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1. INTRODUCTION

1.1 Background

- 1.1.1 The Yuen Long Highway (YLH) provides a continuation of Route 9 (viz. New Territories Circular Route) connecting San Tin, Yuen Long and Tuen Mun and forms part of the major road network serving various proposed developments in NWNT, including Hung Shui Kiu, Long Bin, Tin Shui Wai, Lam Tei Quarry (LTQ), Tan Kwai Tsuen, Yuen Long, etc. Upon commissioning of Route 11, YLH will serve as a major road connecting Route 11 and NWNT, facilitating commuters travelling to and from urban areas.
- 1.1.2 In the course of the feasibility study on Route 11, the Traffic Impact Assessment (TIA) revealed that the traffic demands at the section of YLH between LTQ and Tong Yan San Tsuen Interchange (TYSTI) are anticipated to exceed the traffic capacities on or before 2036 upon the commissioning of Route 11 and the progressive intakes of planned developments along YLH, such as Public Housing Developments at Long Bin, Yuen Long South Development, Tan Kwai Tsuen Public Housing Developments, LTQ Developments and Hung Shu Kiu / Ha Tsuen New Development Area, etc.
- 1.1.3 From the above TIA, the projected volume to capacity (V/C) ratio at YLH between LTQ and TYSTI would be 1.1 during peak hours in 2036 and 2041, indicating the onset of congestion. The traffic impact assessments for the NWNT developments put forward by the Civil Engineering and Development Department (CEDD) and the Agreement No. CE 75/2019 (TT) – “Review of Highway Projects - Feasibility Study” managed by the Transport Department (TD) also indicated V/C ratio forecasts of similar order for this section of YLH.
- 1.1.4 To improve the traffic condition and the traffic-carrying capacities of YLH between LTQ and TYSTI, the TIA for Route 11 recommended widening of this road section from a dual three-lane to a dual four-lane carriageway so as to complement the commissioning of Route 11 and support future developments in the NWNT. The TIA forecasted that, after the widening, V/C ratio of YLH between LTQ and TYSTI would be reduced to 0.9 during peak hours in 2036 and 2041.
- 1.1.5 HyD has commissioned AECOM Asia Company Limited in associated with specialist sub-consultants to carry out Agreement No. CE 17/2022 (HY) and undertake an Environmental Impact Assessment (EIA) for Widening of Yuen Long Highway (section between Lam Tei and Tong Yan San Tsuen).

1.2 Project Description

1.2.1 The widening of two sections of YLH, i.e., Lam Tei - Tin Shui Wai West Interchange and Tin Shui Wai West Interchange - Tong Yan San Tsuen Interchange sections, from existing dual-three lane to dual-four lane will increase the road capacity. Overall, the traffic performance will be improved with the widening. Meanwhile, the section of YLH at Tin Shui Wai West Interchange will operate with sufficient capacity in all cases. Therefore, TSWWI section would be maintained 3 lanes.

1.2.2 The overall Project includes:

- Widening of an approximately 1000-metre-long at-grade road section (with 20m long x 8m wide bridge deck at Shui Fu Road) of YLH between Lam Tei Quarry Interchange (LTQI) and Tin Shui Wai West Interchange (TSWWI) (the road levels at about +24 to +37 mPD) from existing dual-three lane to dual-four lane (additional 7.3m width carriageway) at eastbound and one side of the existing YLH supported by slope works, and existing central divider will be adjusted toward south between LTQI and future Ping Shan South Housing Development (PSS), and toward north between PSS and TSWWI;
- Widening of an approximately 600-metre-long at-grade road section of YLH between Tin Shui Wai West Interchange and Tong Yan San Tsuen Interchange (the road levels at about +14 to +19 mPD) from existing dual-three lane to dual-four lane (additional 7.3m width carriageway) at westbound and one side of the YLH support by retaining structures, and existing central divider will be adjusted toward south between TSWWI and TYSYI;
- Widening of an approximately 300-metre-long at-grade slip road connecting Hung Tin Road (southbound) to Yuen Long Highway (eastbound) (the road levels at about +13 to +14 mPD) from existing one lane to two lanes (additional 3.65m width carriageway) support by retaining structures;
- Associated works including civil, geotechnical, slope, road drainage, waterworks, utilities, public lighting, landscaping works, sign gantries modification, noise barrier upgrading/re-provisioning works due to the widening of Yuen Long Highway, traffic control and surveillance system, re-provisioning of facilities affected by the proposed road works and environmental mitigation measures; and
- The interfacing works with other projects including
 - Proposed waterworks along YLH eastbound (between Tan Kwai Tsuen Road and Hung Tin Road) under Agreement No. CE 71/2020 (CE) - Hung Shui Kiu / Ha Tsuen New Development Area
 - Proposed roadworks along YLH westbound (between TYSYI and TSWWI) under Agreement Nos. CE 58/2019(CE) & CE 16/2022(CE) for Yuen Long South Development
 - Proposed roadworks at TSWWI and at slip road connecting Hung Tin Road (northbound) under Agreement No. CE 16/2022(CE) for Yuen Long South Development
 - Proposed roadworks along YLH eastbound (between Tai To Tsuen Road and TSWWI) under Agreement No. CE 16/2022(CE) for Yuen Long South Development

1.3 Designated Projects under EIAO

1.3.1 A Project Profile (No.PP-647/2022) was submitted to EPD on 6 June 2022 for application for an Environmental Impact Assessment (EIA) Study Brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) and the EIA Study Brief No. ESB-356/2022 for the Project was issued on 14 July 2022 under the EIAO.

1.3.2 The Project is classified as a Designated Project (DP) under

Part I, Item A.1 of Schedule 2 of the EIAO – A carriageway for motor vehicles that is an expressway, trunk road, primary distributor road or district distributor road.

- the road widening of road section of Yuen Long Highway which is an expressway; and
- the road widening of a slip road connected from Hung Tin Road (district distributor) southbound to Yuen Long Highway eastbound.

1.4 Construction Programme

1.4.1 The Project construction works are anticipated to commence in Year 2028 and complete by Year 2032. A tentative construction programme is provided in **Appendix A**.

1.5 Purpose of this Manual

1.5.1 This Environmental Monitoring and Audit (EM&A) Manual has been prepared in accordance with the EIA Study Brief (No. ESB-356/2022) and Annex 21 of the Technical Memorandum of Environmental Impact Assessment Process (Annex 21 of EIAO-TM). Also, the purpose of this Manual also includes a) Specify the requirements for monitoring equipment, b) Propose environmental monitoring points, monitoring frequency, etc., c) Propose Action and Limit Levels; and d) Propose Event and Action Plans. The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setups of an EM&A programme to ensure compliance with the EIA study recommendations, to assess the effectiveness of the recommended mitigation measures, and to identify any further need for additional mitigation measures or remedial action. This manual outlines the monitoring and audit programme for construction and operation phase of the Project. It aims to provide systematic procedures for monitoring, auditing, and minimizing environmental impact associated with construction works and operational activities. These mitigation measures and their implementation requirements are presented in **Appendix B**.

1.5.2 Hong Kong environmental regulations have served as environmental standards and guidelines in the preparation of this Manual. In addition, the EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the EIAO-TM.

1.5.3 The EIA Study indicates that an EM&A programme will be required for the pre-construction, construction and post-construction/ operation phases of this Project. A summary of the requirements for each of the environmental parameters is detailed in **Table 1.1**.

Table 1.1 Summary of EM&A Parameters

Parameters	Phase		
	Pre-Construction	Construction	Post-Construction / Operation
Air Quality	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Site inspection and audit Impact monitoring 	<ul style="list-style-type: none"> Not required
Noise	<ul style="list-style-type: none"> Baseline monitoring 	<ul style="list-style-type: none"> Site inspection and audit Impact monitoring 	<ul style="list-style-type: none"> Impact monitoring
Water Quality	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Site inspection and audit 	<ul style="list-style-type: none"> Not required
Waste Management	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Site inspection and audit 	<ul style="list-style-type: none"> Not required
Land Contamination	<ul style="list-style-type: none"> Re-appraisal for Potentially Contaminated sites 	<ul style="list-style-type: none"> Site inspection and audit 	<ul style="list-style-type: none"> Not required
Ecology	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Site inspection and audit 	<ul style="list-style-type: none"> Not required
Landscape and Visual	<ul style="list-style-type: none"> Baseline monitoring 	<ul style="list-style-type: none"> Site inspection and audit 	<ul style="list-style-type: none"> Site inspection and audit
Cultural Heritage	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Not required 	<ul style="list-style-type: none"> Not required

1.5.4 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER) or Project Proponent, Environmental Team (ET) and Independent Environment Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the Project;
- Project organisation 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 field 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.

1.5.5 For the purpose of this Manual, 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.

1.6 Project Organization

1.6.1 Involvement of relevant parties in a collaborative and interactive manner is essential for the implementation of the recommended EM&A programme. The following sections outline the primary responsibilities and duties of the key EM&A programme participants. The proposed project organization and lines of communication with respect to EM&A works are shown in **Figure 1.2**.

The Contractor

1.6.2 The Contractor shall report to the ER. The duties and responsibilities of the Contractor comprise the following:

- Work within the scope of the contract and other tender conditions with respect to environmental requirements;
- Operate and strictly adhere to the guidelines and requirements in this EM&A programme and contract specifications;
- Provide assistance to ET in carrying out monitoring and auditing;
- Participate in the site inspections undertaken by ET as required, and undertake correction actions;
- Provide information / advice to ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
- Submit proposals on mitigation measures in case of exceedance of Action and Limit levels in accordance with the Event / Action Plans;
- Implement measures to reduce impact where Action and Limit levels are exceeded;
- Establish a 24-hour hotline dedicated to the project to receive and respond to complaints or inquiries from the public.; and
- Adhere to the procedures for carrying out complaint investigation

Environmental Team (ET)

1.6.3 An ET shall be established before the commencement of construction of the Project. The ET shall be an independent party from the IEC and the Contractor. The ET shall be led and managed by an ET leader, who shall possess at least 7 years of experience in EM&A and/or environmental management. 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 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.

1.6.4 The duties and responsibilities of the ET are:

- Implementation of EM&A programme;
- Set up all the required environmental monitoring stations;
- Monitor various environmental parameters as required in this EM&A Manual;
- Analyse the environmental monitoring and audit 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;
- Carry out regular site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems; carry out ad hoc site inspections if significant environmental problems are identified;
- Audit and prepare monitoring and audit reports on the environmental monitoring data and site environmental conditions;
- Report to the Contractor of any potential non-compliance;
- Follow up and close out non-compliance actions;
- Report on the environmental monitoring and audit results to the Independent Environmental Checker, 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;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- On as-needed basis, verify and certify the environmental acceptability of the EP holder's construction methodology (both temporary and permanent works), relevant design plans and submissions under the EP;
- Liaise with Independent Environmental Checker (IEC) on all the performance matters, and timely submission of all the EM&A performance for IEC's approval;
- Timely submission of the EM&A report to the Project Proponent and the EPD; and
- Adhere to the procedures for carrying out complaint investigation in accordance with **Section 10.3** of this EM&A Manual.

Engineer or Engineer's Representative (ER) or Project Proponent

1.6.5 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 EM&A may include:

- 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 impact in accordance with the Event and Action Plans;
- Participate in joint site inspection undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation

Independent Environmental Checker (IEC)

1.6.6 An IEC shall be employed before commencement of construction of the Project. Appointment of IEC shall be approved by EPD. The IEC, who possesses at least 7 years' experience in EM&A and/or environmental management, shall be an independent party from the Contractor and the ET. The IEC shall report directly to EPD on matters relating to the EM&A programme and environmental impact from the Project. For IEC, the appointment of IEC shall be approved by the DEP before being appointed by the project proponent. 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 during construction stage of the Project. The duties and responsibilities of the IEC are:

- Review and audit the implementation of the EM&A programme and the overall level of environmental performance being achieved ;
- Carry out random sample check and audit the monitoring activities and results (at least at monthly intervals);
- Conduct random site inspection;
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring stations, monitoring procedures and locations of sensitive receivers;
- Review the EM&A reports submitted by the ET;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- Review and advise the ET and ER on the effectiveness of the remedial measures proposed by the Contractor in accordance to Event and Action Plan;
- On an as needed basis, audit the Contractor's construction methodology and agree the appropriate, reduced impact alternative in consultation with relevant parties;
- Report the findings of site audits and other environmental performance reviews to relevant parties.
- 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; and
- Adhere to the procedures for carrying out complaint investigation

1.6.7 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.

1.7 Structure of the EM&A Manual

1.7.1 Following this introductory section, the remainder of the Manual is set out as follows:

- Section 2 – Sets out EM&A requirement for air quality;
- Section 3 – Sets out EM&A requirement for noise;
- Section 4 – Sets out EM&A requirement for water quality;
- Section 5 – Sets out EM&A requirement for waste;
- Section 6 – Sets out EM&A requirement for land contamination;
- Section 7 – Sets out EM&A requirement for ecology;
- Section 8 – Sets out EM&A requirement for landscape and visual impact;
- Section 9 – Sets out EM&A requirement for cultural heritage;
- Section 10 – Describes scope and frequency of environmental site audits and sets out the general requirements of the EM&A programme; and
- Section 11 – Details the EM&A reporting requirements

2. AIR QUALITY

2.1 Introduction

- 2.1.1 Potential air quality impact associated with the construction and operation phases of the Project has been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.4, Appendix B, and Appendix B-1 of the EIA Study Brief. The assessment results indicated that no adverse air quality impact arisen from the construction of the Project with the implementation of the proposed mitigation measures. Continuous respirable suspended particulate (RSP) and fine suspended particulates (FSP) monitoring by sensors is proposed during construction phase of the Project.
- 2.1.2 Regular site environmental audit is recommended to be conducted during the entire construction phase of the Project so as to ensure the implementation of the proposed dust mitigation measures and dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, and the use of approved non-road mobile machinery stipulated in Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation. Implementation schedule of mitigation measures are presented in **Appendix B**.
- 2.1.3 Potential air quality impact from operation of the Project was also assessed. The assessment results demonstrated that no adverse air quality impact during the operation phase of the Project. Therefore, environmental monitoring and auditing is considered not necessary for this Project.
- 2.1.4 This section presents the requirements, methodology, equipment, monitoring locations, criteria, and protocols for monitoring and auditing of air quality impact during construction phase of the Project.

2.2 Monitoring Parameters

- 2.2.1 The major dusty construction activities of the Project include site clearance, excavation, slope works, earth works, piling, handling of construction materials, and wind erosion of construction sites. Continuous Monitoring of RSP and FSP is recommended at the proposed monitoring locations during construction phase of the Project.
- 2.2.2 The criteria against which ambient air quality monitoring to be assessed are tabulated in **Table 2.1**. These levels are not to be exceeded at ASRs.

Table 2.1 Action and Limit Levels for Air Quality Impact Monitoring

Action Level	1-hour RSP level = 150 µg/m ³
Limit Level	24-hour RSP level (rolling average) = 100 µg/m ³
	24-hour FSP level (rolling average) = 50 µg/m ³

- 2.2.3 Continuous Monitoring and audit of RSP and FSP levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected, and timely action shall be undertaken to rectify such situation.
- 2.2.4 Continuous RSP and FSP monitoring should be measured to indicate the impact of construction dust on air quality. Direct reading method which is capable of producing comparable results with the Federal Reference Method (FRM) for RSP and FSP (Part 50 Chapter 1 Appendices J and L, Title 40 of the Code of Federal Regulations of the USEPA) can be used.
- 2.2.5 All relevant data including temperature, pressure, weather conditions, other special phenomena, and work progress of the concerned sites, etc., should be recorded down in detail. A sample data sheet is shown in **Appendix C**.

2.3 Monitoring Equipment

- 2.3.1 Sensors capable of producing comparable results with FRM for RSP and FSP shall be provided for continuous construction dust monitoring.
- 2.3.2 The ET shall be responsible for the provision of the monitoring equipment. He/she shall ensure that sufficient number of sensors with appropriate calibration kit is available for carrying out the continuous impact monitoring, and ad-hoc monitoring. The sensors shall be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturer's operating manual.
- 2.3.3 Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning at monthly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated before each on-site calibration. The calibration data shall be properly documented for future reference by the concerned parties such as the IEC. All the data shall be converted into standard temperature and pressure conditions.
- 2.3.4 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the ER and the IEC. The following points shall be observed when installing and operating wind data monitoring equipment:
- The wind sensors shall be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by buildings;

- The wind data shall be captured by a data logger. The data recorded in the data logger shall be downloaded periodically for analysis at least once a month;
- The wind data monitoring equipment shall be re-calibrated at least once every six months; and
- Wind direction should be divided into 16 sectors of 22.5 degrees each.

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

2.4 PM Sensor Performance Quality Control

Transfer Standard (TS)

2.4.1 A TS is another PM monitor that is at least as capable as the sensor to be calibrated. Another sensor that has just been calibrated may serve the purpose provided its performance is known to be stable during the subsequent collocation period to be used as TS. Right before each on-site calibration, the TS itself needs to be calibrated e.g. collocating with an PM reference monitor - such as the FRM or FEM PM monitor at the accredited laboratories or research institutes - that has been calibrated against traceable standard. The TS/reference monitor collocation should last for at least seven days.

On-site calibration

2.4.2 The TS should be placed near (<1 m if practicable) the sensor to be calibrated so that both devices would be monitoring a similar environment. The TS is then turned on to warm-up for 30–60 minutes. The collocation period starts after the warm-up and TS is then left running with the sensor to be calibrated for at least three hours. The measurements from the sensor to be calibrated and the TS during the collocation period will be statistically analyzed.

Quality Control Criteria

2.4.3 The response of the sensor should be adjusted if its performance during on-site calibration does not meet the following evaluation criteria. For each device, data below its detection limit will be excluded.

Tier 1: Correlation

2.4.4 The minute average measurements from the two devices when subject to linear regression should have a coefficient of determination (R^2) > 0.7. The regression line slope should be between 0.75 to 1.25. If these criteria are not met due to narrow range of PM concentration (>30 $\mu\text{g}/\text{m}^3$ and >25 $\mu\text{g}/\text{m}^3$ as recommended span range for RSP and FSP, respectively) during the collocation period, Tier 2 will apply.

Tier 2: Root Mean squared error

2.4.5 The root mean squared error of the sensor minute average measurements should be <8 $\mu\text{g}/\text{m}^3$ for RSP and <5 $\mu\text{g}/\text{m}^3$ for FSP.

Frequency

2.4.6 Each deployed sensor should be calibrated every month. If a sensor repeatedly failed in 2 or 3 consecutive calibrations, the sensor should be checked and maintained to improve its performance, or it should be replaced.

2.4.7 Please note that this Quality Control Protocol maybe subject to change.

2.5 Monitoring Locations

2.5.1 The selected monitoring locations are the worst potentially affected air sensitive receivers (ASRs) located in the vicinity of construction sites. The proposed air quality monitoring locations during construction phase are listed in **Table 2.2** below and shown in **Figure 2.1**.

Table 2.2 Proposed Construction Dust Monitoring Stations

Monitoring Station ID	ASR ID in EIA Report	Location	Approximate horizontal distance from the project boundary (m)
CDM1	A1	Temporary Structure at Fuk Hang Tsuen	69
CDM2	PA8	Proposed School at Tan Kwai Tsuen	30
CDM3	A4	Temporary Structure at Wo Ping San Tsuen	19
CDM4	A7	349 Tan Kwai Tsuen	32
CDM5	A5	174B Tan Kwai Tsuen	21
CDM6	A6	345 Tan Kwai Tsuen	32
CDM7	A10	370 Tan Kwai Tsuen	14
CDM8	A12	Temporary Structure at Tai Tao Tsuen	<1
CDM9	A13	House 30 Uptown	17
CDM10	A16	142 Tai Tao Tsuen	30
CDM11	A19	176A Fui Sha Wai	15
CDM12	A30	Hop Hing Building	1
CDM13	A21	Tong Yan San Tsuen Garden	77
CDM14	A20	Jasper Court	29
CDM15	PA1	Proposed School at Long Bin	104
CDM16	A14	Agnes Wise Kindergarten	24
CDM17	PA11	Proposed Public Housing at Lam Tei North	93
CDM18	A18	House 33 Park Villa	182
CDM19	N/A	Temporary Structure at Tai Tao Tsuen	4
CDM20	N/A	177 Fui Sha Wai	25

2.5.2 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 IEC and agreement from EPD on the proposal.

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

- At the site boundary or such locations close to the major dust emission source;
- Close to the air sensitive receivers as defined in the EIAO-TM;
- Proper position/sitting and orientation of the monitoring equipment; and
- Take into account the prevailing meteorological conditions.

2.5.4 The ET shall agree with the IEC on the position of the sensors for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

- A platform with appropriate support to secure the sensors against gusty wind shall be provided;
- No two sensors shall be placed less than 2 meters apart;
- The distance between the sensor and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sensor;
- A minimum of 2 meters of separation from any supporting structure, measured horizontally, is required;
- No furnace or incinerator flue is nearby;
- Airflow around the sensor is unrestricted;
- The sensor is more than 20 meters from dripline;
- Any wire fence and gate, to protect the sensor, shall not cause any obstruction during monitoring;
- Permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- A secured supply of electricity is needed to operate the samplers.

2.6 Impact Monitoring

2.6.1 The ET shall carry out impact monitoring during construction phase of the Project. Construction dust monitoring shall be carried out at the designated monitoring station when there are project-related construction activities being undertaken within a radius of 500m from the monitoring stations. In case of non-compliance with the air quality criteria, actions specified in the Action Plan in the following section, should be conducted. The impact monitoring programme is summarized in **Table 2.3**.

2.6.2 Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the impact monitoring results.

Table 2.3 Summary of Construction Dust Monitoring Programme

Monitoring Period	Duration	Sampling Parameter	Action Level	Limit Level
Impact monitoring	Throughout construction phase, when there are project-related construction activities undertaken within 500m of the designated monitoring stations	1-hour RSP in $\mu\text{g}/\text{m}^3$	150	--
		24-hour averaged RSP in $\mu\text{g}/\text{m}^3$ (rolling average)	--	100
		24-hour averaged FSP in $\mu\text{g}/\text{m}^3$ (rolling average)	--	50

2.7 Event and Action Plan

- 2.7.1 The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour and 24-hour average RSP and 24-hour average FSP. **Table 2.1** shows the air quality criteria, namely Action Limit Levels to be used. The action and limit levels may subject to the change based on the prevailing AQOs implemented at the time of the dust monitoring works.
- 2.7.2 In case of non-compliance with the air criteria, actions in accordance with the Action Plan in **Table 2.4** should be conducted.

Table 2.4 Event and Action Plan for Air Quality

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sample	<ol style="list-style-type: none"> 1. Notify IEC and ER; 2. Check the monitoring data and error messages to confirm if the performance of the monitoring equipment is normal; 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures are properly implemented. 	<ol style="list-style-type: none"> 1. Identify sources of exceedance and discuss with ER, ET and IEC on possible remedial measures; 2. Implement remedial measures; 3. Amend working methods if appropriate.
Action level exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Notify IEC and ER; 2. Check the monitoring data and the performance of the monitoring equipment (refer to Appendix E); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method and verify the performance of the monitoring equipment to be checked by ET (refer to Appendix E); 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET and ER on the effectiveness of the proposed remedial measures; and 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the proposal for remedial measures to be implemented; 4. Ensure the proposal for remedial measures are properly implemented. 	<ol style="list-style-type: none"> 1. Identify source and discuss with ER, ET and IEC on possible remedial measures; 2. Submit proposals for remedial measures to the ER, ET and IEC within 2 working days of notification for agreement; 3. Implement the agreed proposals; and 4. Amend proposal if appropriate.

Event	Action			
	ET	IEC	ER	Contractor
	measures and keep IEC and ER informed of the results until exceedance stops. 6. Notify EPD if the exceedance is confirmed to be related to the Project.	5. Supervise Implementation of remedial measures.		
Limit level exceedance for one 24-hr rolling average RSP concentration record or/and one 24-hr rolling average FSP concentration record	<ol style="list-style-type: none"> 1. Notify IEC, ER, Contractor and EPD; 2. Check the monitoring data and the performance of the monitoring equipment (refer to Appendix E); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial 4. Discuss with IEC, ER and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops. 6. Notify EPD if the exceedance is confirmed to be related to the Project. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ET; 2. Check Contractor's working method; and verify the performance of the monitoring equipment to be checked by ET (refer to Appendix E); 3. Discuss with ER, ET, and Contractor on the possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Review Contractor's remedial measures whenever necessary to assure their effectiveness and advise the ER accordingly; and 6. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with the ET and IEC, agree with the Contractor on the proposal for remedial measures to be implemented; 4. If exceedance continues, identify 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 the sources and discuss with ER, ET and IEC on possible remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit a proposal for remedial measures to the ER, IEC and ET within 2 working days of notification of exceedance for agreement; 4. Implement the agreed proposal; 5. Review and resubmit proposals if problem is still not under control; and 6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

2.8 Mitigation Measures

- 2.8.1 Mitigation measures for construction phase air quality impact have been recommended in the EIA Report. All the recommended mitigation measures are detailed in the implementation schedule in **Appendix B**. The Contractor shall be responsible for the design and implementation of these measures.

2.9 Audit Requirements

- 2.9.1 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.

3. NOISE

3.1 Introduction

- 3.1.1 The EIA Report has assessed the potential construction noise impact and operational road traffic noise impact from the Project.
- 3.1.2 Recommendations on construction noise mitigation measures have been presented in the EIA to mitigate noise impact. A noise monitoring and audit programme is recommended to be undertaken to confirm the proposed mitigation measures have been implemented properly.
- 3.1.3 Direct mitigation measures including provision of low noise road surfacing, noise barriers, and acoustic windows would be required along the roadworks within the Project area to alleviate traffic noise impact. Road traffic noise levels should be monitored at representative noise sensitive receivers (NSRs), which are in vicinity of the recommended direct mitigation measures, during the first year after road opening. The purpose of traffic noise monitoring is to ascertain that the recommended mitigation measures are effective in reducing noise levels.
- 3.1.4 In this section, the requirements, methodology, equipment, monitoring locations, criteria, and protocols for monitoring and auditing of noise impact during construction and operation phase of the Project are presented.

3.2 General Monitoring Requirements and Equipment

- 3.2.1 Referring to the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out 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 shall be accepted as valid only if the calibration level from before and after noise measurement agree to within 1.0 dB.
- 3.2.2 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 wind speed in m/s.
- 3.2.3 The ET is responsible for the provision of monitoring equipment. He/she shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The equipment installation location shall be proposed by the ET leader and agreed with the IEC and EPD.
- 3.2.4 Noise monitoring station shall normally be at a point 1 m from the exterior of the sensitive receivers building façade and be a position 1.2 m above ground. If there is a problem with access to the normal monitoring position, an alternative position shall 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, baseline monitoring and impact monitoring shall be carried out at the same positions.

3.3 Monitoring Parameters for Construction Noise

- 3.3.1 Construction noise levels shall be measured for time period between 07:00 and 19:00 on normal weekdays using 30-minute A-weighted equivalent continuous sound pressure level ($L_{eq(30-min)}$) as the monitoring parameter.
- 3.3.2 Supplementary information for data auditing and statistical results such as L_{10} and L_{90} should also be obtained for reference. A sample data record sheet for construction noise monitoring is shown in **Appendix C** for reference. The ET leader may modify the data record sheet for this EM&A programme but the format of which should be agreed by the IEC.

3.4 Monitoring Locations for Construction Noise

- 3.4.1 The proposed noise monitoring stations during construction phase are shown in **Figure 3.1**. Details of the proposed noise monitoring stations are summarized in **Table 3.1**.

Table 3.1 Proposed Noise Monitoring Stations during Construction Phase of the Project

Noise Monitoring Point	NSR ID in EIA Report	Location
CNM1	WPST	Wo Ping San Tsuen
CNM2	TKT	Tan Kwai Tsuen
CNM3		
CNM4		
CNM5		
CNM6		
CNM7	BT	Buddhist Temple
CNM8	TTT	Tai Tao Tsuen
CNM9		
CNM10		
CNM11	UT	Uptown
CNM12		Agnes Wise Kindergarten
CNM13	LR	Le Regent
CNM14	FSW	Fui Sha Wai
CNM15		
CNM16	STT	Sha Tseng Tsuen
CNM17	JC	Jasper Court
CNM18 ^[1]	TKTPH	Planned Public Housing at Tan Kwai Tsuen
CNM19 ^[1]		
CNM20 ^[2]	LB	Planned School at Long Bin Public Housing Development

Note:

[1] The tentative construction period of the Project is Year 2028 to Year 2032. According to the technical reports for Section 16 Planning Application to be submitted to Planning Department, the tentative first population intake for Tan Kwai Tsuen Public Housing Development is Year 2029 to Year 2031. Therefore, future occupants at TKTPH may be affected by the construction of the Project. Noise monitoring at TKTPH shall be carried out upon occupation.

[2] The tentative construction period of the Project is Year 2028 to Year 2032. According to Preliminary Environmental Review Report for 'Site Formation and Infrastructure Works for Public Housing Developments at Long Bin, Yuen Long – Investigation, Design and Construction', the tentative first population intake year for Phase 2 for Long Bin Public Housing Development is Year 2029 - Year 2031. Therefore, future occupants at LB may be affected by the construction of the Project. Noise monitoring at LB shall be carried out upon occupation.

- 3.4.2 The status and location of NSRs may change after issuing this manual. If such case exists, the ET leader should propose updated monitoring locations and seek approval from IEC and ER, and agreement from EPD before impact monitoring commences.

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

- Alternative locations should be similarly exposed to potential noise impacts;
- It should be close to the NSRs; and
- It should be located where there would be minimal disturbance to the occupants.

3.5 Baseline Monitoring for Construction Noise

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

3.5.2 During baseline monitoring, there shall not be any construction activities in vicinity of the monitoring stations.

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

3.6 Impact Monitoring for Construction Noise

3.6.1 Construction noise monitoring should be carried out at the designated monitoring stations when there are Project-related construction activities being undertaken within 300m radius from the monitoring stations. An initial guide to noise monitoring is to obtain one set of 30-minute measurement at each station between 07:00 and 19:00 hours on normal weekdays at a frequency of once per week when construction activities are underway.

3.6.2 If construction works are extended to include works during the hours of 19:00 to 07:00 (the next day), and/or percussive piling is to be carried out, applicable permits under NCO shall be obtained by the Contractor. The monitoring requirements and conditions, if any, stipulated in the permits must be followed.

3.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the EAP in 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.

3.7 Event and Action Plan for Construction Noise

3.7.1 The Action and Limit levels for construction noise are defined in **Table 3.2**. Should non-compliance with the criteria is identified, action in accordance with the EAP in shall be carried out.

Table 3.2 Action and Limit Levels for Construction Noise

Noise Sensitive Uses	Period of Time	Action Level	Limit Level, dB(A)
Domestic Premise	07:00 to 19:00 on normal weekdays	When one documented complaint is received	75
Place of Public Worship			70
Education Institution			70 ⁽²⁾
Note: (1) If works are to be carried out during restricted hours (i.e., 19:00 to 07:00 on the next day) and/or percussive piling is to be carried out, the monitoring requirements and the conditions, if any, stipulated in the CNP issued by the Noise Control Authority shall be followed. (2) Limit level is reduced to 65 dB(A) for schools during school examination period.			

Table 3.3 Event and Action Plan for Construction Noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. Notify IEC, ER, and the Contractor; 2. Carry out investigation; 3. Report the results of the investigation to the IEC, ER, and the Contractor	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing; 2. Notify the Contractor; 3. Require the Contractor to propose remedial measures for the analysed noise problem; 4. Review and agree on the remedial measures proposed by the Contractor for the analysed noise problem; and 5. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC; and 2. Implement noise mitigation proposals.
Limit Level	1. Identify source;	1. Discuss amongst ER, ET, and the	1. Confirm receipt of notification	1. Take immediate action to avoid

Event	Action			
	ET	IEC	ER	Contractor
	<ol style="list-style-type: none"> 2. Inform IEC, ER, EPD, and the Contractor; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out an analysis of the Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER, and EPD on the causes and actions taken for the exceedances; 7. Assess the effectiveness of the Contractor's remedial actions and keep IEC, EPD, and ER informed of the results; and 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> Contractor on the potential remedial actions; 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> of failure in writing; 2. Notify the Contractor; 3. Require the Contractor to propose remedial measures for the analysed noise problem; 4. Review and agree on the remedial measures proposed by the Contractor for the analysed noise problem; 5. Ensure remedial measures are properly implemented; and 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated. 	<ol style="list-style-type: none"> further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notifications; 3. Implement the agreed proposals; 4. Resubmit proposals if the problem is still not under control; and 5. Stop the relevant portion of works as determined by the ER until exceedance is abated.

3.8 Noise Parameters for Operational Road Traffic Noise

3.8.1 The ET should carry out monitoring of road traffic noise after the works under Contract are completed and upon commencement of operation of the Project. Noise monitoring should be carried out during the first year of operation phase. Road traffic noise during operation of the Project should be measured in terms of A-weighted equivalent of L_{10} (1-hr). During traffic noise measurement, traffic count including traffic volume, percentage of heavy vehicles as defined in Calculation of Road Traffic Noise (CRTN) and traffic speed should also be undertaken concurrently. Supplementary information

for data auditing and statistical results such as L_{eq} and L_{90} should also be obtained for reference.

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

3.9 Monitoring Locations for Operation Road Traffic Noise

- 3.9.1 The most affected NSRs identified in the EIA Report are selected as the noise monitoring locations in this EM&A manual. Traffic noise monitoring locations during operation phase are listed in **Table 3.4** and shown in **Figure 3.2**. The locations for operation noise monitoring shall be defined during detailed design on the basis of the status of the most up-to-date information on proposed developments surrounding the Project.

Table 3.4 Road Traffic Noise Monitoring Locations

Monitoring Station ID	NSR ID in EIA Report	Location	Proposed Mitigation Measures Nearby
TMN1	LR	146 Tai Tao Tsuen	LNRS1
TMN2	UT	Uptown Tower 8	N1
TMN3	TKTPH	Planned Public Housing Development at Tan Kwai Tsuen	N2, N3, N4
TMN4	PSS	Planned Public Housing Development at Ping Shan South	N2, N3, N4

- 3.9.2 The status and locations of NSRs may change after issuing this manual. In this event, the ET leader shall propose updated monitoring locations and seek approval from IEC and agreement from EPD of the proposal.

- 3.9.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria in that they should be:

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

3.10 Impact Monitoring for Operation Road Traffic Noise

- 3.10.1 Traffic noise monitoring shall be carried out at all the designated traffic noise monitoring stations. The following is an initial guide on the traffic noise monitoring requirements during operation phase:

- One set of measurements at morning traffic peak hour on normal weekdays;
- One set of measurements at evening traffic peak hour on normal weekdays;

- A concurrent census of traffic flow and percentage heavy vehicle shall be conducted for the Project roads and the existing road network in vicinity of each measurement point;
 - Average vehicle speed estimated for Project road and the existing road network in vicinity of each measurement point; and
 - The two sets of monitoring data should be obtained within the first year of operation.
- 3.10.2 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 locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. The ET 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.
- 3.10.3 Measured noise levels should be compared with predicted noise levels by applying appropriate conversion corrections to allow for traffic conditions at the time of measurement.
- 3.10.4 Each set of measurements shall include three measurements of 30 minutes. The parameters L_{10} , L_{eq} , L_{90} and L_{max} will be recorded for data auditing and reference.

3.11 Event and Action Plan for Road Traffic Noise

- 3.11.1 For 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.

3.12 Mitigation Measures Construction Phase

- 3.12.1 In order to reduce noise impact from construction site activities on nearby NSRs, the following mitigation measures have been considered:
- Use of quiet construction method / Quality Power Mechanical Equipment (QPME);
 - Use of Noise Barrier, Noise Insulation Fabric, and Noise Enclosure;
 - Good site practices;
 - Scheduling of PME / construction activities; and
 - Construction noise management plan
- 3.12.2 For sheet piles installation, "Press-in" method is more preferable than the use of traditional vibratory hammer due to lesser noise and vibration impact generated. According to the EPD web page, the noise emission of "Press-in" method is 69 dB(A) at 7 m from the silent piler, which is more than 20 dB(A) quieter than the vibratory hammer. The Contractor should prioritise the use of "Press-in" method over the traditional method if site conditions allowed. However, "Press-in" method would also

have its own limitations and thus it should not restrict Contractor to fully adopt the "Press-in" as long as the Contractor can demonstrate the full compliance of daytime noise criteria by using vibratory hammer with proper mitigation measures.

- 3.12.3 The quieter type blade saw was as an alternative for traditional saw which generates high noise level. The quieter type blade saw with higher speed and smoother blade reduces the excitation of vibration and hence the propagation of sound. The sound pressure level of this quieter type blade saw is 76 – 81 dB(A) at 7m from the equipment, which is at least 2 dB(A) quieter than traditional saw.
- 3.12.4 Apart from the above, the Contractor will be required to review and adopt quieter construction methods or technologies to further reduce the noise at its source as far as they are technically feasible and applicable for the proposed construction works. These include non-explosive chemical expansion agent, high pressure water jetting, hand-held concrete crusher, and quieter type wire saw / diamond wire saw. These quieter equipment / construction methods, while not adopted in the assessment, shall be considered during the design, tendering and implementation stage of the construction works as appropriate.
- 3.12.5 The use of QPME is a practicable means to mitigate the construction noise impact. A QPME is defined as a PME having an actual SWL lower than the value specified in the GW-TM. The contractors may adopt alternative QPME as long as it can demonstrate that they would not result in construction noise impacts worse than those predicted in this assessment.
- 3.12.6 Noise barriers or enclosures would be erected to provide screening from the construction plant. Noise barriers will become more effective when located immediately adjacent to the PME and be moved concurrently with the PME along the work site. The Contractor should be responsible for design of the noise barrier/enclosure with due consideration given to the size of the PME and the requirement of intercepting the line of sight between the NSRs and PME. A typical design which has been used locally is a wooden framed barrier with a small cantilevered upper portion of superficial density no less than 14kg/m² on a skid footing with 25mm thick internal sound absorptive lining. Noise barriers should be erected/built in such a way with no openings or gaps on the joints, and should be long enough (e.g., at least five times greater than its height) or be bent around the noise sources to ensure the effectiveness. A cantilevered top cover would be required for the noise barriers to achieve screening benefits at the upper floors of NSRs. It is anticipated that suitably designed noise barriers/enclosures could achieve at least 5 to 10 dB(A) reduction for movable and stationary plants, respectively.
- 3.12.7 In addition, noise insulation fabric (the Fabric) would be installed for PME such as piling rigs and drilling rigs and the Fabric should be lapped such that there would be no opening or gaps on the joints.
- 3.12.8 It is also recommended to implement good site practices as far as practicable to further reduce the noise impact at NSRs. The following good site practices should be followed during the construction phase.
- Only well-maintained plant should be operated on-site and should be served regularly during construction period;
 - Mobile plant, if any, should be sited as far from NSRs as possible;
 - Use of site hoarding as a noise barrier to screen noise at low level NSRs;
 - Machines and plant that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum;

- Silencers or mufflers on construction equipment should be utilized and be properly maintained during construction;
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and
- Material stockpiles should be effectively utilized, wherever practicable, in screening noise from on-site construction activities

3.12.9 The Contractor shall liaise with the school representative(s) to obtain the examination schedule to avoid noisy construction activities during the school examination period. Scheduling construction works outside the school examination period to less intrusive periods or restricting critical works areas would reduce the overall construction noise impacts at the NSRs and ensure compliance with the construction noise criterion.

3.12.10 In addition, the Contractor shall continuously liaise with the contractors of the list of concurrent projects in **Table 3.5** to avoid and minimize the concurrent operation of PMEs. Cumulative construction noise impact at the NSRs shall be assessed in case concurrent operation of PMEs is unavoidable to ensure compliance of relevant noise criteria at the NSRs.

Table 3.5 List of Concurrent Projects

No	Potential Concurrent Projects	Tentative construction period
1	Environmentally Friendly Transport Services in Hung Shui Kiu / Ha Tsuen New Development Area and Adjacent Areas	Phase 1: Year 2027 - 2030/31 Phase 2: Year 2032 - 2036 Phase 3: Year 2034 - 2038
2	Route 11 (Section between Yuen Long and Lantau)	No later than Year 2033
3	Site Formation and Infrastructure Works for Public Housing Developments at Long Bin, Yuen Long	Year 2020 - 2026
4	Site Formation and Infrastructure Works for Public Housing Development near Tan Kwai Tsuen, Yuen Long	Year 2022 - 2027
5	Yuen Long South Development	Year 2022 - 2038
6	Hung Shui Kiu / Ha Tsuen New Development Area	Year 2020 - 2038
7	Potential Sites in Yuen Long Areas 13 & 14 for Housing Development	Year 2025 - 2032

3.12.11 A construction noise management plan should be prepared during the design / tendering and implementation stage of construction works, to verify the inventory of noise sources, assess the effectiveness and practicality of all identified measures, and update construction noise impact assessment and proposed noise mitigation measures as necessary.

Operation Phase

3.12.12 Direct noise mitigation measures including low noise road surface (LNRS) and noise barriers have been proposed to alleviate traffic noise impact. **Table 4.7** to **Table 4.9** in the EIA Report summarize the proposed noise mitigation measures.

- 3.12.13 As confirmed with Housing Department, acoustic window will be installed at the planned public housing development at Ping Shan South and Tan Kwai Tsuen. After implementing the proposed LNRS, noise barriers, and acoustic window, the predicted overall noise levels at all NSRs comply with the relevant noise criteria. Based on the criteria as stated S4.6.12 of the EIA Report, the eligibility test for indirect noise remedies was conducted. According to **Appendix 4.8**, no representative existing NSRs would fall within all the three testing criteria. Therefore, no indirect mitigation measures would be required.
- 3.12.14 The feasibility, practicability, programming, and effectiveness of the above mitigation measures have been reviewed and confirmed by Project Engineer.
- 3.12.15 The implementation schedule for the recommended mitigation measures is presented in **Appendix B**.

3.13 Audit Requirements

- 3.13.1 Regular site environmental audit during construction phase of the Project should be conducted at least once per week to ensure proper implementation of the proposed mitigation measures and good site practices as listed in **Appendix B** and the noise control requirements stated in EPD's "*Recommended Pollution Control clauses for Construction Contracts*" to further minimize the potential noise nuisance during construction phase.
- 3.13.2 Road traffic noise levels should be monitored at representative NSRs, which are in vicinity of the recommended direct mitigation measures, during the first year after road opening. The purpose of monitoring is to ascertain that the proposed noise mitigation measures are effective in reducing traffic noise levels.

4. WATER QUALITY

4.1 Introduction

4.1.1 Potential water quality impacts arising from construction and operation phases of the Project were identified and assessed in the EIA Report. With the implementation of the recommended mitigation measures, no adverse water quality impacts would be expected. No water quality monitoring is therefore considered necessary. Nonetheless, regular site inspections are recommended during the construction phase to ensure the recommended mitigation measures are properly implemented.

4.2 Mitigation measures

4.2.1 Mitigation measures for water quality control during construction phase are recommended in the EIA Report. The Contractor is responsible for the design and implementation of these measures. Recommended mitigation measures to minimize the adverse impacts on water quality by construction activities are listed in the implementation schedule given in **Appendix B**.

4.3 Construction site audits

4.3.1 Implementation of regular site audits is 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. Site audits shall include site inspections and compliance audits.

Site Inspections

4.3.2 Site inspection shall be carried out by the ET and shall be based on the mitigation measures for water pollution control recommended in **Appendix B**. 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

Compliance Audits

4.3.3 Monitoring of the treated effluent quality from the Works Areas is required during construction phase of the Project. The monitoring work shall be carried out at the pre-determined discharge point. Compliance audits are to be undertaken to ensure that a valid discharge license has been issued by EPD prior to the discharge of effluent from the Project site. The monitoring frequency and parameters specified in the discharge license shall be fully considered during the monitoring work. All monitoring requirements shall be approved by EPD. The audit results reflect whether the effluent quality is in compliance with the discharge license requirements. In case of non-compliance, suitable actions shall be undertaken to:

- Notify the site management for non-compliance;
- Identify the sources of pollution;
- Check the implementation status of the recommended mitigation measures;
- Investigate the operating conditions of the on-site treatment systems;
- Implement corrective and remedial actions to improve effluent quality;
- Increase monitoring frequency until the effluent quality is in compliance with the discharge license requirements; and
- Record non-compliance and propose preventive measures.

5. WASTE MANAGEMENT

5.1 Introduction

5.1.1 The quality, quantity and timing for the generation of waste during the construction and operation 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.

5.2 Mitigation Measures Construction Phase

5.2.1 Mitigation measures for waste management recommended in the EIA Report should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor in the construction stage. A 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.

5.2.2 During the site inspections, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices, waste reduction measures and other mitigation measures.

5.2.3 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:

- Chemical Waste Permits / licenses under the Waste Disposal Ordinance (Cap 354);
- Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
- Effluent Discharge Licence under the Water Pollution Control Ordinance (Cap. 358); and

Operation Phase

5.2.4 With the implementation of the recommended mitigation measures for handling, transportation and disposal of the identified waste arisings, no adverse impacts are anticipated during operation phase of the Project. Therefore, no other specific waste monitoring during operation phase is required.

5.2.5 All the proposed mitigation measures are stipulated in the EIA Report and summarised in the EMIS in **Appendix B**.

5.3 Audit Requirement

- 5.3.1 Regular audits and site inspections should be carried out at least once per week 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 B** 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.
- 5.3.2 The requirements of the environmental audit programme are set out in **Section 11** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

6. LAND CONTAMINATION

6.1 Introduction

- 6.1.1 The EIA Report has assessed the potential contaminated land uses associated with the Project, within the land contamination assessment area and the potential impacts on the future land uses.

6.2 Proposed Re-appraisal for Potentially Contaminated sites

- 6.2.1 As the identified concerned areas were inaccessible for detailed site walkover or site investigation (SI) works and were still in operation, and there might be change in land use or operation prior to development which may result in further land contamination issues, further works including site re-appraisal for the identified potential contaminated area are recommended to be carried out prior to commencement of any construction or development works at the identified contaminated sites. The recommended further works, including the submission of Supplementary Contamination Assessment Plan(s) (SCAP(s)), Contamination Assessment Report(s) (CAR(s)) and if necessary, Remediation Action Plan(s) (RAP(s)) and Remediation Report(s) (RR(s)) to EPD for agreement, would follow relevant Guidance Manual, Guidance Note and Practice Guide.

6.3 Construction Phase

- 6.3.1 Remediation works, if necessary, would be carried out after site operation has ceased but prior to the construction works at the concerned sites. Mitigation measures for the remediation works, if necessary, as recommended in the EIA Report, **Appendix B** of this Manual and future RAP(s) should be implemented during the remediation works. EM&A should be carried out in the form of regular site inspection to ensure the recommended mitigation measures are properly implemented and findings of the audit should be reported in the EM&A reports.

6.4 Operation Phase

- 6.4.1 Any contaminated soil/groundwater would be identified and properly treated prior to the construction phase of the project. Additionally, the project would not generate or induce any additional land contamination impact during the operational phases. Therefore, environmental monitoring and auditing for land contamination during the operation phase is considered unnecessary.

7. ECOLOGY

7.1 Introduction

7.1.1 The EIA has recommended ecological mitigation measures for the construction phase and operation phase of the Project. This Section presents the requirements for implementation of the recommended mitigation measures and monitoring of the effectiveness of the implemented measures.

7.2 Mitigation Measures

7.2.1 Site practices for control of construction noise, dust and run-off shall be implemented as far as possible, to avoid any indirect impacts on adjacent habitats and wildlife.

7.2.2 It is proposed that a properly designed temporary drainage system within the site will be implemented and direct discharge away from watercourses downstream to the existing storm drain nearby will occur. The drainage system will be equipped with sand/silt removal facilities to treat the surface run-off. A properly designed temporary drainage system together with standard site practices deployed during the construction phase will minimize the chance of site run-off and the chance of pollution to watercourses downstream.

7.2.3 As a precaution to further minimize bird collision due to the re-provided noise barriers along the new roads, bird friendly design should be adopted for the noise barriers, such as using falcon sticker and tinted materials. The use of transparent/reflective materials should be avoided or minimized.

7.3 Monitoring and Audit Requirements

7.3.1 Any potential bat roosts found on the Chinese Fan-Palm in the vicinity of the Project Site should be inspected by a suitably qualified ecologist and monitored, prior to the commencement of works. If roosts are found, protection measures shall be implemented to avoid any possible construction impact upon the bat roost.

7.3.2 Site audits should be undertaken during the construction phase to check the conditions of the implemented ecological mitigation measures and maintain the measures as per their intended objectives.

8. LANDSCAPE AND VISUAL

8.1 Introduction

8.1.1 The EIA has recommended landscape and visual mitigation measures for the construction phase and operation phase of the Project. This Section presents the requirements for implementation of the recommended mitigation measures and monitoring of the effectiveness of the implemented measures.

8.2 Mitigation Measures

8.2.1 The proposed landscape and visual mitigation measures recommended in Section 9.8 of the EIA should be fully implemented in accordance with the Implementation Schedule in **Appendix B**.

8.2.2 The construction phase mitigation measures should be incorporated in the detailed Project design and should be adopted from commencement of construction. The measures should be in place throughout the entire construction period.

8.2.3 Operational phase mitigation measures should be adopted during the detailed design and be built as part of the construction works to ensure they are fully implemented upon commissioning of the Project.

8.3 Baseline Monitoring

8.3.1 Prior to commencement of construction works, baseline monitoring shall be conducted to check, record and report the baseline conditions of Landscape Resources (LRs) and Landscape Character Areas (LCAs) within the construction site/works area. The baseline conditions of Visually Sensitive Receivers (VSRs) within the zone of visual influence of the Project shall be recorded.

8.3.2 The landscape and visual baseline conditions should be reviewed and compared against the conditions recorded in the EIA. Any 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 Project and/or the proposed mitigation.

8.3.3 A landscape and visual baseline monitoring report including photographic record of the site and the landscape/ visual sensitive receivers shall be prepared by the Contractor and approved by the Engineer's Representative. The approved baseline monitoring report including photographic record shall be submitted to the Project Proponent, ET, IEC and EPD for record.

8.4 Audit Requirement

8.4.1 Site audits should be undertaken during the construction phase and the 12-month establishment period (operation phase) to check the conditions of the implemented landscape and visual mitigation measures and maintain the measures as per their intended objectives. Conditions and growth performance of compensatory planting/ landscape planting should be regularly monitored by qualified specialist of the ET.

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

9. CULTURAL HERITAGE

9.1 Introduction

9.1.1 Desk-top studies and field visits have been conducted to identify cultural heritage resources within 300m assessment area. built heritage were identified within 300m assessment area will not be affected by the Project. In addition, the Sites of Archaeological Interest (SAIs) are identified near the Project. No major archaeological impacts are expected partly or wholly within the Project Limit and the assessment area during the construction and operational phases.

9.2 Impact on Cultural Heritage

9.2.1 No SAI was identified partly or wholly within the Project Limit and assessment area. The nearest SAIs are identified for the Project, two SAIs are identified at about 400m and 350m from the Project Limit at Fu Tei Ha and Nai Wai Kiln respectively. It is anticipated that no SAI will be directly and indirectly affected by the proposed road widening works due to their considerable distance from Yuen Long Highway.

9.2.2 No declared monument , proposed monument, graded historic sites/ buildings/ structure, sites, buildings/ structures in the new list of proposed grading items and Government historic sites are identified within the 300m assessment area. No adverse impact would be anticipated on the historic buildings during the construction and operational phase.

9.2.3 There are four other identified items located within 300m assessment area but outside the Project boundary. Therefore, impacts on built heritage resources are anticipated to be indirect and of insignificance.

9.3 Mitigation Measures

9.3.1 As no SAI and built heritage resources would be affected by the proposed Project, no mitigation measure would be required during the construction phase.

9.3.2 No impact on cultural heritage would be anticipated during the operational phase. Therefore, no mitigation measure would be required for cultural heritage during the operational phase.

9.3.3 As a precautionary measure, Antiquities and Monuments Office (AMO) should be informed immediately in case of discovery of antiquities or supposed antiquities in the course of works, so that appropriate mitigation measures, if needed, can be timely formulated and implemented in agreement with AMO.

9.4 Environmental Monitoring and Site Audit Requirement

9.4.1 As the Project would not generate or induce any additional cultural heritage impact during both construction and operational phases of the Project, monitoring and audit are considered not necessary.

10. SITE INSPECTION / AUDIT

10.1 Site Inspection Requirements

- 10.1.1 Site inspection provides a direct means to trigger and enforce specified environmental protection and pollution control measures. These shall be undertaken regularly and routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. The site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.
- 10.1.2 The ET Leader shall be responsible for formulating the environmental site inspection, the deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall submit a proposal for site inspection and deficiency and remedial action reporting procedures to the Contractor for agreement, and to the ER for approval. The ET's proposal for rectification would be made known to the IEC.
- 10.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control, and mitigation measures within the site. It should also review the environmental situation outside the works area which is likely to be affected, directly or indirectly, by the site activities. The ET shall make reference to the following information in conducting the inspection:
- The EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
 - Ongoing results of the EM&A program;
 - Works progress and programme;
 - Individual works methodology proposals (which shall include proposal on associated pollution control measures);
 - Contract specifications on environmental protection and pollution prevention control;
 - Relevant environmental protection and pollution control laws; and
 - Previous site inspection results undertaken by the ET and others.
- 10.1.4 The Contractor shall keep the ET leader updated with all relevant information on the construction contract necessary for him/her to carry out site inspection. Inspection results and associated recommendations for improvements to environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours for reference and for taking immediate remedial action. The Contractor shall follow the procedures and timeframe stipulated in environmental site inspection, and the deficiency and remedial action reporting system formulated by the ET leader, to report on any remedial measures subsequent to site inspections.
- 10.1.5 The ET shall also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

10.2 Compliance with Legal and Contractual Requirements

- 10.2.1 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.
- 10.2.2 In order that the works are in compliance 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 see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarized in **Appendix B**.
- 10.2.3 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.
- 10.2.4 The Contractor shall regularly copy relevant documents to the ET leader 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 license / permits under the environmental protection laws, and copies of all valid licenses / permits. The site diary shall also be available for the ET leader's inspection upon his/her request.
- 10.2.5 After reviewing the documentation, the ET leader shall advise the 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 license / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he/she shall also advise the Contractor accordingly.
- 10.2.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

10.3 Environmental Complaints

- 10.3.1 Complaints shall be referred to the ET leader for action. The ET leader shall undertake the following procedures upon receipt of any complaint:
- Log complaint and date of receipt onto the complaint database and inform the IEC immediately;
 - investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
 - identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
 - advise the Contractor if mitigation measures are required;
 - review the Contractor's response to identified mitigation measures, and the updated situation;
 - if the complaint is transferred from the Environmental Protection Department (EPD), submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
 - undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;

- report investigation results and subsequent actions to complainant (if the source of complaint is identified through EPD, the results should be reported within the timeframe assigned by EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

10.3.2 A flow chart of complaint response procedure is shown in **Figure 10.1**.

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

11. REPORTING

11.1 Introduction

11.1.1 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 in electronic format.

11.1.2 ET Leader shall submit baseline monitoring report, monthly Environmental Monitoring and Audit (EM&A) report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection.

11.2 Electronic Reporting of EM&A Information

11.2.1 To facilitate public inspection of the baseline monitoring report and various EM&A reports via the EIAO Internet website and at the EIAO register office, electronic copies of these reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF Adobe 11 Pro version or later), unless otherwise agreed by EPD and shall be submitted at the same time as the hardcopies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of these reports shall be included at the beginning of the document. Hyperlinks to all figures, drawings and tables in these reports shall be provided in the main text from where the respective references are made. All graphics in these reports shall be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of these reports must be the same as the hard copies. The summary of the monitoring data taken shall be included in the various EM&A Reports to allow for public inspection via the EIAO Internet website.

11.3 Baseline Monitoring Report

11.3.1 Baseline Environmental Monitoring Report(s) shall be prepared within 10 working days of completion of the baseline monitoring and then certified by the ET Leader. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, ER and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require.

11.3.2 The Baseline Environmental Monitoring Report shall include, but not be limited to the following information:

- Up to half a page executive summary;
- Brief project background information;
- Drawings showing locations of the baseline monitoring stations;
- An updated construction programme with milestones of environmental protection / mitigation activities annotated;
- Monitoring results (in both hard and soft copies) together with the following information:
 - Monitoring methodology;
 - Name of laboratory and types of equipment used and calibration details;
 - Parameters monitored;

- Monitoring locations (and depth);
- Monitoring date, time, frequency, and duration; and
- Quality assurance (QA) / quality control (QC) results and detection limits.
- Details on influencing factors, including:
 - Major activities, if any, being carried out on the site during the period;
 - Weather conditions during the period; and
 - Other factors which might affect results.
- Determination of Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- Revisions for inclusion in the EM&A Manual; and
- Comments, recommendations, and conclusions.

11.4 Monthly EM&A Report

General

- 11.4.1 The results and finding of all EM&A works required in the Manual should be recorded in the monthly EM&A reports prepared by the ET and endorsed by the IEC. The first Monthly EM&A Report should be prepared and submitted to EPD in the month after the major construction works commence with the subsequently Monthly Reports due in 10 working days of the end of each reporting month. Copies of each monthly EM&A report shall be submitted to the parties: Contractor, IEC, HyD, and EPD. Before submission of the first monthly EM&A Report, the ET shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium.
- 11.4.2 The ET leader 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.
- 11.4.3 The first monthly EM&A report shall include at least but not be limited to the following:
- 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.
 - Basic project information:
 - Project organization including key personnel contact names and telephone numbers;
 - Construction programme;
 - Management structure; and
 - Works undertaken during the month.
 - Environmental status:

- advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP, and implementation status of mitigation measures;
- works undertaken during the reporting month with illustrations (such as location of works, etc.); and
- drawings showing the Project area, any environmental sensitive receivers, and the locations of the monitoring and control stations
- A brief summary of EM&A requirements including:
 - All monitoring parameters;
 - Environmental quality performance limits (Action and Limit levels);
 - Event and Action Plan;
 - Environmental mitigation measures as recommended in the Final EIA report; and
 - Environmental requirements in contract documents.
- Implementation status:
 - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA report.
- Monitoring results (in both hard and electronic copies) together with the following information:
 - Monitoring methodology;
 - Name of laboratory and types of equipment used and calibration details;
 - monitoring parameters;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration; and
 - weather conditions during the period.
- Graphical plots of the monitored parameters in the month annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions that may affect the results;
 - any other factors which might affect the monitoring results; and
 - QA / QC results and detection limits.
- report on non-compliance, complaints, notifications of summons and successful prosecutions:
 - record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints 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 legislations, 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-compliance, complaints, summons, and prosecutions including review of pollution sources and working procedures; and
- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- Others:
 - an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on 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.);
 - a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
 - compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies; and
 - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

11.4.4 Subsequent monthly EM&A reports shall include the following:

- 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.
- Basic project information:
 - Project organization including key personnel contact names and telephone numbers;
 - Construction programme;
 - Management structure;
 - Works undertaken during the month; and
 - Any updates as needed to the scope of works and construction methodologies
- Environmental status:
 - advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP, and implementation status of mitigation measures;
 - works undertaken during the reporting month with illustrations (such as location of works, etc.); and
 - drawings showing the Project area, any environmental sensitive receivers, and the locations of the monitoring and control stations
- Implementation status:

- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA report.
- Monitoring results (in both hard and electronic copies) together with the following information:
 - Monitoring methodology;
 - Name of laboratory and types of equipment used and calibration details;
 - monitoring parameters;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration; and
 - weather conditions during the period.
 - Any other factors which might affect the monitoring results; and
 - QA / QC results and detection limits
- report on non-compliance, complaints, notifications of summons and successful prosecutions:
 - record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints 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 legislations, 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-compliance, complaints, summons, and prosecutions including review of pollution sources and working procedures; and
 - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- Others:
 - an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on 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.);
 - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.
- Appendices
 - Action and Limit levels;
 - graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - (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 prosecution; and
- Outstanding issues and deficiencies

11.4.5 A quarterly EM&A summary report of around five pages shall be produced by the ET Leader and shall contain at least the following information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works. Each quarterly EM&A report shall be submitted to the following parties: the IEC, the ER, and EPD.

- Executive summary (1-2 pages);
- basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (AL levels); and
 - environmental mitigation measures, as recommended in the Final EIA report;
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule;
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- graphical plots of the trends of monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.
- Advice on solid and liquid waste management status;
- A summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);
- A brief review of the reasons for and the implications of non-compliance, including a review of pollution sources and working procedures;
- A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- A summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

- A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- Comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and
- Proponents' contacts and any hotline telephone number for the public to make enquiries.

11.5 Final EM&A Review Report for Construction Phase

11.5.1 The construction phase EM&A program shall be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.

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

11.5.3 The final EM&A review report for construction phase should be prepared by the ET leader and contain at least the following information. The final EM&A review report shall be submitted to the following parties: the IEC, the ER, and EPD.

- Executive summary (1-2 pages);
- basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (AL levels); and
 - environmental mitigation measures, as recommended in the Final EIA report;
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule;
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- graphical plots of the trends of monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.
- Compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;

- Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- Advice on solid and liquid waste management status;
- A summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);
- A brief review of the reasons for and the implications of non-compliance, including a review of pollution sources and working procedures;
- A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- A summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- Review monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of breaches, investigation, follow-up actions taken and results;
- Review the practicality and effectiveness of the EIA process and EM&A programme (for example, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme), recommendations (for example, any improvement in the EM&A programme); and
- A conclusion to state the return of ambient and / or the predicted scenario as per EIA findings.

11.6 Data Keeping

11.6.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the EM&A reporting documents. However, any such documents should be properly maintained by the ET and be ready for inspection upon request. All relevant information should be recorded in electronic format, and the software copy must be available upon request. All documents and data should be kept for at least one year after completion of the construction contract.

11.7 Interim Notifications of Environmental Quality Limit Exceedances

11.7.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC, HyD, and EPD, as appropriate. The notification shall be followed up with advice to the IEC, HyD, 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 notifications is presented in **Appendix D**.