

# Appendix I

---

## Environmental Monitoring and Audit Manual



# KCRC EAST RAIL EXTENSION HUNG HOM TO TSIM SHA TSUI ENVIRONMENTAL MONITORING AND AUDIT MANUAL

## TABLE OF CONTENTS

### 1. INTRODUCTION

- 1.1 Purpose of the Manual
- 1.2 Background
- 1.3 EM&A Requirements
- 1.4 Project Organisation
- 1.5 Construction Programme

### 2. THE ENVIRONMENTAL MANAGEMENT SYSTEM FOR THE CONSTRUCTION PHASE

- 2.1 Introduction
- 2.2 The East Rail Hung Hom to Tsim Sha Tsui Extension EIA (EIA)
- 2.3 The EM&A Programme
- 2.4 Environmental Management Plan
- 2.5 Environmental Performance Review
- 2.6 Construction Method Statements
- 2.7 Contractual Documentation

### 3. NOISE MONITORING

- 3.1 Introduction
- 3.2 Methodology and Criteria
- 3.3 Monitoring Equipment
- 3.4 Monitoring Locations
- 3.5 Baseline Monitoring
- 3.6 Impact Monitoring
- 3.7 Compliance Assessment
- 3.8 Event Contingency Plan

### 4. AIR QUALITY MONITORING

- 4.1 Introduction
- 4.2 Methodology and Criteria
- 4.3 Monitoring Equipment

- 4.4 Monitoring Locations
- 4.5 Baseline Monitoring
- 4.6 Impact Monitoring
- 4.7 Compliance Assessment
- 4.8 Event Contingency Plan

## **5. LANDSCAPE AND VISUAL**

## **6. LAND CONTAMINATION**

- 6.1 General
- 6.2 Monitoring

## **7. CONSTRUCTION WASTE MANAGEMENT**

- 7.1 General
- 7.2 Trip Ticket System Monitoring
- 7.3 Construction Waste Management Records

## **8. CULTURAL HERITAGE**

- 8.1 Salvage Excavation
- 8.2 Monitoring Programme

## **9. ENVIRONMENTAL AUDITING**

- 9.1 Site Inspections
- 9.2 Compliance with Legal and Contractual Requirements
- 9.3 Environmental Complaints

## **10. REPORTING**

- 10.1 Introduction
- 10.2 Baseline Monitoring Report
- 10.3 Monthly EM&A Reports
- 10.4 Annual and Bi-annual Reports
- 10.5 Data Keeping
- 10.6 Interim Notifications of Environmental Quality Limit Exceedances

**LIST OF TABLES**

Table 1.3.9	Summary of Monitoring Programme
Table 3.2a	Noise Standards for Daytime Construction Activities
Table 3.2b	Acceptable Noise Levels for Construction other than Percussive Piling
Table 3.3	Noise Monitoring Equipment
Table 3.7	Action and Limit Levels for Construction Noise dB(A)
Table 3.8	Event/Action Plan for Construction Noise
Table 4.3a	TSP Recommended Monitoring Equipment
Table 4.4	Recommended Air Monitoring Locations
Table 4.7a	Derivation of Action and Limit Levels for 24-Hour Air Quality Monitoring
Table 4.7b	Derivation of Action and Limit Levels for 1-Hour Air Quality Monitoring
Table 4.8	Event/Action Plan for Air Quality

**LIST OF FIGURES**

Figure 1.1	Study Area and Rail Extension Alignment
Figure 1.2	EM&A Organization and Lines of Report
Figure 1.3	Project Agreement Baseline Programme - Tsim Sha Tsui
Figure 3.1	Noise Monitoring Locations
Figure 4.1	Air Quality Monitoring Locations

## 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 East Rail Extension Hung Hom to Tsim Sha Tsui 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 construction of the Kowloon Canton Railway Corporation (KCRC) East Rail Extension Hung Hom to Tsim Sha Tsui (hereafter called the Project). It aims to provide systematic procedures for monitoring, auditing and minimising the environmental impacts associated with the construction works.

Hong Kong environmental regulations for air and water quality, noise and waste, the Hong Kong Planning Standards and Guidelines, and recommendations in the EIA study final report on the Project have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following:

- (a) duties of the Contractor's 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

Hyder Consulting Ltd (Hyder) have been commissioned by the KCRC to undertake an EIA for the construction and implementation of the Project which is classified as a

designated project under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) enacted in April 1998. The Project implementation must comply in full with the requirements of the EIAO process.

In accordance with the EIAO, KCRC have submitted a Project Profile to the Environmental Protection Department (EPD) for application of an EIA Study Brief. Subsequently, EPD issued, under the EIAO (Cap.499) Section 5(7), an EIA Study Brief No.ESB-016/1998 for KCRC East Rail Extension from Hung Hom to Tsim Sha Tsui. However, since the issue of the Study Brief, a reduction of the scope of the overall project works was initiated by KCRC but this did not result in the original EPD Study Brief being revised. The EPD Study Brief is presented in Appendix A of the EIA Report.

The study area and rail alignment are presented in Figure 1.1 which illustrates the key project components including: above ground railway from Hung Hom Station to the cross harbour tunnel; tunnel section along Salisbury Road and the East Tsim Sha Tsui Station and associated access arrangements.

A Preliminary Environmental Review (PER) for the proposed project was completed in June 1998<sup>(1)</sup> which incorporated recommendations for further assessment on the key technical environmental issues. The EIA project scope has been defined from this PER and has incorporated the following changes made to the scope of work to satisfy concerns raised by various government departments:

- i. The ETS station will be re-aligned closer to Salisbury Road and clear of Signal Hill with the concourse under the Middle Road Children's Playground and Wing On Plaza Garden.
- ii. The reversing sidings and overrun tunnels along Middle Road to the west of the station will be eliminated. Short minimum length overruns are provided beyond the end of the platforms under Salisbury Road.
- iii. A station entrance/subway along Middle Road with access on both sides of Nathan Road junction.
- iv. The alignment of the interchange subway connecting the ETS and the Mass Transit Railway Corporation's (MTRC) Tsim Sha Tsui Station will be revised to pass under Blenheim Avenue instead of Minden Row. The width will be increased to enhance the capacity. Entrances will be introduced at the junction of Mody Road/Hanoi Road and near Cornwall Avenue.
- v. An interchange subway will also connect Wing On Plaza Gardens and Mody Road via Chatham Road.

---

<sup>(1)</sup> *ERM-Hong Kong Limited, Tsim Sha Tsui Extension - Preliminary Environmental Review, 8th June 1998*

### 1.3 EM&A REQUIREMENTS

The EM&A requirements are based on the findings and recommendations of the Project's EIA Report. The EIA recommended mitigation measures are consolidated as a schedule for implementation (EMIS) in Appendix J of this EIA Report.

#### 1.3.1 Construction Phase EM&A

##### *General*

The issues associated with the construction phase of the Project identified during the EIA process will be addressed through the employment of a range of specific mechanisms, procedures and controls.

Where significant uncertainty exists regarding the scale, severity or nature of a particular impacted resource or potential adverse effect (for example, the extent of land contamination or the presence of buried archaeological deposits), further investigations will be undertaken, in advance of construction, to provide sufficient information on which to base any subsequent required actions. The planning, execution and reporting of such investigations will be undertaken in consultation with relevant Government Departments and in accordance with established legislative and procedural requirements.

The monitoring of the effectiveness of the mitigation measures relating to a range of other issues will be achieved through on-site auditing. Audit protocols will include within their scope; monitoring mechanisms to ensure that site tidiness, hoarding maintenance, waste management provisions, screen planting and the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA. Further details regarding site auditing is provided in Section 10.

The remaining construction phase issues of noise, dust and water pollution will be subject to monitoring regimes which have become common practice in Hong Kong in recent years. The broad description of the monitoring programme for these media is provided in Section 1.3.9.1.

#### 1.3.2 Environmental Monitoring

##### *Monitoring Programme*

The monitoring of environmental impacts shall be carried out by the ET, the monitoring work will comprise noise and air quality impacts at representative sensitive receivers in the vicinity of the works. The monitoring programme for the Project is summarised in Table 1.3.9.

**Table 1.3.9 Summary of Monitoring Programme**

	<b>Noise</b>	<b>Air Quality</b>	<b>Landscape Restoration</b>
Parameters	Restricted period : three consecutive LAeq 5 minutes; Unrestricted period ; six consecutive readings LAeq 5 minutes.	TSP 1-hour (baseline only) and 24-hour	Success of transplanting programme; protection of mature and Champion trees;
Locations	See Appendix A	See Appendix A	
Initial Baseline	Daily at 30 minute intervals for 14 consecutive days prior to construction.	24-hour TSP daily for 14 consecutive days prior to construction and three 1-hour samples should be conducted at least three times per day when the highest dust impacts is expected.	The detailed tree survey undertaken during the detailed design.
Baseline Check	Every six months	Every six months	Every six months
Impact Monitoring	One set of measurement (three consecutive LAeq 5 min) in restricted hours and one set of measurement (six consecutive LAeq 5 min) in unrestricted periods every week when noise generating activities are underway.	One 24-hour TSP every six days.	Site inspection of : tree felling; tree transplanting; tree protection; landscape planting.
Additional Requirement	Ad hoc monitoring as required.	Ad hoc monitoring as required.	Ad hoc monitoring as required.

### 1.3.3 Action and Limit Levels

Action and Limit (A/L) Levels are defined levels of impact recorded by the environmental monitoring activities which represent levels at which a prescribed response is required. These levels are quantitatively defined later in the relevant sections of this manual and described in principle below:

- *Action Limits*: beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to be necessary to prevent environmental quality from falling outside the *Limit Levels*, which would be unacceptable; and
- *Limit Levels*: Statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances. *Hong Kong Planning Standards and Guidelines* (HKPSG) or Environmental Quality Objectives established by the EPD. If there are exceedances, works should not proceed without appropriate remedial action, including a critical review of plant and working methods.

### 1.3.4 Event Contingency Plans

The purpose of the Event Contingency Plans (ECPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant environmental incident (either accidental or through inadequate implementation of mitigation measures on the part of the Contractor) does occur, that the cause is



quickly identified and remedied, and that the risk of a similar event recurring is reduced. This also applies to the exceedance of A/L criteria identified by the EM&A programme.

### 1.3.5 Environmental Auditing

In addition to the monitoring of noise and air quality levels as a means of assessing the ongoing performance of the Contractor, the Engineer and the ET shall undertake regular audits of the Contractor's onsite practices and procedures. The primary objective of the audit programme will be to assess the effectiveness of the environmental management systems (EMS) established by the Contractor to implement the environmental mitigation measures recommended in the EIA for noise, air, landscape and visual impacts, archaeology, cultural and heritage, waste management and land contamination.

Whilst the audit programme will undoubtedly complement the monitoring activity with regard to the effectiveness of dust suppression, noise attenuation measures and water quality control, the criteria against which the audits will be undertaken shall be derived from the clauses within the Contract Document which seek to enforce the recommendations of the EIA and the established EMS.

The findings of site audits shall be made known to site staff at the time of the audit to enable the rapid resolution of identified non-compliance's. Non-compliance's, and the corrective actions undertaken, shall also be reported in the monthly EM&A Reports.

Section 10 presents the scope and frequency of onsite audits and defines the range of issues the audit protocols shall be designed to address.

### 1.3.6 Enquiries, Complaints and Requests for Information

A KCRC Community Liaison Office will be set up for public enquiries, complaints and requests for information as well as for a wide range of individuals and organisations including Government departments, the press and television media and community groups. The vast majority of the correspondence is likely to be received directly by KCRC's Community Liaison Office, although the other major receiver will be the site offices.

All enquiries concerning the environmental effects of the works, irrespective of how they are received, shall be reported to KCRC/IEC and then pass to the Engineer and Contractor who shall set up procedures for the handling, investigation and storage of such information. The following steps shall then be followed:

- (1) The Engineer and the Contractor shall be notified of the nature of the complaints.
- (2) An investigation shall be initiated to determine the validity of the complaint and to identify the source of the problem.
- (3) The Engineer shall undertake the following steps, as necessary:
  - Investigate and identify the source of the problem (the KCRC/IEC or the Engineer may request additional dust or noise monitoring);

- Liaise with the Environmental Manager to identify remedial measures;
  - Require the Contractor to take action to mitigate the situation;
  - Repeat monitoring to check compliance with A/L level criteria; and
  - If monitoring results show exceedances, repeat review procedures to identify further possible areas of improvement.
- (4) The outcome of the investigation and the action taken shall be documented on the complaints proforma. Where possible, a formal response to each complaint received shall be prepared, within a maximum of seven days, in order to notify the concerned person(s) that action has been taken.
- (5) All enquiries which trigger this process shall be reported in the monthly EM&A reports which shall include results of inspections undertaken by site staff, and details of the measures taken, and additional monitoring results.

It should be noted that the receipt of complaints or enquiries will not, in itself be sufficient reason to introduce additional mitigation measures. They, will however initiate the ECP and this procedure may lead to the introduction of mitigation measures if they are considered necessary.

In all cases the complainant shall be notified of the findings of the ECP and audit procedures put in place to ensure that the problem does not recur.

### **1.3.7 Reporting**

EM&A reporting will be annually, bi-annually and monthly. Monthly reports shall be prepared by the Contractors ET, endorsed by IEC and certified by Environmental Manager and submitted to EPD within 10 working days of the end of each calendar month. Further details are presented in Section 11.

### **1.3.8 Cessation of the EM&A Programme**

The construction of the Project will be undertaken under four construction contracts. The EIA has outlined the adverse construction impacts to be expected from the different construction activities for which mitigation and monitoring is required. The Environmental Manager/IEC shall maintain an overview of the impact causing potential of each site, monitoring parameter or activity with a view to maintaining the most cost-effective use of the environmental resources dedicated to the Project.

Applications for the termination of monitoring should focus on the percentage contract completion status and on the basis of a history of benign environmental impact arising from the site over a representative period of monitoring. Justifiable application for termination of monitoring shall be put forward by the Environmental Manager/IEC, to the relevant Government Departments and the EPD, as necessary throughout the construction period.

## 1.4 PROJECT ORGANISATION

An Environmental Team shall be set up for the Project construction phase. The organisation and lines of communication with respect to environmental works are shown in Figure 1.2. The following sub-sections outline the primary responsibilities and duties of the key EM&A programme participants.

### 1.4.1 Environmental Manager

The Environmental Manager is employed by KCRC and is responsible for:

- The broad supervision of the EM&A Program, the IEC, the Engineer and the Contractor the timely production and quality of the outputs;
- Liaise with EPD, the Engineer and the Contractor on environmental issues;
- Meeting the agreed objectives and deadlines as set out in this Manual; and
- Ensuring the quality of the deliverables.

### 1.4.2 Independent Environmental Checker

An Independent Environmental Checker shall be appointed by KCRC to audit and verify the overall environmental performance of each the East Rail Extensions Contract sites and to assess the effectiveness of the Environmental Team in their duties. The main objectives will be to:

- Review and comment the Contractor's environmental submissions as per the Environmental Permit;
- Arrange and conduct monthly general site inspections of the different works areas along the East Rail alignment;
- Review the programme of works, in order to anticipate any potential environmental impacts before they arise;
- Ensure that impact monitoring is conducted at the correct locations at the correct frequency as identified in the EM&A Manual;
- Check that mitigation measures that have been recommended in the EIA, the EM&A Manual an Contract documents, or as required, are correctly implemented, in a timely manner, when necessary; and
- Report the findings of site inspections and other environmental performance reviews to the Environmental Manger and the EPD.

### 1.4.3 Contractor's Environmental Team

The duties of the Contractor's Environmental Team are:

- To monitor the various environmental parameters as required by this EM&A Manual;
- To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;

- To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- To report the environmental monitoring and audit results to the Contractor and the Engineer; and
- To undertake regular on-site audits/inspections and to report to the Contractor and the Engineer of any potential non-compliance.

#### **1.4.4 Engineer**

The Engineer shall:

- Monitor the Contractor's compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures;
- Instruct the Contractor to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints; and
- Comply with the agreed Event Contingency Plan in the event of any exceedance.

#### **1.4.5 Contractor**

Reporting to the Engineer, the Contractor shall:

- Work within the scope of the construction contract and other tender conditions;
- Cooperate with the environmental performance review undertaken by KCRC and the Engineer and undertake any corrective actions as instructed by the Engineer; and
- Operate and strictly adhere to the guidelines of the Environmental Management Plan (EMP) developed by their project staff.

### **1.5 CONSTRUCTION PROGRAMME**

It is anticipated that the overall project programme from the detail design to completion of all civil works will take approximately 60 months. The civil works contract is anticipated to take approximately 44 months. Figure 1.3 presents a summary of the construction programme.

## **2. THE ENVIRONMENTAL MANAGEMENT SYSTEM FOR THE CONSTRUCTION PHASE**

### **2.1 INTRODUCTION**

The management of the construction phase of the Project, in a manner which ensures that the KCRC fulfils the commitments and legal requirements associated with environmental protection will be based upon a number of mechanisms, processes and organisational arrangements. The management system devised will draw upon the following:

- The East Rail Hung Hom to Tsim Sha Tsui Extension EIA (EIA)
- The EM&A Programme;
- Environmental Management Plan;
- The Results of Environmental Performance Review;
- The Construction Method Statements; and
- Contractual Documentation relating to the civil works packages.

Each of these elements is further discussed below and its role in the environmental management function is described.

### **2.2 THE EAST RAIL HUNG HOM TO TSIM SHA TSUI EXTENSION EIA (EIA)**

The EIA focused on the prediction and mitigation of impacts arising from the construction and operation of the railway. The findings and recommendations of the study constitute a formal commitment, on the part of the KCRC, to achieve the levels of environmental protection specified and form the basis upon which the KCRC's environmental performance will be judged during later stages of the project.

### **2.3 THE EM&A PROGRAMME**

The EM&A Manual, this document, provides a description of the organisational arrangements required for the EM&A programme and stipulates the scope of construction monitoring (e.g. Noise and Air), the parameters to be measured, the frequency of monitoring and the actions to be taken in the event of exceedances of the environmental criteria being recorded. Additionally, audit requirements for landscape and visual, cultural and heritage, archaeology, waste management and land contamination issues are presented. The EM&A programme also outlines guidelines for site auditing and reporting.

The EM&A programme provides the means by which feedback on the environmental impacts of the construction phase are provided to the Contractor, the Engineer, KCRC and, as the EM&A process is a requirement of the EIA process, the EPD and the predictions made during the EIA can be tested.

The EM&A programme will also provide for an Environmental Mitigation Implementation Schedule (EMIS, see Appendix J of this EIA Report) for mitigation

measures which ties the implementation of mitigation measures to the specific work activity for which it was prescribed thereby ensuring its timely installation.

## **2.4 ENVIRONMENTAL MANAGEMENT PLAN**

For the effective implementation of the mitigation, monitoring and remedial requirements presented in the EIA, EM&A and EMIS, an appropriate contractual and supervisory framework needs to be established.

The basis of the framework within which implementation will be managed is through the preparation of Environmental Management Plans (EMP) by the Contractor. KCRC will audit against the EMPs and advise the necessary remedial actions required which shall be enforced by the Engineer through contractual means.

The EMP is similar in nature to a safety or quality plan and will provide details of the means by which the Contractor (and all subcontractors working to the Contractor) will implement the EM&A programme, the recommended mitigation measures and achieve the environmental performance standards defined both in Hong Kong environmental legislation and in the EIA documentation. The primary reason for adopting the EMP approach is to make the Contractor aware of his environmental responsibilities and to ensure his commitment to achieving the standards specified.

The EMP approach is grounded on the principle that the Contractor shall define the means by which the environmental requirements of the EIA process, EM&A programme and contractual documentation shall be met. In the first instance, each Tenderer shall prepare a skeletal Environmental Management Plan for submission as part of the tendering process; the skeletal EMP will demonstrate the determination and commitment of the organisation and indicate how the environmental performance requirements laid out in the available EIA documentation will be met and, where appropriate, exceeded. It is recommended that this aspect be included as a specific criterion in the assessment of tender documents; this will act as a clear indication to all Tenderer's of the KCRC's commitment to the minimisation and management of environmental impacts. Upon Contract Award, the successful Tenderer shall be required to submit a draft Environmental Management Plan for the approval of the Engineer and KCRC and a final version prior to the commencement of the works.

## **2.5 ENVIRONMENTAL PERFORMANCE REVIEW**

The environmental performance review programme comprises the regular assessment of the effectiveness of the EMPs, site practices and procedures to ensure that the required mitigation measures are routinely implemented and environmental standards are maintained.

The review of on-site environmental performance will be undertaken by the Engineer on the basis of criteria and methodologies contained within a Review Protocol developed in advance of the commencement of construction works.

The criteria against which the reviews will be undertaken will be derived from:

- The approaches, procedures and commitments given by the Contractor in the Environmental Management Plan;
- The clauses contained within the Contractual Documentation; and
- Those parts of the Contractor's method statement which relate to the minimisation of environmental impacts or other specified environmental protection measures.

These reviews shall focus on the *effectiveness* of the implemented measures to achieve the purpose not simply the fact that a measures has been implemented. In addition, the management systems established by KCRC's on-site management team (i.e. the "Engineer") to monitor the Contractor's compliance with Contractual requirements will be included within the protocols.

The Review Protocols will be developed during the finalisation of the on-site procedures and will be incorporated in the revised EM&A Manual at that time. The likely protocols will include (but not be limited to) the auditing of the following activities:

- The allocation of responsibility for fulfilling environmental requirements and the effectiveness of lines of communication with regard to environmental issues;
- Compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliance;
- The extent and accuracy of record-keeping related to environmental performance indicators;
- The effectiveness of staff training in ensuring high levels of awareness with regard to environmental requirements; and
- The effectiveness of environmental management activities, including:
  - The inspection, cleaning and maintenance of sediment traps and oil interceptors;
  - The management and disposal of on-site waste arisings;
  - The implementation of spill prevention measures;
  - The maintenance of site boundary fences to prevent incursions, tipping, vehicle movements and encroachment of personnel into surrounding areas;
  - The measures adopted to prevent the flow of pollutants, sediment and contaminated runoff into streams and water bodies within the work site boundary; and
  - The speed and effectiveness of responses to complaints.

The protocols will comprise checklists of environmental requirements and will be amended, throughout the construction phase as necessary, to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

## 2.6 CONSTRUCTION METHOD STATEMENTS

It is common practice for the Contractor to submit details of forthcoming works to the Engineer to seek approval for the commencement of the works as well as the methodology and equipment proposed to be used.

It is recommended that this process be expanded, in line with the adoption of the Contractor's EMP, to require the signature of the Contractor's Environmental Team Leader who shall comment on deviations of the specific works from that assumed in the project EIA and advise on the implications of the changes in construction methods for achieving the environmental performance criteria set out in the EIA documentation and the EMP.

This ongoing requirement for the Contractor to review proposed working methods, in terms of their potential to impact upon the environment, will reduce the time taken to implement the necessary environmental control measures and reduce the number of iterations a measure may have to go through before becoming effective.

Any changes in construction methods will need to be reflected in a revised EMP or the Contractor will be required to demonstrate the manner in which the existing EMP shall accommodate that proposed changes.

## 2.7 CONTRACTUAL DOCUMENTATION

The key element to be included in the contractual documentation is the requirement to prepare, implement and maintain an EMP; the EMP places a contractual responsibility for on-site environmental management with the Contractor.

The EMP will, in part, be based upon the requirements contained within the contractual documentation. The contractual documentation would generally comprise appropriate extract from (and references to) the EIA Report and EM&A Manual and include such typical elements as the relevant statutory environmental standards, general environmental control clauses and specific environmental management clauses, as well as an outline of the scope and content of the EMP. In drafting the documentation, due consideration shall be given to the predicative nature of the EIA process and the consequent need to manage and accommodate the actual impacts arising from the construction process. In particular, the Contractor must be placed under a clear obligation to identify and control any implications arising from changes from the EIA assumptions relating to work methods, progress rates and other estimates made during the preliminary design phase.

In addition, the contractual documentation shall define appropriate contractual mechanism to ensure compliance with environmental requirements. The range of mechanisms available to the Engineer shall reflect the priority that the KCRC is to give environmental issues during the construction phase and may include provisions for suspending works pending the remediation of persistent environmental problems. Similarly, the inclusion of environmental performance milestones payments shall be considered by KCRC as a means of enhancing the environmental performance and encouraging the Contractor to meet these contractual obligations.



### 3. NOISE MONITORING

#### 3.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of noise impacts from the construction of the Project are presented.

#### 3.2 METHODOLOGY AND CRITERIA

Noise level measurements shall be carried out by suitably qualified members of the ET using the methodology set out in Annexes of the Technical Memorandum on Noise from Construction Work other than Percussive Piling and the Technical memorandum on Noise form Percussive Piling.

The appropriate parameter for measuring construction noise impacts shall be the equivalent A-weighted sound pressure level ( $L_{Aeq}$ ) measured in decibels (dB). The two statistical sound levels  $L_{10}$  and  $L_{90}$ ; the level exceeded for 10 and 90 percent of the time respectively, shall also be recorded during monitoring. The  $L_{90}$  may be considered as the ambient level into which the  $L_{10}$  as an average peak level intrudes.

The criterion against which the recorded noise levels shall be assessed refers to the noise level 1m from the nearest part of the building facade and at a height approximately 1.2m above the ground or at the height that has the least obstructed view of the construction activity in relation to the receiver.

Whilst the *Noise Control Ordinance* (NCO) does not provide for the statutory control of construction activities occurring on weekdays during normal working hours (i.e. Monday to Saturday inclusive 0700-1900). However, the noise impacts of the daytime construction activities of this Project have been assessed in accordance with the noise standards given in the TMEIA which are summarized in Table 3.2a below.

**Table 3.2a Noise Standards for Daytime Construction Activities**

Uses	Leq, 30 min dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and Hostels	75
Educational Institutions	70
	65 (During examination)

Note: The above standards apply to uses which rely on opened windows for ventilation.

Construction noise during restricted hours (1900-0700 for weekdays and all day on Sundays and Public Holiday) is controlled by the NCO and subsidiary technical memoranda, namely the *Technical Memorandum on Noise from Construction Work Other than Percussive Piling* (TM1) or the *Technical Memorandum on Noise form*

*Construction Work in Designated Areas (TM2)*, for construction works, within designated areas as defined by the *Noise Control (Construction Work Designated Areas) Notice, Legal Supplement No. 2 to Gazette No. 2/1996, 12 January 1996*. TM2 covers the use of the following specified powered mechanical equipment: hand-held breakers, bulldozers, concrete mixer lorries, dump trucks, and hand-held poker vibrators. The prescribed construction works are: erection or dismantling of formwork or scaffolding, loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material and hammering.

The control of percussive piling (at all times) is governed by the *Technical Memorandum on Noise from Percussive Piling (TM3)*. Percussive piling is not anticipated for this Project, and therefore, is not further discussed. These technical memoranda prescribe the permitted noise levels for construction work depending upon working hours and the types of construction activities.

Construction works requiring the use of Powered Mechanical Equipment (PME) during restricted hours and percussive piling at any time require a Construction Noise Permit (CNP) and applicants will need to demonstrate that they can achieve the applicable Acceptable Noise Level (ANL). The ANLs for construction work other than percussive piling and for construction work in designated areas are shown in Table 3.2b.

**Table 3.2b Acceptable Noise Levels for Construction other than Percussive Piling**

Time Period	ASR "A"	ASR "B"	ASR "C"
All days during the evening (1900-2300) and general holiday( including Sundays) during the day and evening (0700-2300)	60(45)	65(50)	70(55)
All days during the night-time (2300-0700)	45(30)	50(35)	55(40)

*Note: ASR - Area Sensitivity Rating*

*Level in brackets are ANLs for construction work in designated areas*

*All noise levels are  $L_{Aeq} 5 \text{ min}$  dB*

### 3.3 MONITORING EQUIPMENT

Sound level meters and calibrators shall comply with the International Electrotechnical Commission (IEC) Publication 651:1979 (Type 1) and 804:1985 (Type 1) specification as referred to in the TM. The sound level meters shall be supplied and used with the manufactures recommended wind shield and with a tripod.

The calibration of the sound level meters and their respective calibrators shall be carried out in accordance with the manufacturer's requirements. The sound level meters, including the calibrators, shall be verified by the manufactures once every two years to ensure they perform to the same level of accuracy as stated in the manufacturers specifications. Calibrated hand-held anemometers shall also be supplied for the measurement of wind speeds during noise monitoring periods.

Sound level meters shall be calibrated using a portable calibrator before and after each measurement. The calibration levels shall be noted with the measurement results and where the difference between the calibration levels is greater than 1dB(A) the measurement shall be repeated.

The equipment shall be kept in a good state of repair in accordance with the manufacturer’s recommendations and maintained in proper working order with sufficient spare equipment available in the event of breakdown to maintain the planned monitoring programme.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with the hand-held anemometers capable of measuring the wind speed in m/s. Table 3.3 lists recommended quantities of noise monitoring equipment required for the Project.

**Table 3.3 Noise Monitoring Equipment**

Description	Quantity
Noise meter	6
Calibrator	3
Hand held anemometer	3

**3.4 MONITORING LOCATIONS**

Eleven noise monitoring locations are recommended and listed below in Table 3.4 (also see Figure 3.1). Prior to the commencement of the EM&A Programme, the actual noise monitoring locations shall be discussed and agreed with EPD.

**Table 3.4 Recommended Noise Monitoring Locations**

NSR No.	Name
N1	Pak Sui Yuen
N2	Hency Tower
N3	Star Mansion
N4	Far East Mansion
N5	Minden Apartment
N6	Minden House
N7	No. 7 Minden Avenue
N8	No. 18 Mody Road
N9	Peninsula Apartment
N10	Mirador Mansion
N13/N14*	Ocean View Court

\* Same NSR but different facades

### 3.5 BASELINE MONITORING

To obtain fully satisfactory baseline results, weatherproof logging sound level meter shall be used. Continuous baseline noise for the A-weighted levels  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  shall be measured over a period of two weeks in a sample period of 5 minutes or 30 minutes between 0700 and 1900, and 5 minutes between 1900 and 0700. The monitoring period shall be selected prior to the commencement of any construction activities and so as to avoid other a typical noise sources. The proper functioning of the logger shall be ensured during this period and shall be visited for a period not less than one hour every two days to ensure its continued operation and to detail specific noise sources audible at the monitoring location. Measurements shall be recorded to the nearest 0.1 dB.

Checking for changes in the baseline noise levels throughout the project construction shall be carried out by taking "sample" noise measurements every six months, when no noisy East Rail construction activities are in progress. In case significant changes which can be observed and validated have arisen, the baseline may be adjusted accordingly after consultation and agreement with the EPD.

### 3.6 IMPACT MONITORING

During normal construction working hours (0700-1900 Monday to Saturday), monitoring of  $L_{Aeq,30\ min}$  noise level (as six consecutive  $L_{Aeq,5\ min}$  readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM. If restricted hours works are undertaken, monitoring of  $L_{Aeq,15\ min}$  noise levels (as three consecutive  $L_{Aeq,5\ min}$  readings) shall be carried out at the agreed monitoring stations at the same frequency as specified for normal working hours.

In relation to the monitored noise levels, other noise sources such as road traffic may make a significant contribution to the overall noise environment. Therefore, the results of noise monitoring activities will take into account such influencing factors which were not present during the baseline monitoring period. All measurements shall be recorded to the nearest 0.1 dB.

### 3.7 COMPLIANCE ASSESSMENT

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. The noise impact monitoring data shall be checked against the agreed A/L Levels as listed in Table 3.7.

**Table 3.7 Action and Limit Levels for Construction Noise dB(A)**

Time Period	Action	Limit
0700-1900 on normal weekdays;	When one or more documented complaints are received	75dB(A)
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days	When one or more documented complaints are received	50 or 55 dB(A) <sup>(1)</sup> 65 or 70 dB(A) <sup>(2)</sup>
2300-0700 of next day	When one or more documented	35 or 40 dB(A) <sup>(1)</sup>

Time Period	Action	Limit
	complaints are received	50 or 55 dB(A) <sup>(2)</sup>

Note:

(1) for non-SPME and prescribed works

(2) for the SPME and prescribed works

To account for cases where ambient noise levels as identified by baseline monitoring approach or exceed the stipulated Limit Levels prior to commencement of construction, a Maximum Acceptable Impact Level may be defined and agreed with EPD, which incorporates the baseline noise level and the identified construction noise Limit Level. This amended level will, therefore, be greater than 75 dB(A) and will represent the maximum acceptable noise level at a specific monitoring station. Correction factors for the effects of acoustic screening and/or architectural features of NSRs may also be applied for, from the EPD, as specified in the TM.

For the purposes of compliance checking, after taking into account any adjustments agreed with EPD, comparison with either the Limit or the Maximum Acceptable Impact Level shall represent the governing criteria for noise impact assessment during the East Rail EM&A.

### 3.8 EVENT CONTINGENCY PLAN

The principle on which the ECP is based is the prescription of procedures and actions associated with the measurement of defined levels of noise impact recorded by the environmental monitoring process and defined in the tables above. In cases where exceedance of these criteria occurs the Environmental Manager, Engineer and the Contractors shall strictly observe the relevant actions of the ECP shown in Table 3.8.

**Table 3.8 Event/Action Plan for Construction Noise**

EVENT	ACTION	
	ET Leader or ER	Contractor
<i>Action Level</i>	<ol style="list-style-type: none"> <li>1. Notify Contractor</li> <li>2. Analyse investigation</li> <li>3. Require Contractor to propose measures for the analysed noise problem</li> <li>4. Increase monitoring frequency to check mitigation effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative</li> <li>2. Implement noise mitigation proposals</li> </ol>
<i>Limit Level</i>	<ol style="list-style-type: none"> <li>1. Notify Contractor</li> <li>2. Notify EPD</li> <li>3. Require contractor to implement mitigation measures Increase monitoring frequency to check mitigation effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement mitigation measures</li> <li>2. Prove to Environmental Team Leader ER effectiveness of measures applied</li> </ol>

## 4. AIR QUALITY MONITORING

### 4.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of air quality impacts during the construction of the Project is presented.

### 4.2 METHODOLOGY AND CRITERIA

The criteria against which air quality (measured as Total Suspended Particulates (TSP)) monitoring shall be assessed are:

- The Hong Kong Air Quality Objectives (AQO) for TSP, 24-hour TSP levels of  $260 \mu\text{g m}^{-3}$ ; and
- The EPD recommended 1-hour TSP limit of  $500 \mu\text{g m}^{-3}$ .

These criteria should not be exceeded at air sensitive receivers (ASRs).

The impact of fugitive dust on ambient air quality depends on the quantity generated, as well as the drift potential of the dust particles injected into the atmosphere. Large dust particles will settle out near the source and particles that are 30-100  $\mu\text{m}$  in diameter are likely to undergo impeded settling. These particles, depending on the extent of atmospheric turbulence, would settle within a distance of 100 m from the sources. TSP levels will, therefore, be monitored to evaluate the dust impact during the construction phase of the Project.

TSP levels shall be determined by following the standard high volume sampling method as set out in High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix J, Title 40 of the Code of Federal Regulations of the USEPA.

24-hour average TSP concentrations are measured by drawing air through a high volume sampler (HVS), fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling, the filter paper with retained particles shall be collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. TSP levels are calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled. The drying and analysis process normally takes about two days to complete.

1-hour TSP concentrations can be measured either by the same monitoring method as 24-hour TSP sampling or real time airborne particulate measurement can be undertaken using a direct reading dust meter such as the MIE Data-Ram Portable Real Time Aerosol Monitor (MIE). The MIE uses optical sensors to analyse the incoming air stream providing real time readout of particulate concentrations. Despite the advantages of using a real time monitor to measure particulate concentrations such as in response to dust complaints, results are not comparable with 24-hour HVS data. Therefore, if the use of a direct reading monitor is agreed for 1-hour TSP sampling

both baseline and ad hoc monitoring must be carried out by the direct reading method.

No comparisons between direct reading and physically measured (HVS) data shall be attempted except that, where the direct reading method for 1-hour TSP sampling is used, the measured TSP concentrations shall be regarded as indicative of the 24-hour TSP results and the actions specified in this Manual shall be implemented.

### 4.3 MONITORING EQUIPMENT

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

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

A hand-held direct reading dust meter, sampling in the range of 0.1-100 mg/m<sup>3</sup> and capable of achieving results comparable to a high volume air sampler shall be used for 1-hr TSP sampling.

Equipment shall be maintained in calibration at all times and recalibration shall be carried out in accordance with requirements stated in the manufacturers operating manual and as described below.

The flow rate of each high volume sampler with mass flow controller shall be calibrated using an orifice calibrator. Initial calibration shall be conducted upon installation and prior to commissioning. One point flow rate calibration should be carried out every two months. Five point calibration should be carried out every six months.



The samplers shall be properly maintained. Prior to dust monitoring commencing, appropriate checks shall be made to ensure that all equipment and necessary power supply are in good working condition.

Table 4.3a presents the recommended types and quantities of TSP monitoring equipment.

**Table 4.3a TSP Recommended Monitoring Equipment**

Description	Quantity
High volume sampler	8
Hand-held direct reading dust meter	2

#### 4.4 MONITORING LOCATIONS

Eight air monitoring locations are recommended and listed below in Table 4.4 (also see Figure 4.1). Prior to the commencement of the EM&A Programme, the actual air monitoring locations shall be discussed and agreed with EPD.

**Table 4.4 Recommended Air Monitoring Locations**

ASR No.	Name
A7	Grand Standard Harbour View Hotel
A12	Empire Centre
A15	Wing On Plaza
A17	New World Centre
A18	Tokyu
A21	Far East Mansion
A29	Lyton Building
A35	No. 5 Mody Road

#### 4.5 BASELINE MONITORING

Baseline monitoring shall be carried out to determine the ambient 1-hour and 24-hour TSP levels at the monitoring locations prior to the commencement of the construction works.

Baseline monitoring shall be carried out for a continuous period of at least two weeks under typical weather conditions with the 24-hour and three 1-hour ambient measurements taken daily at each monitoring location. As noted above, monitoring results of HVS and aerosol monitoring are not directly comparable and the same method must be used for baseline and impact monitoring. General meteorological conditions (wind speed and direction and precipitation) and notes regarding any

significant adjacent dust producing sources shall also be recorded throughout the baseline monitoring period.

The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.

Baseline checking of ambient dust levels shall be carried out every six months at each monitoring location. The checking shall be carried out when dusty East Rail activities are not in operation and detailed notes shall be provided by the monitoring personnel as to any significant dust producing sources during the baseline checking.

#### 4.6 IMPACT MONITORING

The monthly schedule of the compliance and impact monitoring programme shall be drawn up by the Environmental Team, one month prior to the commencement of the scheduled construction period and submitted to the Engineer. TSP monitoring shall include the following:

- One 24-hour sample every six days

Dust monitoring data shall be recorded on a standard record form developed for the Project.

#### 4.7 COMPLIANCE ASSESSMENT

Environmental limits, termed Action and Limit (A/L) levels, provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data shall be checked against the agreed A/L levels as listed in Tables 4.7a and 4.7b.

**Table 4.7a Derivation of Action and Limit Levels for 24-Hour Air Quality Monitoring**

Level	Total Suspended Particulates ( $\mu\text{g m}^{-3}$ )
Baseline	Derived from physical measurements prior to construction commencing
Action	For baseline $< 108 \mu\text{g m}^{-3}$ , average of 130% of baseline and the Limit level
	For $108 < \text{baseline} > 154 \mu\text{g m}^{-3}$ , $200 \mu\text{g m}^{-3}$
	For Baseline $> 154 \mu\text{g m}^{-3}$ , 130% of baseline level
Limit	AQO for TSP : $260 \mu\text{g m}^{-3}$ averaged over 24-hours

**Table 4.7b Derivation of Action and Limit Levels for 1-Hour Air Quality Monitoring**

Level	Total Suspended Particulates
Baseline	Derived from physical Measurements prior to construction commencing
Action	For baseline $< 154 \mu\text{g m}^{-3}$ , average of 130% of baseline and the Limit level

Level	Total Suspended Particulates
	For $154 < \text{baseline} > 269 \mu\text{g m}^{-3}$ , $350 \mu\text{g m}^{-3}$
	For $\text{baseline} > 269 \mu\text{g m}^{-3}$ , 130% of baseline level
Limit	$500 \mu\text{g m}^{-3}$

#### 4.8 EVENT CONTINGENCY PLAN

The principle upon which the ECP is based is the prescription of procedures and actions associated with the measurement of certain defined levels of air pollution (the Action and Limit levels), recorded by the environmental monitoring process, during the construction of the Project. The ECP for exceedance of various levels and the responsibilities of relevant parties in the event of such an exceedance are given in Table 4.8 below.

**Table 4.8 Event/Action Plan for Air Quality**

EVENT	ACTION		
	ET	ER	CONTRACTOR
<b>ACTION LEVEL</b> 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
<b>LIMIT LEVEL</b> 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	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working

EVENT	ACTION		
	ET	ER	CONTRACTOR
	<ol style="list-style-type: none"> <li>5. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results</li> </ol>	<ol style="list-style-type: none"> <li>working methods</li> <li>4. Discuss with Environmental Team Leader and Contractor potential remedial actions</li> <li>5. Ensure remedial actions properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>days of notification</li> <li>3. Implement the agreed proposals</li> <li>4. Amend proposal if appropriate</li> </ol>
<ol style="list-style-type: none"> <li>2. Exceedance for two or more consecutive samples</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source</li> <li>2. Inform ER and EPD the causes &amp; actions taken for the exceedances</li> <li>3. Repeat measurement to confirm findings</li> <li>4. Increase monitoring frequency to daily</li> <li>5. Investigate the causes of exceedance</li> <li>6. Arrange meeting with EPD and ER to discuss the remedial actions to be taken</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep EPD and ER informed of the results</li> <li>8. If exceedance stops, cease additional monitoring</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing</li> <li>2. Notify Contractor</li> <li>3. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented</li> <li>4. Discuss amongst Environmental Team Leader and the Contractor potential remedial actions</li> <li>5. Review Contractor's remedial actions whenever necessary to assure their effectiveness</li> <li>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</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance</li> <li>2. Submit proposals for remedial actions to ER within 3 working days of notification</li> <li>3. Implement the agreed proposals</li> <li>4. Resubmit proposals if problem still not under control</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated</li> </ol>

## 5. LANDSCAPE AND VISUAL

A number of mitigation measures have been identified in the EIA to minimise the landscape and visual impacts during the construction phase as detailed in the Schedule of Environmental Mitigation. The effectiveness of the Contractor's implementation and maintenance of these mitigation measures will be monitored as part of the ongoing site audit programme.

The monitoring and audit will include Site Inspections, Site Supervision and Monitoring of the following:

### **Trees:**

- i. To ensure that tree felling is conducted in accordance with the tree survey;
- ii. To ensure that trees to be maintained are not damaged during the construction work;
- iii. To ensure that tree transplanting is conducted efficiently without reducing the survival potential of the transplanted tree;
- iv. Protection of Champion trees at all times;
- v. To ensure that landscape restoration works commence at the earliest opportunity to minimise the visual impact of the works;
- vi. Monitor planting to ensure correct species and correct spacing etc. to ensure maximum possible survival rates are achieved.
- vii. Monitor the number of planted trees to ensure that tree loss is adequately compensated for in terms of numbers of trees;

### **Site Hoardings:**

- i. To ensure that site hoardings are positioned correctly to provide visual screening of the works from key sensitive receivers;
- ii. To ensure that the recommendations of the EIA for hoarding arrangement, colours and heights are implemented efficiently on-site;

## 6. LAND CONTAMINATION

### 6.1 GENERAL

A moderate to low potential risk for contamination has been identified within the area of the Middle Road petrol filling station and the former railway line, which may have a potential impact upon the Project. The underground tanks for the petrol station are located in Middle Road Children's Playground, at the proposed location of the East TST station. The former railway line intersects the eastern side of the proposed station area.

A focused, intrusive investigation is therefore required in order to define the full extent of any contamination within this area. This will enable the need for and scope of any remedial works and special disposal requirements to be defined.

In view of the extent of hardstanding and likely presence of underground services within the area, boreholes are recommended. Boreholes will enable soil samples to be collected and allow standpipes to be installed for groundwater monitoring and to monitor for the potential presence of volatile organic gases. All borehole locations will be dependent upon accessibility and the extent of below ground services.

### 6.2 MONITORING

Full time supervision of the borehole installation should be provided by a qualified Environmental Scientist, ensuring that the works are carried out to the required standard, at the most suitable locations and that monitoring standpipes are appropriately installed to allow future monitoring. Samples should be taken from all boreholes for subsequent laboratory testing. All soils should be logged and described in accordance with the appropriate standards (e.g. British Standard (BS5930) – Code of Practice for Site Investigation). Typically four samples (3 soil and 1 groundwater) should be submitted for analysis from each borehole although this will be dependent upon site observations.

Analysis of the samples will be dependent upon the findings of the intrusive investigation but should include analysis for volatile organics (including BTEX compounds), total petroleum hydrocarbons, pH, metals, sulphate and PAHs.

All standpipes installed should be purged (typically three well volumes) and sampled following the completion of site works. This will enable the collection of representative groundwater samples which may then be submitted for chemical analysis.

Recommendations with regard to any remedial works may then be made based upon the results of the site investigation. Such recommendations should include an outline design of any remedial works, broad cost estimates and consideration of potential liability/risk management in the long term. In the event that contaminated materials are present, any material excavated as part of the construction works will require special disposal considerations. Special handling and health and safety procedures

must also be in place to ensure that site workers are not exposed to any unacceptable risks and no adverse impacts are sustained to the local receiving environment (including air and water quality). Contaminated material left in-situ may result in a potential risk to the underground structure and building design control measures may be required.

No potentially contaminating land uses have been identified within the most recently reclaimed areas. Prior to the finalisation of the disposal route the nature of the materials should be verified which may be carried out as part of the geotechnical investigation.

“The Contamination Assessment Plan (CAP) should be implemented and the Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) should be approved before the award of the project construction contract involving the concerned sites. This is to allow the remediation/mitigation measures recommended the RAP to be incorporated in the project construction contract. If there is separate contract for the remediation works, such remediation works must be completed prior to the construction of the project works. The tasks that are likely to be required for land contamination assessment during the subsequent stages of the Project development are:

Review the Contamination Assessment Plan (CAP) attached in Annex H of this report; and perform a site visit to identify detailed sampling locations and test parameters;

Submit the amended CAP for EPD’s agreement;

Perform site investigation according to the agreed CAP to ascertain the scale and level of land contamination;

Report the findings of the site investigation in a Contaminated Assessment Report (CAR), and, if land contamination is confirmed, prepare a Remediation Assessment Plan (RAP) for agreement with EPD;

If applicable, the contaminated site shall be remediated in accordance with the approved CAR/RAP”.

## **7. CONSTRUCTION WASTE MANAGEMENT**

### **7.1 GENERAL**

The effective management of waste arising during the construction phase of the Project will be monitored through the site audit programme. The scope of that part of the programme relating to waste management is presented below.

#### **7.1.1 Objectives of the Waste Audit**

The aim of the waste audit are:

- To ensure that the waste arising from works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner;
- To ensure that the handling, storage, collection and disposal of waste arising from the demolition works comply with the relevant requirements under the Waste Disposal Ordinance and its regulations; and
- To encourage the reuse and recycling of materials.

#### **7.1.2 Methodology and Criteria**

The ET should ensure that the Contractor has obtained from appropriate authorities the necessary waste disposal permits or licences in accordance with the various ordinances:

- Chemical Waste Permits/licences under the Waste Disposal Ordinance (Cap 354);
- Public Dumping Licence under the Crown Land Ordinance (Cap 28); and
- Marine Dumping Permit under the Dumping at Sea Ordinance (Cap 466)

The storage, handling and disposal of chemical waste should be audited with reference to the requirements of the Code of Practice on the Package, Labelling and Storage of Chemical Wastes published by the EPD.

The storage, handling and disposal of asbestos waste should be monitored and audited with reference to the requirements of the Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste published by the EPD.

### **7.2 Trip Ticket System Monitoring**

The environmental monitoring shall include trip ticket usage to ensure proper disposal and avoidance of fly tipping. The environmental team shall audit the implementation of the trip ticket system for solid waste disposal by:

1. random site inspections of vehicles leaving and entering the site;



2. auditing of waste disposal records to ensure that the number of trucks leaving the site corresponds with the number of delivery's at the landfill.

### 7.3 CONSTRUCTION WASTE MANAGEMENT RECORDS

Due to the size of this project and the amount of waste requiring disposal it is proposed that a recording system is implemented to assess the effectiveness of waste reduction, recycling and disposal. The waste documentation should incorporate the following:

- waste management objectives as stated in the "Environmental Management Plan" at the outset of the project;
- results of project waste management audits;
- records of waste disposal by category of waste;
- records of truck movements required in waste disposal operations; and
- evaluation of the effectiveness of waste management in terms of reduction, recycling and re-use.

## **8. CULTURAL HERITAGE**

### **8.1 SALVAGE EXCAVATION**

Any areas which will be cut from Signal Hill will require archaeological testing in advance of engineering works. The area should also include any portions of the hill which might be indirectly impacted by these works. A salvage excavation methodology shall be agreed with the AMO prior to the commencement of construction works.

### **8.2 MONITORING PROGRAMME**

It is recommended that a programme of monitoring be used to systematically observe the excavations associated with construction. Areas where this will be required include:

- Area of pre-1924 reclamation to the east of Signal Hill
- Area of pre-1924 reclamation and original landforms along Middle Road
- Areas of pre-1924 reclamation and original landforms along Mody and Blenheim Roads and their intersections with Hanoi and Cornwall Roads

The exact locations of these areas is detailed in the EIA Report. This programme will require archaeologists to be present on site when strata with archaeological potential are penetrated. The EIA has also clearly identified the strata of these areas to be sampled. The timing and duration of archaeological monitoring and the number of archaeologists required will be dependent on the scheduling of the engineering works. Liaison will be required between the archaeologists and the site engineers.

Monitoring entails observation of the stratigraphy and contents of the excavations as they are removed by machinery. The archaeologists will observe the excavation of deposits with archaeological potential, and scan the material as it is removed. These procedures will not interfere with the progress of the works. It is unrealistic to carry out these monitoring procedures for 100% of the site, considering the scale of works. A sampling procedure will therefore be introduced covering approximately 10-15% of the area of the excavations identified as being of archaeological interest, taking account of the resources available for the archaeological monitoring. The sampling units will be randomly spaced within the strata of archaeological interest.

Full structural monitoring techniques shall be applied to the historic buildings/structures on the site during construction. Also a condition survey should be carried out prior to the commencement of construction.

## 9. ENVIRONMENTAL AUDITING

### 9.1 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 used to enforce the environmental protection requirements on the construction site.

The IEC is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works.

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 IEC shall make reference to the following information in conducting the inspection:

- The EIA recommendations on environmental protection and pollution control mitigation measures;
- Works progress and programme;
- Individual works methodology proposals (which shall include proposal on associated pollution control measures);
- The contract specifications on environmental protection;
- The relevant environmental protection and pollution control laws; and
- Previous site inspection results.

The Contractor shall update the IEC 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 Engineer and the Contractor within 24 hours, for reference and for taking immediate action. The Contractors shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the IEC 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 Action Plan for environmental monitoring and audit.

## 9.2 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 Engineer for approval shall be sent to Environmental Manager/IEC for vetting to see whether sufficient environmental protection and pollution control measures have been included.

The Environmental Manager/IEC 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 Environmental Manager 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 Environmental Manager/IEC's inspection upon his request.

After reviewing the document, the Environmental Manager/IEC shall advise the Engineer 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 Environmental Manager/IEC'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 Engineer accordingly.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The Engineer 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.

## 9.3 ENVIRONMENTAL COMPLAINTS

Complaints shall be referred to the Environmental Manager/IEC and passed on to the Environmental Team for carrying out complain investigation procedures. The Environmental Team shall undertake the following procedures upon receipt of the complaints:

- Log complaint and date of receipt onto the complaint database;
- Investigate the complain to determine its validity, and to assess whether the source of the problem is due to works activities;
- If a complaint is valid and due to works identify mitigation measures;
- If mitigation measures are required advise the Contractor accordingly;

- Review the Contractor's response on the identified mitigation measures and the updated situation;
- If the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD.
- Undertake additional monitoring and audit to verify the situation if necessary and review that any valid reason for complaint does not recur;
- 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
- Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and Engineer shall cooperate with the Environmental Manager/IEC 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 Engineer shall ensure that the measures have been carried out by the Contractor.

## **10. REPORTING**

### **10.1 INTRODUCTION**

The primary reporting function, undertaken with the EM&A programme will be the issuance of formal exceedance notifications, corrective actions and ongoing feedback between the Environmental Team and the KCRC. Reporting will be driven by the results of the monitoring and audit programme and will be recorded through written correspondence, audit reports and minutes and notes of meetings.

In addition, periodic reviews of the EM&A process will be prepared and circulated to relevant personnel with the KCRC's Project Team as a means of gauging site staff and contractor performance. The periodic reviews will comprise Monthly, Biannual and Annual EM&A Reports; these Reports will be copied to the EPD for comment. The exact details of the frequency, distribution and deadlines shall be agreed with EPD prior to the commencement of the works.

### **10.2 BASELINE MONITORING REPORT**

The baseline monitoring results, their interpretation and proposals for the A/L level parameters will be presented in the form of a draft report which will be submitted to the EPD for agreement. The draft report will be supported by the baseline monitoring data in electronic format, along with information from the covering monitoring locations, equipment and protocols.

The agreed baseline report will then be reissued as a stand alone report.

### **10.3 MONTHLY EM&A REPORTS**

Monthly EM&A Reports shall be prepared by the Contractor, endorsed by IEC, certified by KCRC and submitted within 10 working days of the end of each calendar month, the first report will be submitted in the month after construction works commence. The report shall include (but not be limited to) the following elements:

- Executive Summary highlighting breaches of agreed criteria, complaints, reporting changes and future key issues;
- Basic project information (e.g. current permits and licences);
- Brief account of construction activities;
- Monitoring results together with details of locations, dates, times, parameters monitored, etc.;
- Interpretation of the significance of monitoring results and explanation of influencing factors;
- Graphical plots of monitored trends over the past four reporting periods;
- Description of recommendations and/or actions taken, or outstanding, in the event of non-compliance's or deficiencies, including site inspections and audits;

- Review of the implementation status and effectiveness of environmental protection works in relation to non-compliance's and deficiencies and the mitigation measures recommended in the EIA report;
- Summary of complaints, results of investigations and follow-up actions; and
- Future key issues.

#### **10.4 ANNUAL AND BI-ANNUAL REPORTS**

In addition to the Monthly Reports, Bi-annual and Annual Reports will be issued which will provide a general overview of the progress of the Project EM&A to date.

The Bi-annual and Annual Reports will document the findings of the audit of noise and air quality monitoring results by contract, referring first to baseline conditions and then impact results. Graphs of the monitoring trends will be included to indicate the performance for impact control for each media over the reporting period. The audit findings of visual, archaeology, waste management and land contamination issues shall also be included.

A summation of the main findings and recommendations to further improve the environmental performance of the Project will be included, as appropriate, in the conclusions.

#### **10.5 DATA KEEPING**

All documents and records, in both paper and electronic format, pertaining to the this EM&A will be retained as part of the Project files and will be subject to appropriate data handling procedures.

#### **10.6 INTERIM NOTIFICATIONS OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES**

Interim notifications of exceedances of Limit Levels will be issued to the EPD within 24 hours of the identification of an exceedance. The Monthly Reports will contain all available details concerning measured exceedances and complaints, their causes and those steps taken to control impacts and prevent their recurrence.

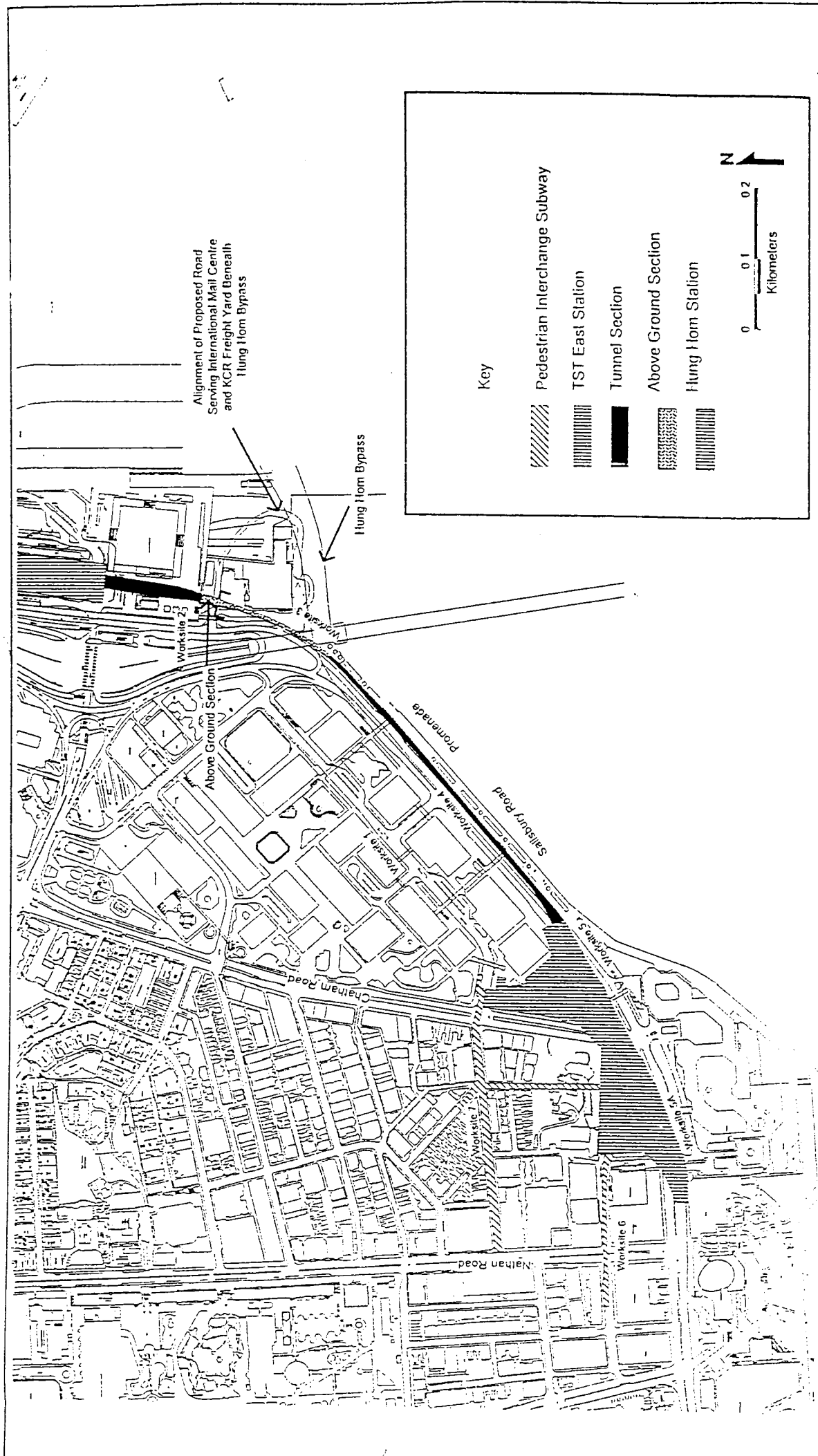
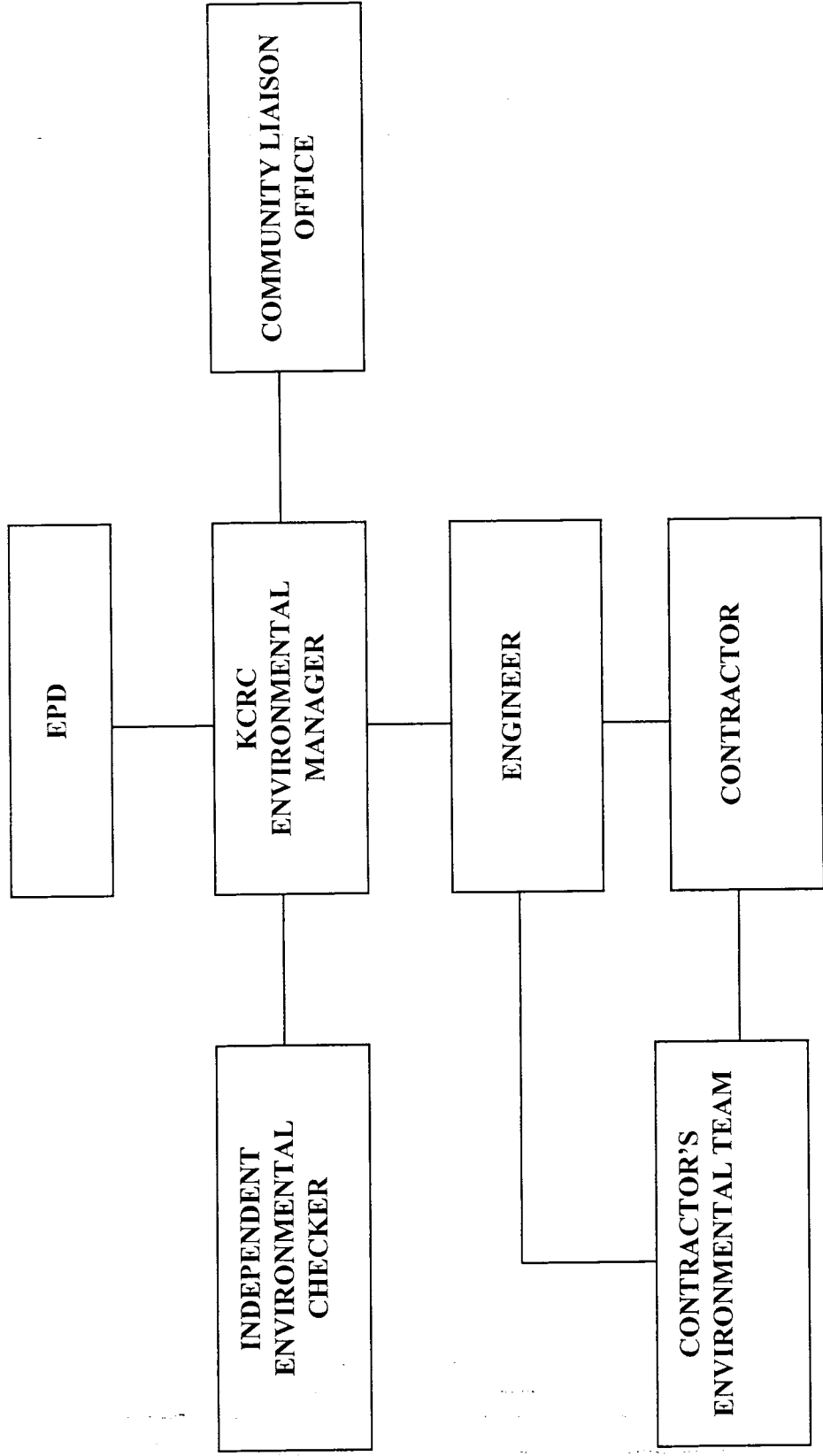


Figure 1.1 Study Area and Rail Extension Alignment





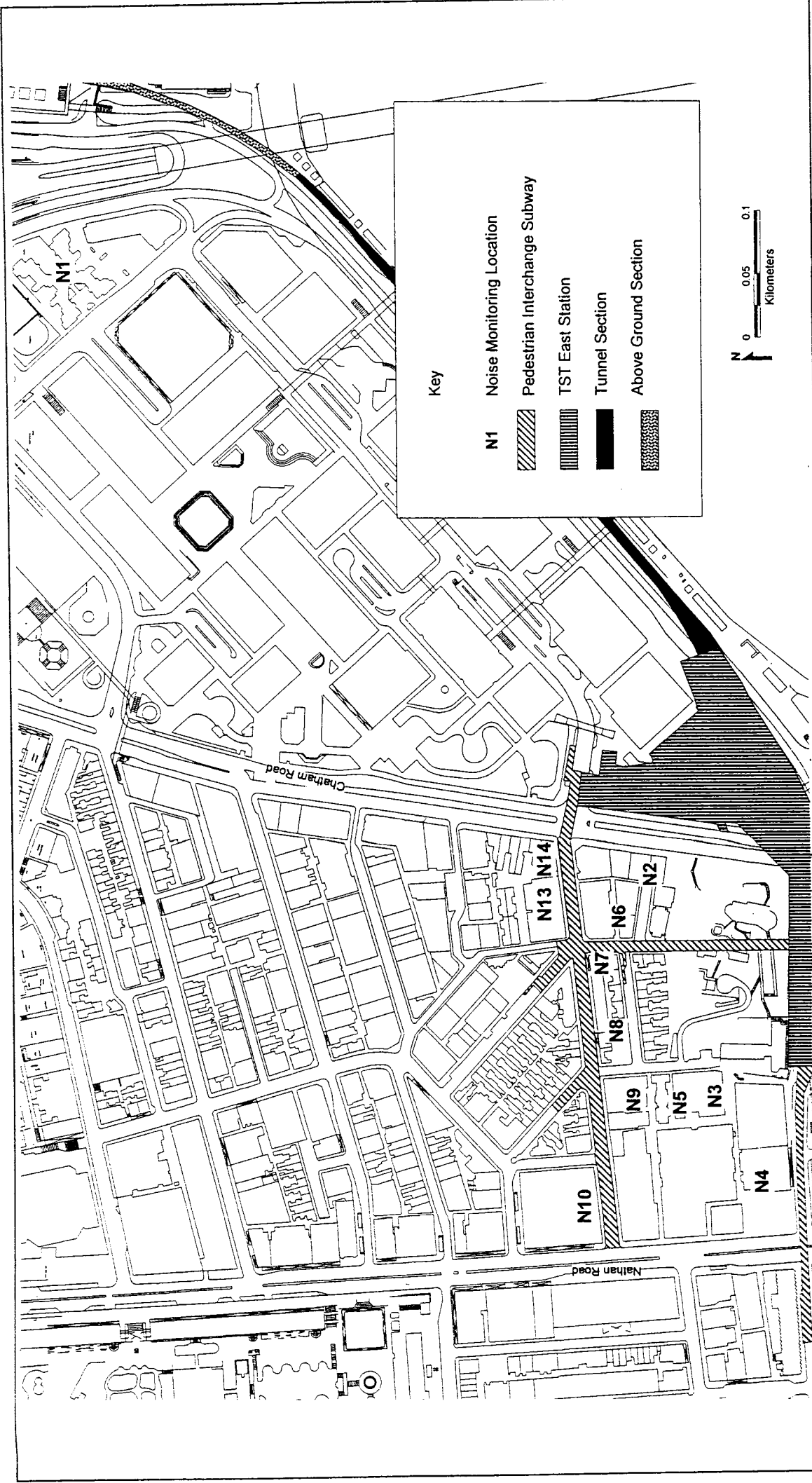
East Rail - Hung Hom to Tsim Sha Tsui Extension EIA - EM&A Manual

**Figure 1.2 EM&A Organization and Lines of Reporting**

Job No. EA00561







East Rail - Hung Hom to Tsim Sha Tsui Extension EIA

**Figure 3.1 Noise Monitoring Locations**

Job No. EA00561

