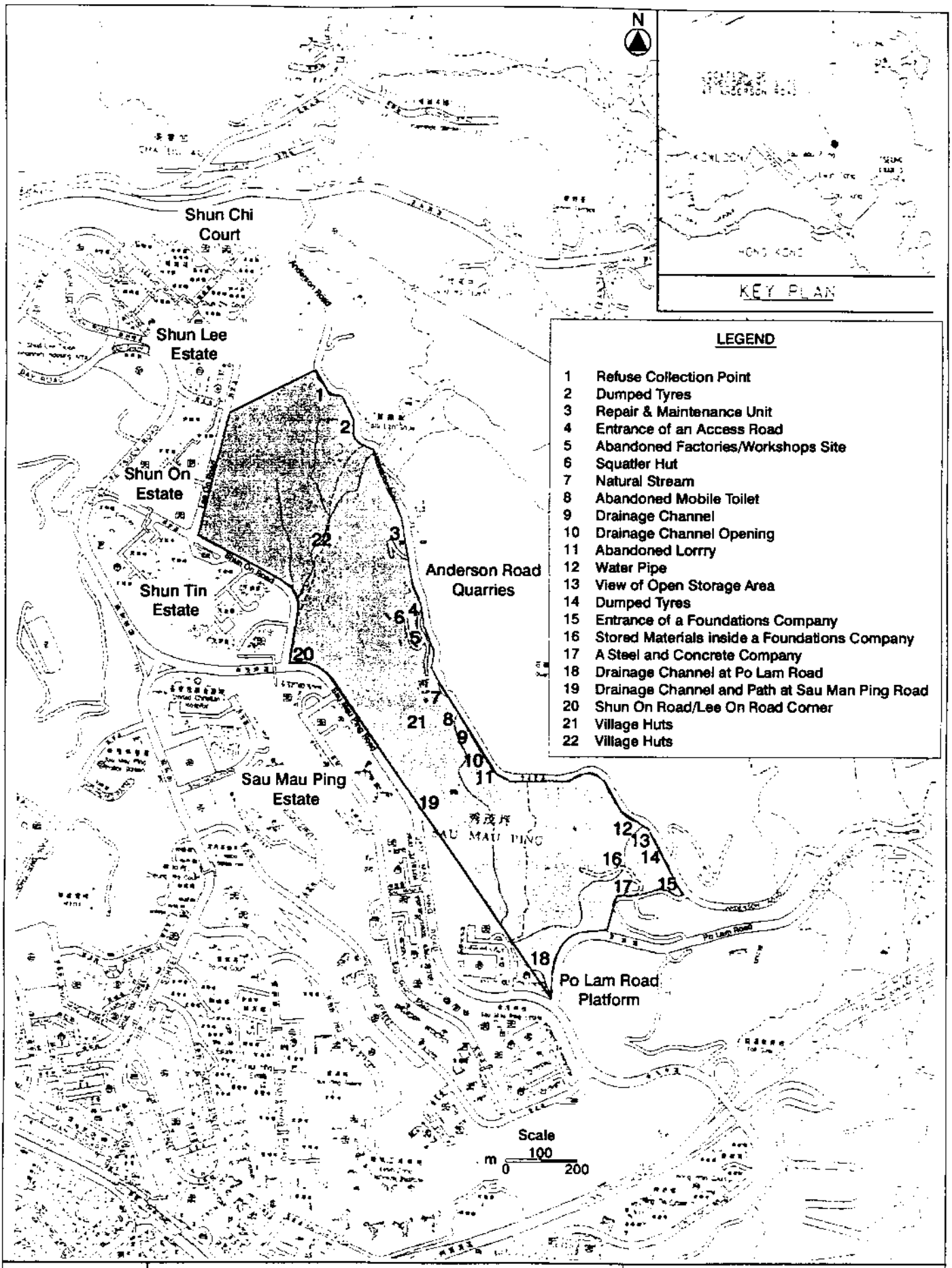
CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	Sept. 1998
DESIGNED	Peter Lee	DRAWING NO	Figure 9.4

環科 CES

TITLE

Aerial Photo of the Development Site and its Surrounding
June 1987

CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	Sept. 1998
DESIGNED	Peter Lee	DRAWING NO	Figure 9.5



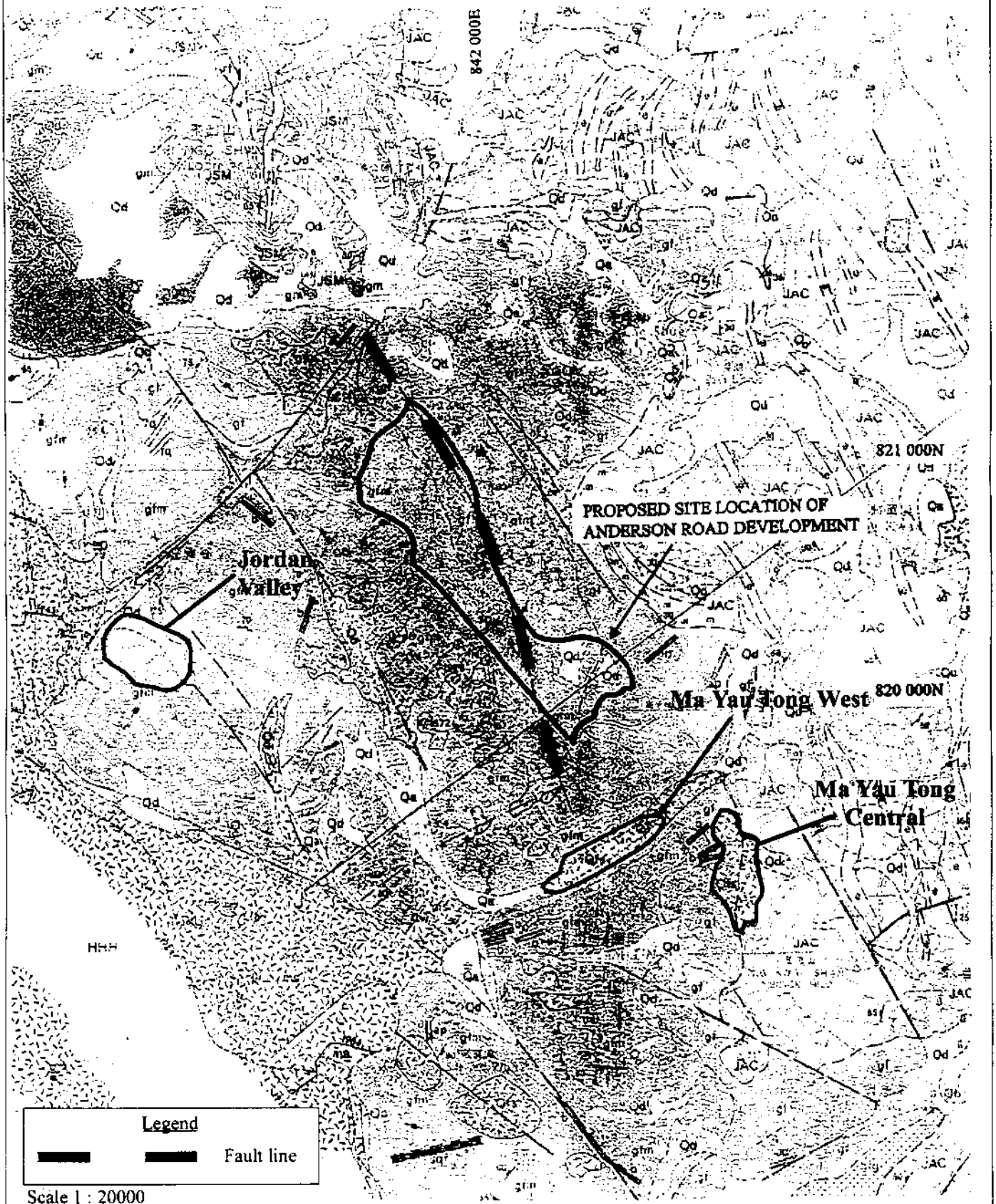
環科 CES

TITLE

Location Map of Special Facilities/Features Around Development Site

CES (ASIA) LIMITED

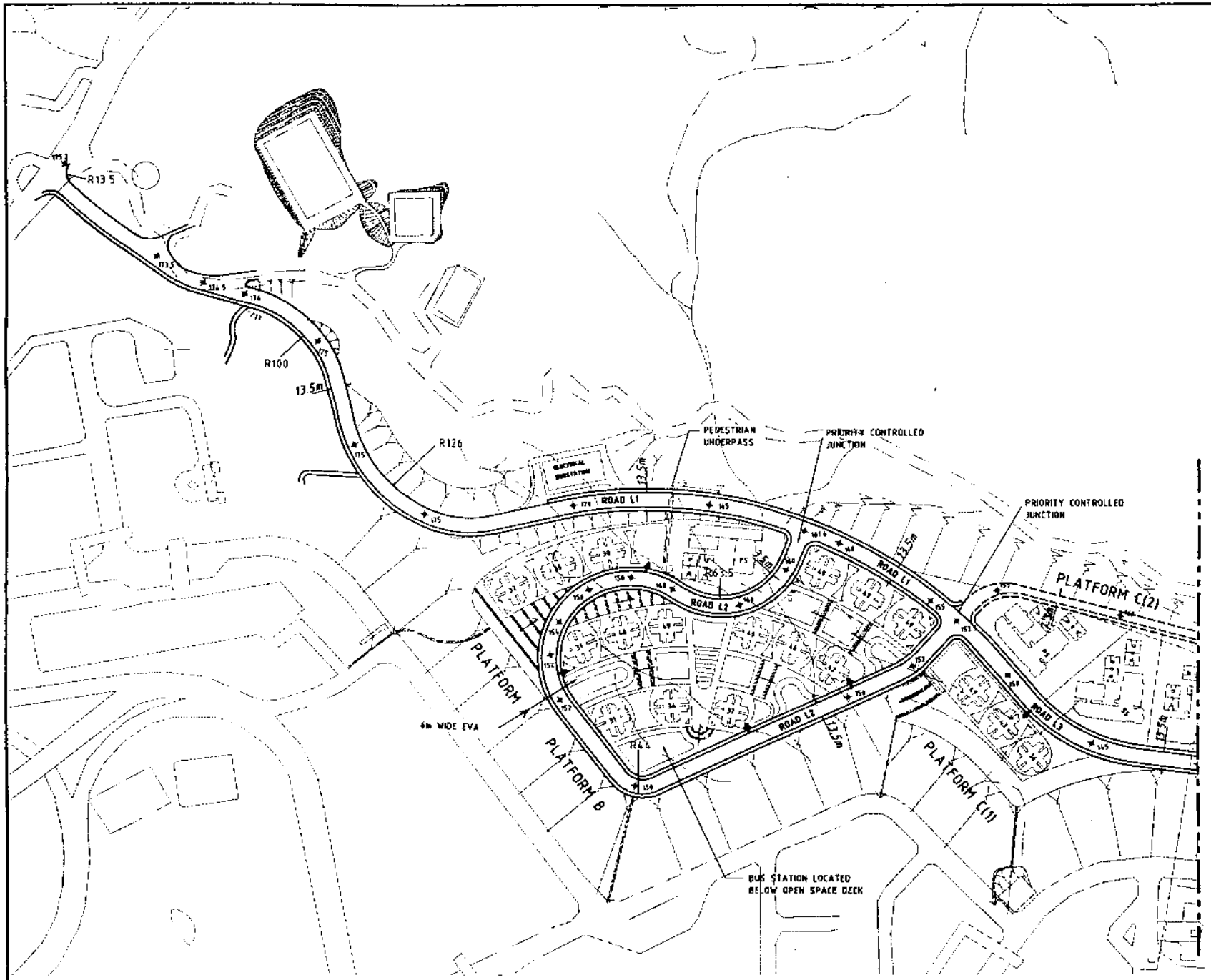
PROJECT NO	C210	DATE	Sept. 1998
DESIGNED	Peter Lee	DRAWING NO	Figure 9.6



Scale 1 : 20000

Source : GEO Solid and Superficial Geology - Hong Kong and Kowloon - Sheet 11

環科 CES	TITLE: Location Plan of Neighbouring Landfill Sites	CES (ASIA) LIMITED	
		PROJECT NO: C210	DATE: Nov. 1998
		DESIGNED:	DRAWING NO: Figure 10.1



LEGEND :

← POTENTIAL ACCESS POINT TO CARPARK (EXACT LOCATION TO BE DETERMINED UPON DETAIL DESIGN)

NOTE :

11m TURNING RADIUS (TYPICAL) SHOULD BE ADOPTED AT ALL JUNCTIONS UNLESS OTHERWISE STATED

0 40 80 120 160 200m

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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

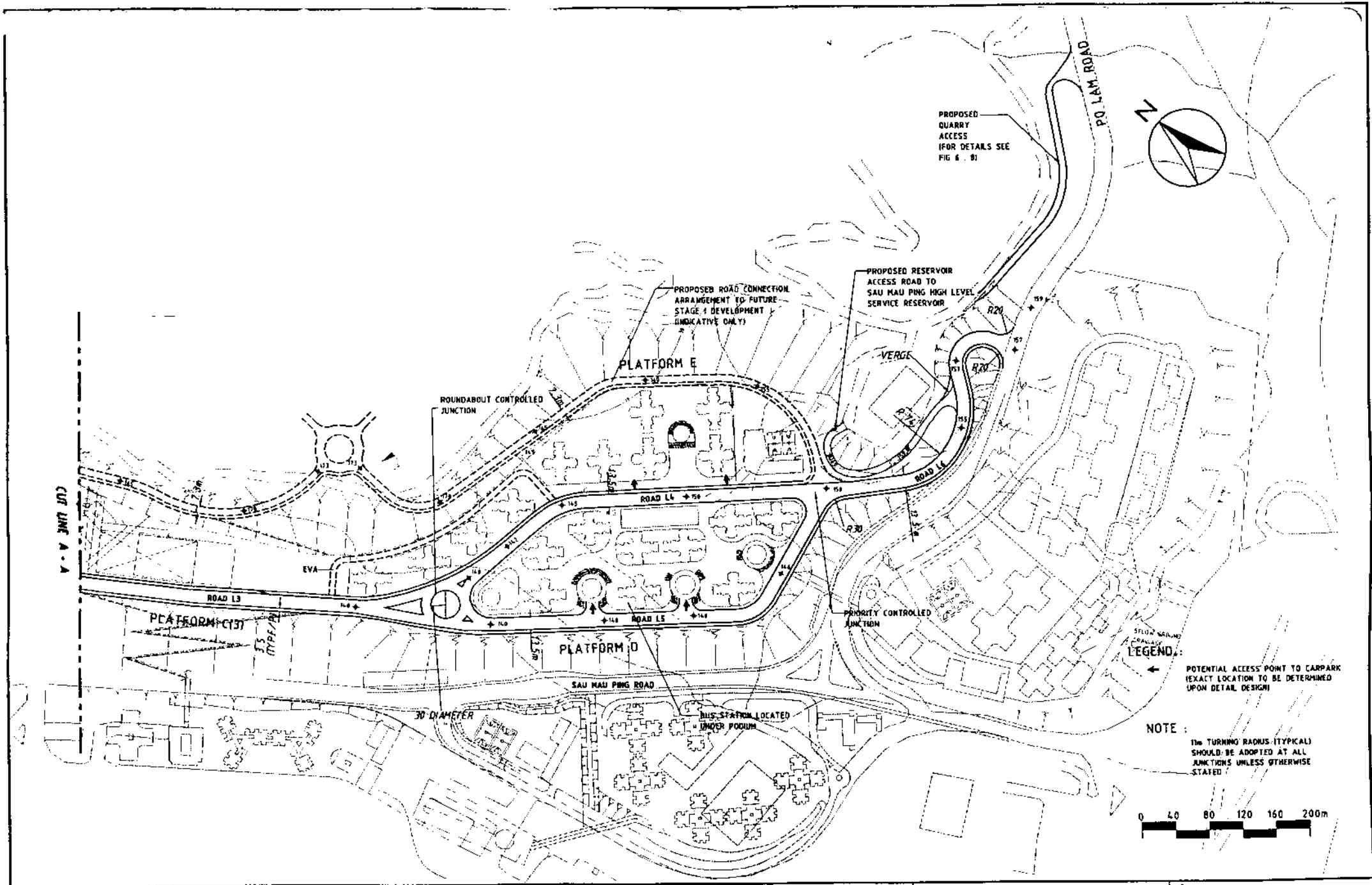
PROPOSED INTERNAL ROAD LAYOUT (SHEET 1 OF 2)

CIVIL ENGINEERING DEPARTMENT, HONG KONG

1:3500

FIGURE 11.1

JFB Q:\PROJECTS\94997\11B\FIG6 3.DGN



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

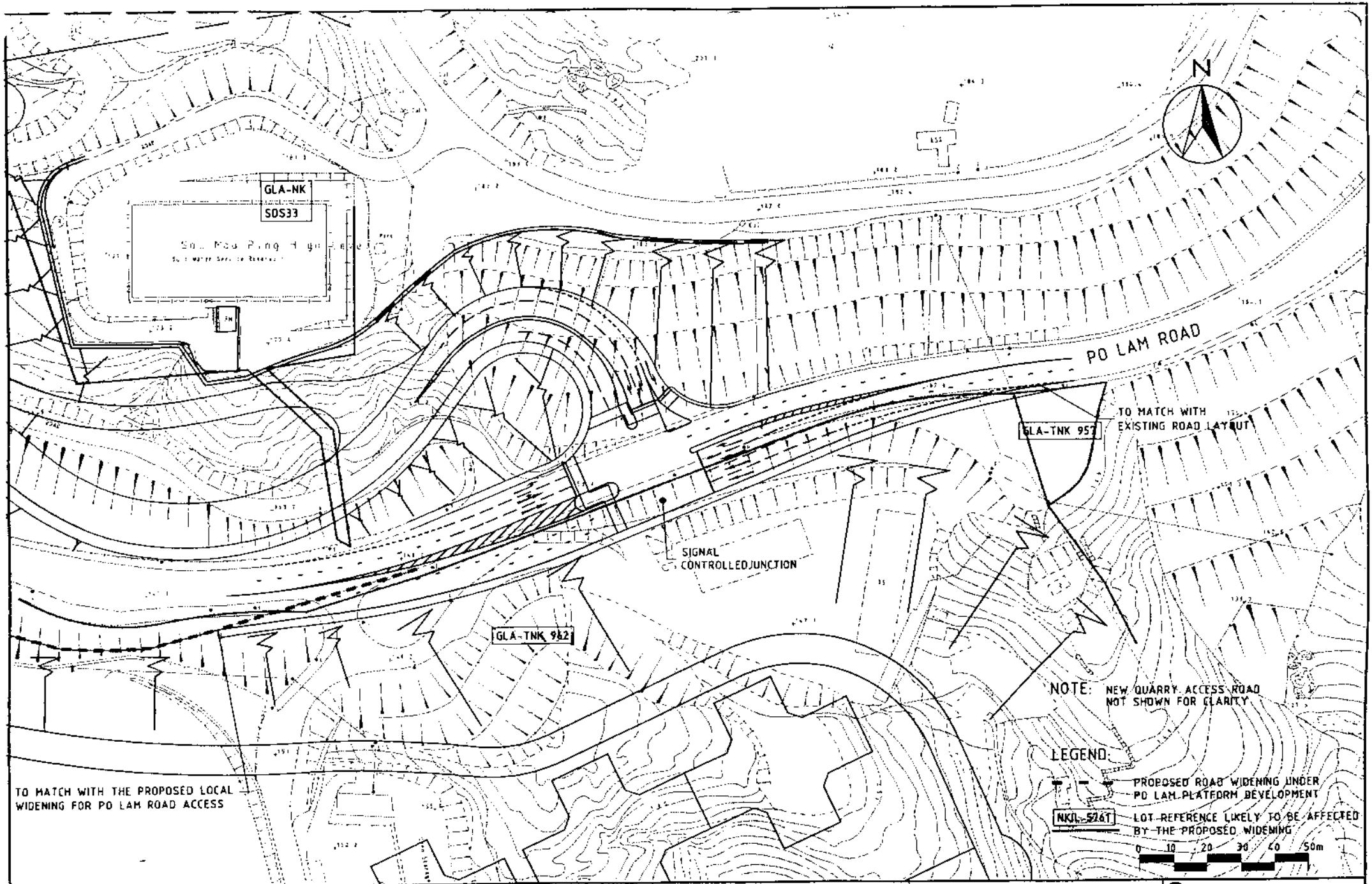
PROPOSED INTERNAL ROAD LAYOUT (SHEET 2 OF 2)

CIVIL ENGINEERING DEPARTMENT, HONG KONG

1:2500

FIGURE 11.2

I:\81 Q:\PROJECTS\94997\DB\FIG6_4.DGN



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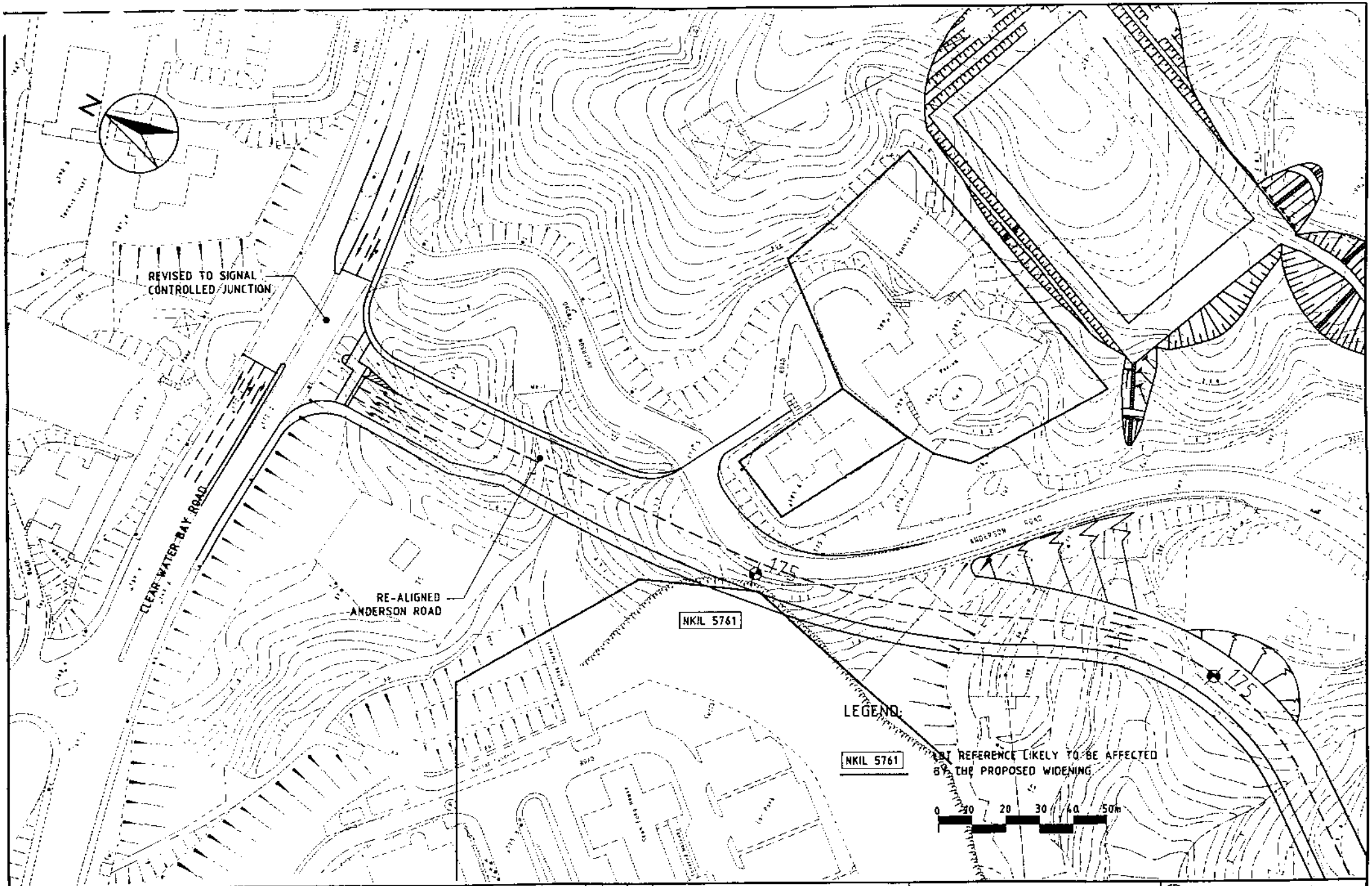
PLANNING AND ENGINEERING FEASIBILITY STUDY
FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED SOUTHERN
ACCESS AT PO LAM ROAD

FIGURE 11.3

2FB Q:\PROJECTS\94997\TIB\FIG6-1.DGN



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

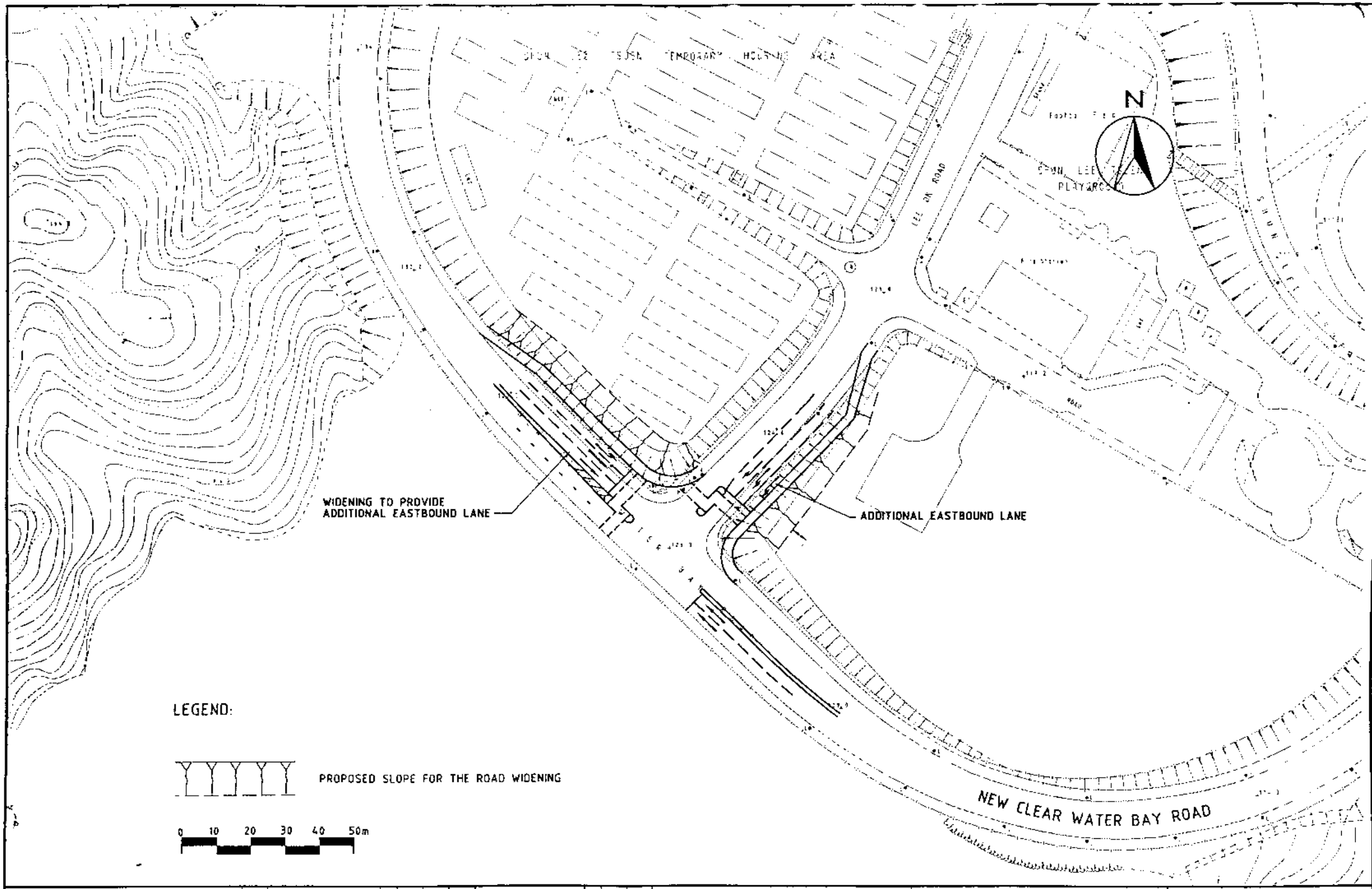
CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED NORTHERN ACCESS AT CLEAR WATER BAY ROAD

1:1000

FIGURE 11.4

P:\9 0 \PROJECTS\92997\TIB\FIG0-2.DGN



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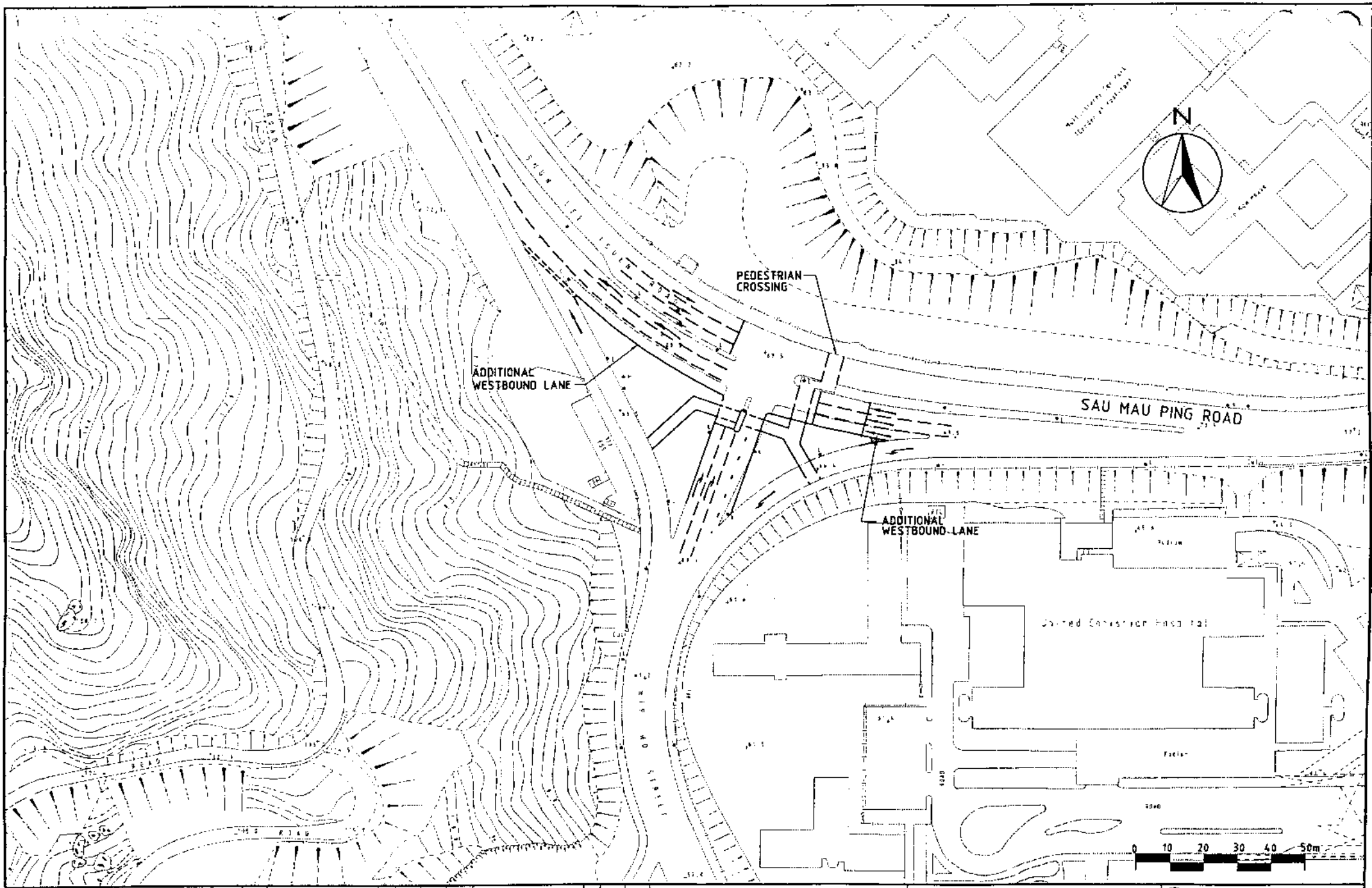
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED JUNCTION IMPROVEMENT AT NEW CLEAR WATER BAY ROAD/LEE ON ROAD

FIGURE 11.5

2FB Q:\PROJECTS\94997\REPORTS\DARL003.dgn



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

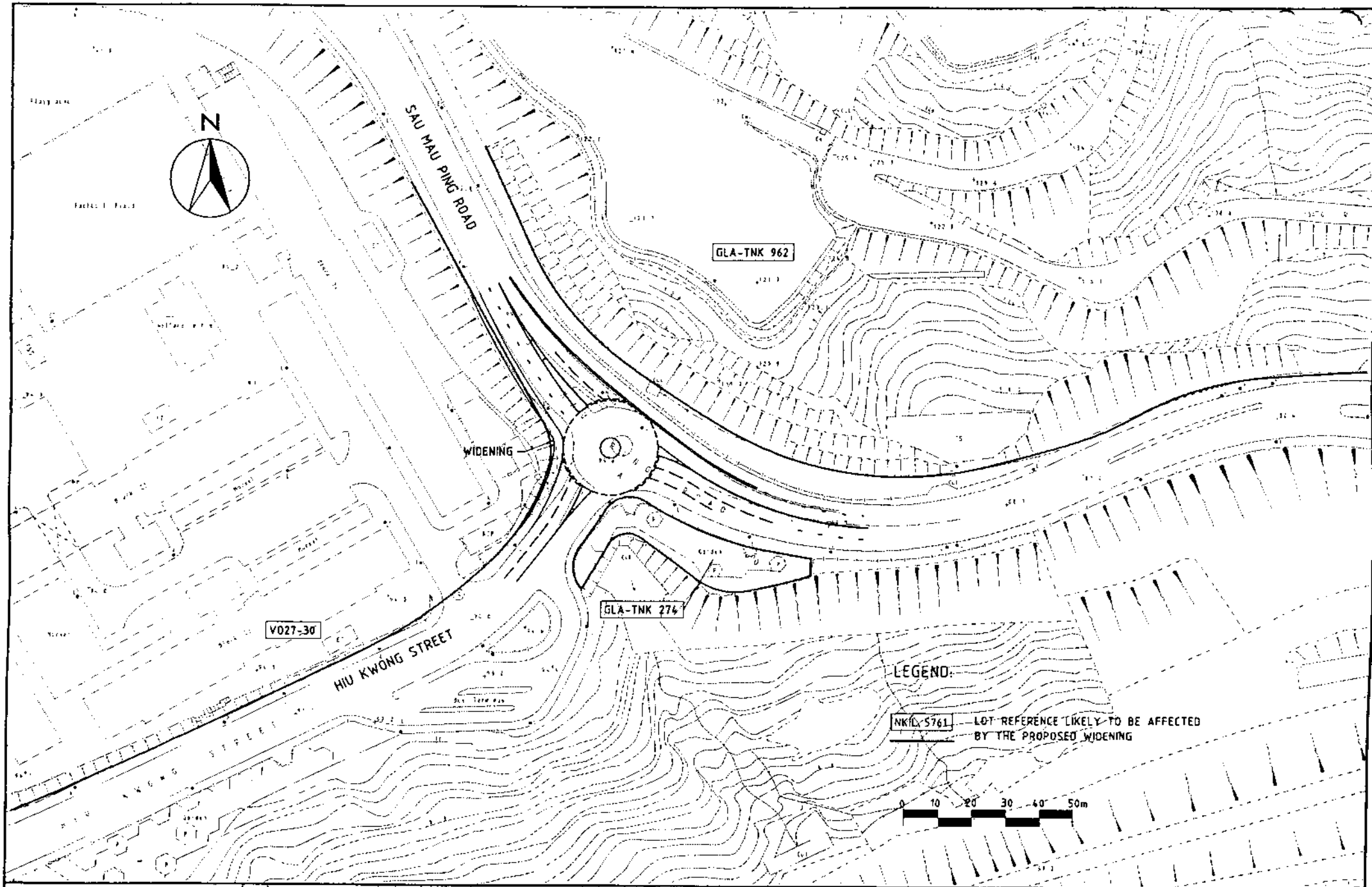
PROPOSED JUNCTION IMPROVEMENT AT SAU MAU PING ROAD/ HIP WO STREET

CIVIL ENGINEERING DEPARTMENT, HONG KONG

1:500

FIGURE 11.6

2FB D:\PROJECTS\94997\TIB\FIGS-5.DGN



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

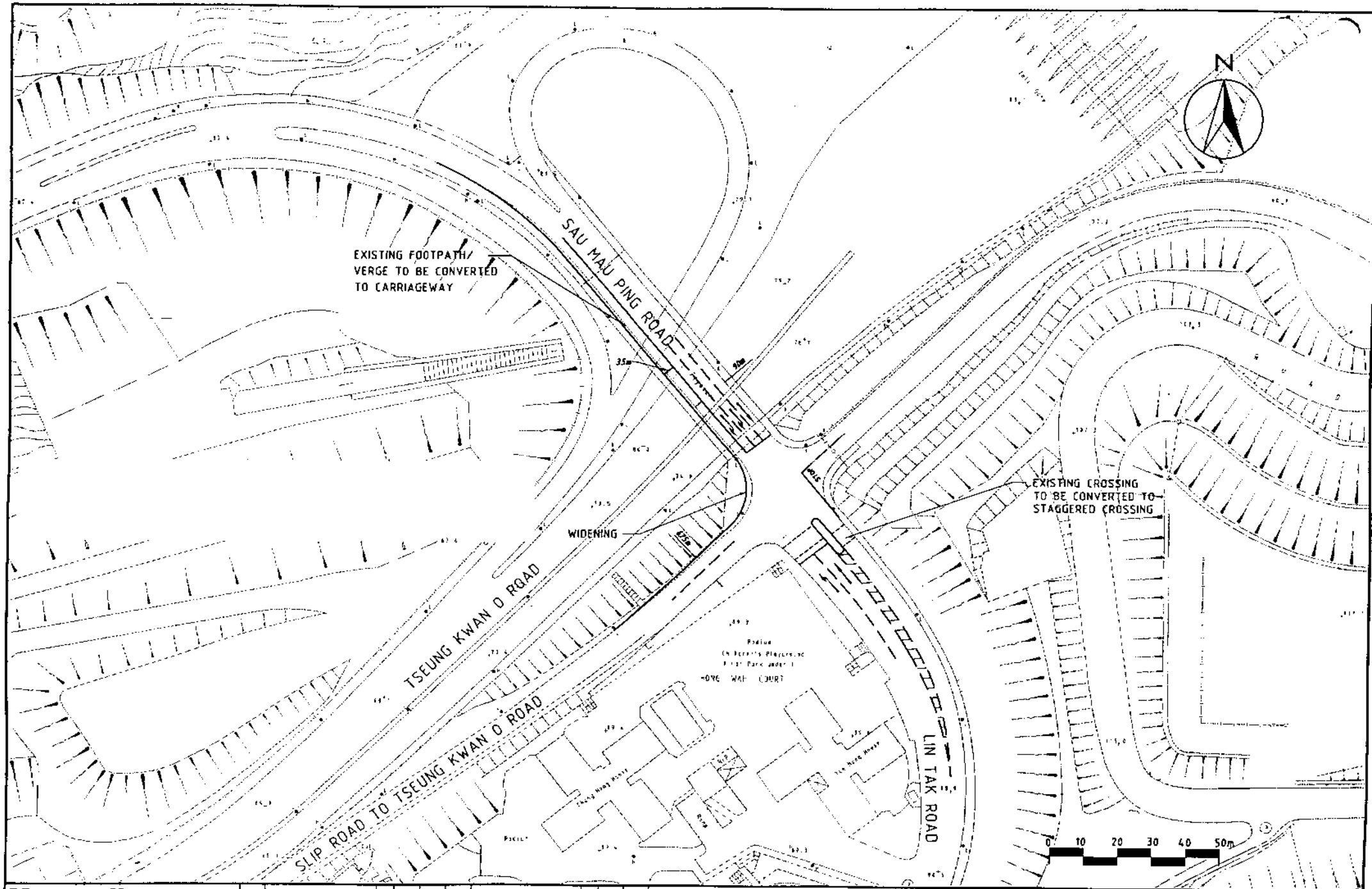
CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED JUNCTION IMPROVEMENT AT SAU MAU PING ROAD/ HIU KWONG STREET

1:1000

FIGURE 11.7

I2FEJ P:\PROJECTS\96997\TIB\FIGS-8.DGN



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PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

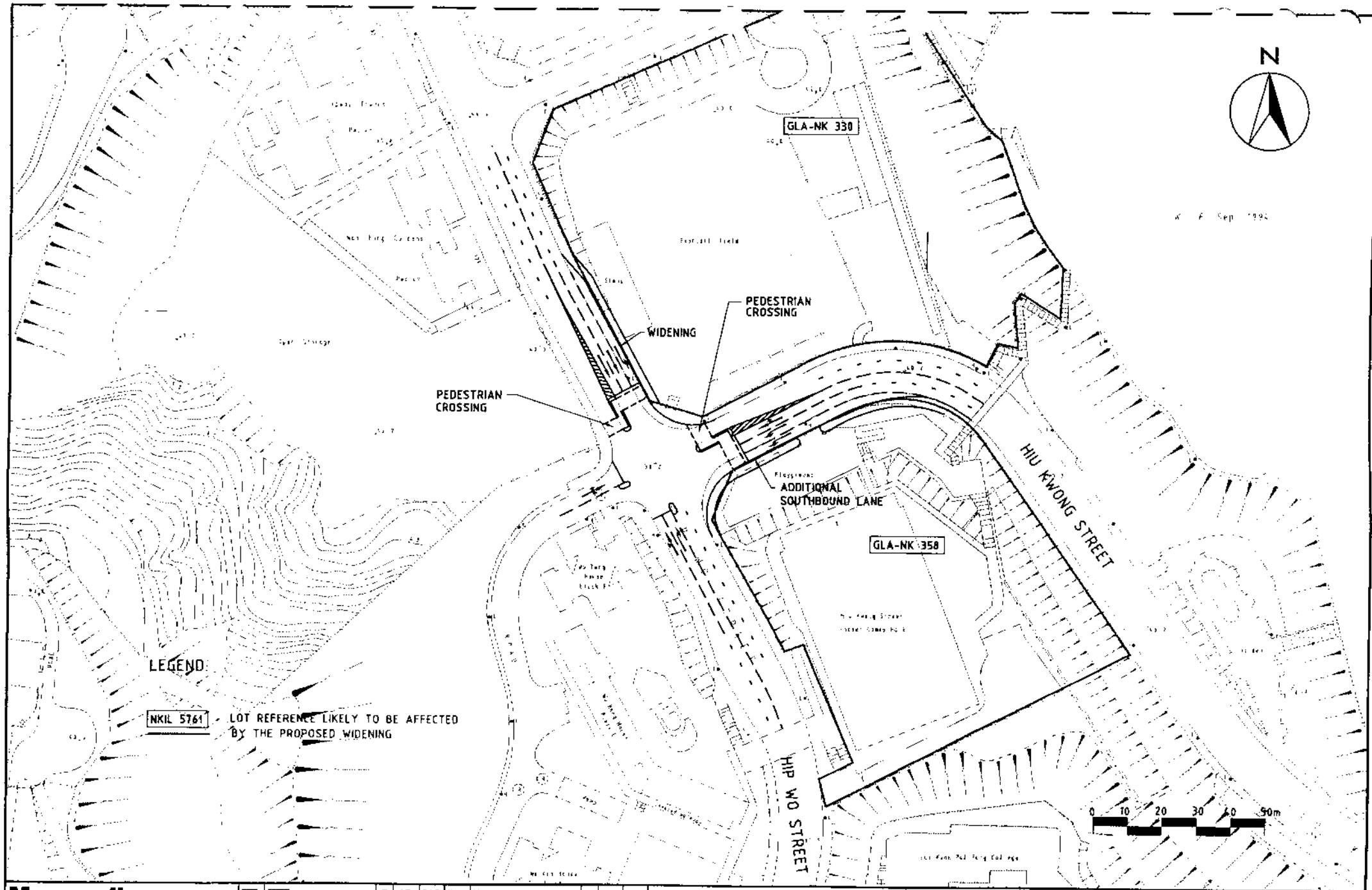
CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED JUNCTION IMPROVEMENT AT SAU MAU PING ROAD/LIN TAK ROAD

1:1000

FIGURE 11.8

2F8 Q:\PROJECTS\94897\TIB\FIGS-9.DGN



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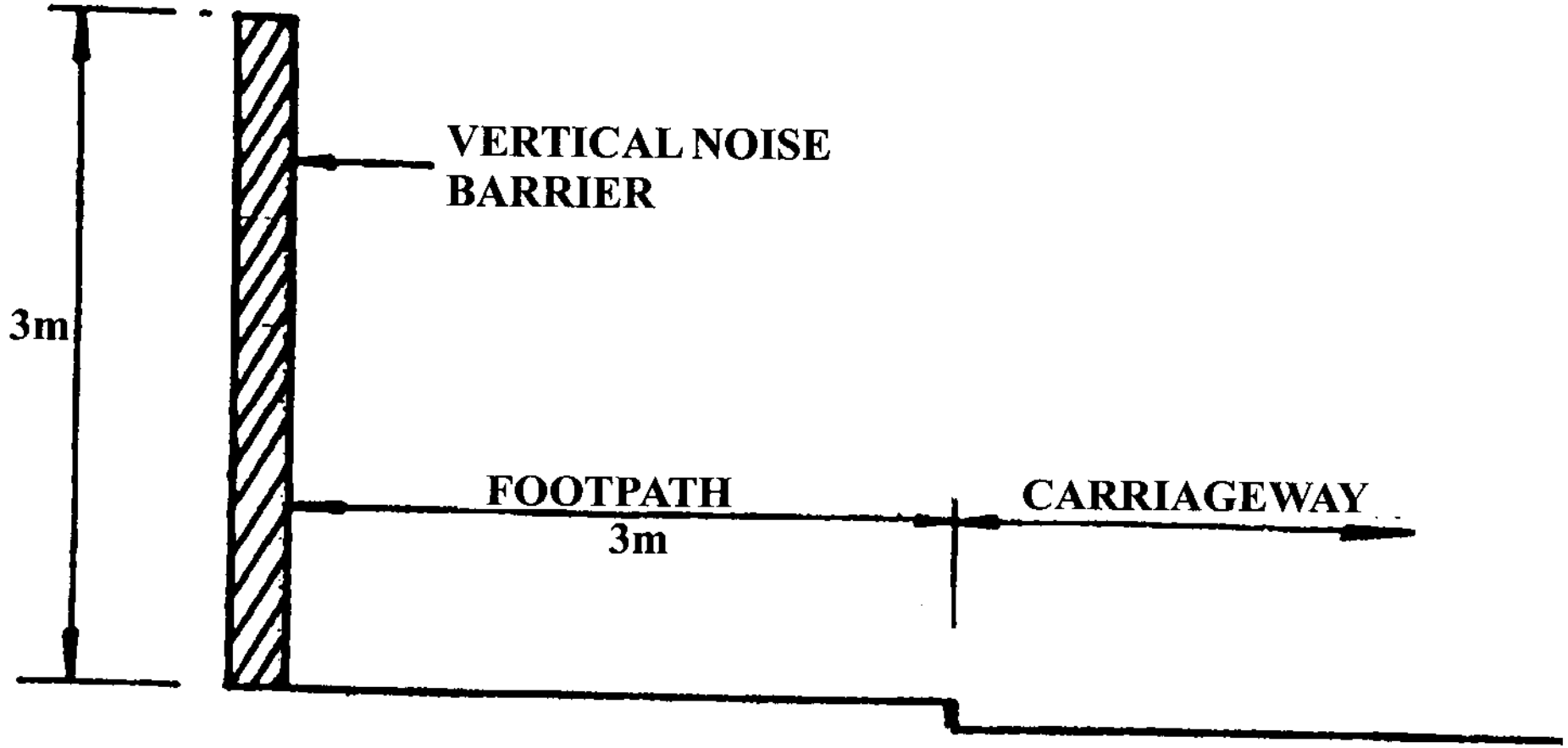
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

CIVIL ENGINEERING DEPARTMENT, HONG KONG

PROPOSED JUNCTION IMPROVEMENT AT HIP WO STREET/HIU KWONG STREET

SCALE 1:1000

FIGURE 11.9

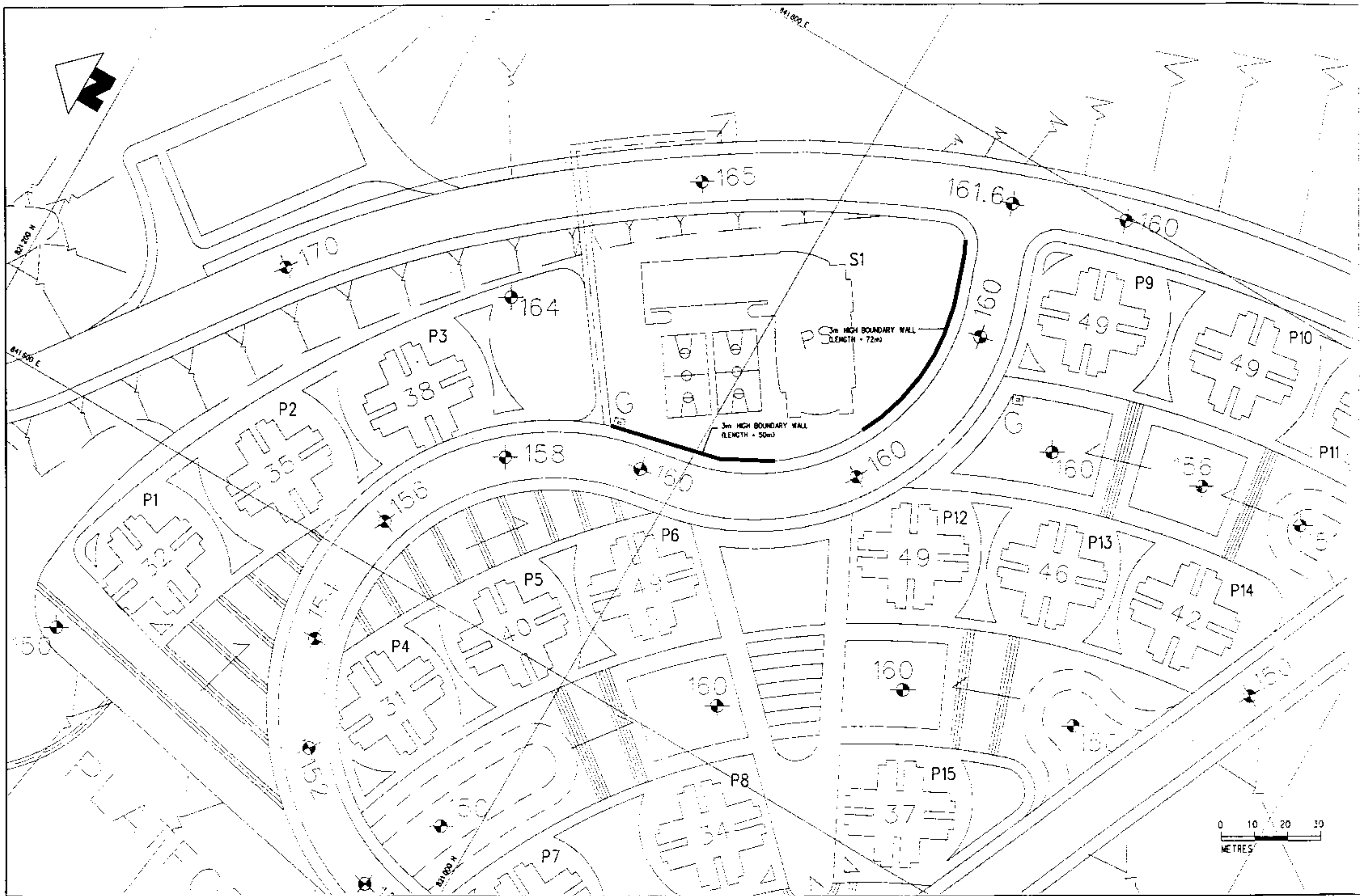


環科 CES

TITLE

Typical Section of 3m High Vertical Noise Barrier

CES (ASIA) LIMITED			
PROJECT NO	C210	DATE	Nov. 1998
DESIGNED	Peter Lee	DRAWING NO	Figure 14.1



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CES

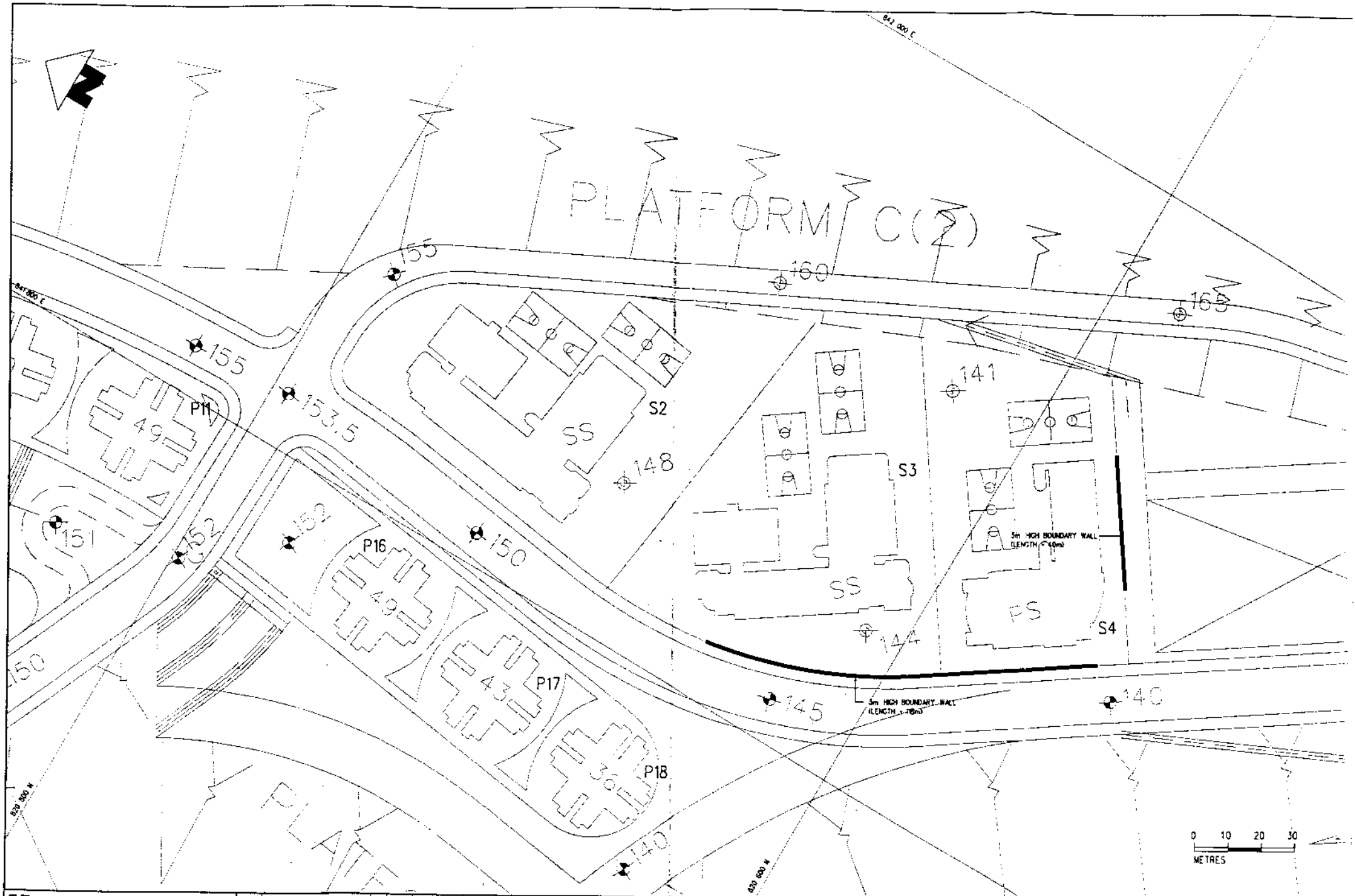
PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

PROPOSED NOISE MITGATION MEASURES FOR ANDERSON ROAD DEVELOPMENT SITE

SHEET 1 OF 5

CIVIL ENGINEERING DEPARTMENT, HONG KONG

FIGURE 14.2



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CES

REV. NO.	DESCRIPTION	BY	DATE	PW REF.	REV. NO.	DESCRIPTION	BY	DATE	PW REF.

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

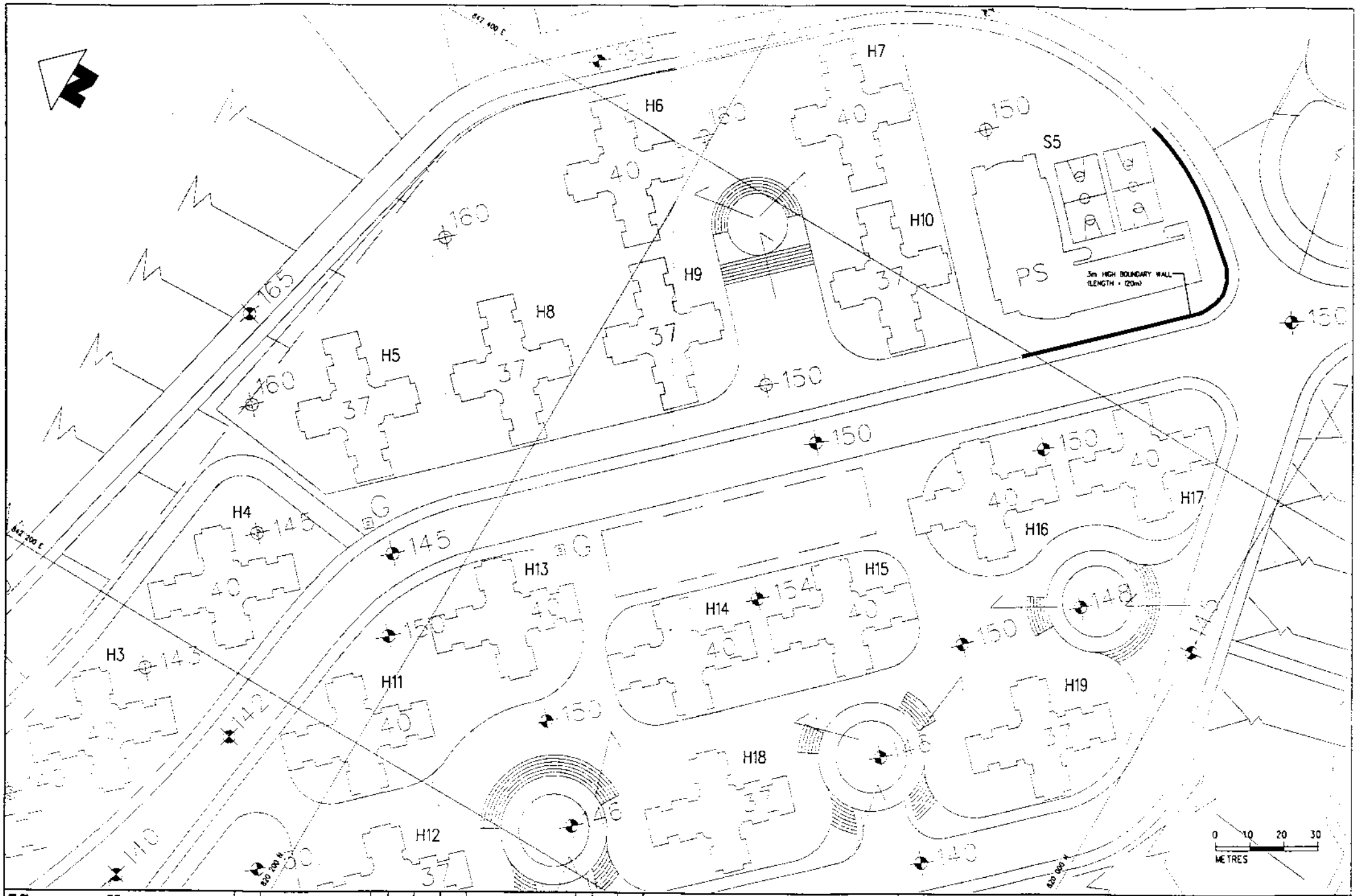
PROPOSED NOISE MITIGATION MEASURES FOR ANDERSON ROAD DEVELOPMENT SITE

SHEET 2 OF 5

CIVIL ENGINEERING DEPARTMENT, HONG KONG

SCALE	1:1000	DATE	SEPTEMBER 98
DESIGNED	TMR	DRAWN	CW
CHECKED		APPROVED	

FIGURE 14.3



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Urbis
CES

PLANNING AND ENGINEERING FEASIBILITY STUDY FOR DEVELOPMENT AT ANDERSON ROAD

PROPOSED NOISE MITIGATION MEASURES FOR ANDERSON ROAD DEVELOPMENT SITE

SHEET 3 OF 5

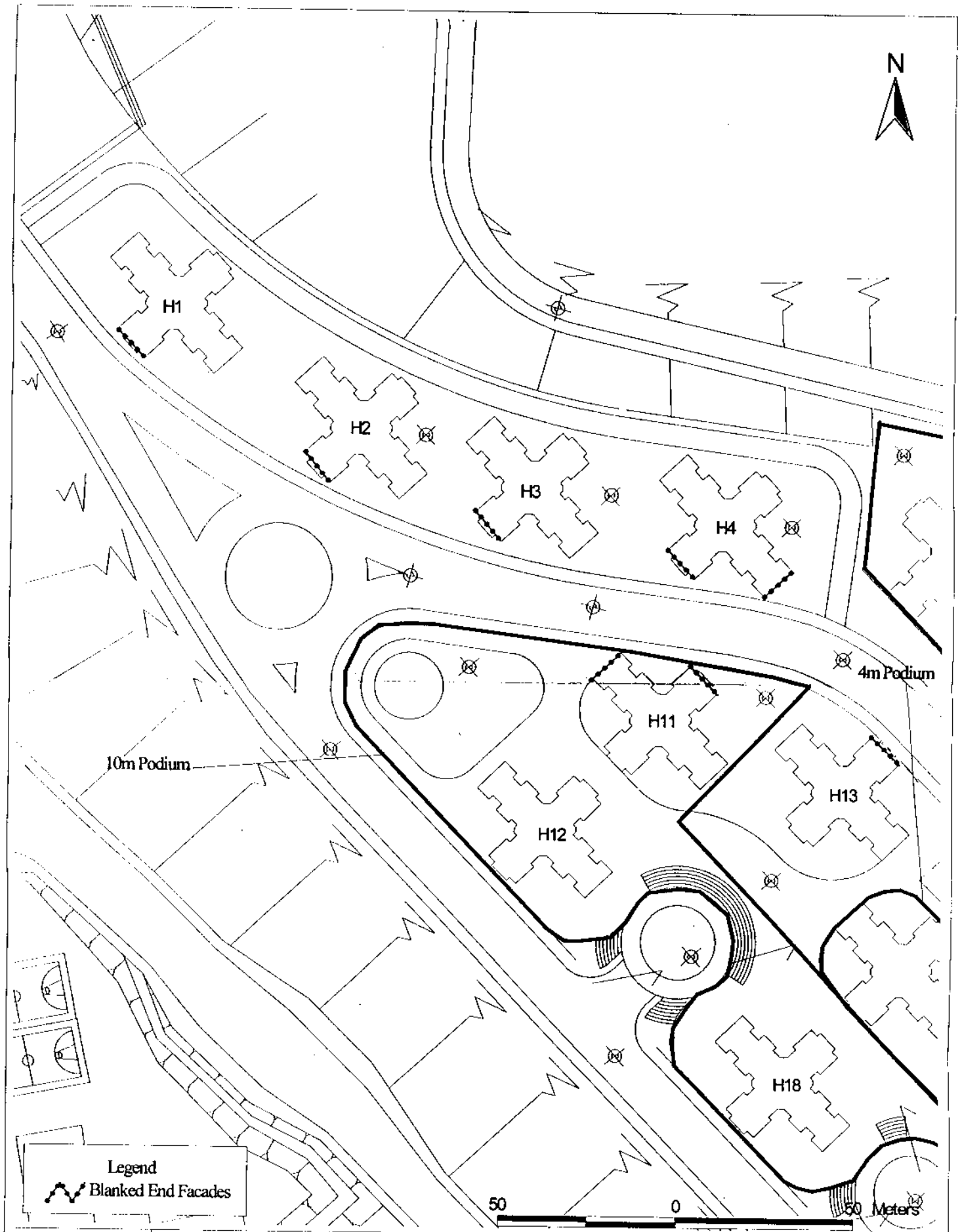
CIVIL ENGINEERING DEPARTMENT, HONG KONG

SCALE 1:1000 DATE SEPTEMBER 98

DESIGNED TMK DRAWN CW

CHECKED APPROVED

FIGURE 14.4



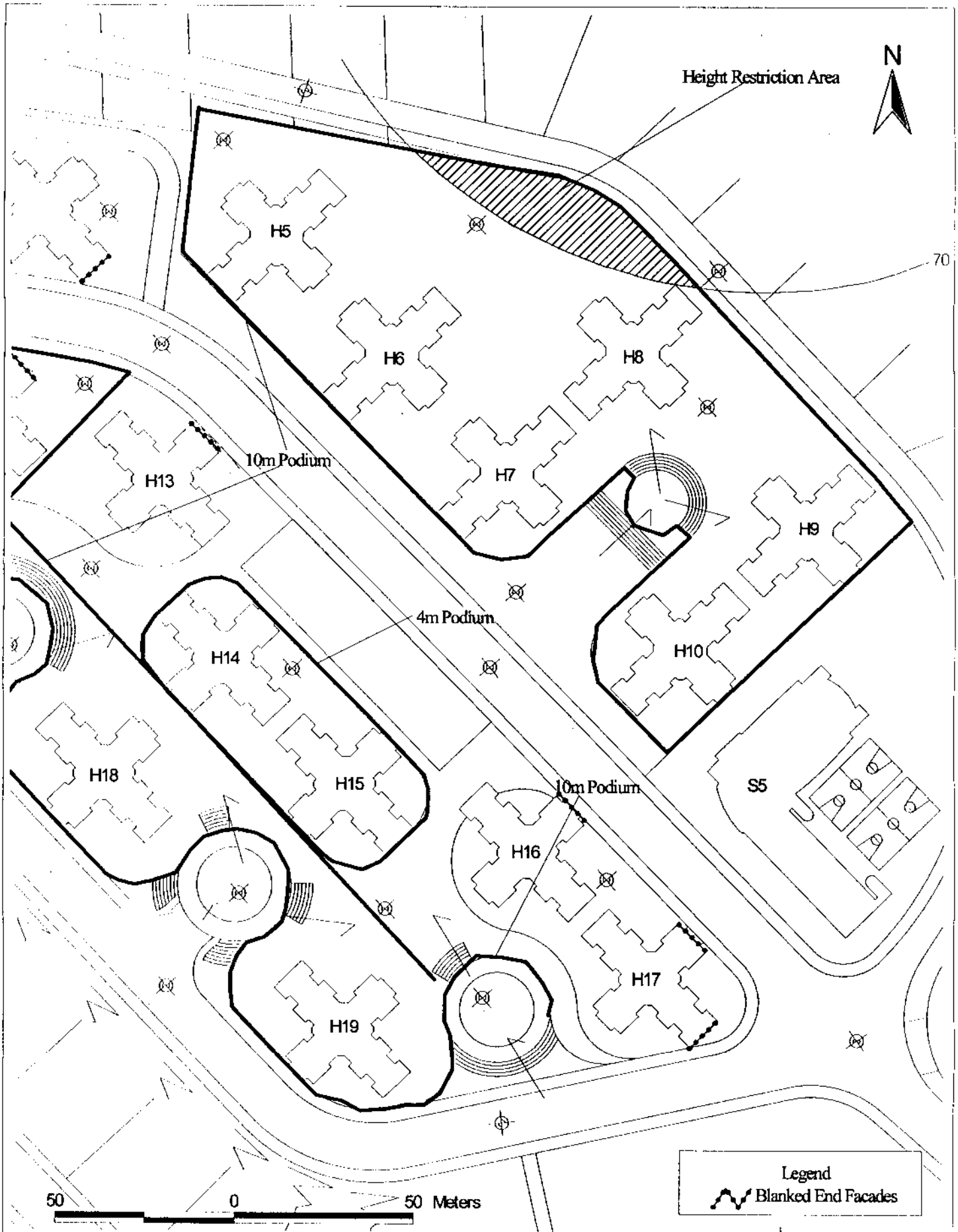
環科 CES

TITLE

Proposed Noise Mitigation Measures
for Anderson Road Development Site
- Sheet 4 of 5

CES (ASIA) LIMITED

PROJECT NO.	C210	DATE	Sept.1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 14.7

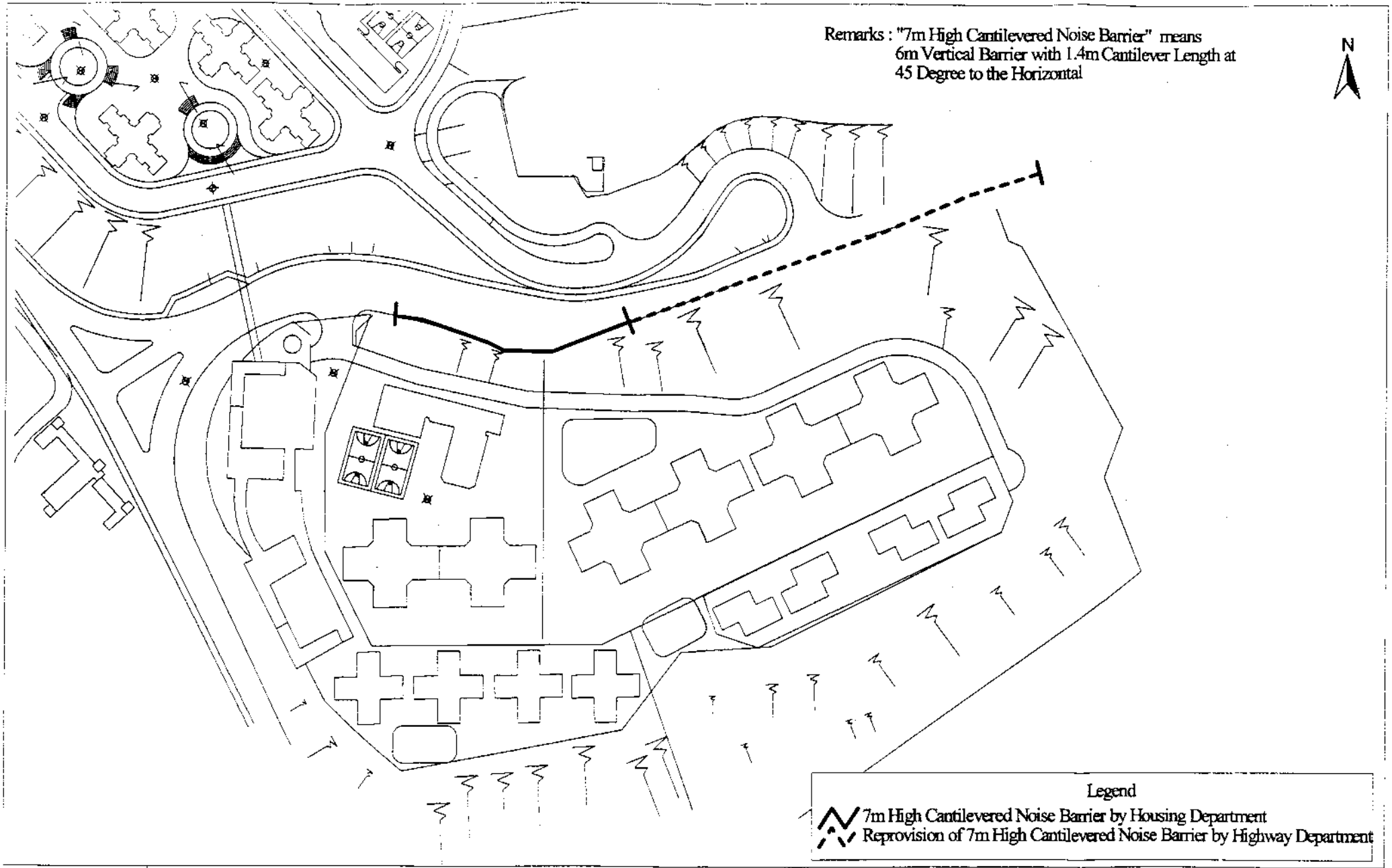


環科 CES

TITLE Proposed Noise Mitigation Measures for Anderson Road Development Site - Sheet 5 of 5

CES (ASIA) LIMITED

PROJECT NO.	C210	DATE	Sept.1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 14.8

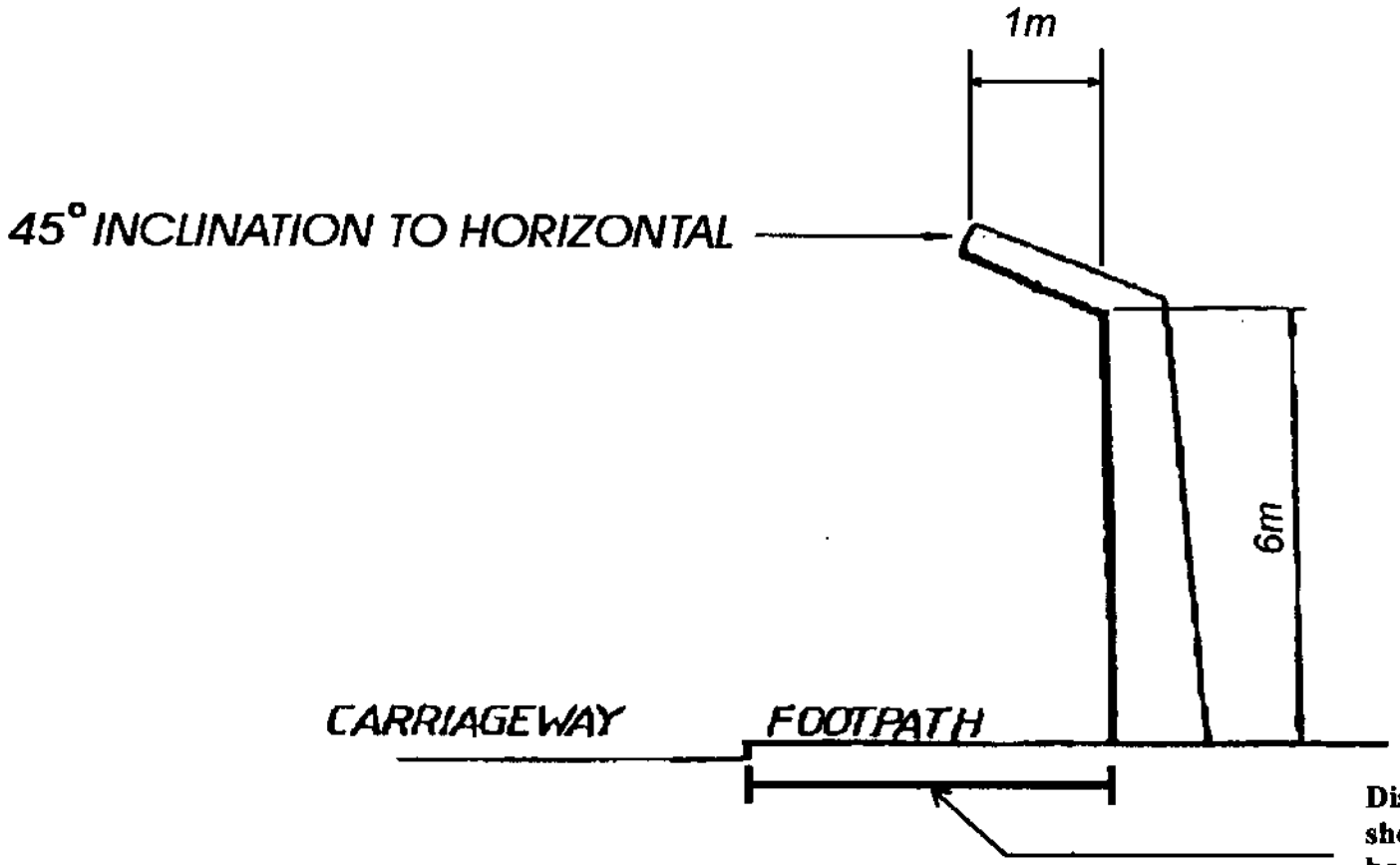


環科 CES

TITLE

Proposed Noise Mitigation Measures for Po Lam Road

CES (ASIA) LIMITED			
PROJECT NO.	C210	DATE	Sept. 1998
DESIGNED	Fanny Lau	DRAWING NO.	Figure 14.9



環科 CES	TITLE: Typical Section of Noise Barrier at Po Lam Road	CES (ASIA) LIMITED	
		PROJECT NO: C210	DATE: Nov. 1998
		DESIGNED: Anna Chung	DRAWING NO: Figure 14.10