

Civil Engineering and Development
Department

Agreement No. CE 18/2012 (CE)
Development of Anderson Road
Quarry - Investigation

Environmental Monitoring and Audit
Manual

227724-REP-038-03

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 227724

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CONTENTS

	Page
1 INTRODUCTION	1
1.1 Background	1
1.2 Study Area	1
1.3 Designated Projects	1
1.4 Objective of the Manual	2
2 PROJECT DESCRIPTION	4
2.1 General Description of the Project	4
2.2 Recommended Outline Development Plan (RODP)	4
2.3 Key Infrastructure	4
2.4 Summary of Concurrent Projects	6
2.5 Project Implementation Schedule	7
3 PROJECT ORGANISATION	8
3.1 Project Organisation	8
4 AIR QUALITY	11
4.1 Introduction	11
4.2 Mitigation Measures	11
4.3 Air Quality Parameters	11
4.4 Monitoring Equipment	11
4.5 Laboratory Measurement / Analysis	13
4.6 Monitoring Locations	13
4.7 Construction Dust Monitoring	14
4.8 Action / Limit Levels	16
4.9 Event and Action Plan	16
4.10 Site Audit Requirements	19
5 NOISE	20
5.1 Introduction	20
5.2 Mitigation Measures	20
5.3 Noise Monitoring Parameters for Construction Noise	20
5.4 Monitoring Equipment for Construction Phase	20
5.5 Monitoring Locations for Construction Phase	21
5.6 Baseline Monitoring for Construction Phase	22
5.7 Impact Monitoring for Construction Phase	22
5.8 Action / Limit Levels	22
5.9 Event and Action Plan for Construction Noise	22
5.10 Site Audit Requirements	24

5.11	Impact Monitoring for Road Traffic Noise during Operational Phase	24
5.12	Monitoring Location for Operational Phase	25
5.13	Event and Action Plan	25
5.14	Impact Monitoring for Fixed Plant Noise during Operational Phase	25
6	WATER QUALITY	26
6.1	Introduction	26
6.2	Mitigation Measures	26
6.3	Site Audit Requirements	26
7	SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS	27
7.1	Introduction	27
7.2	Mitigation Measures	27
8	WASTE MANAGEMENT IMPLICATIONS	28
8.1	Introduction	28
8.2	Mitigation Measures	28
8.3	Waste EM&A Requirements	28
8.4	Site Audit Requirements	29
9	LAND CONTAMINATION	30
9.1	Introduction	30
9.2	Proposed Site Investigation for Potentially Contaminated Areas	30
9.3	Submission Requirements of CAR, RAP and RR	30
10	ECOLOGY	31
10.1	Introduction	31
10.2	Mitigation Measures	31
10.3	Monitoring and Audit Requirements	34
11	LANDSCAPE AND VISUAL IMPACTS	37
11.1	Introduction	37
11.2	Mitigation Measures	37
11.3	Site Audit Requirement	37
12	SITE ENVIRONMENTAL AUDIT	39
12.1	Site Inspection	39
12.2	Compliance with Legal and Contractual Requirements	40
12.3	Environment Complaints	40
13	REPORTING	42
13.1	General	42

13.2	Baseline Monitoring Report	42
13.3	Monthly Monitoring and Audit (EM&A) Report	43
13.4	Quarterly EM&A Report	48
13.5	Final EM&A Review Report	50
13.6	Data Keeping	52
13.7	Interim Notifications of Environmental Quality Limit Exceedances	52

FIGURES

227724/E/0001	Location of Project
227724/E/0002	Locations of Designated Projects
227724/E/0003	Recommended Outline Development Plan
227724/E/0008	Locations of Concurrent Projects
227724/E/1045	Locations of Construction Dust Monitoring (Sheet 1 of 3)
227724/E/1046	Locations of Construction Dust Monitoring (Sheet 2 of 3)
227724/E/1047	Locations of Construction Dust Monitoring (Sheet 3 of 3)
227724/E/2400	Locations of Construction Noise Monitoring
227724/E/6501	Proposed Location of Compensatory Planting in the Wooded Area within the Project Site

APPENDICES

Appendix 2.1	Project Implementation Schedule
Appendix 3.1	Project Organization for Environmental Works
Appendix 4.1	Sample Data Sheet for TSP Monitoring
Appendix 5.1	Sample Data Sheet for Construction Noise Monitoring
Appendix 5.2	Sample Data Sheet for Road Traffic Noise Monitoring
Appendix 13.1	Incident Report on Action Level or Limit Level Non-compliance

1 INTRODUCTION

1.1 Background

- 1.1.1** The Anderson Road Quarries have been in operation since 1956. In 1998, the Central and East Kowloon Development Statement proposed new housing developments at a platform site covering about 40 ha of Anderson Road Quarries (the upper quarry site, now called the Anderson Road Quarry site, ARQ) and at an area west of Anderson Road covering about 20 ha (the lower quarry site, now called the Anderson Road Development, DAR).
- 1.1.2** The site formation works of the lower quarry site are now in progress under Contract No. CV/2007/03 ‘Development at Anderson Road – Site Formation and Associated Infrastructure Works’.
- 1.1.3** PlanD commissioned Arup on 27 January 2011 under Agreement No. CE 4/2010 (TP) to undertake a Planning Study on Future Land Use at Anderson Road Quarry (the Planning Study) to examine the future land use and explore the development potential of the upper quarry area. The recommendations and the Recommended Outline Development Plan (RODP) proposed under the Planning Study will provide the basis for the development at the ARQ.
- 1.1.4** CEDD commissioned Arup on 26 October 2012 under Agreement No. CE 18/2012 (CE) ‘Development of Anderson Road Quarry – Investigation’ to undertake the engineering feasibility study of the development proposals at the Anderson Road Quarry site recommended in the Planning Study and the associated road improvement works and pedestrian connectivity to Kwun Tong Town Centre and nearby MTR stations.

1.2 Study Area

- 1.2.1** The Study Area, as delineated in **Figure 227724/E/0001**, is located on the south-western slopes of the Tai Sheung Tok at the far north-eastern edge of urban East Kowloon, and lies close to the major population centre of Kwun Tong, Lam Tin and Sau Mau Ping. Specifically, the Study Area covers an area of approx. 86 hectares, which includes a platform area of approx. 40 hectares.

1.3 Designated Projects

- 1.3.1** The engineering feasibility study of the Development of Anderson Road Quarry (the Project) is a designated project (DP) under item 1 of Schedule 3 of the Environmental Impact Assessment Ordinance (EIAO), which specifies that “Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000”.
- 1.3.2** On the other hand, the Project also includes the proposed cavern development in the Study Area and the road improvement works at junction between (J/O) Lin Tak Road and Sau Mau Ping Road, at J/O New Clear Water Bay Road and Anderson Road, as well as at the merging lane at Clear Water Bay Road near Shun Lee Tsuen Road. These have been identified as DPs as per Schedule 2, Part I of the EIAO:

- (1) Proposed cavern development: *Item Q.2 – Underground rock caverns;*
- (2) Road improvement works: *Item A.1 – A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing road.*

1.3.3 The locations of these two Schedule 2 DPs are shown in **Figure 227724/E/0002**. The potential environmental impacts of these two Schedule 2 DPs have been reviewed, and concluded that no insurmountable environmental impacts arise from these two Schedule 2 DPs. Nevertheless, the detailed environmental implications of these two Schedule 2 DPs will be further investigated in separate EIAs under EIAO.

1.4 Objective of the Manual

1.4.1 The purposes of this Environmental Monitoring and Audit (EM&A) Manual are to:

- (1) Guide the set up of an EM&A programme to ensure compliance with the EIA recommendations;
- (2) Specify the requirements for monitoring equipment;
- (3) Propose environmental monitoring points, monitoring frequency etc.;
- (4) Propose Action and Limit Level; and
- (5) Propose Event and Action Plan.

1.4.2 This EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (TM-EIAO). This Manual outlines the monitoring and audit programme for the construction and operation of the proposed ARQ development and provide systematic procedures for monitoring, auditing and minimising environmental impacts.

1.4.3 This Manual contains the following information:

- (1) Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of the EM&A;
- (2) Project organisation for the EM&A works;
- (3) The basis for, and description of the broad approach underlying the EM&A programme;
- (4) Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- (5) The rationale on which the environmental monitoring data will be evaluated and interpreted;
- (6) Definition of Action and Limit levels;
- (7) Establishment of Event and Action plans;
- (8) Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints; and
- (9) Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures.

- 1.4.4** This Manual is a dynamic document that should be reviewed regularly and updated as necessary during the construction and operation of the Project including those updates noted in the EIA.
- 1.4.5** For the purpose of this Manual, the ER shall refer to the Engineer as defined in the Construction Contract, in cases where the Engineer's powers have been delegated to the ER, in accordance with the Construction Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

2 PROJECT DESCRIPTION

2.1 General Description of the Project

2.1.1 The Project comprises the development of ARQ into a housing development area, with associated supporting infrastructure within the boundary of ARQ and access roads leading to the adjacent neighbourhood, including but not limited to the new access routes leading to Po Lam Road and DAR.

2.2 Recommended Outline Development Plan (RODP)

2.2.1 Taking into account the comments received from community engagements under the Planning Study with careful and comprehensive consideration, and the findings of the engineering feasibility study under this Assignment, the RODP have been refined and finalized.

2.2.2 **Figure 227724/E/0003** presents the final RODP and a summary of the major planning parameters proposed in the final RODP is given in **Table 2.1** below:

Table 2.1: Major planning parameters of the final RODP

Planning Parameters	
Total Population	25,000
Private Housing Population (no. of flat)	7,530
Subsidised Housing Population (no. of flat)	1,880
Residential Mix (Private : Subsidised Housing) (based on target population or number of units)	80:20
Average Plot Ratio – Subsidised Housing	6.3
Average Plot Ratio – Private Housing	4.2

2.3 Key Infrastructure

2.3.1 In order to support the future development and population inside the Study Area, the following infrastructures will be required:

- (1) Internal roads with associated public transport terminus in the Study Area;
- (2) Access road for main external access via. Po Lam Road;
- (3) Access road for supplementary external access via DAR local road with associated bus bays and semi-enclosure noise barrier;
- (4) Stormwater drainage systems with a retention tank in the Study Area;
- (5) Sewerage systems in the Study Area;
- (6) Water supply systems with salt and fresh water pumping stations and service reservoirs in the Study Area;
- (7) Landscaping works in the Study Area; and
- (8) Viewing platforms.

2.3.2 In addition, two associated infrastructures will also be implemented under this Project, including:

- (1) Rock cavern development; and
- (2) Road improvement works with associated semi-enclosure noise barrier and Bus-Bus Interchange (BBI) outside the Study Area.

2.3.3 As mentioned in **Section 1.3**, the above two associated infrastructures are Schedule 2 DPs and their detailed environmental implications will be further investigated in separate EIAs under EIAO.

2.3.4 Implementation Programme

2.3.5 It is anticipated that development at the Study Area will be commissioned in phases, with half of the population intake expected in 2022 and the final population intake in 2026. The tentative implementation programme is summarised in **Table 2.2** below.

Table 2.2: Summary of the tentative implementation programme

Works Package	Works Components	Time Line
Works Package 1	Site formation at the southern portion of the Study Area	mid 2016 – end 2018
	Internal roads at the southern portion of the Study Area	
	Access road for main external access via. Po Lam Rd	
	Access road for supplementary external access via. DAR local road with associated bus bays and semi-enclosure noise barrier	
	Supporting infrastructure works, including two-way escalators and subways, for pedestrian connectivity between development of ARQ and DAR	
	Stormwater drainage systems at the southern portion of the Study Area	
	Sewerage systems at the southern portion of the Study Area	
	Water supply systems at the southern portion of the Study Area	
	Landscaping at the southern portion of the Study Area	
Works Package 2	Site formation at the northern portion of the Study Area	early 2018 – end 2020
	Internal roads with associated public transport terminus at the northern portion of the Study Area	
	Stormwater drainage systems at the northern portion of the Study Area	
	Sewerage systems at the northern portion of the Study Area	
	Water supply systems at the northern portion of the Study Area	
	Landscaping at the northern portion of the Study Area	
Works Package 3	Drainage retention tanks in the Study Area	mid 2016 – mid 2019
Works Package 4	Viewing platforms	early 2018 – end 2020

Works Package	Works Components	Time Line
Works Package 5	Salt and fresh water pumping stations in the Study Area	mid 2018 – end 2020
	Service reservoirs in the Study Area	
Works Package 6	Road improvement works at J/O Lin Tak Road and Sau Mau Ping Road, including road widening works at Lin Tak Road and a new vehicular bridge from Link Tak Road to Sau Mau Ping Road with associated semi-enclosure noise barrier	early 2017 – early 2022 (Separate EIA will be conducted for these works components. Details refer Section 1.3)
	BBI at TKO Tunnel Toll Plaza Area	
	Pedestrian crossing facilities, including footbridge with lift towers and subway	
	Associated site formation works	
Works Package 7	Road improvement works at J/O Clear Water Bay Road and Road L1 constructed under DAR, including provision of u-turn facility.	early 2017 – early 2021 (Separate EIA will be conducted for these works components. Details refer Section 1.3)
	Road improvement works at merging lane at New Clear Water Bay Road near Shun Lee Tsuen Road, including increase of merging length	
	Associated site formation works	
Works Package 8	Rock cavern development	early 2018 – end 2020 (Separate EIA will be conducted for this works component. Details refer Section 1.3)

2.4 Summary of Concurrent Projects

2.4.1 The evaluations of cumulative impacts due to the potential concurrent projects are presented in **Table 2.3**. Locations of the concurrent projects are shown in **Figure 227724/E/0008**.

Table 2.3: Evaluation of cumulative impacts due to concurrent projects

Concurrent Projects		Evaluation
1	Contract No. CV/2007/03 – Development at Anderson Road – Site Formation and Associated Infrastructure Works	Proposed residential developments in the lower Anderson Road Quarry. According to the latest programme advised by Housing Department, the construction works of DAR has commenced in early 2008 and is scheduled for completion in early 2017. Cumulative impact has been assessed for the operational phase.
2	Road improvement works at J/O Lin Tak Road and Sau Mau Ping Road, at J/O New Clear Water Bay Road and Anderson Road, as well as at the merging lane at Clear Water Bay Road near Shun Lee Tsuen Road	The road improvement works are tentatively scheduled to commence in mid 2017 for completion in mid 2018 to 2022. As the works will be concurrent with the construction of the Project, cumulative impacts have been assessed for both construction and operational phases.
3	Proposed rock cavern development	The proposed cavern development is expected to commence in mid 2018 for completion in mid 2022 which will be concurrent with the construction of the Project. Cumulative impacts have been assessed for the construction phase.

Concurrent Projects		Evaluation
4	Pedestrian Connectivities Project	The proposed pedestrian connectivities are scheduled to commence in 2017 for completion in 2020 which will be concurrent with the construction of the Project. Cumulative impacts during the construction phase have been assessed.

2.5 Project Implementation Schedule

2.5.1

Detailed EIA assessments have been conducted and presented in the EIA report. Mitigation measures have also been identified and recommended. The Project Implementation Schedule (PIS) is given in **Appendix 2.1**. It specifies the extent, locations, time frame and responsibilities for the implementation of the environmental mitigation measures identified.

3 PROJECT ORGANISATION

3.1 Project Organisation

3.1.1 The proposed project organization and lines of communication with respect to environmental protection works are shown in **Appendix 3.1**.

3.1.2 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

3.1.3 The responsibilities of respective parties are:

The Contractor

3.1.4 The Contractor should report to the Engineer. The duties and responsibilities of the Contractor are:

- (1) Implement the EIA recommendations and requirements;
- (2) Employ an ET to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- (3) Provide assistance to ET in carrying out monitoring and auditing;
- (4) Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- (5) Implement measures to reduce impact where Action and Limit levels are exceeded; and
- (6) Adhere to the agreed procedures for carrying out compliant investigation.

Environmental Team (ET)

3.1.5 The Environmental Team should be led and managed by the ET leader. The ET leader shall be an independent party from the Contractor and has relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER and EPD. The ET Leader shall have at least 7 years of experience in conducting EM&A for infrastructure projects. His / Her qualification shall be vetted by the ER. The ET should monitor the mitigation measures implemented by the Contractor on regular basis to ensure the compliance with the intended aims of the measures. The duties and responsibilities of the ET are:

3.1.6 Set up all the required environmental monitoring stations;

- (1) Monitor various environmental parameters as required in the EM&A Manual;
- (2) Analyse the EM&A data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- (3) Carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and take proactive actions to pre-empt problems;

- (4) Liaison with IEC on all environmental performance matters, and timely submission of all relevant EM&A proforma for IEC's approval;
- (5) Prepare reports on the environmental monitoring data and site environmental conditions;
- (6) Report on the EM&A results to the IEC. Contractor, the ER and EPD or its delegated representative;
- (7) Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- (8) Give advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- (9) Undertake regular and ad-hoc on-site audits / inspections and report to the Contractor and the ER of any potential non-compliance;
- (10) Follow up and close out non-compliance actions; and
- (11) Adhere to the procedures for carrying out environmental complaint investigation.

Engineer or Engineer's Representative (ER)

3.1.7

The Engineer / Engineer's Representative is responsible for overseeing the construction works and for ensuring that the works undertaken by the Contractor in accordance with the specification and contractual requirements. The duties and responsibilities of the ER with respect to the EM&A may include:

- (1) Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- (2) Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- (3) Assist the Project Proponent in employing an IEC to audit the results of the EM&A works carried out by the ET;
- (4) Participate in joint site inspection undertaken by the ET;
- (5) Comply with the agreed Event Contingency Plan in the event of any exceedance; and
- (6) Adhere to the procedures for carrying out complaint investigations.

Independent Environmental Checker (IEC)

3.1.8

The Independent Environmental Checker should advise the ER on environmental issues related to the project. The IEC should possess at least 7 years experience in EM&A. The duties and responsibilities of the IEC are:

- (1) Review the EM&A works performed by the ET (at not less than monthly intervals);
- (2) Audit the monitoring activities and results (at not less than monthly intervals);
- (3) Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and location of sensitive receivers;
- (4) Report the audit results to the ER and EPD in parallel;
- (5) Review the EM&A reports (monthly summary reports) submitted by the ET;

- (6) Check the mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- (7) Check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary;
- (8) Report the findings of site inspections and other environmental performance reviews to ER and EPD;
- (9) Coordinate the monitoring and auditing works for all the on-going contracts in the area in order to identify possible sources / causes of exceedances and recommend suitable remedial actions where appropriate;
- (10) Coordinate the assessment and response to complaints / enquires from locals, green groups, district councils or the public at large;
- (11) On as-needed basis, verify and certify the environmental acceptability of the Contractor's construction methodology (both temporary and permanent works) and relevant design plans; and
- (12) Verify investigation results of environmental complaint cases and the effectiveness of corrective measures.

4 AIR QUALITY

4.1 Introduction

4.1.1 The EIA has considered the potential air quality impacts during both the construction and operational phases of the Project. Fugitive dust would be the key impacts in the construction phase during excavation, material handling etc. Dust monitoring is proposed to be conducted during construction phase.

4.2 Mitigation Measures

4.2.1 The EIA Report has recommended dust control measures. All the proposed mitigation measures are summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**.

4.3 Air Quality Parameters

4.3.1 Monitoring and audit of the Total Suspended Particulate (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.

4.3.2 One-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The 1-hour and 24-hour 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). Upon approval of the IEC, 1-hour TSP levels can be measured by direct reading method which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

4.3.3 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 any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix 4.1**.

4.4 Monitoring Equipment

4.4.1 High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:

- a) 0.6 – 1.7 m³ per minute adjustable flow range;
- b) Equipped with a timing / control device with +/1 5 minutes accuracy for 24 hours operations;
- c) Installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- d) Capable of providing a minimum exposed area of 406cm²;
- e) Flow control accuracy: +/-2.5% deviation over 24-hour sampling period;
- f) Equipped with a shelter to protect the filter and sampler;

- g) Incorporated with an electronic mass flow rate controller or other equivalent devices;
- h) Equipped with a flow recorder for continuous monitoring;
- i) Provided with a peaked roof inlet;
- j) Incorporated with a manometer;
- k) Able to hold and seal the filter paper to the sampler housing at horizontal position;
- l) Easily changeable filter; and
- m) Capable of operating continuously for a 24-hour period.

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

4.4.3 Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at fortnightly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The concern parties such as IEC shall properly document the calibration data for future reference. All the data should be converted into standard temperature and pressure condition.

4.4.4 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 data sheet as shown in **Appendix 4.1**.

4.4.5 If the ET proposed to use a direct reading dust meter to measure 1-hour TSP levels, they shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable results to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method.

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

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

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

4.5 Laboratory Measurement / Analysis

- 4.5.1** A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 4.5.2** If on-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 demonstrated to the satisfaction of the ER and IEC. IEC shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 4.5.3** Filter paper of size 8" X 10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.
- 4.5.4** After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate weighing by an electronic balance with readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

4.6 Monitoring Locations

- 4.6.1** Most representative and affected ASRs were selected as monitoring stations. Details of sensitive receivers could refer to the EIA report.
- 4.6.2** The locations of the proposed dust monitoring are shown in **Figures 227724/E/1045 to 227724/E/1047** and summarized in **Table 4.1**. The status and locations of air quality sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall proposed updated monitoring locations and seek approval from ER and agreement from the IEC and EPD. The ER/IEC/EPD may also request a closer locations based on on-site conditions and environmental complaint.

Table 4.1: Monitoring locations for construction dust

ID	ASR ID in EIA	Location
AMS - 1	ACYC-01	Chi Yum Ching She
AMS - 2	DARB-13	Block 8, Site B
AMS - 3	DARC-16	Planned Clinic and Community Centre, Site C2
AMS - 4	DARC-26	Planned School, Site C2
AMS - 5	DARE-06	Block 5, DAR Site E
AMS - 6	DARE-17	Block 9, Site E
AMS - 7	AMYT-04	Ma Yau Tong Village

- 4.6.3** When alternative monitoring locations are proposed, the proposed site should, as far as practicable:
- be at the site boundary or such locations close to the major dust emission source;
 - be close to the sensitive receptors; and

- c) take into account the prevailing meteorological conditions.

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

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

4.7 Construction Dust Monitoring

Baseline Monitoring

4.7.1 Baseline monitoring shall be carried out at all of the designated monitoring locations for construction dust (see **Table 4.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain 1-hour and 24-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. One-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

4.7.2 During the baseline monitoring, there should not be any major construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that, if required, the IEC and ER can conduct on-site audit to ensure accuracy of the baseline monitoring results.

4.7.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations, the ET Leader shall propose and carry out the monitoring at alternative locations that 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 the IEC.

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

4.7.5 Ambient conditions may vary seasonally and shall be reviewed once every three months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC, ER and EPD.

4.7.6 A summary of the requirements for the baseline dust monitoring is shown in **Table 4.2**.

Table 4.2: Summary of baseline dust monitoring programme

Monitoring Period	Duration	Parameter	Frequency
Baseline Monitoring	14 consecutive days prior to commencement of major construction works	1-hour TSP	3 times per day
		Continuous 24-hour TSP	Daily

Impact Monitoring

4.7.7 The ET shall carry out impact monitoring at all designated monitoring locations for construction dust (see **Table 4.1**) during the entire construction period. For regular impact monitoring, the sampling frequency of at least once in every 6 days, 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 3 times in every 6 days should be undertaken when the highest dust impact are likely to occur. Before commencing impact monitoring, the ET shall inform the IEC and ER of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the monitoring results.

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

4.7.9 In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and agreed with the ER and the IEC.

4.7.10 A summary of the requirements for the impact dust monitoring is shown in **Table 4.3**.

Table 4.3: Summary of construction dust impact monitoring programme

Monitoring Period	Duration	Parameter	Frequency
Impact Monitoring	Throughout the construction period	1-hour TSP	At least 3 times in every 6 days when the highest dust impact are likely to occur or when one documented complaint is received.
		24-hour TSP	Once per 6 days

4.8 Action / Limit Levels

4.8.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the construction dust impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 4.4** shows the air quality criteria, namely Action and Limit Levels to be used.

Table 4.4: Action / Limit Levels for construction dust

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 $\mu\text{g}/\text{m}^3$
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 $\mu\text{g}/\text{m}^3$

4.9 Event and Action Plan

4.9.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Event and Action Plan in **Table 4.5** shall be carried out.

Table 4.5: Event / Action Plan for construction dust

Event	Action			
	ET	IEC	ER	Contractor
Action Level exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC, ER and Contractor; 3. Repeat measurement to confirm finding; and 4. Increase monitoring frequency to daily. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; and 3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures. 	<ol style="list-style-type: none"> 1. Notify Contractor. 	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Rectify any unacceptable practice and implement remedial measures; and 3. Amend working methods agreed with ER if appropriate.
Action Level exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC, ER and Contractor; 3. Advise the ER 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; and 3. Supervise 	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Submit proposals for remedial actions

Event	Action			
	ET	IEC	ER	Contractor
	<p>and Contractor on the effectiveness of the proposed remedial measures;</p> <p>4. Repeat measurements to confirm findings;</p> <p>5. Increase monitoring frequency to daily;</p> <p>6. Discuss with IEC, ER and Contractor on remedial actions required;</p> <p>7. If exceedance continues, arrange meeting with IEC and ER; and</p> <p>8. If exceedance stops, cease additional monitoring.</p>	<p>3. Discuss with ET and Contractor on possible remedial measures;</p> <p>4. Advise the ET and ER on the effectiveness of the proposed remedial measures; and</p> <p>5. Supervise Implementation of remedial measures.</p>	<p>and ensure remedial measures properly implemented.</p>	<p>to ER with a copy to ET and IEC within 3 working days of notification;</p> <p>3. Implement the agreed proposals; and</p> <p>4. Amend proposal if appropriate.</p>
Limit Level exceedance for one sample	<p>1. Identify source, investigate the causes of exceedance and propose remedial measures;</p> <p>2. Inform ER, Contractor, IEC and EPD;</p> <p>3. Repeat measurement to confirm finding;</p> <p>4. Increase monitoring frequency to daily;</p> <p>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the</p>	<p>1. Check monitoring data submitted by ET;</p> <p>2. Check Contractor's working method;</p> <p>3. Discuss with ET, ER and Contractor on possible remedial measures;</p> <p>4. Advise the ER and ET on the effectiveness of the proposed remedial measures;</p>	<p>1. Confirm receipt of notification of failure in writing;</p> <p>2. Notify Contractor; and</p> <p>3. Supervise and ensure remedial measures properly implemented.</p>	<p>1. Identify source, investigate the causes of exceedance and propose remedial measures;</p> <p>2. Take immediate action to avoid further exceedance;</p> <p>3. Submit proposals for remedial actions to ER with a copy to ET and IEC within 3 working days of notification;</p> <p>4. Implement the agreed proposals; and</p> <p>5. Amend</p>

Event	Action			
	ET	IEC	ER	Contractor
	results.	5. Supervise implementation of remedial measures.		proposal if appropriate.
Limit Level exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Notify IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC, Contractor and ER to discuss the remedial actions to be taken; 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. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 5. Supervise the implementation of 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 ET and IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise and ensure remedial measures properly implemented; and 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. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit proposals for remedial actions to ER with a copy to ET and IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Resubmit proposals if problem still not under control; 6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

4.10 Site Audit Requirements

- 4.10.1** Mitigation measures for air quality have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures. The implementation schedule for the recommended air quality mitigation measures is presented in **Appendix 2.1**.
- 4.10.2** Regular audits and site inspections at least once per week should be carried out during construction phase by the ET to ensure that the recommended best management practices and other recommended mitigation measures are properly implemented by the Contractor.
- 4.10.3** The requirements of the environmental audit programme are set out in **Section 12** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

5 NOISE

5.1 Introduction

5.1.1 The EIA has considered the potential airborne noise impacts during both the construction and operational phases of the Project. Noise monitoring is proposed to be conducted during construction phase.

5.2 Mitigation Measures

Construction Phase

5.2.1 The EIA Report has recommended construction noise control measures including the use of quiet plant and temporary noise barriers, etc. All the proposed mitigation measures are summarised in the PIS in **Appendix 2.1**.

Operational Phase

5.2.2 Given the building layout plan, especially those concerned sites with non-openable windows/ maintenance window that are not opened for ventilation, and the school development site with assumed L-shape layout and orientation, might be changed by the future developers and school operators, an Environmental Assessment for the future development should be carried out prior to the commencement of the construction works in order to meet the noise criteria. This requirement would be set as one of the Land Lease Conditions of the land lots. The requirement of setback distance ranged from 5 to 10m as noise mitigation measures for other sites would also be set as one of the Land Lease Conditions of the land lots.

5.2.3 Mitigation measure of semi-enclosure for road traffic noise would need to be implemented along Road L4 of ARQ. Rooftop at the public transport terminus within ARQ is also recommended to provide to reduce the public transport terminus noise. These mitigation measures are summarised in the PIS in **Appendix 2.1**.

5.3 Noise Monitoring Parameters for Construction Noise

5.3.1 Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq30min}$ shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, L_{eq5min} shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

5.3.2 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in **Appendix 5.1** for reference.

5.4 Monitoring Equipment for Construction Phase

5.4.1 As referred to in the Technical Memorandum (TM) issued under the 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 agrees to within 1.0 dB.

5.4.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

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

5.5 Monitoring Locations for Construction Phase

5.5.1 Most representative and affected NSRs were selected as monitoring stations. Details of sensitive receivers could refer to EIA report.

5.5.2 The locations of construction airborne noise monitoring stations are summarised in **Table 5.1** and shown in **Figure 227724/E/2400**.

Table 5.1: Proposed construction noise monitoring locations

ID	NSR ID in EIA	Location
NMS – 1	Site C2 – School 05	Planned school at DAR
NMS – 2	Site E – School	Planned school at DAR
NMS – 3	Site C2 – R102	Ancillary Facilities Building

5.5.3 The above proposed construction noise monitoring locations are preliminary proposal, due to the large project site and phased implementation of the Project, the ET shall select the monitoring locations based on the locations of the construction activities and seek approval from ER and agreement from the IEC and EPD to the proposal. The ER/IEC/EPD may also request a closer locations based on on-site conditions and environmental complaint. The monitoring locations should be chosen based on the following criteria:

- (1) At locations close to the major site activities which are likely to have noise impacts;
- (2) Close to the most affected existing noise sensitive receivers; and
- (3) For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

5.5.4 The monitoring station shall normally be at a point 1 m from the exterior of the sensitive receiver building facade and be at a position 1.2 m 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 +3 dB(A) shall be made to the free field measurements. The ET 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.

5.5.5 The IEC may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed/relocated during any stage of the construction phase.

5.6 Baseline Monitoring for Construction Phase

5.6.1 The ET shall carry out baseline noise monitoring prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels L_{eq} , L_{10} and L_{90} shall be carried out daily for a period of at least two weeks in a sample period of 5 minutes or 30 minutes between 0700 and 1900, and 5 minutes between 1900 and 0700. A schedule on the baseline monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

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

5.7 Impact Monitoring for Construction Phase

5.7.1 During normal construction working hour (0700-1900 Monday to Saturday), monitoring of $L_{eq, 30min}$ noise levels (as six consecutive $L_{eq, 5min}$ readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

5.7.2 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan, 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.

5.7.3 A schedule on the compliance monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

5.8 Action / Limit Levels

5.8.1 The ET shall compare the construction noise monitoring results with noise criteria. **Table 5.2** shows the noise criteria, namely Action and Limit levels to be used.

Table 5.2: Action and Limit Levels for construction noise

Time Period	Action Level	Limit Level
0700 - 1900 hours on normal weekdays	When one documented complaint is received	75 dB(A) *

Note: If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.

* Reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

5.9 Event and Action Plan for Construction Noise

5.9.1 Should non-compliance of the noise criteria occur, actions in accordance with the Action Plan in **Table 5.3** shall be carried out.

Table 5.3: Event / Action Plan for construction noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> 1. Notify IEC, ER and Contractor; 2. Carry out 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 accordingly; 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to IEC and ER; 2. Implement noise mitigation proposals.
Limit Level Exceedance	<ol style="list-style-type: none"> 1. Identify source; 2. Inform IEC, ER, EPD and Contractor; 3. Repeat measurements 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 causes and actions taken for the exceedances; 7. Assess effectiveness of 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC 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.

Event	Action			
	ET	IEC	ER	Contractor
	Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.		stop that portion of work until the exceedance is abated.	

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

5.10 Site Audit Requirements

5.10.1 Mitigation measures for noise have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures. The implementation schedule for the recommended noise mitigation measures is presented in **Appendix 2.1**.

5.10.2 Regular audits and site inspections at least once per week should be carried out during construction phase by the ET to ensure that the recommended best management practices and other recommended mitigation measures are properly implemented by the Contractor.

5.10.3 The requirements of the environmental audit programme are set out in **Section 12** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

5.11 Impact Monitoring for Road Traffic Noise during Operational Phase

5.11.1 The ET should prepare and deposit to EPD, at least 6 months before the operation of the proposed roads under the Project, a monitoring plan for the purpose of assessing the accuracy of traffic noise predictions by comparing the noise impact predictions with the actual impacts. The monitoring plan should contain monitoring location, 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 should implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justifications. Monitoring details and results including the comparison between the measured noise levels and the predicted levels should be recorded in a report to be deposited with EPD within one month of the completion of the monitoring. The report should be certified by the ET Leader before deposit with EPD.

5.11.2 Traffic noise monitoring shall be carried out at the designated traffic noise monitoring station. The following is an initial guide on the traffic noise monitoring requirements during the operational phase:

- (1) one set of measurement at the morning traffic peak hour on normal weekdays;
- (2) one set of measurement at the evening traffic peak hour on normal weekdays;
- (3) a concurrent census of traffic flow and percentage heavy vehicles shall be conducted for the Project Road and the existing road network in the vicinity of each measurement points;
- (4) average vehicle speed estimated for Project Road and the existing road network in the vicinity of each measuring points; and
- (5) the two sets of monitoring data shall be obtained within the first year of operation.

5.11.3 Measured noise levels shall be compared with the predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time of measurement. A sample data record sheet for traffic noise monitoring is shown in **Appendix 5.2**.

5.12 Monitoring Location for Operational Phase

5.12.1 The location of operational road traffic noise monitoring station is summarised in **Table 5.4** and shown in **Figure 227724/E/2400**.

Table 5.4: Proposed construction noise monitoring locations

ID	NSR ID in EIA	Location
NMS – 3	Site C2 – R102	Ancillary Facilities Building

5.13 Event and Action Plan

5.13.1 For the traffic noise, the measured/monitored 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 shall be given to justify the discrepancies.

5.14 Impact Monitoring for Fixed Plant Noise during Operational Phase

5.14.1 The EIA report has provided the maximum allowable Sound Power Levels (SWL) for fixed noise sources. The SWL criteria shall be implemented by the Contractor. The Contractor should also carry out a noise commissioning test for all fixed noise sources before operation of the Project, in order to ensure compliance of the operational airborne noise levels with the TM's stipulated noise standard.

6 WATER QUALITY

6.1 Introduction

6.1.1 The EIA Report has assessed the water quality impacts associated with the Project. According to the EIA Report, the impact could be minimized with the implementation of recommended mitigation measures. In particular, the construction activities would be constrained within the construction area of the Project. Water sensitive receiver-Tseng Lan Shue Stream, starting from the other side of the hill opposite the Project Site and discharging to a different sub-catchment, is out of the site boundary. The other water sensitive receiver-Ma Yau Tong Stream nearby would not be contacted by any construction works during construction phase. Therefore, the water flow and water quality of these watercourses would be remained unchanged. As such, water monitoring is not required during construction phase while site inspection is still recommended. The site audit programme as discussed below could ensure the implementation of the recommended mitigation measures and provide continual improvements to the environmental conditions.

6.2 Mitigation Measures

Construction Phase

6.2.1 The EIA Report has recommended mitigation measures for water quality including good site practice and handling the construction sewage. All the proposed mitigation measures are summarized in the Project Implementation Schedule (PIS) in **Appendix 2.1**.

Operation Phase

6.2.2 The mitigation measure of non-point source pollution has been recommended in EIA Report and is summarized in **Appendix 2.1**.

6.3 Site Audit Requirements

6.3.1 Mitigation measures for water quality control have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures. The implementation schedule for the recommended water quality mitigation measures is presented in **Appendix 2.1**.

6.3.2 Regular audits and site inspections at least once per week should be carried out during construction phase by the ET to ensure that the recommended best management practices and other recommended mitigation measures are properly implemented by the Contractor. Apart from site inspection, documents including discharge licenses should be reviewed and audited for compliance with the legislation and contract requirements.

6.3.3 The requirements of the environmental audit programme are set out in **Section 12** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

7 SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

7.1 Introduction

7.1.1 The assessment of potential impacts due to the sewage arising from the proposed Project has been assessed and the details are given in **Section 7** of the EIA Report.

7.2 Mitigation Measures

7.2.1 400m of the downstream sewers at Po Lam Road are recommended to be upgraded from size 225mm to 450mm diameter. This mitigation measures is summarized in the PIS in **Appendix 2.1**.

8 WASTE MANAGEMENT IMPLICATIONS

8.1 Introduction

8.1.1 The quantity and timing for the generation of waste during the construction phase have been estimated. Measures including the opportunity for on-site sorting, reusing excavated materials etc, are devised in the construction methodology to minimise the surplus materials to be disposed off-site. Proper disposal of chemical waste should be via a licensed waste collector.

8.2 Mitigation Measures

8.2.1 All the proposed mitigation measures are stipulated in the EIA Report and summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**.

8.2.2 EM&A requirements are required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:

- To ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
- To encourage the reuse and recycling of material.

8.2.3 The types and quantities of waste that would be generated during the operational phase have been assessed. It is anticipated there would not be any insurmountable impacts during the operational phase. A trip-ticket system should be operated to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal. Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**.

8.2.4 The contractor should submit a Waste Management Plan (WMP) as part of the Environmental Management Plan (EMP) in accordance with the ETWB TC(W) No. 19/2005 for construction phase. The EMP should be submitted to the Engineer for approval. Mitigation measures proposed in the EIA Report and the EM&A Manual should be adopted.

8.3 Waste EM&A Requirements

8.3.1 The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licence/permits for waste disposal. The ET shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licences including:

- (1) Registration of Chemical Waste Producer under the Waste Disposal Ordinance (Cap 354);
- (2) Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
- (3) Marine Dumping Permit under the Dumping at Sea Ordinance (Cap 466); and

(4) Effluent Discharge Licence under the Water Pollution Control Ordinance.

8.3.2 The Contractor shall refer to the relevant booklets issued by the DEP when applying for the license/permit and the ET shall refer to these booklets for auditing purposes.

8.4 Site Audit Requirements

8.4.1 Regular audits and site inspections at least once per week should be carried out during construction phase by the ET to ensure that the recommended good site practices and other recommended mitigation measures are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licenses, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

8.4.2 The requirements of the environmental audit programme are set out in **Section 12** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

9 LAND CONTAMINATION

9.1 Introduction

9.1.1 The EIA Report has assessed the land contamination associated with the Project.

9.2 Proposed Site Investigation for Potentially Contaminated Areas

9.2.1 Within the five potentially contaminated areas proposed for environmental SI, a total of 29 locations are proposed for soil and groundwater sampling and testing according to the EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*. The environmental SI works shall be supervised by the on-site Land Contamination Specialist.

9.2.2 As the Study Area is managed by private owner and still in operation, therefore undertaking the environmental SI at this EIA stage is not feasible. The proposed environmental SI should be carried out once the operation is terminated and the land is resumed to determine the extent of land contamination.

9.3 Submission Requirements of CAR, RAP and RR

9.3.1 Following the completion of environmental SI and lab testing works, the Project Proponent would prepare the Contamination Assessment Report (CAR). The CAR would present the findings of the SI and evaluate the level and extent of potential contamination.

9.3.2 If land contamination is identified during the proposed environmental SI and remediation is required, a Remediation Action Plan (RAP) would be prepared.

9.3.3 A Remediation Report (RR) would also be prepared to demonstrate that the clean-up works are adequate. No construction / development works would be carried out within the potentially contaminated areas in the Study Area prior to the agreement of the RR.

9.3.4 The implementation schedule are summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**.

10 ECOLOGY

10.1 Introduction

- 10.1.1** The ecological impact assessment has evaluated the predicted ecological impacts of the Project and has concluded that ecological impacts can be avoided, reduced or compensated to a low and acceptable level with the implementation of appropriate mitigation measures.
- 10.1.2** Major mitigation measures proposed for the Project include the creation of a Wooded Area in the proposed Quarry Park in the northern part of the Study Area (location refers to **Figure 227724/E/6501**). This measure is aimed to compensate for the loss of young secondary woodland and an isolated woodland patch of lower ecological value as a result of constructing an access road and underpass for connecting Po Lam Road to the southeast side.
- 10.1.3** Though the predicted ecological impacts on floral and faunal species of conservation importance resulting from the Project are generally of lower significance, measures including surveys of floral and faunal species of conservation importance within the proposed works areas, as well as transplantation/ translocation of such identified species will be carried out to avoid and minimize the impacts to these species.
- 10.1.4** In addition, mitigation measures are required to avoid and minimize the potential ecological impact on hydrological condition and water quality of the hillside streams, as well as light disturbance impact on wildlife groups.
- 10.1.5** The required mitigation measures adopted to avoid, minimize and compensate for the ecological impacts arising from the Project were identified in Section 10.7 of the EIA Report and are described in the following sections. The proposed ecological mitigation measures should be checked as an element of the environmental monitoring and audit programme under the Project.

10.2 Mitigation Measures

- 10.2.1** Mitigation measures have been identified and designed in accordance with Annex 16 of the EIAO-TM. The proposed mitigation measures for ecological impacts are summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**. For the mitigation measures on Wooded Area for compensating the loss of secondary woodland and transplantation of any identified floral species of conservation importance, a more detailed design and transplantation methodology will be required at the later detailed design stage of the Project, but the general measures and monitoring requirements are described in more detail below and in **Appendix 2.1**.

Measures to compensate the woodland habitat loss

- 10.2.2** Three small young secondary woodland patches (a total of approximately 1.13 ha) will be directly impacted by the proposed road and underpass at the southeast of the Study Area. Loss of this habitat is compensated by planting of native tree and shrub species at the proposed Wooded Area (about 1.2 ha). This Wooded Area is located within the proposed Quarry Park at the northern side of the Study Area, and connected to the existing benches of rehabilitation plantations (**Figure 227727/E/6501**). The proposed Wooded Area will be on the existing quarry site sitting on a gentle flat land and restored

and connected with the adjacent plantation to the north. To provide a better growth environment for the compensatory planting of the tree and shrub species, ground preparation and modification of planting medium (including subsoil, topsoil and addition of compost) may be required to improve the soil condition for vegetation growth. Routine monitoring on the survival and growth of the compensatory planting is required to monitor the seedling performance throughout the monitoring period. Moreover, it is agreed that LCSD will be responsible for the long-term maintenance and management of this Wooded Area and Quarry Park throughout the operation phase.

Measures to minimize direct impacts on fauna and flora species of conservation significance

10.2.3 Mitigation measures, including transplantation of any presence of floral species of concern and translocation of fauna species of concern (namely amphibians, freshwater crab and reptiles) found in the habitats within the proposed development and works area, are proposed to minimize the ecological impact on these floral and fauna groups. Prior to the site clearance works and/or commencement of construction works, a vegetation survey will be conducted in the habitats which are to be affected by the proposed construction works. The survey will ascertain any presence, as well as update the conditions, number, locations and habitat types of these species and other rare/protected plant species (if any) identified within construction works areas. Any identified floral species of concern will be properly protected and transplanted (if practical and feasible) to the receptor site(s). The transplanted specimens will be maintained throughout the construction phase to ensure its establishment within the receptor site.

10.2.4 Prior to the site clearance works, any water channels or streams within the development area should be searched. Any individual Hong Kong Newts (or other species of conservation significance) found should be caught and relocated to an adjacent stream in the Assessment Area where this species is known to be present. Capture and relocation of species should be conducted by a suitably qualified ecologist. Relocation of the amphibians and aquatic fauna (to a suitable receptor site or holding area) will be required before the commencement of any construction works.

Measures to minimize impacts to hydrological condition and water quality of hillside watercourses

10.2.5 Potential indirect impact during the construction phase may include construction run-off or accidental spillage of chemicals, lubricants or pollutants entering any seasonal or permanent wet watercourses identified to the northeast, east and southeast of the Project, in which faunal species of conservation importance were identified in the ecological surveys. The majority of these watercourses are separated from the Project Site by Tai Sheung Tok Hill and the major construction works will concentrate in the existing quarry site and developed area. In addition, construction phase *in situ* mitigation measures are proposed to address these impacts as detailed in the following:

- (1) Temporary sewerage and drainage will be designed and installed to collect wastewater and prevent it from entering nearby watercourses;
- (2) Proper locations well away from nearby watercourses will be used for temporary storage of materials (i.e. equipment, fill materials, chemicals and fuel) and temporary stockpile of construction debris and spoil, and these will be identified before commencement of works;

- (3) To prevent muddy water entering nearby watercourses, work sites close to nearby watercourses will be isolated, using such items as sandbags or silt curtains with lead edge at bottom and properly supported props. Other protective measures will also be taken to ensure that no pollution or siltation occurs to the water gathering grounds of the works site;
- (4) Stockpiling of construction materials, if necessary, will be properly covered and located away from nearby watercourses;
- (5) Erection of temporary geotextile silt fences will be carried out around earth-moving works to trap any sediments and prevent them from entering watercourses;
- (6) Construction debris and spoil will be covered and/or properly disposed as soon as possible to avoid being washed into nearby watercourses;
- (7) Exposed soil will be covered as quickly as possible following formation works, followed, where appropriate, by covering with biodegradable geotextile blanket for erosion control purposes;
- (8) Where appropriate, earth-bunding will be carried out of areas where soils have been disturbed or where vegetation has been cleared, to ensure that surface runoff will not move soils off-site;
- (9) Construction effluent, site run-off and sewage will be probably collected and/or treated. Wastewater from any construction site will be minimised via the following in descending order: reuse, recycling and treatment;
- (10) Proper locations for discharge outlets of wastewater treatment facilities well away from sensitive receivers will be identified and used;
- (11) Silt traps will be installed at points where drainage from the site enters local watercourses;
- (12) Appropriate sanitary facilities for on-site workers will be provided;
- (13) The site boundary will be clearly marked and any works beyond the boundary strictly prohibited, and
- (14) Regular water monitoring and site audit will be carried out at suitable points. If the monitoring and audit results show that pollution occurs, adequate measures including temporary cessation of works will be considered.

10.2.6 Accidental spillage events could potentially have a large impact on nearby habitats in view of their susceptibility to such pollution. Therefore, an emergency contingency plan should be established and implemented by the Project Proponent or its delegate prior to construction, and will be in place at times during the construction phase. The plan will include, but not be limited to, the following:

- (1) Potential emergency situation;
- (2) Chemicals or hazardous materials used on-site (and their location);
- (3) Emergency response team;
- (4) Emergency response procedures;
- (5) List of emergency telephone hotlines;
- (6) Locations and types of emergency response equipment, and
- (7) Training plan and testing for effectiveness.

Measures to minimize light disturbance impact on wildlife groups

10.2.7 Measures are proposed to minimize the potential indirect light disturbance impact on the wildlife groups inhabiting the terrestrial habitats surrounding the Project Site, especially affecting nocturnal mammals if artificial lights are directed to these habitats. Mitigation measures include but not limited to the following:

- (1) Installation of environmentally-friendly lighting system in open space areas, landscaping areas, and commercial and recreational buildings in the proposed development;
- (2) Avoid pointing light sources directly toward terrestrial habitats (i.e. plantations, secondary woodlands, shrubby grassland and watercourses) within and adjacent to the Study Area;
- (3) Appropriate engineering design of the artificially lit areas and lighting system and consider options to reduce light pollution on the ecosystems, such as limit the duration of lighting at night (high levels of lighting may not be necessary in the middle of the night), change the intensity of lighting, avoid sky glow and limit the number of intensively lit buildings by green building design, change the spectral composition of lighting, and reduce lights infringing into areas that are not intended to be lit; and
- (4) Careful design of any lighting systems proposed for public and commercial uses on or nearby the plantations and secondary woodlands within the Project Site, where high diversity of fauna were identified.

10.3 Monitoring and Audit Requirements

Environmental Audit Requirements

10.3.1 The implementation of mitigation measures described in **Section 10.2** above shall be audited routinely during the implementation of the Project. Requirements of the environmental audit are given in **Section 12** of this manual. This will cover implementation of the mitigation measures described in **Section 10.7** of the EIA Report and in the Implementation Schedule detailed in **Appendix 2.1**.

Environmental Monitoring Requirements

Monitoring of Wooded Area

10.3.2 In order to compensate for the loss of the three young woodland patches totalling 1.13 ha, compensatory planting of native tree and shrub species at the proposed Wooded Area in the future Quarry Park. Proposed list of native tree and shrub species is suggested in **Table 10.38** of the EIA Report.

10.3.3 A Wooded Area Proposal should be prepared by a qualified ecologist/botanist detailing the compensatory planting programme, monitoring methodology and action plan for monitoring the compensatory planting in the proposed Wooded Area (about 1.2 ha). It also specifies the planting location, planting period (early wet season), planting methodology, post-transplantation monitoring and maintenance programme. The proposal should be agreed by EPD/LCSD/AFCD prior to the commencement of the construction phase.

10.3.4 A 5-year monitoring and maintenance period of the compensatory planting is proposed to ensure the establishment of the planted trees and shrubs within the Wooded Area.

While implementation of the compensatory planting and monitoring methodology will be detailed in the Wooded Area Proposal, the key monitoring protocol will be formulated on the basis of having quantitative survey (involving survey quadrats) and walk-through surveys covering all representative areas with ecological compensatory planting. The monitoring shall include measuring parameters (such as growth, health condition, seedlings' survival rate), record any natural recruitments and condition of the site environments (such as any site factors that may be influencing the establishment or human interference of the area).

10.3.5 Given the survival rates of the planted tree whips and shrubs could be higher if the compensatory planting is to be conducted in early wet season (February/March) of Year 1, a baseline quantitative monitoring and a walk-through survey should be carried out after the completion of the planting. The baseline monitoring can also allow remedial measures to be undertaken during the first half of the ensuing wet season (April to June), and quantitative monitoring again in September of the first year to allow measurement of the annual growth/ establishment increment during the wet season. Bi-annual quantitative monitoring will be carried out in the followed Years 2 to 5. In addition, walk-through survey will be conducted on a bi-monthly basis in Year 1, while reduced to quarterly from Years 2 to 5. The walk-through survey should be undertaken in order to inform any adaptive or proactive management measurement, such as the need to clear invasive vegetation.

10.3.6 A 5-year monitoring and maintenance period of the compensatory planting is proposed. Compensatory planting of native tree and shrub species should be supervised by a qualified botanist/ horticulturist/ Certified Arborist with relevant experience in reforestation. The Wooded Area Proposal above shall be prepared by qualified ecologist/ botanist and agreed by EPD/LCSD/AFCD. The monitoring of the compensatory planting shall be conducted by the Environmental Team (ET) and supervised by a qualified botanist/ horticulturist/ ecologist of the ET, while LCSD will be responsible for the maintenance and management of the compensatory planting in the Wooded Area during the operation phase.

Monitoring of transplantation of identified floral species of conservation importance

10.3.7 Though no floral species of conservation importance was located in the accessible secondary woodlands to be directly impacted by the development, given part of these impacted woodlands were inaccessible during the ecological survey and the inaccessible part share floristic composition and structure similar to that of the adjacent hillside young secondary woodland with records of floral species of conservation importance, a vegetation survey is proposed to ascertain the presence of any floral species of conservation importance in the impacted secondary woodlands or other habitats once would be accessed in the future detailed design stage. This is to further minimize the potential impact on any floral species of conservation importance resulting from the proposed development.

10.3.8 Prior to the commencement of the construction works, a vegetation survey will be conducted in the habitats which are to be affected by the proposed construction works. The survey should be conducted by a qualified ecologist/ botanist and includes the following scopes:

- (1) Ascertain the presence of, as well as update the conditions, number, locations and habitat types of these species and other rare/protected plant species (if any) identified within construction works areas.

- (2) Determine the number and locations of the affected individuals of floral species of concern and evaluate the suitability and/or practicality of the transplantation.

10.3.9 If the identified floral species of conservation importance are suitable and practical to be transplanted, a Transplantation Proposal should be prepared by a qualified ecologist/botanist with full details of the findings of the comprehensive survey (including number and locations of the affected individuals, and assessment of suitability and/or practicality of the transplantation), locations of the receptor site(s), transplantation methodology, implementation programme of transplantation, post-transplantation monitoring and maintenance programme. The proposal should be submitted to and approved by AFCD prior to construction. The approved transplantation works will be supervised by a qualified botanist/horticulturist/Certified Arborist with relevant experience in transplanting floral species of conservation importance.

11 LANDSCAPE AND VISUAL IMPACTS

11.1 Introduction

11.1.1 The EIA has recommended landscape and visual mitigation measures to be undertaken during both the construction and operational phases of the project. The design, implementation and maintenance of landscape and visual mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape measures and any other works of the project would be resolved as early as practical without affecting the implementation of the mitigation measures.

11.2 Mitigation Measures

11.2.1 The proposed mitigation measures for landscape and visual impacts are summarised in the Project Implementation Schedule (PIS) in **Appendix 2.1**. The landscape and visual mitigation measures proposed should be incorporated in the detailed landscape and engineering design. The construction phase mitigation measures should be adopted as early as possible during construction and should be in place throughout the entire construction period. Mitigation measures for the operational phase should be adopted during the detailed design and be built as part of the construction works so that they are in place on commissioning of the Project.

11.3 Site Audit Requirement

11.3.1 Site audits should be undertaken during the construction phase of the Project to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives.

11.3.2 Site inspections should be undertaken by the ET at least once every two weeks during the construction period.

11.3.3 In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 12.1**.

Table 12.1: Event / Action Plan for landscape and visual during construction phase

Event	Action			
	ET	IEC	ER	Contractor
Non-conformity on one occasion	1. Identify source(s) 2. Inform the Contractor, IEC and ER; 3. Discuss remedial actions with IEC, ER and Contractor 4. Monitor remedial actions until rectification	1. Check inspection report 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures 4. Advise ER on	1. Confirm receipt of notification of non-conformity in writing 2. Review and agree on the remedial measures proposed by the Contractor 3. Supervise implementation of remedial measures	1. Identify source and investigate the non-conformity 2. Implement remedial measures 3. Amend working methods agreed with ER as appropriate 4. Rectify

Event	Action			
	ET	IEC	ER	Contractor
	has been completed	effectiveness of proposed remedial measures 5. Check implementation of remedial measures		damage and undertake any necessary replacement
Repeated Non-conformity	<ol style="list-style-type: none"> 1. Identify source(s) 2. Inform the Contractor, IEC and ER; 3. Discuss inspection frequency 4. Discuss remedial actions with IEC, ER and Contractor 5. Monitor remedial actions until rectification has been completed 6. If non-conformity stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Check inspection report 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures 4. Advise ER on effectiveness of proposed remedial measures 5. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Notify the Contractor 2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Identify source and investigate the non-conformity 2. Implement remedial measures 3. Amend working methods agreed with ER as appropriate 4. Rectify damage and undertake any necessary replacement. Stop relevant portion of works as determined by ER until the non-conformity is abated.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer's Representative

12 SITE ENVIRONMENTAL AUDIT

12.1 Site Inspection

12.1.1 Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.

12.1.2 The ET shall be responsible for formulating the environmental site inspection programme as well as the deficiency and action reporting system, and for carrying out the site inspections. The proposal for rectification, if any, should be prepared and submitted to the ET Leader, IEC and ER by the Contractor.

12.1.3 Regular site inspections shall be carried out and led by the ER and attended by the Contractor, ET and IEC at least once per week during the construction phase. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental situations outside the works area which is likely to be affected, directly or indirectly, by the construction site activities of the Project. The ET and IEC shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:

- (1) EIA Report recommendations on environmental protection and pollution control mitigation measures;
- (2) works progress and programme;
- (3) individual works methodology proposals (which shall include the proposal on associated pollution control measures);
- (4) contract specifications on environmental protection;
- (5) relevant environmental protection and pollution control legislations; and
- (6) previous site inspection results.

12.1.4 The Contractor shall keep the ER, IEC and ET Leader updated with all relevant environmental related information on the construction contract necessary for him to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be recorded and followed up by the Contractor in an agreed time-frame. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET, to report on any remedial measures subsequent to the site inspections.

12.1.5 The ER, IEC, ET and the Contractor should also carry out ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the investigation work, as specified in the Event and Action Plan for the EM&A programme.

12.2 Compliance with Legal and Contractual Requirements

- 12.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.
- 12.2.2 In order that the works comply with the contractual requirements, all works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to ensure sufficient environmental protection and pollution control measures have been included. A copy shall also be sent to IEC for reference and providing comments on needed basis. The implementation schedule of mitigation measures is summarised in **Appendix 2.1**.
- 12.2.3 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 laws can be prevented.
- 12.2.4 The Contractor shall regularly copy relevant documents to the ET Leader and IEC so that works checking could be carried out effectively. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.
- 12.2.5 After reviewing the document, the ET Leader shall advise the IEC and Contractor of any non-compliance with 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 result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor, ER and IEC accordingly.
- 12.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to correct the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

12.3 Environment Complaints

- 12.3.1 The following procedures should be undertaken upon receipt of any environmental complaint:
- (1) The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
 - (2) The Contractor to investigate, with the ER and ET, the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency and stations, if necessary;
 - (3) The Contractor to identify remedial measures in consultation with the IEC, ET and ER if a complaint is valid and due to the construction works of the Project;
 - (4) The Contractor to implement the remedial measures as required by the ER and to agree with the ET and IEC any additional monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;

- (5) The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- (6) The ET to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- (7) If the complaint is referred by the EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and additional monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and
- (8) The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and additional monitoring results in the monthly EM&A reports.

13 REPORTING

13.1 General

13.1.1 Reports 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. All the monitoring data (baseline and impact) shall also be submitted on diskettes or other approved media. The formats for air quality, noise and water quality monitoring data to be submitted shall be separately agreed.

13.1.2 The ET is responsible for establishing and maintaining a dedicated website throughout the entire construction period for publishing all the real-time relevant environmental monitoring data (for construction noise monitoring) and reporting (including but not limited to the baseline and impact monitoring). The ET shall propose the format and functionality of the website for agreement with the ER and IEC prior to publishing of data. Once the monitoring data are available (i.e. dust and noise) and vetted by the IEC, the ET is responsible to upload the relevant data to the dedicated website.

13.1.3 Types of reports that the ET shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly and final review EM&A reports shall be made available to the Director of Environmental Protection.

13.2 Baseline Monitoring Report

13.2.1 The ET should prepare and submit a Baseline Monitoring Report at least one month before commencement of construction of the Project. Copies of the Baseline Monitoring Report should be submitted to the IEC, ER and EPD. The ET should liaise with the relevant parties on the exact number of copies require.

13.2.2 The baseline monitoring report shall include at least the following:

- (1) up to half a page executive summary;
- (2) brief project background information;
- (3) drawings showing locations of the baseline monitoring stations;
- (4) 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;
 - monitoring date, time, frequency and duration; and
 - quality assurance (QA) / quality control (QC) results and detection limits;
- (5) details of 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 monitoring results;
- (6) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (7) revisions for inclusion in the EM&A Manual; and
- (8) comments, recommendations and conclusions.

13.3 Monthly Monitoring and Audit (EM&A) Report

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

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

First Monthly EM&A Report

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

- (1) Executive summary (1-2 pages):
- breaches of Action and Limit levels;
 - compliant log
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- (2) 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;
 - major activities being carried out on site during the month;
 - weather conditions that may affect the results;
 - management structure; and
 - works undertaken during the month.

- (3) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
 - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
 - drawings showing the project are, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).
- (4) A brief summary of EM&A requirements including:
- all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the project EIA study final report; and
 - environmental requirements in contract documents.
- (5) Implementation status
- advice on the implementation programme, impact prediction review procedures, implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule.
- (6) 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;
 - monitoring parameters;
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - QA / QC results and detection limits.
- (7) Report on non-compliance, complaints, and 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 investigation, liaison and

consultation undertaken, actions and follow-up procedures taken, results and summary;

- record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- review of the reasons for and the implications of non-compliances, 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.

(8) 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;
- 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 reporting period;
- record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
- comments (for examples, comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions, the assessment of the effectiveness of the environmental management systems, practices and procedures, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

(9) Appendices

- Action and Limit levels;
- graphical plots of trends of the monitoring parameters at key stations over the reporting periods for representative monitoring stations annotated against the following:
 - a) major activities being carried out on site during the period;
 - b) weather conditions during the period; and
 - c) any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

Subsequent Monthly EM&A Reports

13.3.4 Subsequent monthly EM&A reports shall include at least the following:

- (1) Executive summary (1-2 pages):
 - breaches of Action and Limit levels;
 - compliant log
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- (2) 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;
 - major activities being carried out on site during the month;
 - weather conditions that may affect the results;
 - management structure;
 - works undertaken during the month; and
 - any updates as needed to the scope of works and construction methodologies.
- (3) Environmental status:
 - advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
 - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
 - drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (4) Implementation status
 - advice on the implementation programme, impact prediction review procedures, implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule.
- (5) 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;

- monitoring parameters;
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - QA / QC results and detection limits.
- (6) Report on non-compliance, complaints, and 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 investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - review of the reasons for and the implications of non-compliances, 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.
- (7) 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;
 - 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 reporting period;
 - record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
 - comments (for examples, comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions, the assessment of the effectiveness of the environmental management systems, practices and procedures, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

(8) Appendices

- Action and Limit levels;
- graphical plots of trends of the monitoring parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

13.4 Quarterly EM&A Report

13.4.1 A quarterly EM&A report shall be produced and shall contain at least the following information. Apart from these, the first quarterly EM&A 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.

(1) Executive summary (1 - 2 pages):

- breaches of Action and Limit levels;
- compliant log
- notifications of any summons and successful prosecutions;
- reporting changes; and
- future key issues.

(2) 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 quarter;
- major activities being carried out on site during the quarter;
- weather conditions that may affect the results;
- management structure;
- works undertaken during the quarter; and
- any updates as needed to the scope of works and construction methodologies.

- (3) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
 - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
 - drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (4) Implementation status
- advice on the implementation programme, impact prediction review procedures, implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule.
- (5) 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;
 - monitoring parameters;
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the quarter;
 - any other factors which might affect the monitoring results; and
 - QA / QC results and detection limits.
- (6) Report on non-compliance, complaints, and 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 investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - review of the reasons for and the implications of non-compliances, 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.

(7) 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;
- 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 reporting quarter;
- record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
- comments (for examples, comparison of project impact predictions with actual impacts for the purpose of assessing the accuracy of predictions, the assessment of the effectiveness of the environmental management systems, practices and procedures, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

(8) Appendices

- Action and Limit levels;
- graphical plots of trends of the monitoring parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the quarter; and
 - any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting quarter;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

13.5 Final EM&A Review Report

13.5.1 The EM&A programme should be terminated upon the completion of the construction activities that have the potential to result in significant environmental impacts. The deadline of final EM&A report shall be submitted to EPD within 2 months after the termination of EM&A programme.

13.5.2 Prior to the proposed termination, it may be advisable to consult relevant local communities. The termination of EM&A programme shall be determined on the following basis:

- (1) Completion of construction activities and insignificant environmental impacts of the remaining outstanding construction works;
- (2) 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;
- (3) No environmental complaint and prosecution; and
- (4) All the required monitoring works (for construction and operational phase) were completed.

13.5.3 The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project Proponent followed by approval from the Director of Environmental Protection.

13.5.4 The final EM&A report should contain at least the following information:

- (1) Executive summary (1-2 pages):
- (2) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (3) 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;
- (4) A brief summary of EM&A requirements including:
 - environmental mitigation measure, as recommended in the project EIA Report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit levels);
 - all monitoring parameters;
 - Event and Action Plans;
- (5) Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report, summarized in the updated implementation schedule;
- (6) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (7) Graphical plots and the statistical analysis of the trends of monitoring parameter over the course of the project, including the post-project monitoring for all monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - the return of ambient environmental conditions in comparison with baseline data;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (8) Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;

- (9) Advice on the solid and liquid waste management status;
- (10) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (11) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (12) A description of the actions taken in the event of non-compliance and any follow-up involved;
- (13) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, notifications of summons and successful prosecutions for breaches of the current environmental/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- (14) Compare and contrast the EM&A data with EIA predictions and annotate with explanation for any discrepancies in EIA recommendations;
- (15) Review the monitoring methodology adopted and with the benefit hindsight;
- (16) Comments (for examples, a review of the practicality, effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the EIA process and overall EM&A programme); and
- (17) Recommendations and conclusions (for example, a review of practicality and effectiveness of the overall EIA process and EM&A programme (e.g. monitoring methodology adopted) including cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary, state the return of ambient and/or the predicted scenario as per EIA findings).

13.6 Data Keeping

13.6.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following completion of the construction contract.

13.7 Interim Notifications of Environmental Quality Limit Exceedances

13.7.1 With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proven to be valid, the ET should immediately notify the IEC and EPD, as appropriate. The notification should be followed up with advice to the IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notification is presented in **Appendix 13.1**.