AGREEMENT No. CE 77/95
HIRAM'S HIGHWAY IMPROVEMENT
IMPROVEMENT BETWEEN NAM WAI AND HO CHUNG AND UPGRADING OF LOCAL ACCESS ROADS

ENVIRONMENTAL MONITORING AND AUDIT MANUAL (FINAL)

Report No. BBHK/96044/D/011

March 1997

Highways Department / N.T. Region
2nd floor, Ho Man Tin Government Offices
88 Chung Hau Street
Ho Man Tin
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Environmental Monitoring and Audit Manual

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1. INTRODUCTION

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the Hiram's Highway Improvements: Improvement between Nam Wai and Ho Chung and upgrading of local access roads. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

Hong Kong environmental regulations for noise, the Hong Kong Planning Standards and Guidelines, and recommendations in the EIA study final report on the Hiram's Highway Improvements, Stage 1, Remaing Works (Part) Phase 3 have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following :

(a) duties of the Environmental Team (ET) with respect to the environmental monitoring and audit requirements during construction;

(b) information on project organisation and programming of construction activities for the project;

(c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;

(d) definition of Action and Limit levels;

(e) establishment of event and action plans;

(f) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;

(g) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

1.2 Background

The section of Hiram's Highway between Nam Wai and Ho Chung included in the Project comprises a sharp bend following a steep downgrade outside Nam Wai. The proposed improvement works involve the construction of (a) a two lane carriageway on elevated embankments and structures about 0.7 km long between Nam Wai and Ho Chung, (b) the formation of road reserve for two future traffic lanes, (c) the construction of a roundabout or traffic signal controlled junction at the junction of Hiram's Highway and Nam Pin Wai Road, and (d) local improvement to the existing Hiram's Highway between Nam Wai and Nam Pin Wai.

The identified NSRs in the Study Area are low-rise development, including village houses, villas, schools and churches. A summary is given in Appendix A.

Figure 1.1 shows the project site including the locations of NSRs.

One of the objectives of the EIA Study as stated in the Study Brief is to *design and specify the environmental monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.*

1.3 Environmental Monitoring and Audit Requirements

The Environmental Protection Department (EPD) requires that monitoring is undertaken for the following stages of the Project:

- *Baseline Monitoring* refers to the measurements of environmental parameters such as existing noise levels, to determine the nature and ranges of natural variation and to establish, where appropriate, the nature of change. This information is useful for assessing the short and long term environment impacts of the Project activities.

- *Impact monitoring* involves the measurement of environmental parameters during the Project activities, in order to determine the impacts of the activities and the effectiveness of the mitigation measures proposed in the EIA Report, and any further remedial measures which are needed.

It is a further requirement of the EPD that the environmental monitoring programme is subject to environmental audit. The aim is to determine satisfactory compliance with the legislative requirements, ensure that no annoyance is caused to sensitive receivers and initiate the remedial action plan when required. This will require information on the statutory requirements for parameters of concern and monitoring data.

Each audit will consist of a review of the monitoring data and comparison with the relevant legislative requirements and environmental performance standards specified in the Contract Document.

The monitoring and audit requirements for the Project will be as follows:

- *Pre-Construction Phase* Including all baseline monitoring prior to any Project activity occurring on site.

- *Construction Phase* Including impact/compliance monitoring and audit during all construction activities.

1.4 Project Organization

The project organisation and lines of communication with respect to environmental protection works is shown in Figure 1.2.

The ET shall not be in any way an associated body of the Contractor. The ET leader shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER and the Environmental Protection Department (EPD).

Appropriate staff shall be included in the ET, under the supervision of the ET Leader, to fulfil the EM&A duties of the ET Leader specified in this manual. Basically, the duties comprise the following:

(a) To monitor the various environmental parameters as required in EIA study final report.

(b) To investigate and audit the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise.

(c) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;

(d) To report on the environmental monitoring and audit results to the Contractor, the ER, and the EPD or its delegate.

Appropriate resources shall also be allocated under the Contractor and the ER to fulfil their duties specified in this manual.

1.5 Construction Programme

Road improvement works consist of construction of bridge foundations, piers, bridge deck, retaining walls and box culvert, and associated earthworks, roadworks, drainage works and landscaping works.

A preliminary 30-month construction programme for the road improvement works is shown below (also see Figure 1.3):

Jul - Aug 98	Preliminaries, site clearance and mobilisation
Sept - Dec 98	Cutting
Jan - Feb 99	Piling
Mar - May 99	Col/Abut
Jun - Aug 99	Decks

Sept 99 - Feb 2000	Embankment
Mar - May 2000	Drainage
Jun - Sept 2000	Carriageways
Oct - Nov 2000	Tie-in Works
Dec 2000	Completion

Figure 1.3 is the tentative works programme for the project. This programme is for information of the ET Leader to get an initial idea of the projection of the works. The ET Leader shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader for formulating the EM&A schedule.

2. NOISE

2.1 Noise Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq(30 min) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, Leq(5 min) shall be employed for comparison with the NCO criteria.

As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in Appendix B for reference.

2.2 Monitoring Equipment

As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding $5ms^{-1}$ or wind with gusts exceeding $10ms^{-1}$. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

The ET Leader is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

2.3 Monitoring Locations

Baseline and impact/compliance noise monitoring is suggested to be undertaken at the following locations:

M1 Sai Kung Central Primary School
M2 House near the access road to Wo Mei Village

The noise monitoring locations are shown in Figure 2.1. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal.

When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:

(a) at locations close to the major site activities which are likely to have noise impacts;
(b) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
(c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The ET Leader shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

2.4 Baseline Monitoring

The ET Leader shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

2.5 Impact Monitoring

Noise monitoring shall be carried out at all the designated monitoring station. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

(a) one set of measurements between 0700-1900 hours on normal weekdays;
(b) one set of measurements between 1900-2300 hours;
(c) one set of measurements between 2300-0700 hours of next day; and
(d) one set of measurements between 0700-1900 hours on holidays.

For the measurements (b), (c) and (d) above, one set of measurements shall at least include 3 consecutive Leq(5 min) results.

If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 2.6 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

2.6 Event and Action Plan for Noise

The Action and Limit levels for construction noise are defined in Table 2.1. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in Table 2.2, shall be carried out.

2.7 Noise Mitigation Measures

The EIA report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures. The recommended noise mitigation measures during the construction phase is listed below.

- Install temporary noise barriers
- Locate noise equipment and activities as far from NSRs as is practical.
- Replace noisy plant or processes by quieter alternatives where possible.
- Schedule noisy activities to minimise exposure of nearby NSRs to high levels of construction noise.
- Turn off or throttle down idle equipment, and operate noisy equipment only when necessary.
- Provide vibration isolation and/or acoustic enclosures to the power units of non-electric stationary plant and earth-moving plant.
- Plan to avoid parallel conduction of noisy activities close to a given receiver.
- Properly maintain and operate construction plant and the associated silencing measures.

If the above measures are not sufficient to restore the construction noise quality to an acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures.

Table 2.1 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days		60/65/70** dB(A)
2300-0700 hrs of next day		45/50/55** dB(A)

* reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.
** to be selected based on Area Sensitivity Rating.

Table 2.2 Event/Action Plan for Construction Noise

EVENT	ACTION	
	ET Leader or ER	Contractor
Action Level	1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness	1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative 2. Implement noise mitigation proposals
Limit Level	1. Notify Contractor 2. Notify EPD 3. Require contractor to implement mitigation measures 4. Increase monitoring frequency to check mitigation effectiveness	1. Implement mitigation measures 2. Prove to Environmental Team Leader ER effectiveness of measures applied

3. AIR QUALITY

3.1 Air Quality Parameters

Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.

1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval of the ER, 1-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details. A sample data sheet is shown in Appendix C.

3.2 Monitoring Equipment

High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

(a) 0.6-1.7 m^3/min (20-60 SCFM) adjustable flow range;
(b) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
(c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
(d) capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
(e) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
(f) equipped with a shelter to protect the filter and sampler;
(g) incorporated with an electronic mass flow rate controller or other equivalent devices;
(h) equipped with a flow recorder for continuous monitoring;
(i) provided with a peaked roof inlet;
(j) incorporated with a manometer;
(k) able to hold and seal the filter paper to the sampler housing at horizontal position;
(l) easy to change the filter; and
(m) capable of operating continuously for 24-hr period.

The ET Leader is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.

Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data should be converted into standard temperature and pressure condition.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet as mentioned in Section 3.1.

If the ET Leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the ER to prove that the instrument is capable of achieving a comparable result as that the HVS and may be used for the 1-hr sampling. The instrument should also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.

Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET Leader and agreed with the ER. For installation and operation of wind data monitoring equipment, the following points shall be observed:

(a) the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
(b) the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
(c) the wind data monitoring equipment should be re-calibrated at least once every six months; and
(d) wind direction should be divided into 16 sectors of 22.5 degrees each.

In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from EPD.

3.3 Laboratory Measurement / Analysis

A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.

If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the ER. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.

After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

All the collected samples shall be kept in a good condition for 6 months before disposal.

3.4 Monitoring Locations

The dust monitoring locations are shown in Figure 3.1. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD on the proposal.

When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:

(a) at the site boundary or such locations close to the major dust emission source;
(b) close to the sensitive receptors; and
(c) take into account the prevailing meteorological conditions.

The ET Leader shall agree with the ER on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

(a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
(b) no two samplers should be placed less than 2 meter apart;
(c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
(d) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
(e) a minimum of 2 metre separation from any supporting structure, measured horizontally is required;
(f) no furnace or incinerator flue is nearby;
(g) airflow around the sampler is unrestricted;
(h) the sampler is more than 20 metres from the dripline;
(i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

(j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and

(k) a secured supply of electricity is needed to operate the samplers.

3.5 Baseline Monitoring

The ET Leader shall carry out baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be done at least 3 times per day while the highest dust impact is expected.

During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER and agreed with EPD.

In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with EPD.

3.6 Impact Monitoring

The ET Leader shall carry out impact monitoring during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, shall be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

The specific time to start and stop the 24-hr TSP monitoring shall be clearly defined for each location and be strictly followed by the operator.

In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Action Plan in Section 3.7, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

3.7 Event and Action Plan for Air Quality

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET Leader shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 3.1 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occurs, the ET, the ER and the Contractor shall undertake the relevant action in accordance with the Action Plan in Table 3.2.

Table 3.1 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24 Hour TSP Level in $\mu g/m^3$	For baseline level < 108 $\mu g/m^3$, Action level = average of baseline level plus 30% and Limit level For baseline level > 108 $\mu g/m^3$ and baseline level < 154 $\mu g/m^3$, Action level = 200 $\mu g/m^3$ For baseline level > 154 $\mu g/m^3$, Action level = 130% of baseline level	260
1 Hour TSP Level in $\mu g/m^3$	For baseline level < 154 $\mu g/m^3$, Action level = average of baseline level plus 30% and Limit level For baseline level > 154 $\mu g/m^3$ and baseline level < 269 $\mu g/m^3$, Action level = 350 $\mu g/m^3$ For baseline level > 269 $\mu g/m^3$, Action level = 130% of baseline level	500

Table 3.2 Event/Action Plan for Air Quality

EVENT	ACTION		
	ET	ER	CONTRACTOR
ACTION LEVEL			
1. Exceedance for one sample	1. Identify source 2. Inform ER 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily	1. Notify Contractor 2. Check monitoring data and Contractor's working methods	1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	1. Identify source 2. Inform ER 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with ER for remedial actions required 6. If exceedance continues, arrange meeting with ER 7. If exceedance stops, cease additional monitoring	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with Environmental Supervisor and Contractor on potential remedial actions 5. Ensure remedial actions properly implemented	1. Submit proposals for remedial actions to ER within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate
LIMIT LEVEL			
1. Exceedance for one sample	1. Identify source 2. Inform ER and EPD 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with Environmental Team Leader and Contractor potential remedial actions 5. Ensure remedial actions properly implemented	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Identify source 2. Inform ER and EPD the causes & actions taken for the exceedances 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Investigate the causes of exceedance 6. Arrange meeting with EPD and ER to discuss the remedial actions to be taken 7. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 4. Discuss amongst Environmental Team Leader and the Contractor potential remedial actions 5. Review Contractor's remedial actions whenever necessary to assure their effectiveness 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

3.8 Dust Mitigation Measures

The EIA report has recommended the following dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

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

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

- In the process of material handling, any material which has the potential to create dust shall be treated with water or wetting agent sprays.

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

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

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

- The Contractor shall frequently clean and water the site to minimize the fugitive dust emissions.

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

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

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

If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and implement the mitigation measures.

4. LANDSCAPE AND VISUAL

The landscape measures proposed within the EIA to mitigate the landscape and visual impacts of the scheme should be embodied into the detailed landscape design drawings and contract documents including the protection of existing woodland area and trees, the transplant of existing trees, and the planting of new trees and shrubs. The proposed landscape and visual mitigation plans are shown in Figure No. 2.2 and 2.3

During Construction Phase

- The landscape construction works should be closely monitored to ensure all specified measures to ensure the healthy establishment of the plants are fully undertaken and that any defects or omissions are rectified at the earliest opportunity and before the end of the construction period. Monitoring should continue on a regular basis throughout the construction period and a subsequent 24-month establishment period.

- The protection provided to all trees and woodland blocks identified to be retained shall be monitored throughout the construction period to ensure that it is kept in a good condition. Any damage by the Contractor or by other parties to the protection or the trees/woodland shall be notified to the appropriate authorities for remedial action.

- The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the Contractor outside the limit of the works, including any damage to existing trees and woodland shall be reported to the appropriate authorities.

- Prior to the start of construction, a reliable supply of plant material should be secured. Operations relating to the supply of specialist plant material (including the collecting, germination and growth of plant from seed) should be monitored to ensure that plants will be available in time to be used within the construction works.

- The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

- Tree preservation and erosion control should be monitored during and after the construction stage. This should be carried out by a qualified landscape architect.

Post Construction Phase

All works necessary for the successful establishment of the plant material intended to mitigate the visual and landscape impact of the road and the noise barrier should be monitored on a weekly basis during a 24-month (minimum) Establishment Period. During the first year where the area is still under the project maintenance period, the monitoring and auditing tasks should be performed by the project office under the landscape contract. After the first year maintenance period expires, the monitoring and auditing tasks should be performed by the relevant government maintenance authorities where resources permit. Measures to correct any defects should be implemented at the earliest opportunity.

5. ECOLOGY

A baseline ecological study of flora and fauna was completed during the environmental impact assessment stage and the results are presented in the EIA report.

The following ecological issues shall be addressed through the EM&A programme. The objective of monitoring is to determine the effectiveness of impact avoidance and mitigation measures and to document the success of vegetation and habitat restoration.

- timing and success of revegetation of rare species
- efficacy of revegetation measures

The transplanting and replanting of the uncommon specimen of *Endospermum chinensis* to a suitable locations within the project site should be incorporated into the detailed design and undertaken at the outset of the contract works. Suggested list of species for planting is given in Table 5.1. Planting will be undertaken at the earliest practical time in the construction period. The proposed ecological mitigation plans are shown in Figure No. 2.2 and 2.3.

Table 5.1 Proposed Species List

	Embakments alongside Secondary Woodland (Woodland Mix A)	Other Embankments (Woodland Mix B)
Nurse Species	Acacia auriculaeformis	Acacia auriculaeformis
	Acacia mangium	Acacia mangium
	Eucalyptus robusta	Eucalyptus robusta
	Eucalyptus tereticomis	Eucalyptus tereticomis
		Melaleuca leucadendron
Long Term Species	Ardisia crenata *	Albizia lebbek *
	Alangium chinense *	Averhoa carambola
	Bischofia trifoliata *	Bischofia trifoliata *
	Bridelia monoica *	Bombax malabaricum
	Castanopsis fissa *	Callistemon viminalis
	Celtis sinensis *	Cassia surattensis
	Cinnamomum camphora *	Castanopsis fissa *
	Endospermum chinense * (1)	Celtis sinensis *
	Ficus variegata *	Cinnamomum camphora *
	Ficus virens *	Delonix regia
	Gordonia axillaris *	Ficus variegata *
	Ilex rotunda *	Ficus virens *
	Litsea glutinosa *	Gordonia axillaris *
	Macaranga tanarius *	Ilex rotunda *
	Mallotus paniculatus *	Litsea glutinosa *
	Quercus edithae *	Macaranga tanarius *
	Sapium sebiferum *	Mallotus paniculatus *
	Schefflera octophylla *	Mangifera indica
	Scolopia chinensis *	Melia azedarach
	Sterculia lanceolata *	Michelia alba
	Ternstroemia gymnanthera *	Pterocarpus indicus
		Sapium sebiferum *
		Schefflera octophylla *
(1) Extensive planting of this species will be		Sterculia lanceolata *
provided at appropriate location.		Terminalia catappa
		Toona sinensis

* Native Tree Species in Hong Kong

Establishment, survival and growth in the revegetated areas including the uncommon specimen of *Endospermum chinensis* should be monitored every 6 months for two years through examination of permanently delineated areas. During the first year where the area is still under the project maintenance period, the monitoring and auditing tasks should be performed by the project office under the landscape contract. After the first year maintenance period expires, the monitoring and auditing tasks should be performed by the relevant government maintenance authorities where resources permit. Management decisions on thinning or replanting will be made on the results of this monitoring. Photographic records should be made on each occasion from fixed photo-points to demonstrate the development of the new woodland.

6. SITE ENVIRONMENTAL AUDIT

6.1 Site Inspections

Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The ET Leader shall make reference to the following information in conducting the inspection:

(a) the EIA recommendations on environmental protection and pollution control mitigation measures;
(b) works progress and programme;
(c) individual works methodology proposals (which shall include proposal on associated pollution control measures);
(d) the contract specifications on environmental protection;
(e) the relevant environmental protection and pollution control laws; and
(f) previous site inspection results.

The Contractor shall update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

6.2 Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.

The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that the any foreseeable potential for violating the laws can be prevented.

The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET Leader's inspection upon his request.

After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

6.3 Environmental Complaints

Complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall undertake the following procedures upon receipt of the complaints:

(a) log complaint and date of receipt onto the complaint database;
(b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
(c) if a complaint is valid and due to works, identify mitigation measures;
(d) if mitigation measures are required, advise the Contractor accordingly;
(e) review the Contractor's response on the identified mitigation measures, and the updated situation;

(f) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;

(g) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur;

(h) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and

(i) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaint response procedures is shown in Figure 6.1.

7. REPORTING

7.1 General

The following reporting requirements based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

7.2 Baseline Monitoring Report

The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they want. The format of the report and the format of the baseline monitoring data in magnetic media to be submitted to EPD shall be agreed with EPD.

The baseline monitoring report shall include at least the following:

(a) up to half a page executive summary;

(b) brief project background information;

(c) drawings showing locations of the baseline monitoring stations;

(d) monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
- equipment used and calibration details;
- parameters monitored;
- monitoring locations (and depth);
- monitoring date, time, frequency and duration;

(e) details on influencing factors, including:
- major activities, if any, being carried out on the site during the period;
- weather conditions during the period;
- other factors which might affect the results;

(f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;

(g) revisions for inclusion in the EM&A Manual; and

(h) comments and conclusions.

7.3 Monthly EM&A Reports

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

The ET leader shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

7.3.1 First Monthly EM&A Report

The first monthly EM&A report shall include at least the following :

(a) 1-2 pages executive summary;

(b) basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;

(c) a brief summary of EM&A requirements including:
- all monitoring parameters;
- environmental quality performance limits (Action and Limit levels);
- Event-Action Plans;
- environmental mitigation measures, as recommended in the project EIA study final report;
- environmental requirements in contract documents;

(d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;

(e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) monitoring results (in both hard and diskette copies) together with the following information;
- monitoring methodology
- equipment used and calibration details
- parameters monitored
- monitoring locations (and depth)
- monitoring date, time, frequency, and duration;

(g) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring stations annotated against the following:
- major activities being carried out on site during the period;
- weather conditions during the period; and
- any other factors which might affect the monitoring results;

(h) advice on the solid and liquid waste management status;

(i) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(j) a review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;

(k) a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;

(l) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and

(m) An account of the future key issues as reviewed from the works programme and work method statements.

7.3.2 Subsequent EM&A Reports

The subsequent monthly EM&A reports shall include the following :

(a) Title Page

(b) Executive Summary (1-2 pates)
- Breaches of AL levels
- Complaint Log
- Reporting Changes
- Future key issues

(c) Contents Page

(d) Environmental Status
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- Summary of non-compliance with the environmental quality performance limits
- Summary of complaints

(e) Environmental Issues and Actions
- Review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies)

- Description of the actions taken in the event of noncompliance and deficiency reporting
- Recommendations (should be specific and target the appropriate party for action)
- Implementation status of the mitigatory measures and the corresponding effectiveness of the measures

(f) Future Key Issues

(g) Appendix
- AL levels
- Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  i) major activities being carried out on site during the period;
  ii) weather conditions during the period; and
  iii) any other factors which might affect the monitoring results
- Monitoring schedule for the present and next reporting period
- Cumulative complaints statistics
- Details of complaints, outstanding issues and deficiencies

7.4 Quarterly EM&A Summary Reports

The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information:

(a) up to half a page executive summary;

(b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(c) a brief summary of EM&A requirements including:

- monitoring parameters;
- environmental quality performance limits (Action and Limit levels); and
- environmental mitigation measures, as recommended in the project EIA study final report;

(d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;

(e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against;

- the major activities being carried out on site during the period;
- weather conditions during the period; and
- any other factors which might affect the monitoring results;

(g) advice on the solid and liquid waste management status;

(h) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(j) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(k) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(l) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(m) proponents' contacts and any hotline telephone number for the public to make enquiries.

7.5 Data Keeping

The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

7.6 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in Tables 2.2 and 3.2, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the ER & EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Appendix D.

Appendix E Implementation Schedule

Recommendations	Responsibilities	Locations	Timing
3m high plain barrier	HyD	374m long at NSRs at Wo Mei, Nam Wai, Heung Chung, Nam Pin Wai Road and Planned NSRs at Wo Mei and Nam Pin Wai. Another 82m long at NSRs at Ho Chung	Before completion of the road improvement works
Inverted-L barrier (3m high with 0.9m inclined cantilever)	HyD	109m long at NSRs at Nam Pin Wai and 90m long at NSR Sai Kung Central Primary School	Before completion of the road improvement works
Inverted-L barrier (3m high with 1.3m inclined cantilever)	HyD	253m long at NSRs at Wo Mei and Nam Pin Wai	Before completion of the road improvement works
3.5m inverted-L noise barrier and 5m setback for CDA Development	PlanD & the CDA Developers	Within the proposed CDA site	Planning and Design Stage of the CDA development
Building dispositioning or a/c and window insulations for small houses in "V" zone	Lands Department and small houses developers	Within the small houses site	Planning and Design Stage of small houses
Environmental pollution control measures for construction impacts	HyD	Within the works boundary	Within the construction period
Detailed drawings for ecological, landscape and visual impact mitigation measures (3.75 ha planting and replanting)	HyD	Within the works boundary	During detail design stage

APPENDIX E

Implementation Schedule

Appendix D Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

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Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Prepared by : _____

Designation : _____

Signature : _____

Date : _____

Location Plan

APPENDIX D

Sample Template for Interim Notification of Environmental Quality limit Exceedances

Appendix C Sample TSP Monitoring Data Sheet

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial Flow Rate, Qsi	Pi (mmHg)	
	Ti(°C)	
	Hi (in.)	
	Qsi (Std. m^3)	
Final Flow Rate, Qsf	Pf(mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std. m^3)	
Average Flow Rate (Std. m^3)		
Total Volume (Std. m^3)		
Filter Identification No.		
Initial Wt. of Filter (g)		
Final Wt. of Filter (g)		
Measured TSP Level ($\mu g/m^3$)		

	Name & Designation	Signature	Date
Field Operator :	_____	_____	_____
Laboratory Staff :	_____	_____	_____
Checked by :	_____	_____	_____

APPENDIX C

Sample TSP Monitoring Data Sheet

Appendix B Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L_{90} (dB(A))	
	L_{10} (dB(A))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

	Name & Designation	Signature	Date
Recorded By :	_____	_____	_____
Checked By :	_____	_____	_____

APPENDIX B

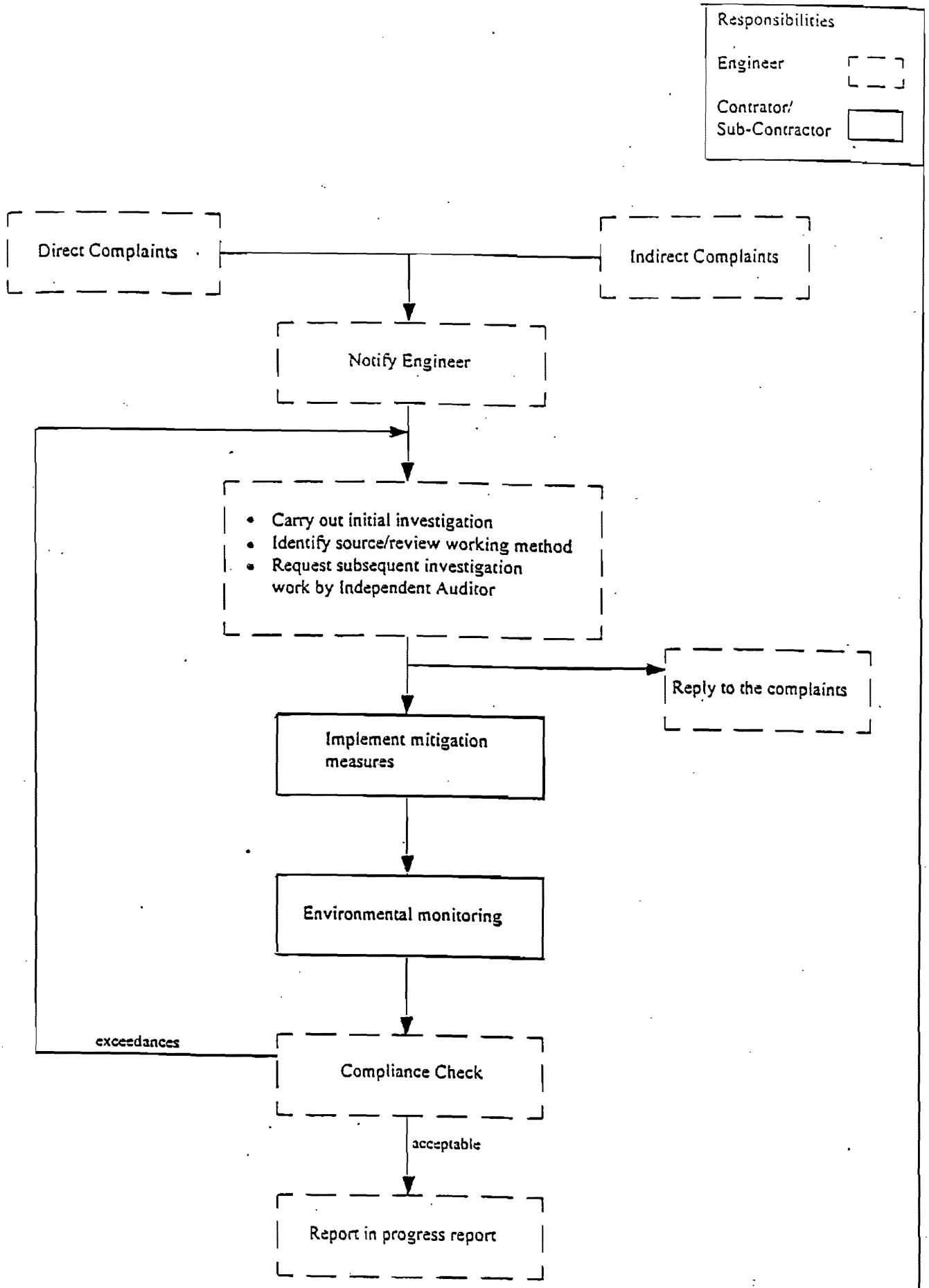
Noise Monitoring Field Record Sheet

Appendix A Identified Noise Sensitive Receivers

NSR ID	Name/Description	No. of Storey		
		Non-sensitive	Educational/Institutional	Residential
WM1	Village House at Wo Mei	-	-	3
WM2	Village House at Wo Mei	-	-	3
WM3	Village House at Wo Mei	-	-	3
WM4	Village House at Wo Mei	-	-	3
WM5	Village House at Wo Mei	-	-	3
CW	Church at Wo Mei	-	2	-
GV	Grenville Villas	1	-	2
CH	Church at Nam Wai	-	2	-
NW	Low-rise Residential at Heung Chung	-	-	3
PS1	Sai Kung Central Primary School (south wing)	-	5	-
PS2	Sai Kung Central Primary School (north wing)	-	5	-
BB	Berkeley Bay Villa	-	-	2
VH1	Village House at Ho Chung	-	-	1
VH2	Village House at Ho Chung	-	-	1
TG	Treasure Spot Garden	-	-	3

APPENDIX A

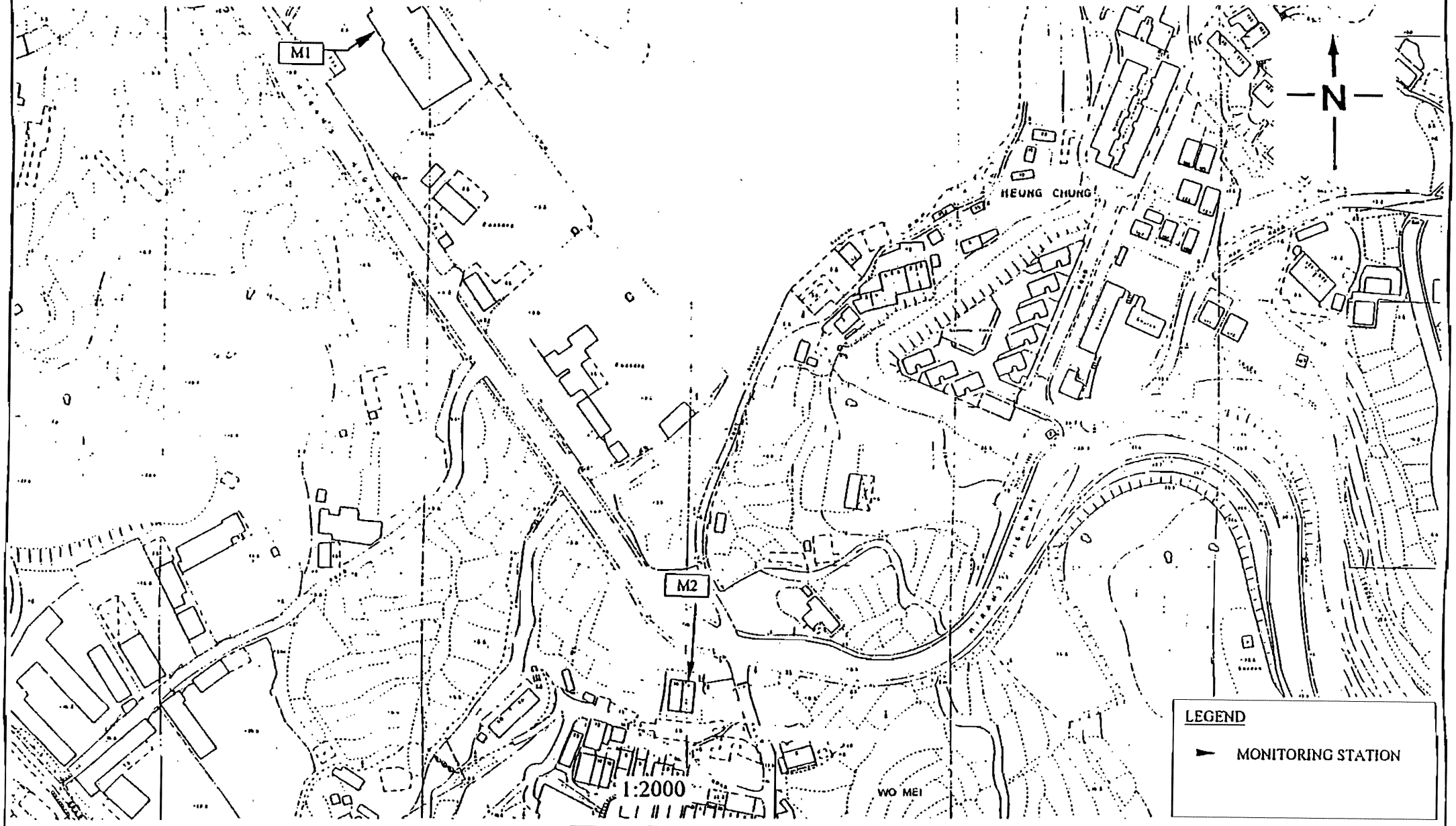
Identified Noise Sensitive Receivers



COMPLAINTS HANDLING PROCEDURES

Figure 6.1

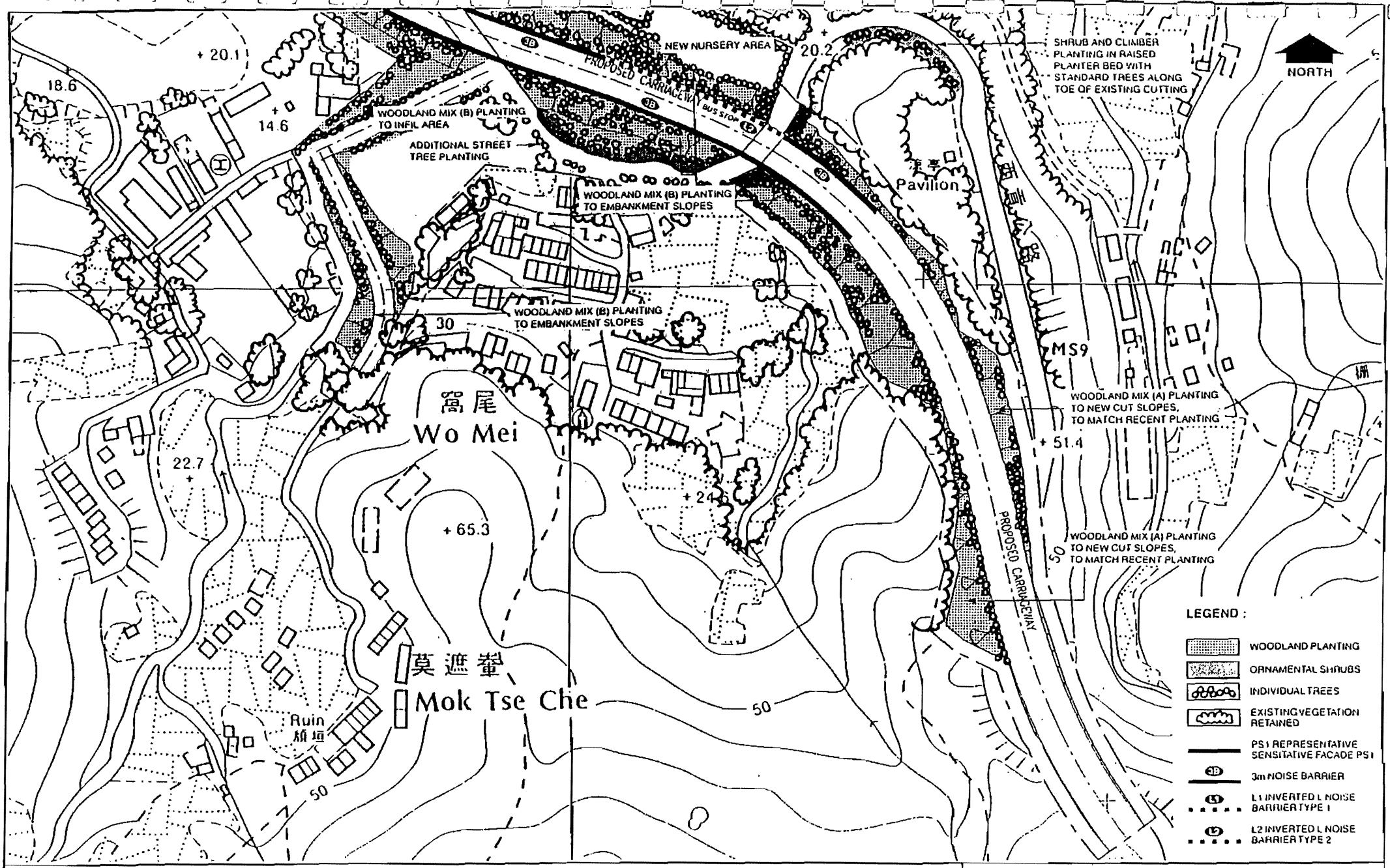
Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



AIR QUALITY MONITORING LOCATIONS

Figure 3.1

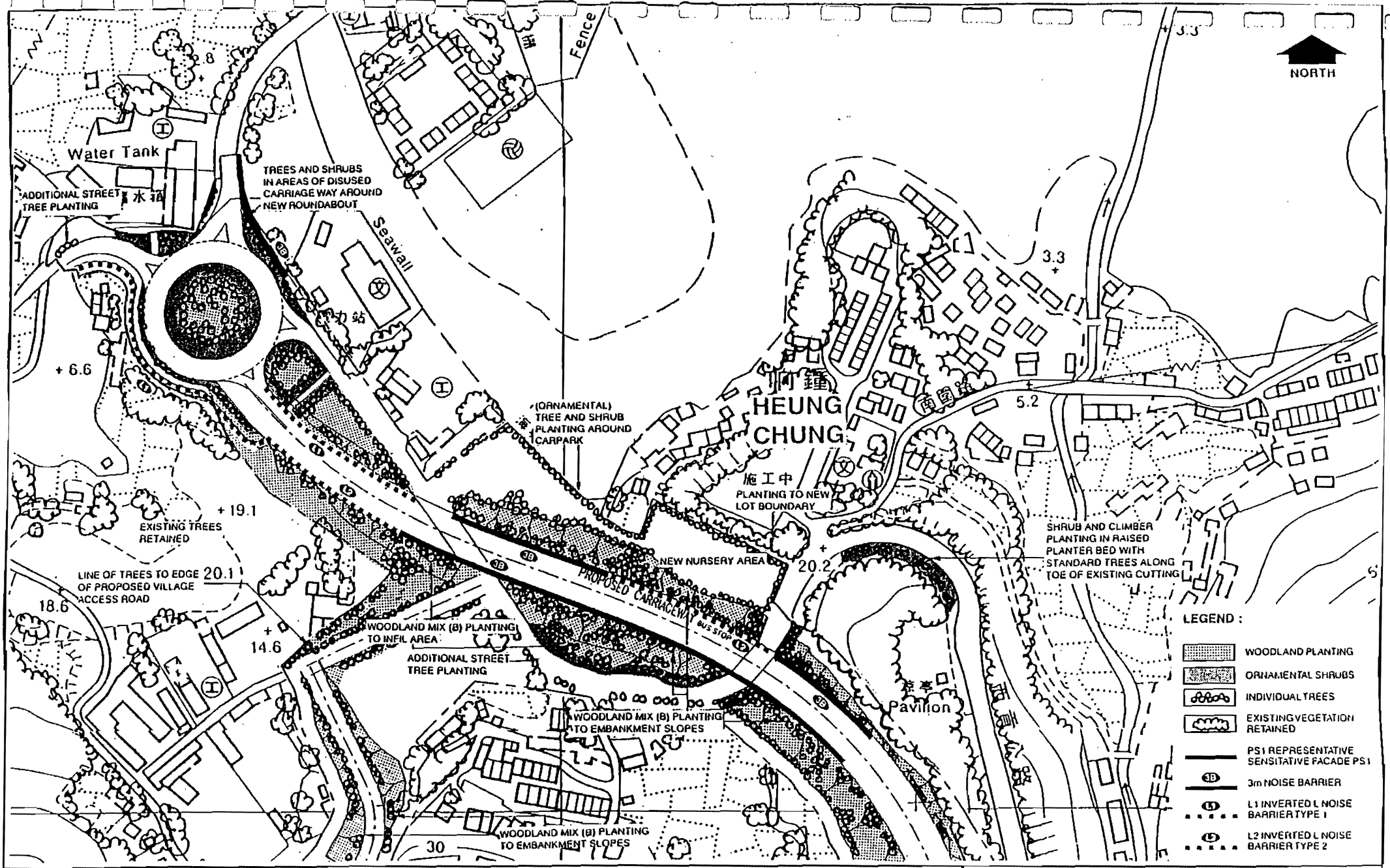
Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



Hiram's Highway Improvements between Nam Wai and Ho Chung
Landscape Mitigation Measures Plan (2 of 2)

Figure 2.3

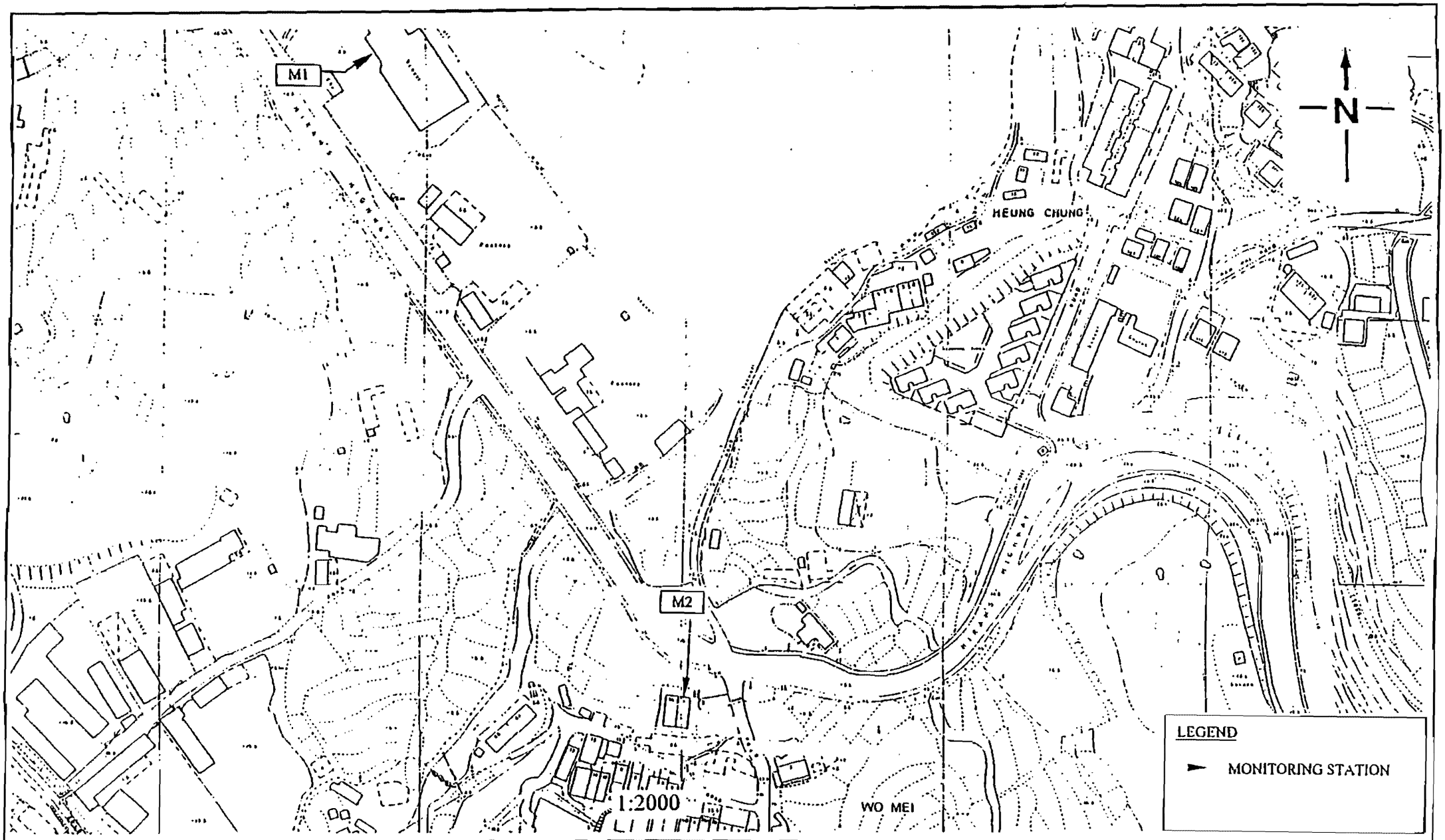
Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



Hiram's Highway Improvements between Nam Wai and Ho Chung
Landscape Mitigation Measures Plan (1 of 2)

Figure 2.2

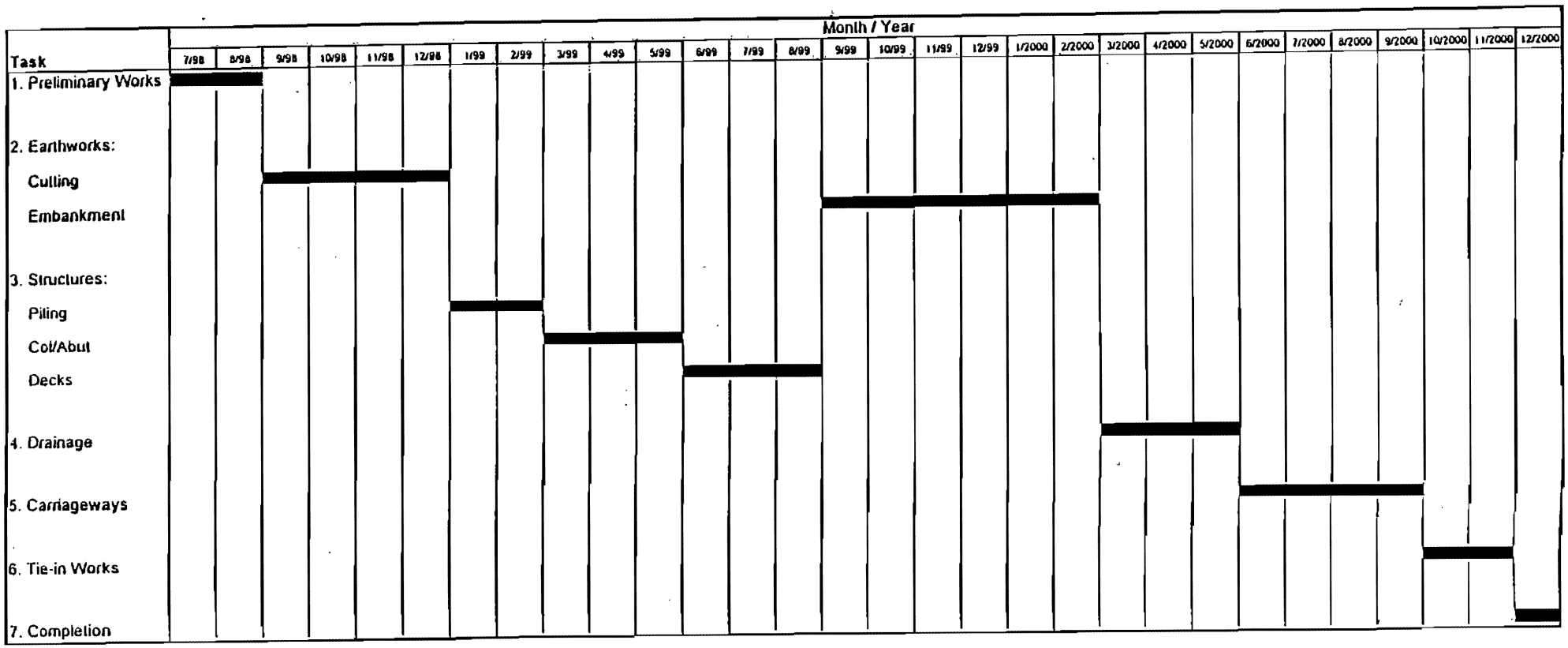
Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



NOISE MONITORING LOCATIONS

Figure 2.1

Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



TENTATIVE WORKS PROGRAMME

Figure 1.3

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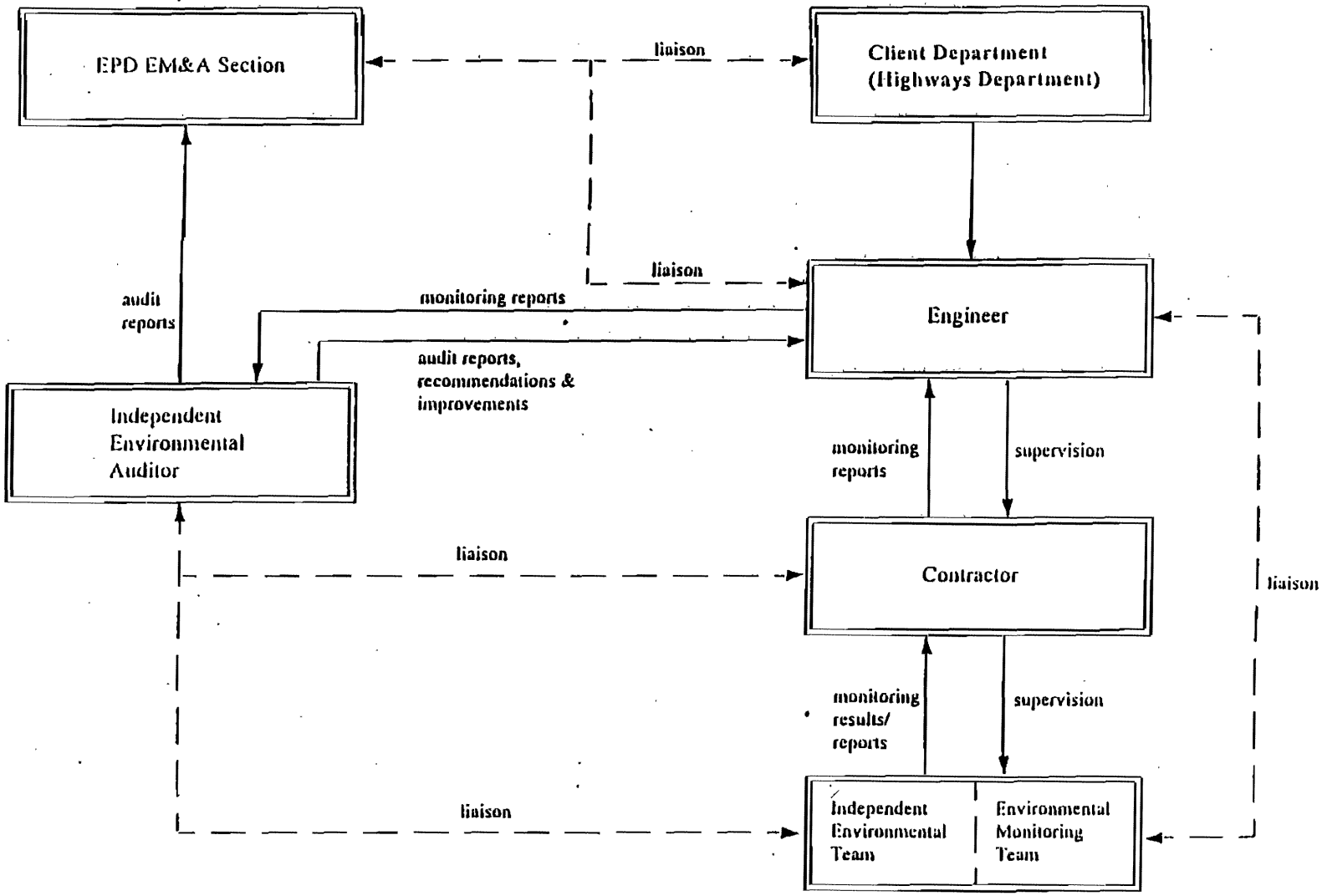
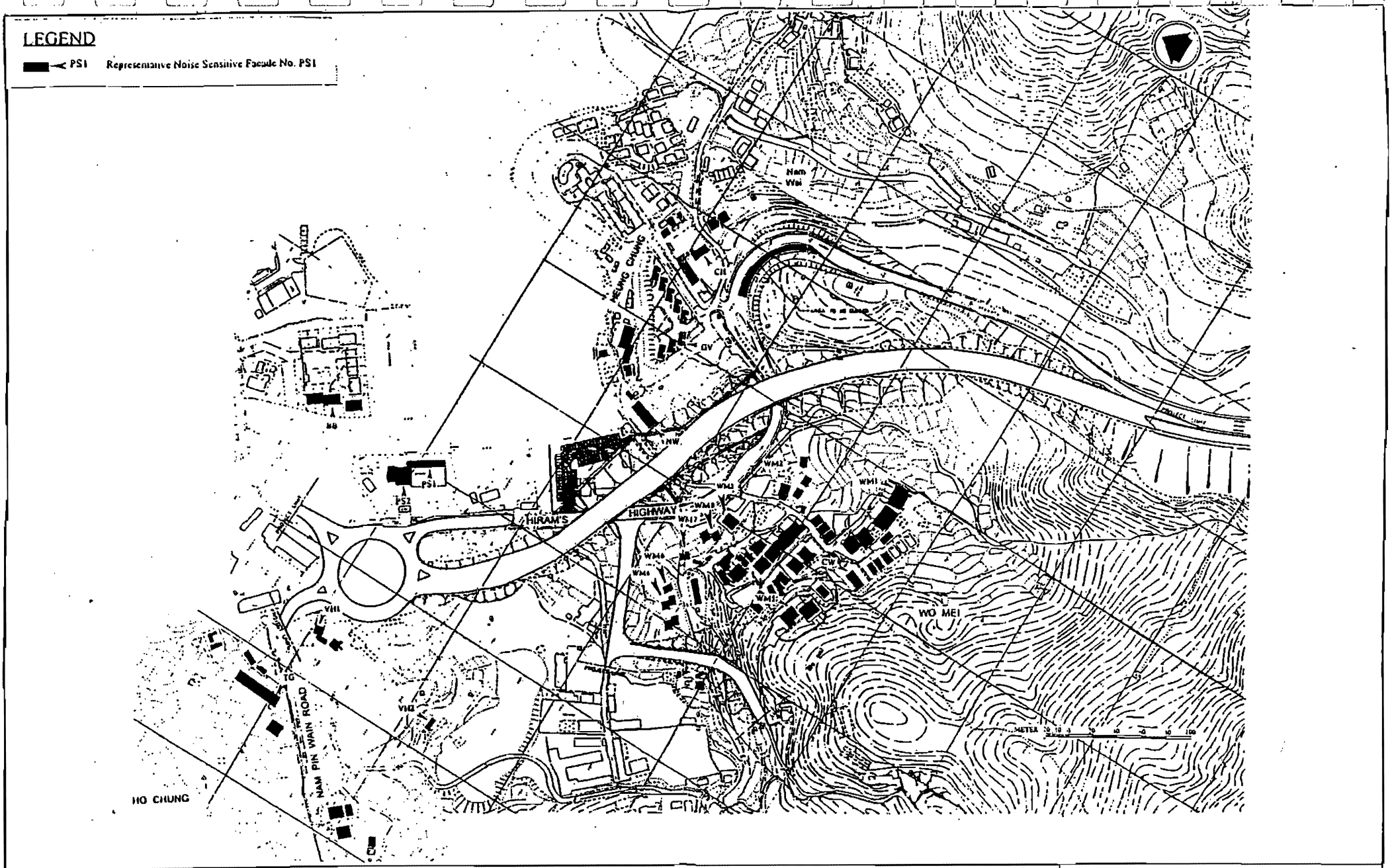
Consulting Engineers



PROJECT ORGANISATION

Figure 1.2

Babtie BMT (Hong Kong) Ltd.
Consulting Engineers



SITE PLAN

Figure 1.1

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Consulting Engineers

FIGURES

Figure No.	Title
1.1	Site Plan
1.2	Project Organisation
1.3	Tentative Works Programme
2.1	Noise Monitoring Locations
2.2	Landscape Mitigation Measures Plan (1 of 2)
2.3	Landscape Mitigation Measures Plan (2 of 2)
3.1	Air Quality Monitoring Locations
6.1	Complaints Handling Procedures