



**AECOM**



渠務署

Drainage Services Department

Agreement No. CE 3/2015 (DS)

# Yuen Long Effluent Polishing Plant – Investigation, Design and Construction

**Environmental Monitoring & Audit Manual  
(Final)**

February 2019

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## 1. INTRODUCTION

### 1.1 Background

- 1.1.1 The existing Yuen Long Sewage Treatment Works (YLSTW), was commissioned in 1984 with a design capacity of 70,000 m<sup>3</sup>/day at average dry weather flow (ADWF) provides secondary level treatment to sewage catchment from Yuen Long area such as Wang Chau, Yuen Long Industrial Estate, the Yuen Long Town and Kam Tin.
- 1.1.2 In 2013, Drainage Services Department (DSD) has commissioned the Agreement No. SP06/2013 “Effluent Polishing Scheme at Yuen Long Sewage Treatment Works – Treatment Process Study” (hereinafter refer to as “Treatment Process Study”) to review the sewage flow projection and treatment process for upgrading YLSTW. The design capacity was expected to be fully committed based on the flow projection derived from the village sewerage programme and latest planning data under Treatment Process Study.
- 1.1.3 There is a need for the upgrade of YLSTW into Yuen Long Effluent Polishing Plant (YLEPP) in order to cope with the forecast increase in sewage flow upon completion of sewerage under interfacing projects, extension of village sewerage in area as planned by Environmental Protection Department (EPD), as well as the proposed housing developments in the region.
- 1.1.4 AECOM Asia Company Ltd was commissioned by DSD to undertake “Agreement No. CE3/2015(DS) Yuen Long Effluent Polishing Plant – Investigation, Design and Construction Works” (the Assignment) to upgrade the YLSTW to YLEPP and cater for the future needs. The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) Study for the Project has been undertaken as part of the Assignment, in accordance with the EIA Study Brief (No. ESB-309/2018) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

### 1.2 Project Scope and Location

- 1.2.1 Location plan of the proposed YLEPP (the Project) is shown in **Figure 1.1**. The YLEPP would be constructed in two phases. Phase 1 works would upgrade the existing YLSTW into the YLEPP with a treatment capacity of 100,000 m<sup>3</sup>/day in ADWF. Phase 2 works will be implemented subject to further review of sewage flow projections. The tentative programme, Phase 2 works would further upgrade the treatment capacity to 180,000 m<sup>3</sup>/day in ADWF.
- 1.2.2 Phase 1 works will include the following principal elements:
- (i) Clearance of the existing main store and administration building for construction of the new Inlet Works, including inlet pumping station, screening and degritting facilities;
  - (ii) Demolition of existing Primary Sedimentation Tanks (PSTs) No. 5 to 8 for construction of Lamella PSTs;
  - (iii) Demolition of existing Aeration Tanks (ATs) No. 5 to 8 and existing Final Sedimentation Tanks (FSTs) No. 5 to 8 for construction of new biological and tertiary treatment facilities;
  - (iv) Reconstruction of sludge treatment facilities;
  - (v) Demolition of existing PSTs No. 1 to 4 for construction of sludge dewatering building;
  - (vi) Demolition of existing Inlet Works for construction of new admin building;
  - (vii) Installation of odour mitigation works, including the provision of covers and installation of associated deodourizers to proposed treatment units; and
  - (viii) Other ancillary works, such as organic waste co-digestion, landscaping, E&M facilities, workshops, laboratory, roadworks etc.
- 1.2.3 Phase 2 works will include the following principal elements:
- (i) Demolition of existing ATs No. 1 to 4 and existing circular FSTs No. 1, 2, 3 and 4 for construction of new biological and tertiary treatment facilities;
  - (ii) Reconstruction of sludge treatment facilities;

- (iii) Installation of odour mitigation works, including the provision of covers and installation of associated deodourizers to proposed additional treatment units;
- (iv) Construction of additional Lamella PSTs; and
- (v) Other ancillary works, such as landscaping, E&M facilities, roadworks, etc.

### 1.3 Construction Programme

1.3.1 The Project construction works are anticipated to commence in 2020 with completion of the Project by 2026 and 2030 for Phase 1 and Phase 2, respectively. A tentative construction programme is provided in **Appendix A**.

### 1.4 Purpose of this Manual

1.4.1 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 the construction and operational phases of the Project. It aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with construction works and operational activities.

1.4.2 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.

1.4.3 This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), 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.

1.4.4 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.

### 1.5 Project Organization

1.5.1 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*

1.5.2 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; and
- Adhere to the procedures for carrying out complaint investigation.

#### *Environmental Team (ET)*

1.5.3 A single ET with an ET Leader working full-time for the Project shall be employed, unless otherwise agreed by the EPD, to conduct the EM&A programme to ensure the compliance with the project's environmental performance requirements. The minimum on-site time for the ET, and the qualifications of the specialists in the ET shall be proposed with justifications for the approval of the EPD. The ET Leader or the ET shall be an independent party from the IEC and the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the EPD. The ET shall be led and managed by the ET leader. The ET leader shall possess at least 7 years of experience in EM&A and/or environmental management.

1.5.4 The duties and responsibilities of the ET are:

- 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 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;
- 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 11.3** of this EM&A Manual.



*Engineer or Engineer's Representative (ER)*

- 1.5.5 The ER is responsible for overseeing the construction works and for ensuring that the works undertaken by the Contractor in accordance with the specification and contractual requirements. The duties and responsibilities of the ER with respect to 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 impacts 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)*

- 1.5.6 A single IEC working full-time for the Project shall be employed unless otherwise agreed by the EPD. The IEC shall be an independent party from the Contractor and the ET and possess at least 7 years' experience in EM&A and/or environmental management. The IEC shall report directly to the EPD on matters relating to the EM&A programme and environmental impacts from the Project. The minimum on-site time for the supporting team of the IEC shall be proposed with justifications for the approval of the EPD. The duties and responsibilities of the IEC are:
- Review the EM&A works performed by the ET (at least at monthly intervals);
  - Carry out random sample check and audit the monitoring activities and results (at least at monthly intervals);
  - Conduct random site inspection;
  - Review the EM&A reports submitted by the ET;
  - Review the effectiveness of environmental mitigation measures and project environmental performance;
  - Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
  - Check the mitigation measures that have been recommended in the EIA 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.
- 1.5.7 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.

## 2. AIR QUALITY

### 2.1 Introduction

- 2.1.1 Potential air quality impacts arising from the construction phase of the Project were addressed in the EIA Report. Results indicated that no adverse air quality impact arising from Phase 1 and Phase 2 construction of the Project with the implementation of the mitigation measures. Dust monitoring is proposed to be conducted during Phase 1 and Phase 2 construction.
- 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 the dust suppression measures stipulated in *Air Pollution Control (Construction Dust) Regulation*. Implementation schedule of mitigation measures are presented in **Appendix B**.
- 2.1.3 Potential air quality and odour impacts from operation of the Project were also assessed and no adverse impact would be anticipated during the operation phase of this Project. Nevertheless, it is recommended to conduct commissioning test at the combined heat and power (CHP) unit and ammonia stripping (ASP) unit to demonstrate compliance with the design emission limits and odour monitoring in terms of hydrogen sulphide (H<sub>2</sub>S) at the deodorizers upon commissioning to determine whether it can meet the odour removal performance requirement. In addition, odour patrol should be carried out during the period of maintenance or cleaning of the deodorization system to ensure no adverse odour impacts arisen from the operation of the Project.
- 2.1.4 This section presents the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact during the construction and operation phases of the Project.

### 2.2 Construction Phase

#### *Monitoring Parameters*

- 2.2.1 The major dusty construction activities of the Project would mainly be related to construction dust from site clearance, excavation, demolition, piling, roadworks and pipe works construction and wind erosion which would generate dust emissions. Therefore, 1-hour Total Suspended Particulates (TSP) is recommended to be monitored and audited at the proposed monitoring locations during construction phase.
- 2.2.2 The criteria against which ambient air quality monitoring to be assessed are 1-hour TSP limit of 500 µg m<sup>-3</sup>. This level is not to be exceeded at ASRs.
- 2.2.3 Monitoring and audit of the TSP 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 1-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels should be measured by following the standard method as set out in High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA (hereinafter referred to as "HVS method"). Upon approval of EPD and IEC, an alternative sampling method of using direct reading methods which are capable of producing comparable results as that by the high volume sampling method can be used to indicate short event impacts
- 2.2.5 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site, etc., should be recorded down in detail. A sample data sheet is shown in **Appendix C**.

#### *Monitoring Equipment*

- 2.2.6 High volume sampler (HVS) in compliance with the following specifications should be used for carrying out the 1-hour TSP monitoring:
- 0.6 - 1.7 m<sup>3</sup> per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
  - equipped with a timing / control device with ± 5 minutes accuracy for 24 hours operation;
  - installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation;

- capable of providing a minimum exposed area of 406 cm<sup>2</sup> ;
- flow control accuracy:  $\pm 2.5\%$  deviation over 24-hour sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hour period.

2.2.7 The ET shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with appropriate calibration kit is available for carrying out the baseline, regular impacts monitoring and ad-hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual. All the equipment, calibration kit, filter papers, etc., shall be clearly labelled. If direct reading dust meters is proposed to be used, the ET Leader should submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the HVS may be used for the 1-hour sampling. The instrument should also be calibrated regularly.

2.2.8 Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by the concerned parties such as the IEC. All the data shall be converted into standard temperature and pressure condition.

2.2.9 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded on the data sheet as shown in **Appendix C**.

2.2.10 If the ET Leader proposes to use a direct reading dust meter to measure 1-hour TSP levels, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that of the HVS before it may be used for the 1-hour sampling. The instrument shall also be calibrated regularly, and the 1-hour sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.

2.2.11 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. For installation and operation of wind data monitoring equipment, the following points shall be observed.

- 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 the 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.

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

#### *Laboratory Measurement / Analysis*

2.2.13 A clean laboratory with constant temperature and humidity control and equipped with necessary measuring and conditioning instruments to handle the dust samples collected,

shall be available for sample analysis, and equipment calibration and maintenance. The laboratory shall be the Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited or other internationally accredited laboratory.

- 2.2.14 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be verified by the IEC and approved by the ER. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC.
- 2.2.15 The IEC shall conduct regular audit of the measurement performed by the laboratory so as to ensure the accuracy of measurement results. The ET shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his/her reference.
- 2.2.16 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hour and be pre-weighed before use for the sampling.
- 2.2.17 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1mg. The balance shall be regularly calibrated against a traceable standard.
- 2.2.18 All the collected samples shall be kept in a good condition for 6 months before disposal.

*Monitoring Locations*

- 2.2.19 The selected monitoring locations are the worst potentially affected air sensitive receivers located in the vicinity of construction sites. The proposed air quality monitoring locations during construction phase are listed in **Table 2-1** below and shown in **Figure 2.1**.

**Table 2-1 Proposed Construction Dust Monitoring Stations**

Monitoring Station ID	EIA ID	Location
AM1	ASR09	Topfine Machinery (China) Co. Ltd.
AM2	ASR11	Squatter house at the west of Yuen Long STW

- 2.2.20 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.
- 2.2.21 When alternative monitoring locations are proposed, the following criteria, as far as practicable, shall be followed:
  - i. at the site boundary or such locations close to the major dust emission source;
  - ii. close to the air sensitive receivers as defined in the EIAO-TM;
  - iii. proper position/sitting and orientation of the monitoring equipment; and
  - iv. take into account the prevailing meteorological conditions.
- 2.2.22 The ET shall agree with the IEC on the position of the HVS for installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:
  - i. a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
  - ii. two samplers shall be placed less than 2 meter apart;
  - iii. the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
  - iv. a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
  - v. a minimum of 2 metres of separation from any supporting structure, measured horizontally is required;
  - vi. no furnace or incinerator flue is nearby;
  - vii. airflow around the sampler is unrestricted;
  - viii. the sampler is more than 20 metres from the dripline;

- ix. any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
- x. permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- xi. a secured supply of electricity is needed to operate the samplers.

*Baseline Monitoring*

- 2.2.23 Baseline monitoring shall be carried out to determine the ambient 1-hour TSP levels at the monitoring locations prior to the commencement of the Project. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations. The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.
- 2.2.24 Before commencing the baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 2.2.25 TSP baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works. 1-hour TSP sampling shall be done at least three times per day at each monitoring station. During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources should also be recorded throughout the baseline monitoring period. A summary of baseline monitoring is presented in **Table 2-2**.
- 2.2.26 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring location shall be approved by the ER and agreed with IEC.
- 2.2.27 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.
- 2.2.28 If the ET Leader considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels. The revised baseline levels, in turn, the air quality criteria, shall be agreed with the IEC and EPD.

*Impact Monitoring*

- 2.2.29 The ET shall carry out impact monitoring during construction phase of the Project. For 1-hour TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs. In case of non-compliance with the air criteria, more frequent monitoring, as specified in the Action Plan in the following section, should be conducted. This additional monitoring should be continued until the excessive dust emission or the deterioration in the air quality is rectified. The impact monitoring programme is summarized in **Table 2-2**.
- 2.2.30 The monthly schedule of the compliance and impact monitoring programme should be drawn up by the ET one month prior to the commencement of the scheduled construction period. Before commencing the 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 2-2 Summary of Construction Dust Monitoring Programme**

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

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

*Event and Action Plan*

2.2.31

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour TSP. **Table 2-3** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, action in accordance with the Action Plan in **Table 2-4** shall be carried out.

**Table 2-3 Action and Limit Levels for Air Quality (Construction Dust)**

Parameter	Action Level [1]	Limit Level
TSP (1 hour average)	BL ≤ 384 µgm <sup>-3</sup> , AL = (BL * 1.3 + LL)/2 BL > 384 µgm <sup>-3</sup> , AL = LL	500 µgm <sup>-3</sup>

Note: [1] BL = Baseline level, AL = Action level, LL = Limit level



**Table 2-4 Event and Action Plan for Air Quality (Construction Dust)**

Event	Action			
	ET	IEC	ER	Contractor
Action level being exceeded by	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of complaint and propose remedial measures;</li> <li>2. Inform Contractor, IEC and ER;</li> <li>3. Repeat measurement to confirm finding; and</li> <li>4. Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method; and</li> <li>3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s), investigate the causes of exceedance and propose remedial measures;</li> <li>2. Implement remedial measures; and</li> <li>3. Amend working methods agreed with the ER as appropriate.</li> </ol>
Action level being exceeded by two or more consecutive	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform Contractor, IEC and ER;</li> <li>3. Advise the Contractor and ER on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings;</li> <li>5. Increase monitoring frequency to daily;</li> <li>6. Discuss with IEC and Contractor on remedial actions required;</li> <li>7. If exceedance continues, arrange meeting with Contractor, IEC and ER; and</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET, ER and Contractor on possible remedial measures;</li> <li>4. Advise the ET and ER on the effectiveness of the proposed remedial measures; and</li> <li>5. Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source and investigate the causes of exceedance;</li> <li>2. Submit proposals for remedial measures to the ER with a copy to ET and IEC within three working days of notification;</li> <li>3. Implement the agreed proposals; and</li> <li>4. Amend proposal as appropriate.</li> </ol>
Limit level being exceeded by one sampling	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform Contractor, IEC, ER, and EPD;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily; and</li> <li>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures; and</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) and investigate the causes of exceedance;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Submit proposals for remedial measures to ER with a copy to ET and IEC within three working days of notification;</li> <li>4. Implement the agreed proposals; and</li> <li>5. Amend proposal if appropriate.</li> </ol>
Limit level being exceeded by two or more consecutive sampling	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, Contractor and EPD;</li> <li>2. Identify source;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET;</li> <li>2. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and</li> <li>4. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>3. Supervise the implementation of remedial measures; and</li> <li>4. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) and investigate the causes of exceedance;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Submit proposals for remedial measures to the ER with a copy to the IEC and ET within three working days of notification;</li> <li>4. Implement the agreed proposals;</li> <li>5. Revise and resubmit proposals if problem still not under control; and</li> <li>6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

## 2.3 Operation Phase

### *Commissioning Test at the Exhausts of CHP and ASP units*

- 2.3.1 Measurement of air quality parameters of concern due to stack emissions from the combined heat and power (CHP) unit and ammonia stripping (ASP) unit should be conducted at each stack during commissioning stage to demonstrate the process/facility is properly operated and the emissions can be minimized to meet the design emission limits as presented in **Table 2-5** and **Table 2-6**. The proposed sampling and analytical methods for measured parameters are listed in **Table 2-7**. The proposed methods below are for reference only. The scopes and methods to be adopted shall be agreed with EPD at least one month before measurement.

**Table 2-5 Emission Limit for CHP Units**

Parameters	Maximum Emission Level (mg/Nm <sup>3</sup> )
RSP	16
NO <sub>x</sub> (as NO <sub>2</sub> )	30
SO <sub>2</sub>	53
NH <sub>3</sub>	22

Note:

- (1) The emission level refers to oxygen content in the exhaust gas of 5% and dry basis.

**Table 2-6 Emission Limit for ASP Unit**

Parameters	Maximum Emission Level (mg/Nm <sup>3</sup> )
RSP	8
NO <sub>x</sub> (as NO <sub>2</sub> )	96
SO <sub>2</sub>	80
NH <sub>3</sub>	17

Note:

- (1) All emission levels refer to oxygen content in the exhaust gas of 5% and dry basis.

**Table 2-7 Analytical Parameters and Methodology**

Parameters	Method
Particulates (as RSP)	ISO 9096, ASTM D3685-98, USEPA Method 17
NO <sub>x</sub>	USEPA Reference methods USEPA Method 7 and associated methods
SO <sub>2</sub>	USEPA Method 8
NH <sub>3</sub>	USEPA CTM-027

### *Odour Monitoring*

- 2.3.2 The odour monitoring (in term of H<sub>2</sub>S concentration) at the inlets and outlets of each deodourizing unit shall be conducted by H<sub>2</sub>S sensor quarterly in the first three years upon commissioning of the YLEPP Phase 1 and Phase 2 to determine whether the odour removal efficiency meet the requirements as stated in the EIA Report. The first odour monitoring shall be conducted within one month, after the operation of the YLEPP Phase 1 and Phase 2. Subsequent odour monitoring shall be conducted quarterly, i.e. at the 4th, 7th and 10th month for the first year. For the second and third years, the frequency of the impact monitoring could be reduced to once every 6 months subject to EPD's approval, if no non-compliance is found. If there is any non-compliance, the operator should inspect the deodorization unit and the frequency of odour monitoring shall be resumed to quarterly. Upon the third year monitoring, the odour monitoring should be reviewed and agreed with EPD if the monitoring is required to be continued.

### *Odour Patrol*

- 2.3.3 Odour patrol is proposed to monitor the potential odour impact from YLEPP during the

period of maintenance or cleaning of the deodorization system. The odour patrols will be conducted by an odour patrol team. The odour patrol team will patrol and sniff along an odour patrol route within the YLEPP site boundary. The implementation of the odour patrols shall be subject to the prevailing weather forecast condition and should not be carried out during rainy days.

2.3.4 The odour patrol team shall be comprised of at least two independent trained personnel / competent persons, who should pass a set of screening tests and fulfil the following requirements:

- Have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80 ppb/v required by the European Standard Method (EN 13725);
- Be at least 16 years of age and willing and able to follow instructions;
- Be free from any respiratory illnesses;
- Be engaged for a sufficient period to build up and monitor/detect at several monitoring location;
- Not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 minutes before and during odour patrol;
- Take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics; and
- Not communicate with each other about the results of their choices.

2.3.5 The independent trained personnel / competent persons should use their noses (olfactory sensors) to sniff odours at the monitoring locations. The main odour emission sources and the areas to be affected by the odour nuisance shall be identified.

2.3.6 The perceived odour intensity is divided into 5 levels. **Table 2-8** describes the odour intensity for different levels.

**Table 2-8 Odour Intensity Levels**

Level	Odour Intensity
0	Not detected. No odour perceived or an odour so weak that it cannot be easily characterised or described
1	Slight identifiable odour, and slight chance to have odour nuisance
2	Moderate identifiable odour, and moderate chance to have odour nuisance
3	Strong identifiable, likely to have odour nuisance
4	Extreme severe odour, and unacceptable odour level

2.3.7 The independent trained personnel / competent persons shall record the findings including date and time, weather condition (e.g. sunny, fine, cloudy, and rainy), odour intensity, odour nature and possible odour sources, local wind speed, and wind direction at each location.

*Event and Action Plan*

2.3.8 **Table 2-9** shows the air quality criteria, namely Action and Limit levels to be used for the odour patrol. Should the action or limit level be reached, action in accordance with the Action Plan in **Table 2-10** shall be carried out.

**Table 2-9 Action and Limit Levels for Air Quality (Odour)**

Parameter	Action Level	Limit Level
Odour Nuisance	Odour intensity of 2 is measured from odour patrol	Odour intensity of 3 or above is measured from odour patrol

**Table 2-10 Event and Action Plan for Air Quality (Odour)**

EVENT	ACTION		
	YLEPP Engineer-in-charge of Odour Patrol	DSD Sewage Treatment Division 1 (ST1)	DSD Sewerage Projects Division (SP) / Electrical and Mechanical Projects Division (E&MP)
<b>ACTION LEVEL</b>			
Action level from Odour Patrol is reached	1. Identify source / reason of exceedance; 2. Repeat odour patrol to confirm finding	1. Carry out investigation to identify the source/reason of exceedance; 2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary.	1. Assist ST1 to find the root cause of non-compliance; and 2. Modify or improve design as appropriate.
<b>LIMIT LEVEL</b>			
Limit level from Odour Patrol is reached	1. Identify source / reason of non-compliance; 2. Repeat odour patrol to confirm findings; 3. Assess effectiveness of remedial action and keep EPD informed of the results	1. Carry out investigation to identify the source/reason of non-compliance; 2. Rectify any unacceptable practice; 3. Amended working methods if required; 4. Notify DSD SP / E&MP; 5. Formulate remedial actions; 6. Ensure amended working methods and remedial actions properly implemented; 7. If non-compliance continues, consider what portion of the work is responsible and stop that portion of the work until the non-compliance is abated; and 8. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.	1. Assist ST1 to find the root cause of non-compliance; 2. Modify or improve design as appropriate; and 3. Formulate remedial actions in association with ST1.

## **2.4 Mitigation Measures**

- 2.4.1 Mitigation measures for construction phase air quality impacts and appropriate design for minimizing potential operational odour impact have been recommended in the EIA Report. All the recommended mitigation measures and designs are detailed in the implementation schedule in **Appendix B**. The Contractor should be responsible for the design and implementation of these measures.

## **2.5 Audit Requirements**

- 2.5.1 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 has predicted the potential construction noise impact and operation phase fixed plant noise impact from this Project.

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

3.1.3 For fixed plant noise impact, a noise commissioning test should be conducted to ensure fixed plant noise impact would comply with the relevant noise standards. No noise monitoring during operational phase is required.

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

#### 3.2 Monitoring Parameters for Construction Noise

3.2.1 The construction noise levels should be measured in terms of the 30-minute A-weighted equivalent continuous sound pressure level ( $L_{eq(30-min)}$ ).  $L_{eq(30-min)}$  should be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays.

3.2.2 Supplementary information for data auditing and statistical results such as  $L_{10}$  and  $L_{90}$  should also be obtained for reference. Sample noise field data sheets are shown in **Appendix C** of this Manual 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.

#### 3.3 Monitoring Equipment

3.3.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements shall be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0 dB.

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

3.3.3 The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The equipment installation location shall be proposed by the ET Leader and agreed with the IEC and EPD.

#### 3.4 Monitoring Locations

3.4.1 Based on the noise assessment results in the EIA Report, noise exceedances would only be predicted during construction of Phase 1 works under unmitigated scenario, whereas no noise exceedance would be predicted during construction of Phase 2 works. Thus, construction noise monitoring during Phase 1 works construction is proposed. **Figure 3.1** shows the construction noise monitoring stations. Details of the proposed noise monitoring stations are summarized in **Table 3-1**.



**Table 3-1 Proposed Noise Monitoring Stations during Construction of Phase I Works of the Project**

Noise Monitoring Point	EIA ID	Location	Monitoring Period
CM1	NSR1	Squatter house to the north of YLSTW	Phase 1 Works Construction
CM2	NSR2	Squatter house to the west of YLSTW	
CM3	NSR3	Squatter house to the east of YLSTW	

3.4.2 The status and locations of noise sensitive receivers (NSRs) may change after issuing this Manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from the IEC and agreement from EPD of the proposal.

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

- i. at locations close to the major site activities which are likely to have noise impacts;
- ii. close to the NSRs; and
- iii. for monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring

3.4.4 The construction 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 the 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, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

### 3.5 Baseline Monitoring

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

3.5.2 During the baseline monitoring, there shall not be any construction activities in the 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

3.6.1 Construction noise monitoring should be carried out at the designated monitoring station when there are Project-related construction activities being undertaken within a radius of 300 m from the monitoring stations. The monitoring frequency should depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

3.6.2 If construction works are extended to include works during the hours of 1900 - 0700, and/or percussive piling is be carried out, applicable permits under NCO shall be obtained by the Contractor. The monitoring requirements and conditions stipulated in the permits have to be followed.

3.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan in **Table 3-3** 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

3.7.1 The Action and Limit levels for construction noise are defined in **Table 3-2**. Should non-

compliance of the criteria occur, action in accordance with the Action Plan in **Table 3-3** shall be carried out.

**Table 3-2 Action and Limit Levels for Construction Noise**

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

Notes:

- If works are to be carried out during restricted hours and/or percussive piling is carried out, the monitoring requirements and the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.
- \* 70 dB(A) and 65 dB(A) for schools during normal teaching periods and school examination periods, respectively.

**Table 3-3 Event and Action Plan for Construction Noise**

Event	Action			
	ET	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Notify IEC and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures; and</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analyzed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analyzed noise problem; and</li> <li>4. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC; and</li> <li>2. Implement noise mitigation proposals.</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
Limit Level	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC, ER, EPD and Contractor;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IEC, ER and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analyzed noise problem;</li> <li>4. Ensure remedial measures properly implemented; and</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control; and</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

### 3.8 Mitigation Measures

#### Construction Phase

3.8.1 To alleviate the construction noise impact on the affected NSRs, use of movable noise barriers for excavators mounted with hydraulic breaker is recommended during construction phase.

3.8.2 In addition to the above construction noise mitigation measures, good site practices listed below and the noise control requirements stated in EPD's "Recommended Pollution Control Clauses for Construction Contracts" should be included in the Contract Specification for the Contractors to follow and implemented to further minimize the potential noise impacts during the construction phase of the Project:

- Quiet PME, such that those listed in EPD's Quality Powered Mechanical Equipment, should be considered for construction works to further minimize the potential construction noise impact.
- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program.

- Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction program.
- Mobile plant, if any, should be sited as far away from NSRs as possible.
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum.
- 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.
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

3.8.3 The implementation schedule of the good site practices is presented in in **Appendix B**.

Operation Phase

3.8.4 All of the fixed plants, with exception for the extraction fans for deodorizers, would be located inside a plantroom with silencers at air inlet and outlet and a sound proof door. Silencers should be installed for ventilation fans in order to ensure compliance of the operation airborne noise levels with the noise standard stipulated in the EIAO-TM and Noise Control Ordinance (NCO). The implementation of the recommended mitigation measures for the fixed plant noise arising from the operation of the Project is presented in **Appendix B**.

**3.9 Audit Requirements**

3.9.1 Regular site environmental audit during the construction phase (both Phase 1 works and Phase 2 works) of the Project should be conducted at least once per week to ensure proper implementation of mitigation measures and good site practices as listed in **Appendix 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.

**3.10 Commissioning Test for Fixed Plant Noise Sources**

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

## 4. WATER QUALITY

### 4.1 Introduction

4.1.1 During the construction phase, the key water quality impact would be associated with the land-based construction. The potential water quality impact from the land-based construction activities would be controlled by the mitigation measures recommended in the EIA Report. Regular site inspections and water quality monitoring should be undertaken during the construction phase to inspect the construction activities and work areas to ensure that the recommended mitigations measures are properly implemented.

4.1.2 During operational phase, there is possibility of failure of power supply, treatment units or equipment under the Project operation. Therefore, water quality monitoring is recommended in case of any emergency discharge events during the operational phase of this Project.

4.1.3 Under normal operation of the YLEPP, treated effluent would be discharged through Shan Pui River into Deep Bay following the same practice of existing YLSTW. Water quality monitoring during the first year of the YLEPP Phase 1 and Phase 2 operation is recommended. Monitoring of the treated effluent quality from the YLEPP will be governed by the Water Pollution Control Ordinance (WPCO) license to ensure that the effluent quality would comply with the design standards, which is under the ambit of regional office (RO) of EPD.

4.1.4 Water quality monitoring for the Project can be divided into the following stages:

- Water quality monitoring during the YLEPP Phase 1 construction;
- Water quality monitoring during the first year operation of the YLEPP Phase 1;
- Water quality monitoring during the YLEPP Phase 2 construction;
- Water quality monitoring during the first year operation of the YLEPP Phase 2; and
- Follow-up water quality monitoring after any emergency discharge event at any stage.

### 4.2 Water Quality Parameters

4.2.1 The parameters that have been selected for measurement *in-situ* and in the laboratory are those that were either determined in the EIA to be those with the most potential to be affected by the construction works or are a standard check on water quality conditions. Parameters to be measured in the construction phase, operation phase and emergency discharge are summarized in **Table 4-1**.

**Table 4-1 Parameters measured in the marine water quality monitoring**

Parameters	Unit	Abbre.	Remarks			
			Baseline	Construction	YLEPP	Emergency Discharge at Any Stage
					Water Quality Monitoring (Phase 1 & 2)	
<b><i>In-situ</i> measurements</b>						
Dissolved Oxygen	mg/L	DO	✓	✓	✓	✓
Salinity	-	-	✓	✓	✓	✓
Temperature	°C	-	✓	✓	✓	✓
pH	-	-	✓	✓	✓	✓
Turbidity	NTU	-	✓	✓	✓	✓
<b>Laboratory measurements</b>						
Suspended Solids	mg/L	SS	✓	✓	✓	✓
Biochemical Oxygen Demand	mg/L	BOD <sub>5</sub>	✓		✓	✓
Ammonia Nitrogen	mg/L	NH <sub>3</sub> -N	✓		✓	✓
Nitrite Nitrogen	mg/L	NO <sub>2</sub> -N	✓		✓	✓
Nitrate Nitrogen	mg/L	NO <sub>3</sub> -N	✓		✓	✓
Total Inorganic Nitrogen	mg/L	TIN	✓		✓	✓
Total Kjeldahl Nitrogen	mg/L	TKN	✓		✓	✓
Total Nitrogen	mg/L	TN	✓		✓	✓

Parameters	Unit	Abbre.	Remarks			
			Baseline	Construction	YLEPP	Emergency Discharge at Any Stage
					Water Quality Monitoring (Phase 1 & 2)	
Total Phosphorus	mg/L	TP	✓		✓	✓
<i>E.coli</i>	cfu/ 100mL	-	✓		✓	✓

4.2.2 Measurements shall be taken at three water depths, including 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. If the water depth is less than 3 m, only the mid-depth station will be monitored.

4.2.3 In addition to the water quality parameters as shown in **Table 4-1**, other relevant data shall also be recorded, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, current velocity and direction, sea conditions, weather conditions and any special phenomena or work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in **Appendix C** for reference.

### 4.3 Sampling Procedures and Monitoring Equipment

#### *Dissolved Oxygen and Temperature Measuring Equipment*

4.3.1 The instrument shall be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. The equipment shall be capable of measuring:

- a DO level in the range of 0 – 20 mg L<sup>-1</sup> and 0 – 200% saturation; and
- a temperature of 0 - 45 degree Celsius.

4.3.2 It shall have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. For example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument.

4.3.3 Shall salinity compensation not be built-in to the DO equipment, *in-situ* salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

#### *Turbidity Measurement Instrument*

4.3.4 Turbidity shall be measured *in-situ* by the nephelometric method. The instrument shall be portable and weatherproof turbidity measuring instrument using a DC power source complete with cable, sensor and comprehensive operation manuals. It shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument). The cable shall not be less than 25m in length. The meter shall be calibrated to establish the relationship between NTU units and the levels of suspended solids.

#### *Sampler*

4.3.5 A water sampler is required. It shall comprise a transparent Polyvinyl Chloride (PVC) cylinder, with a capacity of not less than 2 liters, which can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

#### *Water Depth Detector*

4.3.6 A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.



### *Salinity*

- 4.3.7 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) shall be provided for measuring salinity of the water at each monitoring location.

### *pH*

- 4.3.8 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1 pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use. Details of the method shall comply with American Public Health Association (APHA), 19th ed. 4500-HTB.

### *Sample Containers and Storage*

- 4.3.9 Water samples shall be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory and analyzed as soon as possible after collection. Sufficient volume of samples shall be collected to achieve the required detection limit.

### *Monitoring Position Equipment*

- 4.3.10 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication or other equipment instrument of similar accuracy, shall be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### *Current Velocity and Direction*

- 4.3.11 No specific equipment is recommended for measuring the current velocity and direction. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.

### *Calibration of In-Situ Instruments*

- 4.3.12 All *in-situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

- 4.3.13 Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

## **4.4 Laboratory Measurement / Analysis**

- 4.4.1 Analysis of SS, BOD, TIN<sup>(1)</sup>, NH<sub>3</sub>-N, NO<sub>2</sub>-N, NO<sub>3</sub>-N, UIA<sup>(2)</sup>, TKN, TP and *E. coli* levels shall be carried out in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the necessary laboratory analysis. The analysis shall commence within 24 hours after collection of the water samples. The analyses shall follow the standard methods described in APHA Standard Methods for the Examination of Water and Wastewater, 19<sup>th</sup> edition or other approved methods. Detailed testing methods, pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limits and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any

(1) Total Inorganic Nitrogen (TIN) = Ammonia Nitrogen (NH<sub>3</sub>-N) + Nitrate-N (NO<sub>3</sub>-N) + Nitrite Nitrogen (NO<sub>2</sub>-N)

(2) The level of Unionized Ammonia (UIA) shall be calculated from the Ammonia Nitrogen (NH<sub>3</sub>-N) level, salinity, pH and temperature using the method proposed by Bower, C. E. and Bidwell, J. P. (1978)

circumstance, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall prepare to demonstrate the programmes to EPD or his representatives when requested.

#### 4.5 Water Quality Monitoring Stations

##### *Construction Phase*

4.5.1 Water quality monitoring at designated locations are proposed to be carried out during the construction phase to monitor any sub-standard water discharge into the nearby water bodies from the YLSTW/YLEPP.

4.5.2 It is recommended to establish control and impact monitoring stations to monitor water quality impact during construction phase. The impact monitoring stations have been selected at locations in vicinity to the construction site that may potentially be affected during the construction phase. Water quality at these locations shall be monitored during the construction. The control stations have been selected such that they are located within the same water body as the impact monitoring stations but are located outside the area of influence of the works. Data collected from the control stations enables a comparison of the water quality at the potentially impacted site with the ambient water quality.

4.5.3 The proposed water quality monitoring stations are shown in **Table 4-2**. **Figure 4.1** indicates the approximate locations of the water quality monitoring stations. During flood tide, the station M1 is set at upstream location which serves as control station, while stations M2 and M3 are the corresponding impact stations at the downstream locations. During ebb tide, the stations M2 and M3 are set at upstream location which serve as control stations, while station M1 is the corresponding impact station at the downstream location.

**Table 4-2 Proposed Water Quality Monitoring Stations under Construction Phase**

Station	Purpose of the Monitoring Station	Easting	Northing
<i>Flood Tide</i>			
M1	Serve as the control station at upstream location of construction site	821 086	836 656
M2	Serve as the impact station at downstream location of construction site	820 996	836 246
M3	Serve as the impact station at downstream location of construction site	820 645	836 335
<i>Ebb Tide</i>			
M1	Serve as the impact station at downstream location of construction site	821 086	836 656
M2	Serve as the control station at upstream location of construction site	820 996	836 246
M3	Serve as the control station at upstream location of construction site	820 645	836 335

Notes: The coordinates provided in this table are for reference only. The ET Leader shall propose the exact monitoring locations and coordinates to the IEC and ER for approval before commencement of water sampling.

##### *Operation Phase*

4.5.4 During operation phase, water quality monitoring during the first year of the YLEPP Phase 1 and Phase 2 operation as well as emergency discharge are proposed to be conducted at 8 monitoring stations within the Inner Deep Bay as well as along Shan Pui River and Kam Tin River, including:

- Five Impacts stations within Inner Deep Bay covering Ma Po Marshes SSSI (E1), Mai Po Inner Deep Bay Ramsar Site / Inner Deep Bay SSSI (E2), oyster culture area (E3), mangroves (Inner Deep Bay) (E4) and mangroves along Shan Pui River (E5), which represent the water sensitive receivers, which are likely affected by the Project during emergency discharge; and

- Three Control Stations within Inner Deep Bay (DB1) as well as at Shan Pui River (SP1) and Kam Tin River (KT1) (in sections upstream of the discharge point) to assist in the identification of the source of any impact.

4.5.5 The locations of the proposed monitoring stations are illustrated in **Figure 4.2** and summarized in in **Table 4-3**.

**Table 4-3 Proposed Water Quality Monitoring Stations under Operation Phase**

Station	Description	Easting	Northing
<i>Impact Stations</i>			
E1	Ma Po Marshes SSSI	821 036	837 913
E2	Mai Po Inner Deep Bay Ramsar Site / Inner Deep Bay SSSI	820 025	838 830
E3	Oyster Culture Area	816 047	837 277
E4	Mangroves (Inner Deep Bay)	820 238	838 028
E5	Mangroves along Shan Pui River	821 005	836 665
<i>Control Stations</i>			
DB1	Inner Deep Bay	814 631	836 460
SP1	Shan Pui River, upstream of discharge point	821 192	835 933
KT1	Kam Tin River, upstream of discharge point	821 526	836 682

4.5.6 The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. Any change to the monitoring stations shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to its implementation.

4.5.7 The status and availability of monitoring locations may change after issuing this Manual. If such cases exist, the appointed ET Leader may propose alternative monitoring locations taking into consideration of the latest status, availability and/or accessibility of the various possible monitoring locations. Any change to the monitoring stations shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to the implementation of sampling programme.

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

- at locations close to and preferably at the boundary of the site activities as indicated in the EIA report, which are likely to have water quality impacts;
- close to the sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring; and
- control station shall be selected at a location to allow a comparison of the water quality at the potentially impacted site with the ambient water quality. The control station shall be selected such that it is located within the same body of water as the impact monitoring station but is located outside the area of influence of the works.

4.5.9 Enough replicates *in-situ* measurements and sample collected from each independent sampling event are required for all parameters to ensure a robust statistically interpretable dataset.

#### 4.6 Details of Water Quality Monitoring

##### *Baseline Monitoring*

4.6.1 Baseline conditions of water quality should be established by the ET and agreed with IEC and DEP. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works, to demonstrate the suitability of the proposed

control and impact monitoring stations, and for establishment of the action and limit levels.

- 4.6.2 The baseline conditions should be established by measuring the water quality parameters including pH, salinity, temperature, turbidity, DO (in mg/L and % of saturation) and SS at the proposed monitoring stations as shown in **Figure 4.1** (see **Table 4-2**) and water quality parameters as specified in **Table 4-1** at the proposed monitoring stations as shown in **Figure 4.2** (see **Table 4-3**), 3 days a week, for a period of 4 weeks prior to the commencement of construction works. The interval between two sets of monitoring shall not be less than 36 hours, and the baseline monitoring schedule shall be submitted to DEP and IEC at least one week prior to the commencement of the baseline monitoring. The ET Leader shall seek approval from the ER, IEC and EPD on the alternative proposal prior to its implementation.
- 4.6.3 There shall not be any major construction activities in the vicinity of the stations during the baseline monitoring. The ET shall be responsible for undertaking the baseline monitoring and submitting the results within 10 working days from the completion of the baseline monitoring work.
- 4.6.4 In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from the ER, IEC and EPD on an appropriate set of data to be used as baseline reference.
- 4.6.5 For operation phase, the ET Leader shall seek approval from the ER, IEC and EPD on an appropriate set of data to be used as baseline reference, and if additional baseline monitoring is required, the baseline monitoring methodology for operation phase prior to the commencement of such monitoring.

#### *Construction Monitoring*

- 4.6.6 During the course of the construction works, impact monitoring shall be undertaken three days per week at mid-flood and mid-ebb tides, with sampling/measurement at the monitoring stations as shown in **Figure 4.1** and **Table 4-2**. The ET should carry out spot check to ensure that the Contractor has undertaken all recommended control measures to prevent direct contact of pollutants with rainwater or runoff, and measures to abate contaminants in the stormwater runoff. Parameters to be monitored include pH, salinity, temperature, turbidity, DO (in mg/L and % of saturation) and SS (see **Table 4-1**). The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency shall be increased.
- 4.6.7 Requirements as stated in **Section 4.5.7** shall be followed. Any change to the EM&A requirements or programme shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to its implementation.
- 4.6.8 Upon completion of all construction activities, a post project monitoring exercise on water quality shall be carried out for four weeks in the same manner as the baseline monitoring. The results of the monitoring shall be presented in the Final EM&A Summary Report.
- 4.6.9 Proposed water quality monitoring schedule shall be submitted to ER, IEC and EPD at least 1 week before the first day of the monitoring month. The ER, IEC and EPD shall also be notified immediately for any changes in schedule.

#### *First-year Operation Phase*

- 4.6.10 Upon commencement of the YLEPP Phase 1 and Phase 2, an operation phase water quality monitoring exercise should be carried out for a minimum of once per week at mid-flood and mid-ebb tides for one-year.
- 4.6.11 The proposed water quality monitoring schedule should be submitted to ER, IEC and EPD at least 4 weeks before the first day of the monitoring month. The ER, IEC and EPD should also be notified immediately for any changes in schedule. Water quality parameters presented in **Table 4-1** should be monitored at the 8 proposed monitoring stations as shown in **Figure 4.2** and **Table 4-3**.
- 4.6.12 After obtaining one year of monitoring results, the ET shall review against the baseline conditions to identify if there is any change to the overall water quality in Deep Bay and propose remedial action if there is any deterioration in water quality due to the Project.

#### *Emergency Discharge Follow-up Monitoring Exercise*

- 4.6.13 The emergency discharge follow-up monitoring requirements will be proposed in the

Emergency Response Plan that will be formulated prior to commissioning of YLEPP. As a basic approach, in case of emergency discharge during operational phase of this Project, a follow-up water quality monitoring exercise shall be commenced within 24 hours after the start of the emergency discharge at all the 8 designated stations as shown in **Figure 4.2** and **Table 4-3**. The monitoring shall be conducted by DSD or other agent appointed by the DSD. The result of the monitoring each day shall be compared with the baseline data collected under normal Project operation to identify the degree of impact caused by the emergency discharge. The monitoring exercise shall be repeated on the next day until the baseline water quality is restored for 2 consecutive days.

- 4.6.14 DSD or its appointed agent shall inform the mariculturists, relevant stakeholders and relevant government departments (e.g. AFCD, EPD) everyday on the latest results of the water quality monitoring exercise to allow these parties to make informed decisions. By the end of the follow-up water quality monitoring exercise, DSD or its appointed agent shall also inform these parties that the ambient water quality is restored at all WSRs for two consecutive days to signal the recovery of water quality. It is recommended that the DSD / Plant operators shall maintain good communications with various concerned parties. A list of address, email address, phone and fax number of key persons in various departments responsible for action shall be made available to the Plant operators. A summary of the mitigation measures and monitoring requirements for emergency discharge is provided in **Table 4-4**.

**Table 4-4 Mitigation Measures and Monitoring Requirement for Follow-up Emergency Discharge Exercise during Operation of the Proposed YLEPP**

Event	Mitigation Measures and Monitoring Requirement
Emergency Discharge during operation of this Project	<ol style="list-style-type: none"> <li>1. Investigate the reason of failure and determine possible remedial measures and identify the need of emergency discharge.</li> <li>2. Inform EPD and AFCD of the emergency discharge.</li> <li>3. Ensure remedial measures are implemented.</li> <li>4. Assess the effectiveness of the implemented remedial measures and identify alternative measures if necessary.</li> <li>5. Discuss with EPD and AFCD for the required remedial actions if necessary and ensure all necessary remedial actions are properly implemented.</li> <li>6. Conduct water quality impact monitoring daily until the baseline water quality is restored for 2 consecutive days.</li> <li>7. The monitoring data collected in Item 6 above shall be compared with the baseline data collected under normal Project operation to identify the degree of impact caused by the emergency discharge.</li> </ol>

*Water Quality Compliance*

- 4.6.15 Construction phase water quality monitoring will be evaluated against Action and Limit Levels. The proposed Action and Limit Levels for water quality is presented in **Table 4-5**. Action and Limit levels are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (**Table 4-6**) should be undertaken and a review of works will be carried out by the Contractor(s)
- 4.6.16 Any noticeable change to water quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Particular attention will be paid to the Contractor(s)'s implementation of the recommended mitigation measures.

**Table 4-5 Action and Limit Levels for Water Quality**

Parameters	Action	Limit
<b>Construction Phase Water Quality Monitoring</b>		
DO in mg/L (Surface, Middle & Bottom) <sup>b</sup>	<u>Surface &amp; Middle</u> 5%-ile of baseline data for surface and middle layer.  <u>Bottom</u> 5%-ile of baseline data for bottom layer.	<u>Surface &amp; Middle</u> 4 mg/L or 1%-ile of baseline data for surface and middle layer  <u>Bottom</u> 2 mg/L or 1%-ile of baseline data for bottom layer
SS in mg/L (depth-averaged <sup>a</sup> ) <sup>c</sup>	95%-ile of baseline data or 120% of upstream control station's SS recorded on the same day	99%-ile of baseline data or 130% of upstream control station's SS recorded on the same day
Turbidity in NTU (depth-averaged <sup>a</sup> ) <sup>c</sup>	95%-ile of baseline data or 120% of upstream control station's turbidity recorded on the same day	99%-ile of baseline data or 130% of upstream control station's turbidity recorded on the same day

Notes:

- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

**Table 4-6 Event and Action Plan for Water Quality Monitoring**

Event	Action			
	ET	IEC	ER	Contractor
Action level being exceeded by one sampling day	<ul style="list-style-type: none"> <li>Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>Identify source(s) of impact and record in notification of exceedance;</li> <li>Inform IEC, Contractor(s) and ER</li> </ul>	<ul style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>Inform EPD and AFCD.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing</li> </ul>	<ul style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Check plant and equipment and rectify unacceptable practice</li> </ul>
Action level being exceeded by two or more consecutive sampling days	<ul style="list-style-type: none"> <li>Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>Identify source(s) of impact and record in notification of exceedance;</li> <li>Inform IEC, Contractor(s) and ER;</li> <li>Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>Inform EPD and AFCD;</li> <li>Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>Ensure additional mitigation measures are properly implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm receipt of notification of exceedance in writing;</li> <li>Check plant and equipment and rectify unacceptable practice;</li> <li>Consider changes of working methods;</li> <li>Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>Implement the agreed mitigation measures.</li> </ul>

Event	Action			
	ET	IEC	ER	Contractor
Limit level being exceeded by one sampling day	<ul style="list-style-type: none"> <li>○ Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>○ Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>○ Identify source(s) of impact and record in notification of exceedance;</li> <li>○ Inform IEC, Contractor(s) and ER;</li> <li>○ Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.</li> </ul>	<ul style="list-style-type: none"> <li>○ Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>○ Inform EPD and AFCD;</li> <li>○ Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>○ Assess the effectiveness of the implemented mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>○ Confirm receipt of notification of exceedance in writing;</li> <li>○ Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>○ Ensure additional mitigation measures are properly implemented.</li> <li>○ Request Contractor(s) to critically review the working methods.</li> </ul>	<ul style="list-style-type: none"> <li>○ Confirm receipt of notification of exceedance in writing;</li> <li>○ Check plant and equipment and rectify unacceptable practice;</li> <li>○ Critically review the need to change working methods;</li> <li>○ Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>○ Implement the agreed mitigation measures.</li> </ul>
Limit level being exceeded by two or more consecutive sampling days	<ul style="list-style-type: none"> <li>○ Repeat <i>in situ</i> measurement on the next day of exceedance to confirm findings;</li> <li>○ Check monitoring data, plant, equipment and Contractor(s)'s working methods;</li> <li>○ Identify source(s) of impact and record in notification of exceedance;</li> <li>○ Inform IEC, Contractor(s) and ER;</li> <li>○ Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented.</li> </ul>	<ul style="list-style-type: none"> <li>○ Check monitoring data submitted by ET and Contractor(s)'s working methods;</li> <li>○ Inform EPD and AFCD;</li> <li>○ Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly;</li> <li>○ Assess the effectiveness of the implemented mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>○ Confirm receipt of notification of exceedance in writing;</li> <li>○ Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented.</li> <li>○ Ensure additional mitigation measures are properly implemented.</li> <li>○ Request Contractor(s) to critically review the working methods.</li> </ul>	<ul style="list-style-type: none"> <li>○ Confirm receipt of notification of exceedance in writing;</li> <li>○ Check plant and equipment and rectify unacceptable practice;</li> <li>○ Critically review the need to change working methods;</li> <li>○ Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days;</li> <li>○ Implement the agreed mitigation measures.</li> </ul>

#### 4.7 Construction Site Audits

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

4.7.2 Site inspections should be carried out by the ET based on the recommended mitigation measures for water pollution control as detailed 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 should 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.



## 5. WASTE MANAGEMENT

### 5.1 Introduction

- 5.1.1 It will be the contractor's responsibility to ensure that any wastes produced during the construction and demolition works are handled, stored and disposed of in accordance with good waste management practices and relevant EPD's regulations and other legislative requirements.
- 5.1.2 Waste materials generated during construction activities, such as construction and demolition (C&D) materials and general refuse, are recommended to be audited at regular intervals (at least quarterly) to ensure that proper storage, transportation and disposal practices are being implemented. This monitoring of waste management practices would ensure that these solid wastes generated during construction are not disposed into the nearby coastal waters. The Contractor would be responsible for the implementation of any mitigation measures to minimize waste or redress problems arising from the waste materials. A Waste Management Plan (WMP), as a part of the Environmental Management Plan (EMP), should be prepared in accordance with *ETWB TC (W) No.19/2005* and submitted to the Engineer for approval. The recommended mitigation measures should form the basis of the WMP. The monitoring and auditing requirement stated in *ETWB TC (W) No.19/2005* should be followed with regard to the management of C&D materials.
- 5.1.3 Large quantities of wastes are not expected from the operation of the Project and no adverse environmental impacts would arise with the implementation of good waste management practices. EM&A would not be necessary during the operational phase.

### 5.2 Mitigation Measures

- 5.2.1 Mitigation measures for waste management recommended in the EIA Report should form the basis of the site WMP to be developed by the Contractor in the construction stage. **Appendix B** provides the implementation schedule of the recommended mitigation measures during both construction and operational phases.
- 5.2.2 Waste generated during the construction activities should be audited regularly by the ET to determine if waste is being managed in accordance with approved procedures and the site WMP. The audit should look at 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 legislations and contract requirements. In addition, the routine site inspections should check the implementation of the recommended good site practices, waste reduction measures, and other waste management mitigation measures.
- 5.2.3 With the appropriate handling, storage and removal of waste arisings during the construction and operation of the Project as presented in **Appendix B**, the potential to cause adverse environmental impacts would be minimized. 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.

### 5.3 Audit Requirement

- 5.3.1 Regular audits and site inspections should be carried out during construction phases 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 All the existing YLSTW facilities are currently in operation and it would not be feasible to carry out the proposed SI works under the EIA Study. Moreover, based on the tentative construction programme, the YLSTW will continue to operate during the construction period commencing in 2020 and the concerned facilities / areas will be decommissioned and demolished in stages. There could be changes in YLSTW operation which may result in new hotspots. Therefore, the proposed SI works and any necessary remediation action are recommended to be carried out after decommissioning but prior to the construction works at the concerned facilities / areas. Supplementary Contaminated Assessment Plan(s) (CAP(s)), Contamination Assessment Report(s) (CAR(s)) and if necessary, Remediation Action Plan(s) (RAP(s)) and Remediation Report(s) (RR(s)) should be submitted to EPD for agreement.

### **6.2 Construction Phase**

6.2.1 Remediation works, if necessary, would be carried out after decommissioning of concerned facilities / areas but prior to the construction works at the concerned facilities / areas. 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.

### **6.3 Operation Phase**

6.3.1 As any contaminated soil / groundwater would be identified and properly treated prior to the construction works at the concerned facilities / areas, land contamination during the operation phase is not expected. As such, environmental monitoring and audit during operation phase for land contamination is considered not necessary.

## 7. ECOLOGY

### 7.1 Introduction

7.1.1 Potential ecological impacts arising from the construction and operation phases of the Project were assessed in the EIA Report. Since the Project would be constructed within the footprint of existing YLSTW, no direct impact on ecological resources would be anticipated. Mitigation measures have been recommended to minimize the potential indirect impacts to the nearby sensitive wetland habitats and associated wildlife, particularly waterbirds. With the implementation of appropriate mitigation measures, no unacceptable adverse residual impacts would be anticipated. Nonetheless, EM&A is considered necessary during construction of the Project and the requirements are described below. No specific ecological EM&A during operation phase is recommended.

### 7.2 Mitigation Measures

7.2.1 The implementation of mitigation measures recommended in the EIA Report to minimize potential ecological impacts are provided in **Appendix B**.

### 7.3 Monitoring Requirements

7.3.1 Utilization of the wetland habitats by birds within 500m of the Project site, where a number of avifauna of conservation interest (particularly overwintering waterbirds) and areas of conservation interest (including the Ramsar Site, Priority Site, WCA, WBA, SSSI and CA) were recorded, should be monitored monthly during the construction phase.

7.3.2 The area within 100m from the Project boundary should be monitored monthly during the construction phase to check the location and status of any active night roost.

#### *Baseline Ecological Monitoring of Birds*

7.3.3 The result of the ecological field surveys conducted for the EIA study, which were conducted monthly over a 12-month period between August 2016 and July 2017, will be adopted as the baseline for the evaluation of utilization of the wetland habitats by birds nearby the Project site and effectiveness of the proposed mitigation measures during the ecological monitoring. The ET should review the applicability of the results of baseline surveys conducted for the EIA and conduct verification surveys as necessary.

7.3.4 A Baseline Bird Survey Report should be submitted to relevant Government departments.

#### *Pre-construction Survey of Ardeid Night Roost*

7.3.5 A pre-construction survey should be conducted to record and verify the status and locations of any active ardeid night roost within 100m of the Project site boundary. It should also suggest a location as close to the night roost as practicable for monitoring of noise level during construction. The findings of the pre-construction surveys will serve as a reference for the evaluation of usage of ardeid night roost identified and effectiveness of the proposed mitigation measures during the construction phase ecological monitoring. A Report on Pre-construction Survey of Ardeid Night Roost should be submitted to relevant Government departments.

#### *Ecological Monitoring of Birds*

7.3.6 Monthly ecological monitoring, focusing on avifauna species of conservation interest, and overwintering waterbirds utilising wetland habitats in Fung Lok Wai and Nam Sang Wai as well as along Shan Pui River and Kam Tin River within 500m from the Project boundary should be conducted during construction phase. The proposed locations of monthly ecological monitoring are illustrated in **Figure 7.1**. For the surveys overlooking the mudflats and mangroves in the Shan Pui River and Kam Tin River, the tidal level at the time of the survey should be taken into consideration and the surveys should be taken when the tidal level is generally 1.5m or below.

7.3.7 Avifaunal communities should be surveyed quantitatively along transects and at selected point count locations. All birds heard or seen along the transects should be identified to species level and counted. Noise level should also be recorded. Any changes in site condition or disturbances detected or observed at the monitoring locations, including both construction and non-construction related activities, during each impact monitoring visit

should also be recorded.

- 7.3.8 The monitoring results should be compared to pre-construction baseline condition during the dry and wet seasons as summarized in the Baseline Bird Survey Report.
- 7.3.9 The ecological monitoring should be undertaken by experienced ecologist(s) with relevant working experience. Should any unpredicted indirect ecological impacts arising from the proposed Project be detected, remedial measures should be developed and implemented by the Contractor. The monitoring results with comparison to pre-construction baseline condition should be reported in the monthly EM&A Reports.

*Ardeid Night Roost Monitoring*

- 7.3.10 Monthly monitoring of the area within 100m from the Project boundary should be conducted during the construction phase to check the status and location of any active ardeid night roost. The night roost survey should be conducted from one hour before sunset to one hour after sunset. Direct observation should be made from a vantage point which enables an unobstructed view over the area. The species, abundance and time of all ardeids observed at the night roosts during the survey should be recorded, as well as the noise levels. Any changes in site condition or disturbances detected or observed at the monitoring locations, including both construction and non-construction related activities, during each monitoring visit should also be recorded.
- 7.3.11 The ecological monitoring should be undertaken by experienced ecologist(s) with relevant working experience. The usage of the ardeid night roost should be reviewed and analyzed, and if any significant decline is identified, the cause of the decline, with reference to any changes in site condition or disturbances detected, should be reviewed to identify any unpredicted indirect ecological impacts arising from the proposed Project. Remedial measures should be developed and implemented by the Contractor as necessary. On the other hand, if the active night roost is found to have relocated to 100m away from the project boundary naturally, subject to further consultation and agreement with AFCD/EPD, restriction on working hours (i.e. no construction works with PME within 100m from the night roost after 18:00 during wet season and after 17:30 during dry season) can be ceased. The monitoring results and evaluation of the usage of the ardeid night roost should be reported in the monthly EM&A Reports.

*Groundwater Monitoring*

- 7.3.12 During the construction phase, groundwater observation wells and recharge wells will be provided along with dewatering wells at the northern and western side of the Project site in order to ensure no excessive groundwater drawdown will be resulted from the proposed works. Groundwater table will be closely monitored at the observation wells. Whenever abnormal draw-down of groundwater table near the excavation area is found, groundwater dewatering will stop and in case it is needed, water will be pumped into the recharge wells to recover the normal groundwater table.

**7.4 Audit Requirements**

- 7.4.1 Site audits should be undertaken on weekly basis to check the proper implementation and maintenance of recommended mitigation measures during construction phase of the Project.

## **8. FISHERIES**

### **8.1 Introduction**

8.1.1.1 The potential fisheries impact associated with the Project has been assessed in the EIA Report. No unacceptable fisheries impact would be anticipated during the construction and operation phases of the Project and hence no specific monitoring for fisheries resources is considered necessary.

### **8.2 Mitigation Measures**

8.2.1.1 Mitigation measures for water quality control recommended in Section 5 of the EIA Report would also serve to protect fisheries resources from indirect impacts. Details of the mitigation measures are presented in **Appendix B**.

### **8.3 EM&A Requirements**

8.3.1.1 No specific fisheries monitoring and auditing programme is required. Monitoring and audit requirements for water quality as detailed in **Section 4** of this Manual would be applicable for the protection of the fisheries resources.

8.3.1.2 As standard engineering practice, during construction phase, groundwater observation wells and recharge wells will be provided along with dewatering wells at the northern and western side of the Project site in order to ensure no excessive groundwater drawdown will be resulted from the proposed works. Groundwater table will be closely monitored at the observation wells. Whenever abnormal draw-down of groundwater table near the excavation area is found, groundwater dewatering will stop and in case it is needed, water will be pumped into the recharge wells to recover the normal groundwater table.

## **9. LANDSCAPE & VISUAL**

### **9.1 Introduction**

9.1.1 The EIA Report has recommended landscape and visual mitigation measures for the construction and operation phases of the Project. This section defines the audit requirements to confirm the recommended landscape and visual impact mitigation measures are effectively implemented.

### **9.2 Mitigation Measures**

9.2.1 The implementation schedule of the recommended mitigation measures is presented in **Appendix B**. The landscape and visual mitigation measures proposed should be incorporated in the detailed landscape and engineering design. The construction phase mitigation measures should be adopted from the commencement of construction and should be in place throughout the entire construction period. Mitigation measures for the operational phase should be adopted during the detailed design and be built as part of the construction works so that they are in place on commissioning of the YLEPP.

9.2.2 Any potential conflicts among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved at early stage. Any changes to the mitigation measures should be incorporated in the detailed design.

### **9.3 Baseline Review**

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

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

9.3.3 A baseline report including photographic record of the site at the time of the Contractor's possession of the site shall be prepared by the Contractor and approved by the ER. The approved baseline monitoring report including photographic record shall be certified by the ET Leader and verified by the IEC before submitting to EPD and PlanD for record.

### **9.4 Audit Requirements**

9.4.1 Site audits should be undertaken during the construction phase and the 12-month establishment period (operation phase) to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives.

9.4.2 A Landscape Architect or related professional shall be employed to audit the implementation of landscape construction works particularly during site clearance operations when the proposed tree felling and transplanting will take place and subsequent maintenance operations.

9.4.3 Site inspections should be undertaken every week during the construction period and once every two months for the 12-month establishment period during operation phase.

9.4.4 In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 9-1**.

**Table 9-1 Event / Action Plan for Landscape and Visual during Construction Stage**

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

## **10. HAZARD TO LIFE**

### **10.1 Introduction**

10.1.1 The EIA study concluded that no unacceptable risk is anticipated during the construction and operation phases of the Project, no mitigation measures would be required.

### **10.2 Mitigation Measures**

10.2.1.1 Safeguard measures are recommended to further manage and minimize the potential risks during construction and operation phases of the Project. They are summarized in the Implementation Schedule provided in **Appendix B**.

### **10.3 EM&A Requirements**

10.3.1.1 Implementation of the recommended mitigation measures should be regularly audited during the construction phase. No specific monitoring would be required.



## 11. SITE ENVIRONMENTAL AUDIT

### 11.1 Site Inspections

11.1.1 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.

11.1.2 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.

11.1.3 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.

11.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the 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 time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

11.1.5 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.

### 11.2 Compliance with Legal and Contractual Requirements

11.2.1 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.

11.2.2 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**.

11.2.3 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.

11.2.4 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 licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.

- 11.2.5 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 licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor accordingly.
- 11.2.6 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.

### 11.3 Environmental Complaints

- 11.3.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any complaint:
- i. log complaint and date of receipt onto the complaint database and inform the IEC immediately;
  - ii. investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
  - iii. identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
  - iv. advise the Contractor if mitigation measures are required;
  - v. review the Contractor's response to identified mitigation measures, and the updated situation;
  - vi. 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;
  - vii. undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
  - viii. 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
  - ix. record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

- 11.3.2 A flow chart of the complaint response procedure is shown in **Figure 11.1**.

## **12. REPORTING**

### **12.1 Introduction**

12.1.1 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.

12.1.2 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.

### **12.2 Electronic Reporting of EM&A Information**

12.2.1 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.

### **12.3 Baseline Monitoring Report**

12.3.1 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. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.

12.3.2 The baseline monitoring report shall include, but not be limited to the following:

- i. up to half a page executive summary;
- ii. brief project background information;
- iii. drawings showing locations of the baseline monitoring stations;
- iv. an updated construction programme with milestones of environmental protection / mitigation activities annotated;
- v. 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.
- vi. 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.

- vii. determination of the 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;
- viii. revisions for inclusion in the EM&A Manual; and
- ix. comments, recommendations and conclusions.

## 12.4 Monthly EM&A Reports

### *General*

- 12.4.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days at the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the IEC, the ER and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.
- 12.4.2 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.

### *First Monthly EM&A Report*

- 12.4.3 The first monthly EM&A report shall include at least but not be limited to the following:
- i. executive summary (1-2 pages):
    - breaches of AL levels;
    - complaint log;
    - notifications of any summons and successful prosecutions;
    - reporting changes; and
    - future key issues.
  - ii. basic project information:
    - project organisation including key personnel contact names and telephone numbers;
    - construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
    - management structure, and
    - works undertaken during the month.
  - iii. environmental status:
    - works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage of fines in the fill materials used, etc.); and
    - drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).
  - iv. a brief summary of EM&A requirements including:
    - all monitoring parameters;
    - environmental quality performance limits (AL levels);
    - Event-Action Plans;

- environmental mitigation measures, as recommended in the Final EIA report; and
- environmental requirements in contract documents.
- v. implementation status:
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule.
- vi. monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth);
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - graphical plots of the monitored parameters in the month annotated against:
    - o the major activities being carried out on site during the period;
    - o weather conditions that may affect the results; and
    - o any other factors which might affect the monitoring results;
  - any other factors which might affect the monitoring results; and
  - quality assurance (QA) / quality control (QC) results and detection limits.
- vii. report on non-compliance, complaints, notifications of summons and successful prosecutions:
  - record of all non-compliance (exceedances) of the environmental quality performance limits (AL 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.
- viii. others:
  - an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status;
  - 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.

*Subsequent monthly EM&A Reports*

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

- i. executive summary (1 - 2 pages):
  - breaches of AL levels;
  - complaints log;
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- ii. environmental status:
  - construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection / mitigation measures for the month;
  - works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
  - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- iii. implementation status:
  - 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.
- iv. monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth);
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - graphical plots of the monitored parameters in the month annotated against:
    - o the major activities being carried out on site during the period;
    - o weather conditions that may affect the results; and
    - o any other factors which might affect the monitoring results.
  - any other factors which might affect the monitoring results; and
  - quality assurance (QA) / quality control (QC) results and detection limits.
- v. report on non-compliance, complaints, and notifications of summons and successful prosecutions:
  - record of all non-compliance (exceedances) of the environmental quality performance limits (AL 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.
- vi. others:
- an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status;
  - 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.
- vii. appendix
- AL 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:
    - o major activities being carried out on site during the period;
    - o weather conditions during the period; and
    - o any other factors that might affect the monitoring results.
  - monitoring schedule for the present and next reporting period;
  - cumulative statistics on complaints, notifications of summons and successful prosecutions;
  - outstanding issues and deficiencies

#### *Quarterly EM&A Summary Reports*

12.4.5 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.

- i. executive summary (1 - 2 pages);
- ii. basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- iii. 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.

- iv. 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;
- v. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- vi. 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.
- vii. advice on the solid and liquid waste management status;
- viii. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);
- ix. a brief review of the reasons for and the implications of non-compliance, including a review of pollution sources and working procedures;
- x. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- xi. a summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- xii. 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;
- xiii. 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
- xiv. proponents' contacts and any hotline telephone number for the public to make enquiries.

## **12.5 Final EM&A Review Report for Construction Phase**

- 12.5.1 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.
- 12.5.2 Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/communities and/or District Boards). 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.
- 12.5.3 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.
  - i. executive summary (1 - 2 pages);
  - ii. basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
  - iii. 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.



- iv. 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 status proformas;
- v. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- vi. graphical plots of the trends of monitored parameters over the course of the project, including the post-project monitoring for all monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - the return of ambient environmental conditions in comparison with baseline data.
- vii. compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
- viii. provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- ix. advice on the solid and liquid waste management status;
- x. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL levels);
- xi. a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- xii. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- xiii. a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- xiv. review monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- xv. 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;
- xvi. review the practicality and effectiveness of the EIA process and EM&A programme (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
- xvii. a conclusion to state the return of ambient and / or the predicted scenario as per EIA findings.

## **12.6 EM&A Reports for Operation Phase**

- 12.6.1 Unless otherwise agreed by EPD, quarterly EM&A reports shall be submitted to record the results and findings of the odour monitoring during the first 3-years of YLEPP Phase 1 and Phase 2 operation, water quality monitoring during the first year of YLEPP Phase 1 and Phase 2 operation, as well as the landscape and visual audit for the 12-month establishment period during operation phase.
- 12.6.2 A final EM&A review report for operation phase shall be submitted after completion of operation monitoring. The final EM&A review report for operation phase should contain at least the following information:
  - i. Executive summary (1-2 pages):
  - ii. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and/or control stations;

- iii. Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- iv. A brief summary of EM&A requirements including:
  - environmental mitigation measures for operation stage, as recommended in the project EIA Report;
  - environmental impact hypotheses tested;
  - environmental quality performance limits (Action and Limit levels);
  - all monitoring parameters;
  - Event and Action Plans;
- v. A summary of the implementation status of environmental protection and pollution control / mitigation measures for operation stage, as recommended in the project EIA Report and summarised in the updated implementation schedule;
- vi. Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- vii. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- viii. A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- ix. A description of the actions taken in the event of non-compliance;
- x. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;
- xi. A review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;
- xii. Comments (for example, a review of the effectiveness and efficiency of the mitigation measures, the performance of the environmental management system, and the overall EM&A programme for operation stage); and
- xiii. Recommendations and conclusions (for example, a review of success of the overall EM&A programme for operational stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

## **12.7 Data Keeping**

- 12.7.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET Leader and be ready for

inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in electronic format, and the software copy must be available upon request. Data format shall be agreed with the EPD. All documents and data shall be kept for at least one year following completion of the construction contract.

## **12.8 Interim Notifications of Environmental Quality Limit Exceedances**

- 12.8.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC and EPD, as appropriate. The notification shall be followed up with advice to IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in **Appendix D**.