

1. INTRODUCTION

Background

- 1.1 The existing Tai Po Road, Sha Tin section, is suffering extensive traffic congestion during peak hours. The Sha Tin and Ma On Shan (STMOS) district traffic study completed in 1995 concluded that provision of Trunk Road T4 would alleviate this congestion. This was further confirmed by a review undertaken by Transport Department (TD) in 2001 based on latest traffic growth estimates. The STMOS also predicted to cause congestion at critical junctions within the Sha Tin Town Centre urban road network during peak times. Provision of Trunk Road T4 and its direct route away from the urban centre would alleviate this. The Project site is shown in Figure 1.1.
- 1.2 The PPFS was completed in February 1997 and the Secretary for Transport's Review Report for Trunk Road T4 in 2001 recommended completion by 2009
- 1.3 Ove Arup & Partners Hong Kong Limited (Arup) was commissioned by the Civil Engineering and Development Department (CEDD) of the Government of the Hong Kong Special Administrative Region to provide professional services in respect of "Trunk Road T4, Sha Tin – Investigation" (hereinafter called 'the Project') under Agreement No. CE 1/2002 (HY), on 6th March 2003 for completion on 5th June 2004.
- 1.4 Cinotech Consultants Limited (Cinotech) is the Environmental Sub-consultant responsible for the environmental impact assessment in this Assignment.

Purpose of this Manual

- 1.5 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 recommendations in the Environmental Impact Assessment (EIA) study, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action.
- 1.6 This Manual outlines the monitoring and audit programme to be undertaken for the construction and operational phases of the project of Trunk Road T4 Sha Tin. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the project.
- 1.7 Hong Kong environmental regulations for noise, air quality, water quality and waste, the *Hong Kong Planning Standards and Guidelines* (HKPSG), and recommendations in the EIA Report on Trunk Road T4 Sha Tin have served as environmental standards and guidelines in the preparation of this Manual.
- 1.8 For the purpose of this Manual, the "Engineer" should 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 should be responsible for and in charge of the ET, should refer to the person delegated the role of executing the environmental monitoring and audit requirements.

1.9 This Manual contains the following:

- Duties of the Environmental Team (ET) with respect to the environmental monitoring and audit requirements during construction;
- Duties of the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during construction;
- Information on project organisation and programming of construction activities for the project;
- Requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impacts;
- Definition of Action and Limit Levels;
- Establishment of event and action plans;
- Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria; and
- Requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

Environmental Monitoring and Audit Requirements

1.10 The construction and operational phase impacts of the project have been assessed and presented in the EIA Report. The EIA Report has specified the recommended environmental mitigation measures to minimise the potential adverse environmental impacts identified. An implementation schedule of the recommended environmental mitigation measures is prepared as part of the EIA study and is contained in Appendix A of this Manual.

1.11 In order to ensure that the mitigation measures recommended in EIA Report are fully implemented and resulted in the expected effectiveness, this Manual defines the scope of EM&A requirements for the construction and operation of the project to achieve satisfactory environmental performance. The EM&A requirements are prepared in accordance with the requirements stipulated in Annex 21 of the TM on EIA Process. The environmental monitoring to be undertaken for the Project are as follows:-

- *Baseline Monitoring* refers to the measurement of prevailing environmental parameters, including existing air quality and noise level, 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 environmental 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 proposed mitigation measures, and any further remedial measures which are needed.
- *Compliance Monitoring* involves periodic sampling and/or continuous measurement of environmental parameters and the determination of their compliance with regulatory requirements and standards.

1.12 The environmental monitoring programme shall also be subject to environmental audit. The aim is to determine whether satisfactory compliance with the legislative requirements has been met, and to ensure that no annoyance is caused to sensitive receivers or else the remedial action plan will be initiated, if required. This will require information on the standards 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.

1.13 In order to ensure that the mitigation measures recommended in the EIA study are implemented fully and resulted in the expected effectiveness, this Manual defines the scope of EM&A requirements for the construction and operation of the proposed developments to achieve satisfactory environmental performance. The EM&A requirements for the Project shall 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.
- Post Construction Phase – including road traffic noise impact/compliance monitoring for a 12-month period upon Project operation.

Project Organizations

- 1.14 The proposed EM&A organization is shown in Figure 1.2 of this Manual. The responsibilities of respective parties for the EM&A programme are listed in later Clauses.

Environmental Team

- 1.15 The ET leader and the ET should not be in any way an associated body of the Contractor. The ET should be led and managed by the ET leader. The ET leader shall be the person who has at least 7 years' experience in EM&A or environmental management.
- 1.16 Suitably qualified staff should be included in the ET, and resources for the implementation of the EM&A programme should be allocated in time under the Contract, to enable fulfillment of the project's EM&A requirements as specified in the EM&A Manual during construction and operation.
- 1.17 The ET leader and the ET are employed to conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during construction and operation. The duties are:
- (a) sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA Report, and recommendations and requirements;
 - (b) environmental site surveillance;
 - (c) audit of compliance with environmental protection, and pollution prevention and control regulations;
 - (d) monitor the implementation of environmental mitigation measures;
 - (e) monitor compliance with Conditions in the relevant Environmental Permit (EP) and compliance with Specifications in the Contract;
 - (f) review construction and operation programme and comment as necessary;
 - (g) review construction and operation methodology and comment as necessary; preparation and updating of EM&A works schedule with reference to the best available detailed construction programme;
 - (h) complaint investigation, evaluation and identification of corrective measures;
 - (i) liaison with Independent Environmental Checker (IEC) on all environmental performance matters, and timely submission of all relevant EM&A proforma for the approval by IEC;
 - (j) advice to the Contractor on environment improvement, awareness, enhancement matters, etc., on site and
 - (k) timely submission of the EM&A report to the project proponent and the DEP.
- 1.18 Site inspections should be carried out by the ET at least once per week. Ad hoc site inspections should also be carried out if significant environmental problems are identified.

Independent Environmental Checker

- 1.19 The IEC should not be in any way an associated body of the Contractor or the ET for the Project. The IEC can serve as an individual independent of the Contractors to audit the overall EM&A program and report to the ER and CEDD directly.
- 1.20 The IEC should advise the ER on environmental issues related to the project. The role of the IEC

should be independent from the management of construction works, but the IEC should be empowered to audit the environmental performance of construction and operation.

- 1.21 The IEC should be employed prior to commencement of construction of the project. The IEC should have at least 7 years experience in EM&A or environmental management. The appointment of the IEC is subject to the approval of the ER.
- 1.22 The IEC should audit the overall EM&A programme including the implementation of all environmental mitigation measures, submissions relating to EM&A, and any other submission required under this Manual. In addition, the IEC should be responsible for verifying the environmental acceptability of permanent and temporary works, and relevant design plans and submissions under this Manual.
- 1.23 The IEC should arrange and conduct at least monthly general site inspections of the project during the construction and operational periods. Ad hoc site inspections should also be carried out if significant environmental problems are identified.
- 1.24 The IEC should ensure the impact monitoring is conducted according to the prescribed schedule at the correct locations.
- 1.25 The IEC should report the findings of the site inspections and other environmental performance reviews to CEDD and EPD.
- 1.26 Appropriate resources should also be allocated under the Contractor and the ER to fulfill their duties specified in this Manual.
- 1.27 The main duty of the IEC is to carry out environmental audit of the construction and operation of the project; this should include, inter alia, the followings:
 - (a) review and audit all aspects of the EM&A programme;
 - (b) advise on proactive actions;
 - (c) validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
 - (d) carry out random sample check and audit on monitoring data and sampling procedures, etc.;
 - (e) conduct random site inspection;
 - (f) audit the recommendations and requirements in EIA Report against the status of implementation of environmental protection measures on site;
 - (g) review the effectiveness of environmental mitigation measures and project environmental performance;
 - (h) on a needs basis, audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET Leader and the Contractor;
 - (i) check complaint cases and the effectiveness of corrective measures;
 - (j) review accuracy of environmental monitoring section of EM&A reports;
 - (k) verify EM&A report submitted by the ET leader;
 - (l) feedback audit results to ET by signing off relevant EM&A proformas.

Contractors

- 1.28 The term "Contractors" should be taken to mean all construction contractors, operators during the operational phase of the project and sub-contractors, working on site at any one time. Besides reporting to the Engineer, the Contractors should:
 - (a) timely submission of the EM&A report to the project proponent and the DEP.
 - (b) work within the scope of the relevant contract and other tender conditions;

- (c) participate in the site inspections undertaken by the ET, as required, and undertake any correction actions instructed by the Engineer;
- (d) provide information/advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
- (e) implement measures to reduce impact whenever Action and Limit Levels are exceeded; and
- (f) take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

Engineer or Engineer's Representative (ER)

- 1.29 The term Engineer, or Engineer's Representative, refers to the organization responsible for overseeing the construction works or operation of the project and 'monitoring' the works undertaken by the various Contractors, and for ensuring that they are undertaken by the Contractors in accordance with the specification and contractual requirements. The ER should:
- (a) monitor the Contractors' compliance with contract specifications, including the implementation and operation of environmental mitigation measures and ensure their effectiveness, and other aspects of the EM&A programme;
 - (b) comply with the agreed Event and Action Plan in the event of any exceedance;
 - (c) provide assistance to the ET as necessary in the implementation of the environmental monitoring and auditing programme; and
 - (d) instruct the Contractors to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

Construction Programme

- 1.30 The ET and IEC shall make reference to the Contractor's actual works progress and works programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader and the IEC for formulating the EM&A schedule.
- 1.31 The works to be executed under Contract include the construction of the following major items:-
- (a) General preliminary works, Pre-condition Survey and Site Survey;
 - (b) Site clearance, Fencing & Hoarding;
 - (c) Construction of Pile Foundations, Piers and Superstructures;
 - (d) Construction of Retaining Wall, Storm Water Drain and Parapets;
 - (e) Construction of Sub-base and Road-base;
 - (f) Utilities Diversion, Bulk Excavation and Noise Barrier Installation;
 - (g) Road surfacing, Road Marking and Signage;
 - (h) Landscape Works
- 1.32 A tentative construction programme and implementation schedule for the Contract prepared by the Engineer is attached at Appendix B of this Manual.

2. AIR QUALITY

Air Quality Monitoring Parameters

- 2.1 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.
- 2.2 1-hour and 24-hour TSP levels shall 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.
- 2.3 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 field log sheet is shown in Appendix C to this Manual.

Monitoring Equipment

- 2.4 High Volume Sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:
- 0.6-1.7m³/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 cm² (63in²);
 - flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
 - equipped with a shelter to protect the filter and sampler;
 - 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-hour period.
- 2.5 The ET Leader shall be responsible for provision of the monitoring equipment and associated and power supply. He shall ensure that sufficient numbers of HVSs with an appropriate calibration kit are available for carrying out the 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 labeled. The ET Leader shall also liaise with the concerned parties for gaining access to the monitoring stations for the installation of the monitoring equipment and carrying out monitoring.
- 2.6 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 recognized primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by the concerned parties such as IEC. All the data should be converted into standard temperature and pressure condition.

- 2.7 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 in the field log sheet mentioned in Section 2.3.
- 2.8 If the ET Leader propose to use a direct reading duct meter to measure 1-hour TSP levels, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the HVS and may be used for the 1-hour sampling. The instrument shall also be calibrated regularly, and the 1-hour sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.
- 2.9 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 in consultation with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:-
- the wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions of turbulence caused by the buildings;
 - the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
 - the wind data monitoring equipment should be re-calibrated at least once every six months; and
 - wind direction should be divided into 16 sectors of 22.5 degrees each.
- 2.10 In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data from the IEC and the ER, and agreement from the IEC.

Laboratory Measurement/Analysis

- 2.11 The ET Leader shall carry out laboratory measurements/analyses for the dust samples collected.
- 2.12 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 shall be Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited.
- 2.13 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.
- 2.14 Filter paper of size 8"×10" shall be labeled 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-hour and be pre-weighed before use for the sampling.
- 2.15 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.
- 2.16 All the collected samples shall be kept in a good condition for 6 months before disposal.

Monitoring Locations

- 2.17 Three designated monitoring stations, AQ1, AQ2 and AQ3 are selected for impact dust monitoring as their roof levels are comparatively close to the proposed Trunk Road T4. Table 2.1 describes the air quality monitoring locations, which are also depicted in Figure 2.1.

Table 2.1 Locations for Air Quality Monitoring Stations

Monitoring Stations	Location
AQ1	Christ College
AQ2	Sha Tin Tau Village
AQ3	Tung Lo Wan Village

- 2.18 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 the ER and the IEC and agreement from EPD on the proposal.
- 2.19 When alternative monitoring locations are proposed, the following criteria, as far as practicable, shall be followed:-
- at the site boundary or such locations close to the major dust emission source;
 - close to the sensitive receptors; and
 - take into account the prevailing meteorological conditions.
- 2.20 The ET Leader shall agree with the ER on the position of the High Volume Sampler for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:
- a horizontal platform should be provided with appropriate support to secure the samplers against gusty wind;
 - no two samplers should be placed less than 2 meters apart;
 - the distance between the sampler and an obstacle, such as buildings, should be at least twice the height that the obstacle protrudes above the sampler;
 - a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samples;
 - a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
 - no furnaces or incineration flues is nearby;
 - airflow around the sampler is unrestricted;
 - the sampler is more than 20 meters from the drip line;
 - any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
 - permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
 - a secured supply of electricity is needed to operate the samplers.

Baseline Monitoring

- 2.21 Baseline monitoring shall be carried out at all the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hour TSP samples. 1-hour TSP sampling shall also be done at least 3 times per day while highest dust impact is expected. Before commencing the baseline monitoring, the ET leader shall inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 2.22 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.
- 2.23 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, monitoring shall be carried out 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 IEC.

- 2.24 In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.
- 2.25 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 repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be conducted at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should changes 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 IEC and EPD.

Impact Monitoring

- 2.26 The ET Leader shall carry out impact monitoring during the course of the Project activities under Contract. For regular impact monitoring, the sampling frequency of at least once in every six-day, shall be strictly observed at all the monitoring stations for 24-hour TSP monitoring. For 1-hour TSP monitoring, the sampling frequency of at least three times in every six-day should be undertaken when the highest dust impact occurs.
- 2.27 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.
- 2.28 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Event/Action Plan in Table 2.3, 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.

Event and Action Plan for Air Quality

- 2.29 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 2.2 below shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, actions in accordance with the Event/Action Plan in Table 2.3 shall be carried out.

Table 2.2 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 200 \mu\text{g}/\text{m}^3$, Action level = (Baseline level * 1.3 + Limit level)/2 For baseline level $> 200 \mu\text{g}/\text{m}^3$, Action level = Limit level	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$, Action level = (Baseline level * 1.3 + Limit level)/2 For baseline level $> 384 \mu\text{g}/\text{m}^3$, Action level = Limit level	500

Table 2.3 Event/Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
1.Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER & IEC 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working methods 	<ol style="list-style-type: none"> 1. Notify Contractor 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2.Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER & IEC 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with ER & IEC for remedial actions required 6. If exceedance continues, arrange meeting with ER & IEC 7. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Checking monitoring data submitted by ET 2. Check Contractor's working methods 3. Discuss with ET, IEC and Contractor on proposed remedial actions 4. Advise the ER & ET on the effectiveness of the proposed remedial measures 3. Supervise the implementation of the remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Ensure remedial actions properly implemented 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER & IEC 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 & IEC informed of the results 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working methods 3. Discuss with ET and Contractor on proposed remedial actions 4. Advise the ER on the effectiveness of the proposed remedial measures 5. Supervise the implementation of the remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Ensure remedial actions properly implemented 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER, IEC 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 IEC and ER to discuss the remedial actions to be taken 7. Assess effectiveness of Contractor's remedial actions and keep ER, IEC and EPD informed of the results 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET and Contractor on the potential remedial actions 2. Review Contractor's remedial actions to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of the remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented 4. Ensure remedial measure are properly implemented 5. 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 	<ol style="list-style-type: none"> 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

Dust Mitigation Measures

- 2.30 In order that nuisance to residential sensitive receivers is minimized, it is important to minimize dust emissions from construction activities. In 1997, the *Air Pollution Control (Construction Dust) Regulation* came into effect to control dust emission from construction works. Appropriate dust control measures should be implemented during construction stage in accordance with the requirements in the *Air Pollution Control (Construction Dust) Regulation*. Dust control techniques should be considered to control dust to a level not exceeding the AQOs as well as the 1-hour TSP guideline level. These measures include:
- Adoption of good site practices;
 - Avoid practices likely to raise dust level;
 - Frequent cleaning and damping down of stockpiles and dusty areas of the Site;
 - Reducing drop height during material handling or wall felling;
 - Provision of wheel-washing facilities for Site vehicles leaving the Site;
 - Regular plant maintenance to minimize exhaust emission; and
 - Sweep up dust and debris at the end of each shift.
- 2.31 If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of the ET Leader, the Contractor shall liaise with the ET Leader and the IEC on some other mitigation measures, propose to the ER and IEC for approval, and implement the mitigation measures. In addition, the *Air Pollution Control (Construction Dust) Regulation: Chapter 311 Subsidiary Legislation* shall be adhered.

3. NOISE

Noise Monitoring Parameters

- 3.1 The construction noise levels 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 *Noise Control Ordinance* (NCO) criteria.
- 3.2 The ET Leader shall also carry out monitoring of road traffic noise after the works under Contract are completed and put into operation. The road traffic noise during operation of the Project shall be measured in terms of the A-weighted equivalent of L10 (1-hr). During the traffic noise measurement, traffic count shall also be undertaken concurrently.
- 3.3 As supplementary information for data auditing, statistical results such as L10 and L90 shall also be obtained for reference. Sample noise field data sheets are shown in Appendix D and E to this Manual for reference.

Monitoring Equipment

- 3.4 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.
- 3.5 Noise measurements shall 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.
- 3.6 The ET Leader shall be responsible for the provision of the monitoring equipment and associated accessories and power supply. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The ET Leader shall also liaise with the concerned parties for gaining access to the monitoring stations for the installation of the monitoring equipment and carrying out monitoring.

Monitoring Locations for Construction Noise

- 3.7 Four designated monitoring stations, NC1 to NC4 are selected for construction noise monitoring. Table 3.1 describes the construction noise monitoring locations, which are also depicted in Figure 3.1. The status and locations of noise sensitive receivers may change after this Manual is issued. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from the IEC and EPD of the proposal.

Table 3.1 Locations for Construction Noise Monitoring Stations

Monitoring Stations	Location
NC1	Christ College
NC2	Sha Tin Tau Village
NC3	Tung Lo Wan Village
NC4	Block 1, Scenery Court

- 3.8 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:-
- at locations close to the major site activities which are likely to have noise impacts;
 - close to the noise sensitive receivers. 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
 - for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.
- 3.9 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 IEC 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.

Baseline Monitoring for Construction Noise

- 3.10 The ET Leader shall carry out baseline monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least 14 consecutive days. A schedule on the baseline monitoring for construction noise prior to the commencement of the construction works shall be submitted to the ER for approval before the monitoring starts.
- 3.11 Before commencing the baseline monitoring, the ET leader shall inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 3.12 There shall not be any construction activities in the vicinity during the baseline monitoring. In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC to agree on an appropriate set of data to be used as a baseline reference and submit to the EPD for approval.
- 3.13 Noise monitoring shall be carried out at all the designated monitoring stations. 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:-
- one set of measurements between 0700-1900 hours on normal weekdays;
 - one set of measurements between 1900-2300 hours;
 - one set of measurements between 2300-0700 hours of next day; and
 - one set of measurements between 0700-1900 hours on holidays.
- 3.14 For the measurements (b), (c) and (d) above, one set of measurements shall at least include 3

consecutive Leq (5 min) results.

Impact Monitoring for Construction Noise

- 3.15 Noise monitoring shall be carried out at all the designated monitoring stations. 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:-
- one set of measurements between 0700-1900 hours on normal weekdays;
- 3.16 If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the school 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 construction.
- 3.17 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event/Action Plan in Table 3.3 of this Manual 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.

Event and Action Plan for Construction Noise

- 3.18 The Action and Limit levels for construction noise are defined in Table 3.2. Should non-compliance of the criteria occur, action in accordance with the Event/Action Plan in Table 3.3, shall be carried out.

Table 3.2 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.

Construction Noise Mitigation Measures

- 3.19 Good site practice and noise management can significantly reduce the impact of construction site activities on nearby NSRs. The following package of measures should be followed during of construction:
- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
 - machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
 - plant known to emit noise strongly in one direction should, where possible, be orientated to direct noise away from the NSRs;
 - mobile plant should be sited as far away from NSRs as possible; and

- material stockpiles and other structures should be effectively utilized, where practicable, to screen noise from on-site construction activities.

3.20 The following mitigation measures were also recommended:

Adoption of Quiet PME

3.21 The contractor should be requested, as far as possible, to use quiet PME, whose actual SWL is less than the value specified in GW-TM. This is one of the most effective measures and is increasingly practicable because of the availability of quiet equipment. Examples of SWLs for specific silenced PME taken from a British Standard, namely Noise Control on Construction and Open Sites, BS 5228: Part 1: 1997.

Use of Movable Noise Barrier

3.22 Movable barriers could be very effective in screening noise from particular items of plant. A noise barrier located close to the noise generating component of a PME could produce at least 10 dB(A) screening for stationary plant and 5 dB(A) for mobile plant, depending on the line of sight that could be blocked by the barriers when viewed from the NSRs.

Reducing the Number of Plant Operating close to NSRs

3.23 With the use of quiet plant and movable noise barriers, the predicted noise levels at some NSRs still exceeded the noise criteria. It is recommended to restrict the number of particularly noisy plant operating within certain parts of the site that are very close to the affected NSRs.

Table 3.3 Event/Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify IEC, ER and Contractor 2. carry our investigation 3. Report the results of investigation to the IEC, ER and Contractor 4. Discuss with the Contractor and formulate remedial measures 5. increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET 2. Review the proposed remedial measures by the Contractor and advise the ER & ET accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of complaint in writing 2. Notify Contractor 3. require Contractor to proposed remedial measures for analyzed noise problem 4. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to ET, IEC and ET 2. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify IEC, ER, EPD and Contractor 2. Identify the source(s) of impact 3. Repeat measurement to confirm findings 4. Increase monitoring frequency 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. inform IEC, ER and EPD the cause & actions taken for the exceedances 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET, and Contractor on the potential remedial actions 2. Review Contractor's remedial actions to assure their effectiveness and advise the ER & ET accordingly 3. Supervise the implementation of the remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analyzed noise problem 4. Ensure remedial measures are properly implemented 5. If exceedance continuous, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is aborted 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within three working days of notification 3. Implement the agreed proposals 4. Resubmit proposal if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

Operational Traffic Noise Monitoring

- 3.24 The ET Leader shall prepare and deposit to EPD, at least 6 months before the operation of the works under the Project, a monitoring plan for the purpose of assessing the accuracy of traffic noise predictions by comparing the project noise impact predictions with the actual impacts. The monitoring plan shall contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. The ET Leader shall implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justification. Monitoring details and results including the comparison between the measured noise levels and the predicted levels shall be recorded in a report to be deposited with EPD within one month of the completion of the monitoring. The report shall be certified by the ET Leader and the Project Proponent before deposit with EPD.
- 3.25 The traffic noise levels shall be measured twice at 6-month intervals within the first year upon completion of the Project. Measurements shall be made in terms of the A-weighted L_{10} over 3 half hour periods during the peak traffic hour, other metrics like L_{eq} may be added as seen fit.
- 3.26 As shown in Table 3.4, three designated monitoring stations, NO1 to NO3 are selected for operational noise monitoring. Figure 3.2 describes the operational noise monitoring locations, which are also depicted in. The status and locations of noise sensitive receivers may change after this Manual is issued. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER & IEC and agreement from EPD of the proposal.

Table 3.4 Locations for Operational Noise Monitoring Stations

Monitoring Stations	Location
NO1	Pok Tat House, Pok Hong Estate
NO2	Block 1, Scenery Court
NO3	On Ting Terrace

- 3.27 The monitoring locations shall be selected according to the following criteria:-
- they should be at NSRs in the vicinity of recommended direct technical remedies; preferably, there should be one representative monitoring locations near each types of noise screening element (i.e. vertical barrier, cantilever barrier and enclosure);
 - one high floor and one medium floor monitoring points should be chosen at each location as far as possible; and
 - selected monitoring locations should enable monitoring to be done twice within one year after implementation of the mitigation measures during operation of the proposed road
- 3.28 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:-
- alternative location shall be similarly exposed to potential noise impacts;
 - it shall be close to the noise sensitive receivers; and
 - shall be located so as to cause minimal disturbance to the occupants.
- 3.29 The operational noise monitoring shall be carried out at a distance of 1 m from the openable window and 1.2 m above the floor level of the noise sensitive receivers identified. The ET Leader shall agree with the IEC on any necessary corrections adopted.

- 3.30 Noise monitoring shall be carried out at all the designated traffic noise monitoring stations. The following is an initial guide on the traffic noise monitoring requirements during the operational phase:-
- (a) one set of measurements at the morning traffic peak hour on normal weekdays;
 - (b) one set of measurements at the evening traffic peak hour on normal weekdays;
 - (c) a concurrent census of traffic flow and percentage heavy vehicle shall be obtained for far-side and near-side of the road and the existing road network in the vicinity of each measuring point;
 - (d) average vehicle speed estimated for far-side and near-side of the road and the existing road network in the vicinity of each measuring point; and
 - (e) the two sets of monitoring data should be obtained within the first year of operation.
- 3.31 Measured noise levels should be compared with predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time of measurement. A sample operational noise field data sheet is attached in Appendix E.
- 3.32 The measured/monitor noise levels shall be compared with the predicted results and the predicted traffic flow conditions (calculated noise levels based on concurrent traffic census obtained). In case discrepancies are observed, explanation should be given to justify the discrepancies.

4. WATER QUALITY

- 4.1 The potential impacts on water quality were identified in this assessment. These potential sources of impact comprise construction runoff and drainage; debris, refuse and liquid spillages from general construction activities; and sewage effluents from the construction workforce. Minimization of water quality deterioration could be achieved through implementing adequate mitigation measures such as control measures on the turnoff and drainage from the site to minimize construction run-off. Proper site management and good housekeeping practices would also be required to ensure that construction wastes would not enter the nearby open drainage channels. Sewage effluent arising from the construction workforce would also require appropriate treatment through provision of portable toilets. As such, with the implementation of the recommended mitigation measures, no insurmountable impact on the water quality was anticipated during the construction phase.
- 4.2 With adoption and incorporation of appropriate drainage collection and treatment systems, no detrimental operational water quality impact was expected. Provided that appropriate drainage facilities were implemented, along with regularly cleaning and maintenance practices, no insurmountable residual water quality impact during the operational phase was expected.
- 4.3 It was considered that only site inspections would be required to ensure that the recommended water pollution mitigation measures would be properly implemented, functioned and maintained during construction and operational stages of the Project.

Water Quality Mitigation Measures

Construction Runoff and Drainage

- 4.4 Construction site runoff and drainage should be prevented or minimized in accordance with the guidelines stipulated in the *EPD's Practice Note for Professional Persons, Construction Site Drainage* (ProPECC PN 1/94). The practices include the following items:
- Provision of perimeter channels to intercept storm-runoff from outside the site. These shall be constructed in advance of site formation works and earthworks.
 - Sand/silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the WPCO. These facilities shall be properly and regularly maintained.
 - Careful programming of the works to minimize soil excavation works during rainy seasons.
 - Exposed soil surface shall be protected by paving as soon as possible to reduce the potential of soil erosion.
 - Temporary access roads shall be protected by crushed gravel and exposed slope surfaces shall be protected when rainstorms are likely.
 - Trench excavation shall be avoided in the wet season as far as practicable, and if necessary, these shall be excavation and backfilled in short sections.
 - Open stockpiles of construction materials on site shall be covered with tarpaulin or similar fabric during rainstorms.
- 4.5 Sand and silt in the wash water from the wheel washing facilities, which ensure no earth, mud and debris is deposited on roads, shall be settled out and removed before discharging into storm drains. A section of the road between the wheel washing bay and the public road shall be paved with backfall to prevent wash water or other site runoff from entering public road drains.
- 4.6 Oil interceptors shall be provided in the drainage system and regularly emptied to prevent the release of oils and grease into the storm water drainage system after accidental spillages. The interceptor shall have a bypass to prevent flushing during periods of heavy rain.

General Construction Activities

- 4.7 Debris and rubbish generated on-site shall be collected, handled and disposed of properly to avoid entering the nearby stormwater drains and open drainage channels. All fuel tanks and storage areas shall be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. Open storm water drains and culverts near the works area shall be covered to block the entrance of large debris and refuse.

Sewage from Workforce

- 4.8 Temporary sanitary facilities, such as portable chemical toilets, shall be employed on-site. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities.

Operational Phase

- 4.9 It is important that appropriate measures are implemented to control road runoff entering the Shing Mun River Channel and Kwun Yam Shan Stream. The following recommendations should be implemented, as appropriate, to ensure that the potential water quality impacts during the operation of the Trunk Road T4 are minimized and meet the existing regulatory requirements:

- A surface water drainage system shall be provided to collect the road runoff. The runoff would be discharged into the local stormwater drainage system.
- The road drainage shall be directed through oil and grit interceptors to remove oil, grease and silt before entering the public storm water drainage system.
- Grit and oil interceptors shall be regularly cleaned and maintained in good working condition.
- The road sludge shall be frequently cleaned by vacuum air sweeper/truck.

5. WASTE MANAGEMENT

- 5.1 The Contractor is responsible for the management of materials and wastes arising during construction. This includes control of wastes on site, removal of the waste materials from the site and the implementation of any mitigation measures to minimize waste or redress any problems that arise from waste associated with the works. In addition to C&D waste and general refuse, this material may include sewage, waste water or any other site discharges on to adjacent land, sewers, or water course.
- 5.2 This section sets out the measures to be adopted to avoid or minimize potential adverse impacts associated with waste arising from the works under the headings of each waste type. The Contractor should incorporate these recommendations into a comprehensive on-site waste management plan (WMP). If, for any reason, the recommendations cannot be implemented full justification should be given in the WMP.
- 5.3 The WMP should be prepared and submitted for approval by the Engineer's Representative prior any construction activities. During the construction period the WMP should be used as a working document to detail the on-going management procedures and to record waste arising and import of fill throughout the Contract. The WMP shall be subject to audit under the requirements of the Environmental Monitoring and Audit Procedures set out in the EM&A Manual accompanying this EIA Report.

Waste Management Hierarchy

- 5.4 The WMP shall be developed and implemented according to a best-practice philosophy of waste management. There are various waste management options, which can be categorized in terms of preference from an environmental viewpoint. The options considered to be more preferable have the least impacts and are more sustainable in a long-term context. Hence, the hierarchy is as follows:
- Avoidance and minimization, i.e. avoiding or not generating waste through changing or improving practices and design;
 - Reuse materials, thus avoiding disposal (generally with only limited reprocessing);
 - Recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
 - Treatment and disposal, according to relevant laws, guidelines and good practice.

Training

- 5.5 To facilitate adoption of the best-practice philosophy, training shall be provided to all personnel working on site. The training shall promote the concept of general site cleanliness and clearly explain the appropriate waste management procedures defined in the WMP. Overall, the training should encourage all workers to reduce, reuse and recycle wastes.

Records of Waste Arising and Management

- 5.6 During construction, the WMP should be kept up to date on a monthly basis with records of the actual quantities of wastes generated, recycled and disposed of off-site, as well as fill imported to site. Quantities shall be determined by weighing each load or other methods agreed to by the Engineer's Representative. Waste shall only be disposed of at licensed sites and the WMP should include procedures to ensure that illegal disposal of wastes does not occur. Only waste hauliers authorized to collect the specific category of waste concerned should be employed and a trip ticket system shall be implemented for off-site disposal of C&D and solid waste at public filling facilities and landfills (in accordance with ETWB TCW No. 31/2004). Appropriate measures should be employed to minimize windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers.

Site Planning

- 5.7 The Work site shall be arranged and managed to facilitate the proper management of wastes and materials. The WMP shall include plans indicating specific areas designated the storage of particular types of waste, reusable and recyclable materials as well as areas and management proposals for any stockpiling areas. Waste storage areas should be well maintained and cleaned regularly. Specific provisions for different types of material are outlined below. In general, these areas should be designed to avoid cross contamination of material as well as pollution of the surrounding environment.

Excavated Materials and Public Fill

- 5.8 Excavated materials and public fill should be segregated for proper reuse or disposal. Any stockpiles should be sited away from existing watercourses and suitably covered to prevent wind erosion and impacts air and water quality. The materials should also be avoided possible contamination, thereby allowing disposal at public filling areas.

Construction and Demolition Waste

- 5.9 In order to minimize waste arising and keep environmental impacts within acceptable levels, the mitigation measures described below should be adopted:
- :
- 5.10 Careful design, planning and good site management can minimize over ordering and generation of surplus materials such as concrete, mortars and cement grouts. The design of formwork should maximize the use of standard wooden panels so that high reuse can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.
- 5.11 C&D materials should be segregated on site into different waste and material types. This will increase the feasibility of certain components of the waste stream being recycled by specialized contractors. The Contractor should clearly demonstrate in the WMP how he intends to maximize the reuse of C&D material on-site. Where reuse of materials on site is not feasible, the Contractor should explore opportunities for recycling materials off-site. Inert C&D materials shall be reused on site as much as possible or recycled with the remaining non-inert materials which cannot be reused or recycled being disposed of to landfill.

Chemical Waste

- 5.12 For those processes which generate chemical waste, it may be possible to find alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste.
- 5.13 The Contractor should register with EPD as a Chemical Waste Producer. Waste oils and other chemical wastes as defined in the *Waste Disposal (Chemical Waste) (General) Regulation* will require disposal by an appropriate means and could require pre-notification to EPD prior to disposal. An appropriate disposal facility could be the Chemical Waste Treatment Center (CWTC) at Tsing Yi. Chemical waste that is produced should be handled in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* as follows:
- Containers used for the storage of chemical waste should:
 - Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed;
 - Have a capacity of less than 450 litres unless the specifications have been approved by the EPD; and
 - Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.

- The storage area for chemical waste should:
 - Be clearly labelled and used solely for the storage of chemical waste;
 - Be enclosed on at least 3 sides;
 - Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
 - Have adequate ventilation;
 - Be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and
 - Be arranged so that incompatible materials are adequately separated.

- Disposal of chemical waste should:
 - Be via a licensed waste collector; and
 - Be a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or
 - Be to a re-user of the waste, under approval from the EPD.

General Refuse

- 5.14 General refuse should be stored in enclosed bins or compaction units separate from chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site, on a daily or every second day basis to minimize odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.
- 5.15 General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate, labeled bins for their deposit should be provided if feasible.
- 5.16 Office waste can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.

6. LANDSCAPE AND VISUAL IMPACTS

- 6.1 The EIA has recommended the EM&A for landscape and visual resources is undertaken during both the construction and operational phases of the project. The implementation and maintenance of the landscape compensatory planting measures is a key aspect of this and should be checked to ensure that the proposals are fully realised. The mitigation measures are detailed in Section 9.11 of the Environmental Impact Assessment Report.
- 6.2 Also any potential conflicts between the proposed landscape measures and any other project works and operational requirements should be resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the construction phase site audit programme.

Baseline Monitoring

- 6.3 Baseline monitoring for the landscape and visual resources will comprise a vegetation survey of the entire selected route undertaken on an 'area' basis. Representative vegetation types will be identified along with typical species composition. An assessment of landscape character will be made against which future change can be monitored. The landscape resources and elements of particular concern are to be noted.
- 6.4 The landscape and visual baseline will be determined with reference to the habitat maps included in the EIA Report.

Construction and Operational Phase Audit

- 6.5 A competent Landscape Architect should be employed by the Contractor for the implementation of landscape construction works particularly during the site clearance operations when the proposed tree felling, lifting and transplantation will take place and subsequent maintenance operations during the 12 month establishment period. The establishment works will be undertaken throughout the Contractor's one year maintenance period which will be within the first operational year of the project.
- 6.6 All measures undertaken by both the Contractor and the Landscape Contractor during the construction phase and first year of the operational phase shall be audited by a Landscape Architect, as a member of the Environmental Team. This will be completed on a regular basis to ensure compliance with the intended aims of the EIA. Site inspections should be undertaken at least once every two weeks throughout the construction period and once every two months during the operational phase. The broad scope of the audit is detailed in Sections 6.8 and 6.9 below. Operational phase auditing will be restricted to the 12 months establishment works of the landscaping proposals, with HyD / LCSD / AFCD as appropriate taking over the maintenance and monitoring after this period.
- 6.7 In addition, audit of mitigation measures to avoid impacts on landscape and visual resources will be required during the construction period, together with supervision of the compensatory planting. The audit of the compensatory planting will also extend through the first year of the proposed Trunk Road, during the Contractor's one year maintenance period, to ensure that the establishment of the planting. The maintenance and monitoring of the planting will be responsibility of LCSD / AFCD as appropriate depending on location after this period.

Mitigation Measures for Landscape and Visual during Construction

6.8 The following mitigation measures shall be implemented to minimize the landscape and visual impact of the construction works:

Existing vegetation and landscape context

- The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the Contractor outside limit of the works, including any damage to existing trees and woodland shall be noted;
- Existing trees will be retained as far as is possible on site. The felling of trees will be in accordance with WBTC 14/2002, ETWB 2/2004, including compensatory planting plans approved by relevant government departments. Trees identified in the Tree Survey Report and Felling Application as suitable for transplantation or retention and those requiring felling are to be identified on site by the Contractor and the inspected by a qualified Landscape Architect to ensure compliance with the Felling Application;
- 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;
- All existing trees and vegetation within the study area which are not directly affected by the works are retained and protected;
- The methods of protecting existing vegetation proposed by the Contractor should be in accordance with the guidelines laid down in the Tree Survey Report completed by others and these provisions should be enforced;

Construction Site Controls

- The location of the work sites associated with the proposed development shall be carefully selected to minimize the potential landscape and visual impacts of the construction works;
- Regular checks shall be carried out to ensure that the work site boundaries are not exceeded and that no damage is being caused to the surrounding areas;
- Topsoil disturbed by the works should be tested for quality and if worthy, it should be stockpiled not greater than 2m high and either temporarily hydroseeded or periodically turned to avoid degradation of the organic material. Topsoil should be reused on completion of the engineering works or on other projects;
- Control of night time lighting on the temporary works areas and within the project limit;
- Erection of decorative screen hoarding to screen construction activity;
- Advance planting for screening;
- Minimizing the height of temporary buildings;
- Careful positioning of construction plant and storage of materials;
- The potential for soil erosion shall be reduced at the construction stage by minimizing the extent of vegetation disturbance on site and providing a protective cover (e.g. plastic sheeting or a grass cover established by hydroseeding) over any exposed ground, and;
- Temporary construction sites shall be restored to standards as good as, or better than the original condition.

Construction of the Soft Works

- Soft landscape measures should be used where appropriate, employing native plant species as far as practicable, to restore the green land cover and enhance the vegetated, rural environment. This includes tree / shrub planting and hydroseeding in the peripheral site area, footpath sides and access roads.
- The design of all engineering structures will be subject to ACABAS approval to ensure their visual appearance minimizes impact and that they are compatible with the surrounding environment. Trees and shrubs to be planted around the structures to soften their impact;

- The proposed noise barriers should be designed to minimize visual impacts and visually integrate as far as possible into the fabric of the surrounding context. They will utilize clear materials to reduce the screening of views;
- Consideration of the design of all slopes to minimize the extent of cutting and ensure the design is in accordance with the recommendations of the EIA ;
- All detailed landscape design to be carried out by a landscape architect;
- All landscape works are carried out in accordance with the specifications, and;
- The planting of trees and shrubs are carried out properly and within the right season.

Mitigation Measures for Landscape and Visual during Operation

6.9 The newly planted trees, shrubs and grassed areas are maintained throughout the establishment period, particularly in respect of the following:

- Regular watering, weeding and fertilizing of all tree and shrub planting and areas of grass reinstatement;
- Regular grass cutting for reinstated areas;
- Firming up of trees after periods of strong winds;
- Regular checks for and eradication of pests, fungal infection etc;
- Pruning of dead or broken branches; and
- Prompt replacement of dead plants and reseeded of failed areas of grass to ensure the landscape mitigation measures fulfill their design intention.

7. SITE ENVIRONMENTAL AUDIT

Site Inspections/Audits

- 7.1 Site Inspections/Audits 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.
- 7.2 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 commencement of Contract to the Contractor for agreement and to the ER and the IEC for approval.
- 7.3 Regular site inspections / audits 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; the ET Leader shall 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.
- 7.4 The ET Leader shall liaise with the Contractor to update all relevant information of Contract for him to carry out the site inspections / audits. The inspection results and the associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER, the IEC 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 / audits.
- 7.5 The ET Leader shall carry out ad hoc site inspections / audits if significant environmental problems are identified. He shall also carry out any inspections/ audits 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.

Compliance with Legal and Contractual Requirements

- 7.6 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.
- 7.7 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 also be sent to the ET Leader and the IEC for vetting to see whether sufficient environmental protection and pollution control measures

have been included.

- 7.8 The ET Leader shall also be responsible for certifying the environmental acceptability of permanent and temporary works, and the environmental acceptability of relevant design plans and submissions.
- 7.9 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 any foreseeable potential for violating the laws can be prevented.
- 7.10 The Contractor shall regularly copy relevant documents to the ET Leader and the IEC 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 license/permits under the environmental protection laws, and all valid licenses/permits. The site diary shall also be available for the ET Leader's inspection upon his request.
- 7.11 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.
- 7.12 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.

Environmental Complaints

- 7.13 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.
- 7.14 During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader and the 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 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. A sample of the complaint log sheet is provided in Appendix G.

8. REPORTING

General

- 8.1 The ET Leader shall prepare and certify the EM&A Reports and Traffic Noise Monitoring Reports in accordance with following reporting requirements. 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.

Baseline Monitoring Report

- 8.2 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 four parties: the Contractor, the ER, the IEC 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.

- 8.3 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) an updated construction programme with milestones of environmental protection/mitigation activities annotated;
- (e) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth); and
 - monitoring date, time, frequency and duration;
 - QA/QC results and detection limits.
- (f) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
- (g) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant different between control and impact stations for the parameters monitored;
- (h) revisions for inclusion in the Updated EM&A Manual, and
- (i) comments and conclusions.

Monthly EM&A Reports

- 8.4 The results and findings of all EM&A work required in this EM&A Manual shall be recorded in the monthly EM&A reports certified by the ET Leader and verified by the IEC. 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. Six hard copies of each monthly EM&A report shall be submitted to each of the five parties: the Employer, the Contractor, the ER, the IEC and EPD (2 hard copies), and an electronic copy as described in Section 8.11 shall be submitted to each of the ER and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on format of the monthly reports in both hard copy and electronic medium requirement.

- 8.5 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.

First Monthly EM&A Report

- 8.6 The first monthly EM&A report shall include at least the following:
- (a) 1-2 pages executive summary;
 - breaches of Action/Limit levels;
 - Complaint Log;
 - Notifications of any summons and successful prosecutions;
 - Reporting Changes;
 - Future key issues.
 - (b) Basic project information;
 - Project organization including key personnel contact names and telephone numbers;
 - Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
 - Management structure; and
 - Works undertaken during the month;
 - (c) Environmental Status
 - Works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used) and;
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
 - (d) 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 EIA report and the ERR;
 - environmental requirements in contract documents;
 - (e) Implementation Status
 - advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA report and the ERR, summarized in the updated implementation schedule;
 - (f) Monitoring results (in both hard and diskette copies) together with the following information;
 - monitoring methodology
 - name of laboratory and types of equipment used and calibration details
 - parameters monitored
 - monitoring locations (and depth)
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - graphical plots of the monitored parameters in the month annotated against;
 - the major activities being carried out on site during the period;
 - weather conditions that may affect the results;
 - any other factors which might affect the monitoring results;
 - QA/QC results and detection limits.

- (g) Report on non-compliance, complaints, notifications of summons and successful prosecutions
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - 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, results and summary;
 - record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up action taken, results and summary;
 - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance
- (h) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on the solid and liquid waste management status; and
 - submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

Subsequent Monthly EM&A Reports

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

- (a) Executive Summary (1-2 pages)
- Breaches of Action and Limit levels
 - Complaint Log
 - Notifications of any summons and successful prosecution
 - Reporting Changes
 - Future key issues
- (b) Environmental Status
- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month
 - Works undertaken during the month with illustration including key personnel contact names and telephone numbers; and
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- (c) Implementation Status
- Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report and ERR, summarized in the updated implementation schedule.
- (d) Monitoring Results
- To provide monitoring results (in both hard and diskette copies) together with the following information:
- Monitoring methodology
 - Name of laboratory and types of equipment used and calibration details
 - Parameters monitored

- Monitoring locations (and depth)
 - Monitoring date, time, frequency, and duration;
 - Weather conditions during the period;
 - Graphical plots of the monitored parameters in the month annotated against;
 - The major activities being carried out on site during the period;
 - Weather conditions that may affect the results;
 - Any other factors which might affect the monitoring results;
 - QA/QC results and detection limits.
- (e) Report on non-compliance, complaints, notifications of summons and successful prosecutions
- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - 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, results and summary;
 - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up action taken, results and summary;
 - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance
- (f) Others
- An account of the future key issues as reviewed from the works programme and work method statements;
 - Advice on the solid and liquid waste management status.
- (g) Appendix
- Action and Limit 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

Quarterly EM&A Summary Reports

8.8 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. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works:

- (a) up to half a page executive summary;
- (b) basic project information including a synopsis of the project organization, 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 EIA report and the ERR;
- (d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the EIA report and the ERR, summarized 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 non-compliance (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 quarterly assessment of construction impacts on suspended solids at the project site, including, but not limited to, a comparison of the difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline data or EPD data, of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 on water quality times of the ambient mean ($p < 0.05$)
- (k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (m) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (n) 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
- (o) the Employer's contacts and any hotline telephone number the public to make enquiries.

Final EM&A Summary Report

8.9 The termination of EM&A programme shall be determined on the following basis:

- (a) completion of construction activities and insignificant environmental impacts of the remaining outstanding construction works;
 - (b) trends analysis to demonstrate the narrow down of monitoring exceedances due to construction activities and the return of ambient environmental conditions in comparison with baseline data; and
 - (c) no environmental complaint and prosecution involved.
- 8.10 The proposed termination may be required to consult related local community such as village representative/committee and/or District Board and the proposal should be endorsed by the IEC, ER and the project proponent prior to final approval from the Director of Environmental Protection.
- 8.11 The final EM&A summary report shall include, inter alias, the following:
- (a) an executive summary;
 - (b) basic project information including a synopsis of the project organization, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
 - (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 reports and ERR, summarized in the updated implementation status proformas;
 - (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 construction period for representative monitoring stations annotated against:
 - the major activities being carried out on Site during the period;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - the return of ambient environmental conditions in comparison with baseline data;
 - (g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
 - (h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
 - (i) advice on the solid and liquid waste management status;
 - (j) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - (k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

- (l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (m) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- (o) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (p) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme ; and
- (q) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

Data Keeping

- 8.12 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. All the documents and data shall be kept for at least one year after completion of the Contract.

Interim Notifications of Environmental Quality Limit Exceedances

- 8.13 With reference to Event/Action Plans in Tables 2.3 and 3.3, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the ER, the IEC, and 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 F.

Electronic Reporting of EM&A Information

- 8.14 To facilitate public inspection of the monthly EM&A Reports via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later) unless otherwise agreed by EPD and submitted to the ER and to EPD at the same time as the hard copies as described in Sections 8.2 and 8.4. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of these Reports shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in these Reports shall be provided in the main text from where the respective references are made. All graphics in these Reports shall be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of these Reports must be the same as the hard copies.
- 8.15 The ET shall establish a website and all environmental monitoring data shall be made available to the public via internet access in the form of a website, in the shortest possible time and in no event later than 2 weeks after the relevant environmental monitoring data are collected or become available,

unless otherwise agreed with EPD. The ET shall inform EPD in writing within 6 weeks after the commencement of the Project the internet address where the environmental monitoring data are to be placed. The internet address and the environmental monitoring data shall be made available to the public via the EIAO Internet Website and the EIAO Register Office.

- 8.16 The internet website as described in Section 8.12 above shall enable user-friendly public access to the monitoring data with features capable of:
- (a) providing access to all environmental monitoring data collected since the commencement of works;
 - (b) searching by date;
 - (c) searching by types of monitoring data (air quality and noise); and
 - (d) providing hyperlinks to relevant monitoring data after searching,
- or otherwise as agreed by EPD.
- 8.17 The ET shall incorporate the Baseline Monitoring Report in the internet website described in Section 8.14 above.

TABLE OF CONTENTS

	Page
1. INTRODUCTION	1
Background	1
Purpose of this Manual.....	1
Environmental Monitoring and Audit Requirements	2
Project Organizations	3
Construction Programme.....	5
2. AIR QUALITY	6
Air Quality Monitoring Parameters.....	6
Monitoring Equipment	6
Laboratory Measurement/Analysis	7
Monitoring Locations.....	7
Baseline Monitoring.....	8
Impact Monitoring	9
Event and Action Plan for Air Quality.....	9
Dust Mitigation Measures	11
3. NOISE.....	12
Noise Monitoring Parameters.....	12
Monitoring Equipment	12
Monitoring Locations for Construction Noise	12
Baseline Monitoring for Construction Noise	13
Impact Monitoring for Construction Noise.....	14
Event and Action Plan for Construction Noise	14
Construction Noise Mitigation Measures.....	14
Operational Traffic Noise Monitoring	17
4. WATER QUALITY.....	19
Water Quality Mitigation Measures	19
5. WASTE MANAGEMENT	21
6. LANDSCAPE AND VISUAL IMPACTS.....	24
Baseline Monitoring.....	24
Construction and Operational Phase Audit	24
Mitigation Measures for Landscape and Visual during Construction.....	25
Mitigation Measures for Landscape and Visual during Operation	26
7. SITE ENVIRONMENTAL AUDIT	27
Site Inspections/Audits.....	27
Compliance with Legal and Contractual Requirements	27
Environmental Complaints.....	28
8. REPORTING	29
General	29
Baseline Monitoring Report	29
Monthly EM&A Reports.....	29
Quarterly EM&A Summary Reports.....	32
Final EM&A Summary Report	33
Data Keeping.....	35
Interim Notifications of Environmental Quality Limit Exceedances.....	35
Electronic Reporting of EM&A Information	35

LIST OF TABLES

Table 2.1	Locations for Air Quality Monitoring Stations
Table 2.2	Action and Limit Levels for Air Quality
Table 2.3	Event/Action Plan for Air Quality
Table 3.1	Locations for Construction Noise Monitoring Stations
Table 3.2	Action and Limit Levels for Construction Noise
Table 3.3	Event/Action Plan for Construction Noise
Table 3.4	Locations for Operational Noise Monitoring Stations

LIST OF FIGURES

Figure 1.1	Site Layout
Figure 1.2	Project Organization Chart
Figure 2.1	Locations of Air Quality Monitoring Stations
Figure 3.1	Locations of Construction Noise Monitoring Stations
Figure 3.2	Locations of Operational Stage Traffic Noise Monitoring Stations
Figure 7.1	Flow Chart of the Complaint Response Procedures

LIST OF APPENDICES

A	Environmental Mitigation Implementation Schedule (EMIS)
B	Tentative Construction Programme and Implementation Schedule
C	Sample Air Quality Monitoring Field Data Sheet
D	Sample Construction Noise Monitoring Field Data Sheet
E	Sample Operational Stage Traffic Noise Monitoring Field Data Sheet
F	Sample of the Interim Notifications of Exceedances
G	Sample of Complaint Log