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1 INTRODUCTION

1.1 Background

1.1.1 The 2011-12 Policy Address announced that the Government would adopt a multi-pronged approach, including Rock Cavern Development (RCD), for expanding land resources. Civil Engineering and Development Department (CEDD) took initiative to commission a study on "Enhancing Land Supply Strategy: Reclamation outside Victoria Harbour and Rock Cavern Development".

1.1.2 The Study has identified three Government facilities (viz. the Diamond Hill Fresh Water and Salt Water Service Reservoirs (DHSRs), Sham Tseng Sewage Treatment Works and Sai Kung Sewage Treatment Works) for relocating to caverns and recommended further detailed feasibility study to identify and address the issues associated with the relocation proposal.

1.1.3 Water Supplies Department (WSD) commenced a detailed feasibility study under Agreement No. CE 33/2014 (WS) "Relocation of Diamond Hill Fresh Water and Salt Water Service Reservoirs to Caverns – Feasibility Study" in December 2014. The result of the Feasibility Study (FS) affirmed that relocating the DHSRs and associated facilities to caverns is technically feasible.

1.1.4 Binnies Hong Kong Limited was commissioned by WSD in December 2018 to undertake the investigation, design and construction supervision on relocating the DHSRs into caverns. Description of the Project element have been further elaborated and presentation in **Section 2**.

1.2 Purpose of the Manual

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

- Guide the set-up of an EM&A programme to ensure compliance with the EIA recommendations;
- Specify the requirements for monitoring equipment;
- Propose environmental monitoring points, monitoring frequency etc;
- Propose Action and Limit Levels; and
- Propose Event and Action Plans.

1.2.2 This Manual outlines the monitoring and audit programme for the construction and operation of the proposed Project and provides systematic procedures for monitoring, auditing and minimizing environmental impacts.

1.2.3 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines (HKPSG) have served as environmental standards and guidelines in the preparation of this Manual. In addition, this EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).

1.2.4 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of EM&A;
- Project organization for the EM&A works;
- The basis for, and description of the broad approach underlying the EM&A programme;

- Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- Definition of Action and Limit Levels;
- Establishment of Event and Action Plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints; and;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures.

1.2.5 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 environmental monitoring and audit requirements.

2 PROJECT DESCRIPTION

2.1 General Description of the Project

2.1.1 The relocated DHSRs will be constructed in a series of caverns linked by access tunnels and adits. The relocated DHFWSR and DHSWSR will be compartmented while the existing DHPS will be split into two (2) pump houses for fresh and salt water supply when relocated.

2.1.2 Ancillary facilities to be constructed near the tunnel portal may include transformer room, switch room, emergency generator room, control room, ventilation building, and pumping station control room, which will be constructed in an above-ground building outside the tunnel.

2.1.3 The scope of the Project comprises the following:

a) Construction of the relocated DHSRs and associated pumping stations and water main laying works;

b) Construction of tunnels, adits, ventilation system and caverns for accommodating the relocated DHSRs and the associated facilities;

c) Terminating the operation of the existing DHSRs and the associated facilities; and

d) All other associated works that are incidental to and necessary for the completion of the Project.

2.1.4 The major construction activities of the Project include earthworks, drilling and blasting, construction of concrete structures, handling and transportation of excavated materials, water mains laying, installation of electrical and mechanical (E&M) equipment and material transportation. The operation of the existing DHSRs and the associated facilities will be terminated after the completion of the testing and commissioning of the relocated DHSRs. Under the Project, the existing DHSRs and associated facilities will be retained after termination of the operation. The subsequent demolition works will be carried out by other government departments/project proponents.

2.1.5 The Project layout is shown in **Figure 2.1**. Some locations in the close vicinity of construction site may be potentially affected by the construction dust and noise during the construction phase of the Project, the location of the proposed air quality and noise monitoring stations are shown in **Figure 2.2**.

2.2 Designated Project

2.2.1 The Project is a Designated Project under Item Q.2, Part I of Schedule 2 of the Environmental Impact Assessment Ordinance, "Underground Rock Caverns", which requires an environmental permit from Environmental Protection Department for its construction and operation.

2.3 Project Programme

2.3.1 Construction of the Project is tentatively scheduled to commence in the mid of 2022 for completion by 2027. The tentative programme for proposed fresh water and salt water mains will commence in the end of 2022 and complete in Q3 of 2026. The tentative of completion date of the construction of relocated DHSRs is in Q3 of 2026. Tentative programme for commissioning of the relocated DHSRs and terminating the operation of the existing DHSRs will be undertaken in Q4 of 2026. The remaining associated works e.g. landscaping/slope works and reinstatement for access tunnel portal will be undertaken in 2027. The tentative construction programme is presented in **Appendix 2A**.

3 PROJECT ORGANIZATION

3.1 Project Organization

3.1.1 The proposed project organization and lines of communication with respect to environmental protection works are shown in **Appendix 3A**.

3.1.2 Only one ET with an ET Leader shall be engaged for the entire Project at any time. The ET shall conduct the EM&A programme and ensure the Contractor's compliance with the Project's environmental performance requirements. The ET shall be established by the Project Proponent, or shall be part of the Resident Site Staff of the Engineer and directly supervised by the Engineer or Engineer's Representative, and shall be an independent party from the Contractor or the IEC for the Project. The ET shall be led and managed by an ET leader. The ET leader shall possess at least 7 years of experience in EM&A and/or environmental management. The ET Leader, or an ET Leader representative who shall be a member of the ET with at least 5 years of experience in EM&A or environmental management, shall work full time on-site.

3.1.3 Only one IEC with a supporting team shall be directly employed by the Project Proponent for the entire Project at any time. The IEC shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this Manual, as well as any other relevant submissions required under the Environmental Permit. The IEC shall be an independent party from the Engineer or Engineer's Representative, Contractor and the ET for the Project. The IEC shall possess at least 7 years of experience in EM&A and/or environmental management. The IEC shall report directly to the EPD on matters relating to the EM&A programme and environmental impacts from the Project. The IEC shall report directly to the EPD on matters relating to the EM&A programme and environmental impacts from the Project. The IEC, or an IEC representative who shall be a person with at least 5 years of experience in EM&A or environmental management, shall work full time on-site.

3.1.4 The responsibilities of respective parties are:

<u>The Contractor</u>

- Implement the EIA recommendations and requirements;
- Provide assistance to ET in carrying out monitoring and auditing;
- Submit proposals on mitigation measures in case of exceedances of Action and Limit Levels in accordance with the Event and Action Plans;
- Implement measures to reduce impact where Action and Limit Levels are exceeded; and
- Adhere to the agreed procedures for carrying out compliant investigation.

<u>Environmental Team</u>

- Set up all the required environmental monitoring stations;
- Monitor various environmental parameters as required in the EM&A Manual;
- Analyse the environmental monitoring and audit data, review the success of EM&A programme, confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising;
- Carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and

environmental mitigation measures, and take proactive actions to pre-empt problems;

- Audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
- Report on the environmental monitoring and audit results to the IEC, Contractor, the ER and EPD or its delegated representative;
- 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;
- Undertake regular on-site audits / inspections and report to the Contractor and the ER of any potential non-compliance;
- Follow up and close out non-compliance actions; and
- Adhere to the procedures for carrying out environmental complaint investigation.

Engineer or Engineer's Representative

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

Independent Environmental Checker

- Review the EM&A works performed by the ET (at not less than monthly intervals);
- Audit the monitoring activities and results (at not less than monthly intervals);
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and location of sensitive receivers;
- Report the audit results to the ER and EPD in parallel;
- Review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures that have been recommended in the EIA Report and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- Report the findings of site inspections and other environmental performance reviews to ER and EPD.

3.1.5 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.

4 AIR QUALITY IMPACT

4.1 Introduction

4.1.1 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact during the construction phase of the Project are presented. Dust monitoring is proposed to be conducted during construction phase.

4.2 Air Quality Parameters

4.2.1 Monitoring and audit of the Total Suspended Particulate (TSP) levels shall be carried out by the ET to ensure that construction works are not generating dust that exceeds the acceptable level. Timely action should be taken to rectify the situation if an exceedance is detected.

4.2.2 One-hour TSP shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B*. Upon approval of the IEC and the Environmental Protection Department (EPD), 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.

4.2.3 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and any other local atmospheric factors affecting or affected by site conditions, special phenomena and work progress of the site etc., shall be recorded down in detail by the ET. A sample data sheet is shown in **Appendix 4A**.

4.3 Monitoring Equipment

4.3.1 A high volume sampler (HVS) in compliance with the following specifications should be used for carrying out the 1-hour TSP monitoring:

- 0.6 - 1.7 m^3 per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
- equipped with a timing / control device with ± 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2;
- flow control accuracy: ± 2.5% deviation over 24-hour sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hour period.

4.3.2 The ET is responsible for the provision, installation, operation, maintenance, and dismantling of the monitoring equipment. They shall ensure that sufficient number of HVSs with an

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

4.3.3 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 mentioned in **Appendix 4A**.

4.3.4 Wind data monitoring equipment shall also be provided and set up at suitable locations 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 Engineer and the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:

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

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

4.4 Proposal of Use of Portable Direct Reading Dust Meter

4.4.1 If the ET proposes 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 result to the HVS. The instrument should also be calibrated every year against HVS to check the validity and accuracy of the results measured by direct reading method.

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, equipment calibration and maintenance. The laboratory should be Hong Kong laboratory accreditation scheme (HOKLAS) accredited.

4.5.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the Engineer, in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and IEC. The IEC shall regularly audit the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET shall provide the Engineer and the IEC with one copy of the Title 40 of Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for reference.

4.5.3 Filter paper of size 8" × 10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes and shall be conditioned in a humidity-controlled chamber for over 24-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.

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

4.6 Monitoring Locations

4.6.1 The selected air quality monitoring locations are the worst potentially affected air sensitive receivers located in the vicinity of construction sites. The proposed air quality monitoring locations during construction phase are listed in **Table 4.1** below and shown in **Figure 4.1**.

Table 4.1 Construction Dust Monitoring Locations

ID	ASR ID	Description	Impact Monitoring Period [1]
DM-1	ASR 2	Tennis Court near Tin Ma Court	Year 2022-2026
DM-2	ASR 5	Chun Sing House, Tin Ma Court	Year 2022-2026
DM-3	ASR 7	Grace Methodist Church Kindergarten	Year 2022-2026
DM-4	ASR 9	Block 6, Tsui Chuk Garden	Year 2022-2026

Note:
[1] The monitoring period is determined based on the tentative construction period of the nearest worksites within the Project Site and will subject to adjustment based on the actual construction programme of the relevant contracts in the Construction Stage.

4.6.2 The status and locations of the air quality sensitive receivers may change after issuing this manual. In such case, the ET shall propose updated monitoring locations and seek approval from ER and the IEC, and agreement from the EPD on the proposal.

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

i. At the site boundary or such locations close to the major dust emission source;
ii. Close to the air sensitive receivers as defined in the EIAO-TM;
iii. Proper position/ sitting and orientation of the monitoring equipment; and
iv. 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:

i. a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
ii. the distance between the sampler and an obstacle, such as buildings, shall be at least twice the height that the obstacle protrudes above the sampler;
iii. a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
iv. a minimum of 2 metres of separation from any supporting structure, measured horizontally is required;
v. no furnace or incinerator flue is nearby;
vi. airflow around the sampler is unrestricted;
vii. the sampler is more than 20 metres from the dripline;
viii. any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
ix. permission must be obtained to set up the samplers and to obtain access to the monitoring stations;

x. a secured supply of electricity is needed to operate the samplers; and

xi. no two samplers should be placed less than 2 meters apart.

4.6.5 Before construction in each month, the corresponding dust monitoring schedule shall be prepared by the ET based upon the construction schedule provided by the Contractor. The ET shall forward the IEC the impact monitoring programme such that he/she can conduct on-site audits to ensure accuracy of the impact monitoring results.

4.7 Baseline Monitoring

4.7.1 The ET shall carry out the baseline monitoring at all of the designated monitoring locations (**Table 4.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain 1-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 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 during the baseline monitoring period, the ET shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring location shall be agreed with the Engineer and the IEC, and approved by the EPD.

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 Engineer and IEC for approval.

4.7.5 Ambient conditions may vary seasonally and shall be reviewed once every three months. If the ET considered that 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 and the EPD.

4.8 Impact Monitoring

4.8.1 The ET shall carry out impact monitoring during construction phase of the project. For 1-hour TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs. In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the action plan in the following section, should be conducted within the specified timeframe after the result is obtained. This additional monitoring should be continued until the excessive dust emission or the deterioration in the air quality is rectified. The impact monitoring programme is summarised in **Table 4.2**.

Table 4.2 Summary of Construction Dust Monitoring Programme

Monitoring Period	Duration	Sampling Parameter	Frequency
Baseline Monitoring	Consecutive days of at least 2 weeks before commencement of major construction works	1-hour TSP	3 times per day

Monitoring Period	Duration	Sampling Parameter	Frequency
Impact Monitoring	Throughout the construction phase	1-hour TSP	3 times every 6 days

4.9 Event and Action Plan

4.9.1 The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour TSP. **Table 4.3** shows the air quality criteria, namely action and limit levels to be used.

Table 4.3 Action and Limit Levels for Air Quality (Dust)

Parameter	Action Level	Limit Level
1-hour TSP level in $\mu g/m^3$	For baseline level 384 $\mu g/m^3$, action level = (baseline level $\times$ 1.3 + limit level)/2 For baseline level > 384 $\mu g/m^3$, action level = limit level.	500 $\mu g/m^3$

4.9.2 Should non-compliance of the air quality criteria occur, action in accordance with the action plan in **Table 4.4** shall be carried out.

Table 4.4 Event and Action Plan for Air Quality (Dust)

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Action level exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
Action level exceedance for two or more consecutive samples	1. Identify source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial actions to ER within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Limit level exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	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. Amend proposal if appropriate.
Limit level exceedance for two or more consecutive samples	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 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.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	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.

Notes:
ET – Environmental Team; IEC – Independent Environmental Checker; ER – Engineer's Representative

4.10 Mitigation Measures

4.10.1 Mitigation measures for construction phase air quality impacts has been recommended in the EIA Report. All the recommended mitigation measures and designs are detailed in the implementation schedule in **Appendix 4B**.

4.11 Audit Requirements

4.11.1 Regular site inspection and audit at least once per week should be conducted during the entire construction phase of the Project to ensure the recommended mitigation measures are properly implemented.

5 NOISE IMPACT

5.1 Introduction

5.1.1 Construction noise impact and operation phase fixed plant noise impact from this Project are predicted at the identified representative noise sensitive receivers (NSRs).

5.1.2 Construction noise mitigation measures would be required to reduce noise levels to the stipulated standard. A noise monitoring and audit programme should be undertaken to confirm such mitigation measures would be implemented properly.

5.1.3 For fixed noise sources, the Contractor should ensure the operation of fixed plant equipment fulfill the maximum sound power levels adopted in the EIA report, in order to ensure compliance of the operation airborne noise levels with the Technical Memorandum (TM)'s stipulated noise standard. No noise monitoring during operational phase is required.

5.1.4 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction phase of the Project are presented.

5.2 Noise Monitoring Parameters

5.2.1 Construction noise level shall be monitored by the ET and shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq(30\text{-}min)}$ shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, $L_{eq\ (5\text{-}min)}$ shall be employed for comparison with the noise control ordinance (NCO) criteria. A sample data sheet is shown in **Appendix 5A**.

5.2.2 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference.

5.3 Monitoring Equipment

5.3.1 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.

5.3.2 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

5.3.3 The ET is responsible for the provision, installation, operation, maintenance, dismantling 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.

5.4 Monitoring Locations

5.4.1 The most affected NSRs were selected as monitoring stations. The locations of construction noise monitoring stations are summarised in **Table 5.1** and shown in **Figure 5.1**.

Table 5.1 Proposed Construction Noise Monitoring Locations

ID	NSR ID	Description	Impact Monitoring Period[1] [2]
NM-1	NSR 2	Block 1, Meridian Hill	Year 2022 - 2026
NM-2	NSR 3	Chun Sing House, Tin Ma Court	Year 2022 - 2026

ID	NSR ID	Description	Impact Monitoring Period[1] [2]
NM-3	NSR 5	Grace Methodist Church Kindergarten	Year 2022 - 2026
NM-4	NSR 7	Block 6, Tsui Chuk Garden	Year 2022 - 2026

Note:
[1] The monitoring period is determined based on the tentative construction period of the nearest worksites within the Project Site and will subject to adjustment based on the actual construction programme of the relevant contracts in the Construction Stage.

5.4.2 If the status or location of a NSR changes after issuing this manual, the ET shall propose the updated monitoring location and seek approval from the Engineering and agreement from the IEC and the EPD of the proposal to amend the monitoring location.

5.4.3 When alternative monitoring locations are proposed, the monitoring locations shall be chosen taking account of the following criteria:

i. Monitoring at sensitive receivers close to the major site activities that are likely to have noise impacts;

ii. Monitoring should close to or at the NSRs as defined in the EIAO-TM; and

iii. Assurance of minimal disturbance to the occupants during monitoring.

5.4.4 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 prior to the commencement of the works. 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 Baseline Monitoring

5.5.1 Baseline noise monitoring shall be carried out daily in all of the identified monitoring stations for at least 2 weeks prior to the commissioning of the construction works. A schedule of the baseline monitoring shall be submitted to the IEC and ER for approval before the monitoring starts.

5.5.2 During the baseline monitoring, there shall not be any construction activities in the vicinity of the monitoring stations. Any non-project related construction activities in the vicinity of the monitoring stations during the baseline monitoring should be noted and the source(s) and location(s) of such activities should be properly recorded.

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

5.6 Impact Monitoring

5.6.1 Construction noise monitoring should be carried out at the designated monitoring stations (**Table 5.1**) directly affected by the construction works once every week after the commencement of construction. During construction works, one set of $L_{eq(30\text{-}min)}$ measurement at each station between 0700 and 1900 hours on normal weekdays shall be taken. If construction works are extended to include works during the period between 1900 and 0700 hours, additional weekly impact monitoring shall be carried out during evening and night-time works. Applicable permits under NCO shall be obtained by the Contractor.

5.6.2 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Event and Action Plan in **Table 5.3**, shall be carried out. This additional

monitoring shall be continued until the recorded noise levels are rectified or proved to be unrelated to the construction activities.

5.7 Action and Limit Levels

5.7.1 The Action and Limit levels for construction noise are defined in **Table 5.2**. Should non-compliance of the criteria occur, the ET, the IEC, the Engineer and the Contractor shall undertake their specified actions in accordance with the Event and Action Plan shown in **Table 5.3**.

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) *

Notes:
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.

5.8 Event and Limit Levels

5.8.1 Should non-compliance of the noise criteria occur, actions in accordance with the event and 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	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.	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.	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.	1. Submit noise mitigation proposals to IEC and ER; 2. Implement noise mitigation proposals.
Limit Level Exceedance	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 Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	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.	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 stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to the IEC within three 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.

Notes:
ET – Environmental Team; IEC – Independent Environmental Checker; ER – Engineer's Representative

5.9 Mitigation Measures

5.9.1 To alleviate the construction noise impact on the affected NSRs, adoption of quiet powered mechanical equipment (PME), adoption of noise barriers or enclosure for particular items of plant are proposed for the Project during construction phase.

5.9.2 All of the fixed plants shall design to ensure compliance of the operation airborne noise levels with the noise standard stipulated in the EIAO-TM and Noise Control Ordinance (NCO).

5.9.3 All the recommended mitigation measures and designs are detailed in the implementation schedule in **Appendix 4B**.

5.10 Audit Requirements

5.10.1 Regular site environmental audit during the construction phase of the Project should be conducted at least once per week to ensure proper implementation of mitigation measures and good site practices as listed in **Appendix 4B** and the noise control requirements stated in EPD's "Recommended Pollution Control Clauses for Construction Contracts" to further minimise the potential noise nuisance during construction phase.

5.11 Commissioning Test for Fixed Plant Noise Sources

5.11.1 Commissioning test for fixed noise sources prior to operation is required to ensure compliance of the operation airborne noise levels with the stipulated noise standard. Commissioning test requirements should be agreed with EPD at least 1 month prior to the commissioning test.

6 WATER QUALITY IMPACT

6.1 Introduction

6.1.1 Potential water quality impacts arising from the construction and operation phases of the Project were assessed in the EIA Report.

6.1.2 No adverse water quality impact from construction of the Project would be anticipated with the implementation of the recommended mitigation measures and ensuring all site effluent are properly treated before discharge. No water quality monitoring is thus proposed for the construction phase of the Project. However, regular site inspection should be conducted during the construction phase in order to ensure the recommended mitigation measures are properly implemented during construction phase.

6.1.3 Given no adverse water quality impact is anticipated during the operation of the Project with the implementation of the recommended mitigation measures, no water quality monitoring and audit requirement specific to the operation phase is deemed necessary.

6.2 Mitigation Measures

6.2.1 Mitigation measures for water quality impacts during construction and operation phases have been recommended in the EIA Report. All the recommended mitigation measures are detailed in the implementation schedule in **Appendix 4B**. The Contractor should be responsible for the design and implementation of the mitigation measures.

6.3 Audit Requirement

6.3.1 Regular site environmental audit during the construction phase of the Project should be conducted at least once per week to ensure that the recommended mitigation measures are to be properly undertaken during construction phase of the Project. It can also provide an effective control of any malpractices and therefore achieve continual improvement of environmental performance on site.

6.3.2 Site inspection should be carried out by ET based on the recommended mitigation measures for water pollution control as detailed in **Appendix 4B**. In the event that the recommended mitigation measures are not fully or properly implemented, deficiency shall be recorded and reported to the site management. Suitable actions are to be carried out to:

- investigate the problems and the causes;
- issue action notes to the Contractor which is responsible for the works;
- implement remedial and corrective actions immediately;
- re-inspect the site conditions upon completion of the remedial and corrective actions; and
- record the event and discuss with the Contractor for preventive actions.

7 WASTE MANAGEMENT IMPLICATIONS

7.1 Introduction

7.1.1 It will be the contractor's responsibility to ensure that any wastes produced during the construction and demolition works are handled, stored and disposed of in accordance with good waste management practices and relevant EPD's regulations and other legislative requirements.

7.1.2 Waste materials generated during construction activities, such as construction and demolition (C&D) materials, chemical waste and general refuse, are recommended to be audited once a week to ensure that proper storage, transportation and disposal practices are being implemented. This monitoring of waste management practices would ensure that these solid wastes generated during construction are not disposed into the nearby coastal waters. The Contractor would be responsible for the implementation of any mitigation measures to minimise waste or redress problems arising from the waste materials. A Waste Management Plan (WMP), as a part of the Environmental Management Plan (EMP), should be prepared in accordance with ETWB TC (W) No.19/2005 and submitted to the Engineer for approval. The recommended mitigation measures should form the basis of the WMP. The monitoring and auditing requirement stated in ETWB TC (W) No.19/2005 should be followed with regard to the management of C&D materials.

7.1.3 Large quantities of wastes are not expected from the operation of the Project and no adverse environmental impact would arise with the implementation of good waste management practices. EM&A would not be necessary during the operation phase.

7.2 Mitigation Measures

7.2.1 The mitigation measures recommended in the EIA Report should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor during the construction stage.

7.2.2 It is recommended that the waste generated during the construction activities should be audited regularly by the ET to determine if waste is being managed in accordance with approved procedures and the site WMP. The handling of the amount of C&D materials generated shall also be checked according to the C&DMMP as pledged in Section 6.5.6 of EIA report. The audit should look at all aspects of on-site waste management practices as described in **Section 7.3.1**.

7.2.3 With the appropriate handling, storage and disposal of waste arising from the construction and operation of the Project as recommended in **Appendix 4B**, the potential adverse environmental impacts would be avoided or minimised. During site inspections, the ET should pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices and mitigation measures.

7.3 Site Audit Requirements

7.3.1 Regular audits and site inspections shall be carried out weekly during construction phase by the ER, ET and Contractor to ensure that the recommended good site practices and the recommended mitigation measures listed in **Appendix 4B** 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 licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

7.3.2 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.

8 LAND CONTAMINATION IMPACT

8.1 Introduction

8.1.1 The land contamination assessment has examined the potential contaminating land uses within the Project area and investigated the potential impacts of the contamination on future use.

8.2 Mitigation Measures

8.2.1 Based on desk-top review of the past and present land uses of the Project site and the site walkover, the presence of contaminated land is not expected. Thus, no specific mitigation measures and monitoring is required.

9 ECOLOGICAL IMPACT

9.1.1 As stated in the EIA, no significant residual ecological impacts were identified for construction and operation phases. With the implementation of appropriate mitigation measures, no unacceptable adverse residual impacts would be anticipated. During construction phase, regular site audit will be conducted to ensure the recommended good site practice are properly implemented. No specific ecological EM&A during operation phase is recommended. Implementation schedule for ecology is presented in **Appendix 4B**.

10 LANDSCAPE AND VISUAL IMPACTS

10.1 Introduction

10.1.1 The EIA has recommended EM&A for landscape and visual mitigation measures to be undertaken during the design, construction and operation stages of the project. The design, implementation and maintenance of landscape mitigation measures is a key aspect of this and should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

10.2 Mitigation Measures

10.2.1 The proposed mitigation measures of landscape and visual impacts are summarised in **Appendix 4B**. 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 from the commencement of construction and should be in place throughout the entire construction period. Mitigation measures for the operation 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.

10.2.2 Any potential conflict among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved at early stage. Any change to the mitigation measure should be incorporated in the detailed design.

10.3 Baseline Review

10.3.1 Baseline review to check, record and report the status of the Landscape Resources (LR) and Landscape Character Areas (LCA) within the construction works sites and works areas and the Visually Sensitive Receivers (VSRs) within the visual envelope shall be conducted prior to commencement of any construction works making reference to the LR, LCA and VSRs maps included in the EIA Report.

10.3.2 Any significant change to the status of LR, LCA and VSRs since the EIA shall be identified. The recommended landscape and visual mitigation measures shall be reviewed if such change warrants a change in the design of the landscape and visual mitigation measures.

10.3.3 A baseline monitoring report including photographic record of the site at the time of the Contractor's possession of the site shall be prepared by the Contractor and approved by the ER. The approved baseline monitoring report including photographic record shall be submitted to the Project Proponent, ET, IEC and EPD for record.

10.4 Audit Requirement

10.4.1 Site audits should be undertaken during the construction phase and the 12-month establishment period (operation phase) to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. The extent of works areas should be regularly checked by the ET to ensure no damage to existing vegetation or trees outside the works limits.

10.4.2 The conditions and growth performance of the implemented compensatory planting should be regularly checked and monitored by a qualified plant specialist of the ET to ensure the effectiveness of the mitigation measures.

10.4.3 Site inspections should be undertaken at weekly basis during the construction period and once every two months for the 12-month establishment period during operation phase.

10.5 Event and Action Plan

10.5.1 In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 10.1**

Table 10.1 Event and Action Plan for Landscape and Visual

Event	Action			
	ET	IEC	ER	Contractor
Non-conformity on one occasion	1. Inform the IEC, ER and the Contractor; 2. Discuss remedial actions with IEC, ER and Contractor; and 3. Monitor remedial actions until rectification has been completed.	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 effective of proposed remedial measures; and 5. Check implementation of remedial measures.	1. Confirm receipt of notification of non-conformity in writing; 2. Review and agree on the remedial measures proposed by the Contractor; and 3. Ensure remedial measures are properly implemented.	1. Identify source and investigate the non-conformity; 2. Amend working methods agreed with ER as appropriate; and 3. Rectify damage and undertake any necessary replacement.
Repeated Non-conformity	1. Identify sources; 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; and 6. If non-conformity stops, cease additional monitoring.	1. Check inspection report; 2. Check Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; and 4. Advise ER on effectiveness of proposed remedial measures.	1. Notify the Contractor; 2. in consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented; and 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 damage and undertake any necessary replacement. Stop relevant portion of works as determined by ER until the non-conformity is abated.

11 HAZARD TO LIFE

11.1 Introduction

11.1.1 Potential hazards relate to the storage and use of explosives for the construction of the tunnel and relocated DHSRs have been addressed in the EIA report. Based on the proposed construction programme and the blasting frequencies, the Project will not involve any overnight storage of explosives. Transportation of explosives to site for cavern and tunnel construction will be undertaken on a daily basis. The contractor is required to destroy any unused explosives before nightfall.

11.1.2 The EIA study concluded that there is no unacceptable risk is anticipated during the construction and operation phases of the Project. Considering no overnight storage of explosives under this Project, environmental monitoring and audit is not required.

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 and IEC by the Contractor.

12.1.3 Regular site inspections shall be carried out and led by the ER and attended by the Contractor and ET 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 shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:

a) EIA Report recommendations on environmental protection and pollution control mitigation measures;

b) works progress and programme;

c) individual works methodology proposals (which shall include the proposal on associated pollution control measures);

d) contract specifications on environmental protection;

e) relevant environmental protection and pollution control legislations; and

f) previous site inspection results.

12.1.4 The Contractor shall keep the ER 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, 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 Environmental Compliance

12.2.1 There are statutory requirements on environmental protection and pollution control requirements with which construction activities must comply.

12.2.2 In order to ensure the works comply with corresponding requirements, all method

statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader to ensure sufficient environmental protection and pollution control measures have been included. The Project Implementation schedule (PIS) is summarised in **Appendix 4B**. Any proposed changes to the mitigation measures shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.

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

12.2.4 The Contractor should provide the update of the relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, method statements, any application letters for different licences/permits under the environmental protection laws, and copies of all valid licences/permits. The site diary and environmental records shall also be available for inspection by the relevant parties.

12.2.5 After reviewing the document, the ET shall advise the IEC and Contractor of any non-compliance with legislative requirements on environmental protection and pollution control so that they can timely take follow-up actions as appropriate. If the follow-up actions may still result in potential violation of environmental protection and pollution control requirements, the ER and ET should provide further advice to the Contractor to take remedial action to resolve the problem.

12.2.6 Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The ER and ET shall follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

12.3 Choice of Construction Method

12.3.1 At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA Study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the Project. It is the responsibility of the Contractor and ET, in accordance with established standards, guidelines and EIA Study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma as shown in **Appendix 12A** to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

12.4 Environment Complaints

12.4.1 The following procedures should be undertaken upon receipt of any environmental complaint:

- The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
- 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;

- 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;
- 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;
- The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- 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;
- 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
- 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 relevant environmental monitoring data (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 (e.g. noise, dust, water quality etc) 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 and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly 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 baseline monitoring report shall include at least the following:

i. Up to half a page executive summary;

ii. brief project background information;

iii. drawings showing locations of the baseline monitoring stations;

iv. 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;

v. 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;

vi. determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;

vii. revisions for inclusion in the EM&A Manual; and

viii. comments, recommendations and conclusions.

13.3 Monthly Monitoring 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 should prepare and submit a Baseline Environmental Monitoring Report at least one month before commencement of construction of the Project. Copies of the Baseline Environmental 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.

13.3.3 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.

<u>First Monthly EM&A Report</u>

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

i. Executive summary (1-2 pages);
- breaches of Action and Limit levels;
- complaint log;
- notifications of any summons and successful prosecutions;
- reporting changes; and
- future key issues.

ii. Basic project information:
- project organization including key personnel contact names and telephone numbers;
- programme;
- management structure; and
- works undertaken during the month.

iii. Environmental status
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIA Ordinance, 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 (with co-ordinates of the monitoring locations).

iv. 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.

v. Implementation status

- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report.

vi. Monitoring result (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.

vii. Reporting 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.

viii. 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;

- 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, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

Subsequent monthly EM&A Report

13.3.5 Subsequent monthly EM&A report shall include at least the following:

i. Executive summary (1-2 pages);
- breaches of Action and Limit levels;
- complaint log;
- notifications of any summons and successful prosecutions;
- reporting changes; and
- future key issues.

ii. Basic project information:
- project organization including key personnel contact names and telephone numbers;
- programme;
- management structure;
- works undertaken during the month; and
- any updates as needed to the scope of works and construction methodologies.

iii. Environmental status
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIA Ordinance, 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.

iv. Implementation status
- advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report.

v. Monitoring result (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.

vi. Reporting 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.

vii. 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;
- 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, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

viii. 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:
  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.

13.4 Final EM&A Review Reports

General

13.4.1 The EM&A programme for construction stage should be terminated upon the completion of the construction activities, while the EM&A programme for operation stage should be terminated upon the completion of operation monitoring.

13.4.2 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.

Final EM&A Review Report for Construction Stage

13.4.3 The final EM&A review report for construction stage (to be submitted after completion of construction activities) should contain at least the following information:

i. Executive summary (1-2 pages):

ii. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

iii. Basic project information including a synopsis of the project organization, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;

iv. A brief summary of EM&A requirements including:

- environmental mitigation measures for construction stage, 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;

v. A summary of the implementation status of environmental protection and pollution control/mitigation measures for construction stage, as recommended in the project EIA Report and summarised in the updated implementation schedule;

vi. Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:

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

vii. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

viii. A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

ix. A description of the actions taken in the event of non-compliance;

x. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;

xi. A review of the validity of EIA predictions for construction stage and identification of shortcomings in EIA recommendations;

xii. Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme for construction stage); and

xiii. Recommendations and conclusions (for example, a review of success of the overall EM&A programme for construction stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

Final EM&A Review Report for Construction Stage

13.4.4 The final EM&A review report for operation stage (to be submitted after completion of operation monitoring) should contain at least the following information:

i. Executive summary (1-2 pages):

ii. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

iii. Basic project information including a synopsis of the project organization, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;

iv. A brief summary of EM&A requirements including:

- environmental mitigation measures for construction stage, 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;

v. A summary of the implementation status of environmental protection and pollution control/mitigation measures for operation stage, as recommended in the project EIA Report and summarised in the updated implementation schedule;

vi. Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:

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

vii. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

viii. A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

ix. A description of the actions taken in the event of non-compliance;

x. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;

xi. A review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;

xii. Comments (for example, a review of the effectiveness and efficiency of the

mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme for operation stage); and

xiii. Recommendations and conclusions (for example, a review of success of the overall EM&A programme for operational stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

13.5 Data Keeping

13.5.1 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 and one year following completion of the operation phase monitoring for construction phase EM&A and operational EM&A respectively.

13.6 Interim Notifications of Environmental Quality Limit Exceedances

13.6.1 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 13A**.

END OF TEXT