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Environmental Monitoring and Audit Manual  
for  
Proposed Low-rise and Low-density Residential Development  
At Various Lots and their Adjoining Government Land  
in D.D. 104, East of Kam Pok Road,  
Mai Po, Yuen Long, N.T.

**Final Report**

Prepared by  
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## **1. INTRODUCTION**

### **1.1 Background**

- 1.1.1 The Project Site comprises various lots in D.D. 104, East of Kam Pok Road in Mai Po, Yuen Long. It covers an area of about 3.8ha. The Project Site falls within an area zoned “Residential (Group D)” [“R(D)”] on the Approved Mai Po and Fairview Park Outline Zoning Plan No. S/YL-MP/6 (the OZP). **Figure 1-1** shows the Project Site location.
- 1.1.2 According to Item P of Part 1, Schedule 2 of the EIAO, the Project is a Designated Project since it is a residential development other than New Territories exempted house within the Deep Bay Buffer Zone 2.
- 1.1.3 As part of the Environmental Impact Assessment (EIA) study for the Project, a Manual for guiding the setup of an Environmental Monitoring and Audit (EM&A) programme to check the implementation of the relevant environmental mitigation measures recommended in the EIA, is required. The EM&A programme will be useful in providing a means to verify the effectiveness and adequacy of the mitigation measures recommended in the EIA such that additional mitigation measures or remedial action, if deemed necessary, can be formulated.
- 1.1.4 As part of the EIA study for the Project, Ramboll Environ Hong Kong Limited (the Consultant) has been commissioned as the lead consultant to prepare this EM&A manual.
- 1.1.5 Through the EIA study for the Project, a number of environmental mitigation measures are recommended to be implemented during the design, construction, and operational phases of the Project. These mitigation measures and their implementation requirements are summarised in the Implementation Schedule contained in Appendix I of this EM&A Manual.
- 1.1.6 This Manual provide systematic procedures for the carrying out of recommended monitoring and auditing works for checking of potential environmental impacts which may arise from the project. Mitigation measures recommended in the EIA Report for each key environmental aspect are also summarised and presented.
- 1.1.7 Environmental regulations currently enforced in Hong Kong pertaining to air quality, noise and waste, etc. and the recommendations given in the EIA study report for the Project have been observed in the preparation of this Manual.

### **1.2 Objectives of this EM&A Programme**

- 1.2.1 The main objectives of the EM&A programme include:
- To provide a database on baseline environmental quality for subsequent checking of any short or long term environmental impacts arising from the Project;
  - To provide information at an early stage for identification of potential problem areas and formulation of additional environmental mitigation measures where necessary should any of the environmental control measures or practices fail to achieve the target standards;
  - To monitor the performance of the Project from an environmental viewpoint and the sufficiency and effectiveness of the implemented mitigation measures;
  - To verify the environmental impacts predicted in the EIA Study for the Project;
  - To determine compliance of the Project with relevant regulatory standards, requirements and guidelines;

- To take remedial action should unexpected problems or unacceptable impacts are identified;
- To provide baseline and compliance monitoring data to assist the carrying out of effective environmental audits.

### **1.3 Content of this EM&A Manual**

1.3.1 The recommended EM&A programme in this Manual basically contains the following information:

- Duties of various parties involved in the environmental monitoring and audit programme;
- Information on project organisation, construction schedule and activities;
- Information on the tentative construction programme and the necessary environmental monitoring and audit programme to track the varying environmental impacts;
- Definition of Action and Limit levels, and establishment of Event and Action Plans;
- Requirements of reviewing pollution sources and work procedures in the event of non-compliance of the environmental criteria;
- Requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures;
- An Implementation Schedule (Appendix I) of the environmental mitigation measures recommended in the EIA report for the Project;
- Record forms (Appendix II) to be adopted where applicable during the construction phase of the Project.

1.3.2 The EM&A Manual shall be regarded as an evolving document that should be updated when necessary in order to maintain its relevance during the detailed design stage and/or the construction phase (e.g. when alternative monitoring locations are proposed). The updated EM&A Manual shall be submitted to the ER and EPD for agreement.

## 2. PROJECT DESCRIPTION

### 2.1 The Site and Its Environs

- 2.1.1 The site is located between Kam Pok Road, Ha Chuk Yuen Road and Fung Chuk Road, and bounded by a number of existing and planned residential developments adjacent to Castle Peak Road and Fairview Park Boulevard. Under the Approved Mai Po and Fairview Park Outline Zoning Plan (OZP) No. S/YL-MP/6, the Project Area is zoned “R(D)”. In addition, the Project Area is located outside the Wetland Buffer Area under the Town Planning Board Guidelines (TPB PG No. 12C). The planning intention of the zone is to allow comprehensive low-density residential development within the zone. In brief, the Project Area is designated by the Government for residential use purpose in line with the existing and planned uses on the adjacent sites. **Figure 1-1** refers.
- 2.1.2 The proposed development consists of low density residential development, residential clubhouse and swimming pool to support the development. 32 houses of two storeys high set in spacious surroundings with private gardens and carports and a maximum building height of 2 storeys of 6.6m high, are proposed. The proposed development layout is shown in **Figure 2-1**.

### 2.2 Implementation of the Project

- 2.2.1 Appendix III shows the tentative construction programme of the Project. Construction activities are planned to commence in 2017 for completion in later 2018.
- 2.2.2 The proposed elements of this Project are also depicted in **Figure 9-1**. After site formation works to raise the existing ground level, subsequent construction of building, road and underground services will then commence within the Project Site area.

### 2.3 Environmental Monitoring and Audit Requirements

- 2.3.1 The EIA study has identified the likely environmental impacts during construction and operational phases of the Project. These impacts can be minimized to acceptable levels with the implementation of environmental mitigation measures and environmental monitoring and audit (EM&A) requirements. An EM&A Implementation Schedule of the environmental mitigation measures recommended in the EIA Report is also provided in Appendix I. To ensure the environmental acceptability of the proposed development, monitoring and audit requirements have been identified and are described in details in the subsequent sections.
- 2.3.2 The following areas, identified in the EIA for this Project, will require EM&A during the construction or operational phase:
- Air Quality;
  - Noise Impact;
  - Water Quality;
  - Sewerage;
  - Waste Management;
  - Landscape and Visual; and
  - Ecology.



### 3. PROJECT ORGANISATION

- 3.1.1 The key parties in a typical EM&A programme include the Contractor, the Engineer<sup>1</sup> or the Engineer's representative<sup>1</sup> (hereinafter referred to as the ER), the Project proponent (PP), the Environmental Team (ET), the Independent Checker (Environment) (IEC), and the Environmental Protection Department (EPD). Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required in the EIA, this EM&A Manual, as well as the Project Environmental Permit (EP) for the duration of the Project.
- 3.1.2 A typical construction phase environmental monitoring and audit procedure is enclosed in **Figure 3-1** for reference. The main duties and responsibilities of each party shall include but not be limited to the followings:

#### Environmental Team

- 3.1.3 An Environmental Team (ET) shall be appointed to carry out the recommended EM&A works for the Project. Suitably qualified staff shall be included in the ET, and resources for the implementation of the EM&A programme shall be allocated in time, to enable fulfilment of the Project EM&A requirements as specified in the EIA, this EM&A Manual., and the Project Environmental Permit. The ET shall be headed by an ET Leader<sup>2</sup> in fulfilling the EM&A duties.
- 3.1.4 The ET Leader (ETL) shall plan, organise and manage the implementation of the EM&A programme specified in the EIA, EM&A Manual , and to ensure that the EM&A works are undertaken to the required standards. The ET Leader shall have relevant experience and professional qualifications and possesses at least 7 years' experience in EM&A or environmental management subject to the approval of the ER and the Director of Environmental Protection (DEP).
- 3.1.5 The ET Leader shall be responsible for the implementation of the EM&A programme in accordance with the EM&A requirements specified in this Manual. The ET Leader shall keep a contemporaneous log-book of each and every instance or circumstance or change of circumstances which may affect the EIA and each and every non-compliance with the Environmental Permit or the recommendations in the EIA report. This log-book shall be kept readily available for inspection by the IEC, and DEP or his authorized officers. The ET shall not be in any way an associated body of the IEC or the Contractor for the Project.
- 3.1.6 The board categories of works of the ET comprise the followings:
- Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements as well as that required in the EM&A Manual;
  - Analyse the EM&A data and review the success of EM&A programme to cost effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
  - Schedule the environmental site audit/ surveillance;

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<sup>1</sup> For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract.

<sup>2</sup> The Environmental Team (ET) leader, who shall be responsible for and in charge of the ET, refers to the person delegated the role of executing the environmental monitoring and audit requirements.

- Audit of compliance with environmental protection, and pollution prevention and control regulations;
- Monitor the implementation of environmental mitigation measures;
- Monitor compliance with the environmental protection clauses/specifications in the Contract;
- Review construction programme and comment as necessary;
- Review work methodologies and comment as necessary;
- Complaint investigation, evaluation and identification of corrective measures in accordance with the procedure mentioned in the EM&A Manual;
- Liaison with the Project IEC on all environmental performance matters, and timely submission of all relevant EM&A proforma for IEC's approval;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site;
- Advise on suitable mitigation measures in case of exceedance of Action and Limit levels in accordance with the Event and Action Plans; and
- Timely submission of the EM&A report to the Project Proponent and the DEP.

3.1.7 In the event of any exceedance in action/ limit levels, the ET shall immediately inform the IEC, Engineer/ ER and the Contractor and adhere to the procedures specified in the relevant Event and Action Plan of this EM&A Manual, so that appropriate remedial action can be undertaken by the Contractor promptly. The ET is also responsible for the preparation of the EM&A reports for submission to IEC, the Contractor and the ER, and EPD. The ET shall assist the Contractor and the ER in formulating any necessary corrective actions and/ or additional mitigation measures, and liaising with relevant Government Departments where necessary.

#### Independent Checker (Environment)

3.1.8 The Independent Checker (Environment) (IEC) shall advise the ER on environmental issues related to the project. The IEC shall not be in any way an associated body of the Contractor or the ET for the Project. The IEC shall be empowered to audit from an independently viewpoint the environmental performance of construction. The IEC shall be a person who has at least 7 years' experience in EM&A or environmental management subject to approval of the ER and the DEP. The IEC shall be responsible for the duties defined in the EIA, this EM&A Manual, and shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this EM&A Manual, and any other submissions required under the Environmental Permit. The IEC shall be responsible for verifying the environmental acceptability of permanent and temporary works, relevant design plans and submissions under the Environmental Permits. The IEC shall verify the log-book prepared and kept by the ET Leader. The IEC shall notify DEP by fax, within 24 hours of each and every occurrence, change of circumstances or non-compliance with the EIA Report or the Environmental Permit, which might affect the monitoring or control of adverse environmental impact.

3.1.9 The main duty of the IEC is to carry out independent environmental audit of the Project. This shall include, inter alia, the followings:

- Review and audit in an independent, objective and professional manner all aspects of the EM&A programme;

- Validate and confirm the accuracy of monitoring results; appropriateness of monitoring equipment, monitoring locations with reference to the locations of the nearby sensitive receivers, and monitoring procedures;
- Carry out random sample check and audit on monitoring data and sampling procedures, etc.;
- Conduct random site inspection;
- Audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- On a need basis, verify and audit the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions under the environmental permit. Where necessary, the IEC shall agree in consultation with the ET Leader and the Contractor the least impact alternative;
- Verify investigation results of complaint cases and the effectiveness of corrective measures;
- Verify EM&A report submitted by the ET Leader;
- Adhere to the procedure for carrying out complaint investigation in accordance with the procedure mentioned in the EM&A Manual; and
- Feedback audit results to ET/ER according to the Event/ Action Plans specified in this EM&A Manual and by signing off relevant EM&A proformas.

#### The Contractor

- 3.1.10 The Contractor is responsible for providing assistance to the ET in carrying out the monitoring and EM&A duties, and providing requested information to the ET in the event of any exceedance in the environmental criteria (action/ limit levels) specified in this Manual or other current environmental standards, and to rectify unacceptable practices. The Contractor shall adhere to the procedure for carrying out complaint investigation in accordance with the procedure mentioned in the EM&A Manual. The Contractor shall discuss with the ET, IEC and ER on any additional mitigation measures identified to be required by the ET and implement the agreed measures to alleviate any identified environmental impact to acceptable levels. The Contractor shall submit the proposals on mitigation measures in case of exceedances of Action and Limit level in accordance with the Event and Action Plans, and implement the measures to reduce the impact. The Contractor shall report to the ET on the actions taken targeting at environmental protection for inclusion in the monthly report to be prepared by the ET.

#### The Engineer/ Engineer's Representative (ER)

- 3.1.11 The ER shall be responsible for overseeing the operations of the Contractor and the ET. He shall advise, co-ordinate and give instruction when appropriate for efficient implementation of any specific environmental mitigation measures identified to be required by the contractor, and/or outstanding EM&A works required to be carried out by ET in consultation with the IEC. The ER shall supervise the Contractor's activities and ensure that the requirements in the EIA Report and EM&A Manual are fully complied with. He shall inform the Contractor when action is required to reduce impacts in accordance with the Event/ Action Plans. He shall review the EM&A Reports submitted by the ET and follow up the recommendations. He shall

ensure that the Contractor is implementing the environmental controls and mitigation measures as set out in the EIA report and EM&A Manual, as well as additional measures necessary for compliance with the relevant environmental standards. The Engineer shall adhere to the procedure for carrying out complaint investigation in accordance with the procedure mentioned in the EM&A Manual.

## 4. AIR QUALITY

### 4.1 Introduction

- 4.1.1 During construction, the Contractor shall follow the Air Pollution Control (Construction Dust) Regulation to implement dust mitigation measures to minimize the dust impact to the nearby air sensitive receivers and to ensure the effectiveness of the implementation of dust mitigation measures recommended in the final EIA report and this EM&A Manual.

### 4.2 Air Quality Parameters

- 4.2.1 According to the EIA report, with the implementation of recommended mitigation measures no adverse air quality impact is anticipated during construction. Nevertheless, EM&A programme is also proposed to monitor the effectiveness of implementation of mitigation measures. Monitoring and audit of Total Suspended Particulate (TSP) levels shall be carried out by the ET during the construction phase, which include site formation, slope construction and subsequent roadwork, to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.
- 4.2.2 1-hour TSP levels shall be measured according to the recommended programme. 1-hour TSP levels shall be measured by following the standard high volume sampling method as set out in Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B.
- 4.2.3 Upon approval of the ER, 1-hour TSP levels can alternatively be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts. However, the ET should submit sufficient information to the IEC and the ER to prove that the instrument is capable of achieving a comparable result as that a High Volume Sampler (HVS) and maybe used for 1-hr sampling.
- 4.2.4 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details, where appropriate. A sample data sheet is shown in Appendix II.

### 4.3 Monitoring Equipment

- 4.3.1 Regarding the high volume sampling method, High Volume Sampler (HVS) in compliance with the following specifications shall be used for carrying out the monitoring:
- 0.6-1.7 m<sup>3</sup>/min. (20-60 SCFM) adjustable flow range;
  - Equipped with a timing/control device with  $\pm 5$  minutes accuracy for 24 hours operation;
  - Installed with elapsed-time meter with  $\pm 2$  minutes accuracy for 24 hours operation;
  - Capable of providing a minimum exposed area of 406 cm<sup>2</sup> (63 in<sup>2</sup>);
  - Flow control accuracy:  $\pm 2.5\%$  deviation over 24-hr 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-hr period.
- 4.3.2 If the ET proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the IEC to prove that the instruments is capable of achieving a comparable result as that the HVS and may be used for the 1-hr sampling. The instrument shall also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.
- 4.3.3 During the course of the project, the ET is responsible for provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit, and direct reading dust meters are available for the carrying out of baseline monitoring, regular impact monitoring and ad hoc monitoring.
- 4.3.4 The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.
- 4.3.5 Initial calibration of HVSs shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised 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 should be converted into standard temperature and pressure condition.
- 4.3.6 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 down in the data sheet. Sample forms are provided in Appendix II.
- 4.3.7 Wind data monitoring equipment shall also be provided and set up at a conspicuous location for logging wind speed and wind direction near to the dust monitoring locations. The location for equipment installation shall be proposed by the ET and agreed with the ER and IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- The wind sensors should be installed on masts at an elevated level 10m above ground so that they are clear of obstructions or turbulence caused by the buildings;
  - The wind data should be captured by a data logger and to be downloaded for processing at least once a month;
  - The wind data monitoring equipment should be re-calibrated at least once every six months; and
  - Wind direction should be divided into 16 sectors of 22.5 degrees each.
- 4.3.8 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

#### **4.4 Laboratory Measurement / Analysis**

- 4.4.1 A clean laboratory with constant temperature and humidity control, and equipped

with necessary measuring and conditioning instruments, to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited or other internationally accredited laboratory.

- 4.4.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC. The IEC shall conduct regular audit to the measurement performed by the laboratory 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 reference.
- 4.4.3 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-hr and be pre-weighed before use for the sampling.
- 4.4.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper is then returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 4.4.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

#### 4.5 Proposed Monitoring Locations

- 4.5.1 The air quality impact assessment presented in the EIA report indicated that the nearby air sensitive receivers (ASRs) would not be subjected to adverse dust impact when recommended dust mitigation measures are properly applied onsite. The dust mitigation measures have been recommended and shall be implemented by the Contractor in accordance with the requirements under the Air Pollution Control (Construction Dust) Regulation. The Contractor shall be responsible for the design and implementation of the dust mitigation measures.
- 4.5.2 Figure 4-1 shows the location of the proposed air quality monitoring location identified for the air quality monitoring during construction. Table 4-1 summarizes the location of air quality monitoring station.

**Table 4-1 Locations of Air Quality Monitoring Station**

Monitoring Station ID	Corresponding ASR in EIA Report	Representative for
AM1	A27	Existing building

- 4.5.3 The selection of the above monitoring location has taken into account the air quality assessment results presented in the EIA report and the availability of the monitoring locations. The existing ASR that is worst affected by the Project works is selected for monitoring.
- 4.5.4 Before commencement of monitoring, the ET Leader shall review the status and availability of monitoring locations which may change after issuing this Manual, and availability of continuous electricity supply for the HVS. 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. The alternative monitoring locations proposed by the ET shall be approved by the ER and agreed by IEC. When alternative monitoring locations are proposed, the following criteria should be followed as far as practicable:

- At the site boundary or such locations close to the major dust emission sources;
- Close to the sensitive receptors; and
- Take into account the prevailing meteorological conditions.

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

- A horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- No two samplers should be placed less than 2 meter apart;
- 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;
- A minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- A minimum of 2 metre separation from any supporting structure, measured horizontally is required;
- No furnace or incinerator flue is nearby;
- Airflow around the sampler is unrestricted;
- The sampler is more than 20 metres from the dripline;
- Any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- Permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- A secured supply of electricity is needed to operate the samplers.

#### **4.6 Baseline Monitoring**

4.6.1 Baseline monitoring shall be carried out by the appointed ET Leader at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain hourly TSP samples. 1-hr sampling shall also be done at least 3 times per day during daytime when the highest dust impact is expected. The ET Leader should inform the IEC, ER and DEP on the baseline monitoring programme before commencement such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.

4.6.2 During the baseline monitoring, there should not be any dust generation construction activities in the vicinity of the monitoring stations arising from the Site.

4.6.3 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 locations shall be approved by the ER and agreed with IEC.

4.6.4 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.

4.6.5 If the ET Leader considers that the ambient conditions have been changed and a



repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be carried out at times when the contractor's activities are not generating dust in the proximity of the monitoring station. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC and DEP.

#### 4.7 Impact Monitoring

- 4.7.1 The ET Leader shall carry out impact monitoring during the course of the construction works at the recommended dust monitoring stations.
- 4.7.2 For 1-hr TSP monitoring, a sampling frequency of at least three times in every six-days shall be undertaken during the hours when the highest dust impact is predicted to occur based on the nature of the construction works.
- 4.7.3 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the following section, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

#### 4.8 Event and Action Plan for Air Quality

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

**Table 4-2 Action and Limit Levels for Air Quality**

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

**Table 4-3 Event/Action Plan for Air Quality**

EVENT	ACTION			
	ET Leader	IEC	ER	CONTRACTOR
<b>ACTION LEVEL</b>				
Exceedance for one sample	<ol style="list-style-type: none"> <li>Identify source, investigate the causes of exceedance and propose remedial measures</li> <li>Inform ER, IEC and Contractor</li> <li>Repeat measurement to confirm finding</li> <li>Increase monitoring frequency to daily</li> </ol>	<ol style="list-style-type: none"> <li>Check monitoring data submitted by ET</li> <li>Check Contractor's working method</li> </ol>	<ol style="list-style-type: none"> <li>Notify Contractor</li> </ol>	<ol style="list-style-type: none"> <li>Rectify any unacceptable practice</li> <li>Amend working methods if appropriate</li> </ol>
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>Identify source, investigate the causes of exceedance and propose remedial measures</li> <li>Inform ER, IEC and Contractor</li> <li>Repeat measurements to confirm findings</li> <li>Increase monitoring frequency to daily</li> <li>Discuss with IEC and</li> </ol>	<ol style="list-style-type: none"> <li>Checking monitoring data submitted by ET</li> <li>Check Contractor's working method</li> <li>Discuss with ET Leader and Contractor on possible remedial measures</li> <li>Advise the ER on</li> </ol>	<ol style="list-style-type: none"> <li>Confirm receipt of notification of failure in writing</li> <li>Notify Contractor</li> <li>Ensure remedial measures properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>Submit proposals for remedial actions to IEC within 3 working days of notification</li> <li>Implement the agreed proposals</li> <li>Amend proposal if appropriate</li> </ol>

EVENT	ACTION			
	ET Leader	IEC	ER	CONTRACTOR
	Contractor on remedial actions 6. If exceedance continues, arrange meeting with IEC and ER 7. If exceedance stops, cease additional monitoring	the effectiveness of the proposed remedial measures 5. Supervisor implementation of remedial measures		
LIMIT LEVEL				
Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Inform ER, EPD, IEC and Contractor 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results	1. Checking monitoring data submitted by ET 2. Check Contractor's working method 3. Discuss with ET and Contractor on possible remedial measures 4. Advise the ER on the effectiveness of the proposed remedial measures 5. Supervisor implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Ensure remedial measures properly implemented	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
Exceedance for two or more consecutive samples	1. Identify source, investigate the causes of exceedance and propose remedial measures 2. Notify ER, EPD, IEC and Contractor 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Discuss amongst ER, ET and Contractor on the potential remedial actions 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented 4. Ensure remedial measures properly implemented 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

#### 4.9 Construction Mitigation Measures

- 4.9.1 The EIA report has recommended various dust control and mitigation measures. The following measures are specifically recommended in the EIA for implementation together with those presented in the Air Pollution Control (Construction Dust) Regulation. An implementation schedule is provided in Appendix I.
- 4.9.2 Good site management practices are important in reducing potential air quality impacts. As a general guidance, the contractor shall maintain high standard of housekeeping to prevent emission of fugitive dust emission. Loading, unloading, handling and storage of fuel, raw materials, products, wastes or by-products should be carried out in a manner so as to minimize the release of visible dust emission. It is recommended that the active works areas within the construction site to be

watered regularly during the construction period so as to suppress dust emission effectively.

- 4.9.3 The speed of the trucks travelling on haul roads within the Project Site to be controlled at 10 kph in order to reduce dust impact and for safe movement around the Project Site. Any piles of materials accumulated on-site to be cleaned up regularly. Cleaning, repair and maintenance of all plant facilities within the work areas to be carried out in a manner without generating fugitive dust emissions. The material to be handled properly to prevent fugitive dust emission before cleaning.
- 4.9.4 It is expected that no concrete batching will be required for the Project works, and concrete will be brought to the site in "ready-mixed" state or in pre-cast elements instead. However, if concrete batching is required at the site, the plant should be cleaned and watered regularly as a good practice. Cement and other fine grained materials delivered in bulk should be stored in enclosed silos fitted with high level alarm indicator. Wet mix batching process is preferred over dry mix batching. In addition, concrete batching plant shall comply with the specified process (SP) licence requirements including specified emission limits and dust control measures.
- 4.9.5 All relevant dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation would be fully implemented. Mitigation measures include:
- The designated haul road should be hard paved to minimize fugitive dust emission;
  - During the site formation works, the active works areas should be water sprayed with water browser or sprayed regularly during the construction period. The Contractor(s) should ensure that the amount of water spraying is just enough to dampen the exposed surfaces without over-watering which could result in surface water runoff;
  - Dump trucks for transporting dusty materials should be totally enclosed using impervious sheeting;
  - Any excavated dusty materials or stockpile of dusty materials to be covered by impervious sheeting or sprayed with water so as to maintain the entire surface wet, and recovered or backfilled or reinstated as soon as practicable;
  - Dusty materials remaining after a stockpile is removed should be wetted with water;
  - The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with e.g. concrete, bituminous materials or hardcore or similar;
  - The Contractor(s) shall only transport adequate amount of fill materials to the Project Site to minimize stockpiling of fill materials on-site, thus reducing fugitive dust emission due to wind erosion;
  - Should temporary stockpiling of dusty materials be required, it shall be either covered entirely by impervious sheeting, placed in an area sheltered on the top and the 3 sides; or sprayed with water so as to maintain the entire surface wet;
  - All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty material wet;
  - Vehicle speed to be limited to 10 kph except on completed access roads;
  - The portion of road leading only to a construction site that is within 30 m of a designated vehicle entrance or exit should be kept clear of dusty materials;
  - Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites;

- The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
  - The working area of excavation should be sprayed with water before, during and after (as necessary) the works so as to maintain the entire surface wet; and
  - Use of effective dust screens, sheeting or netting to be provided to enclose dry scaffolding which may be provided from the ground floor level of the building or if a canopy is provided at the first floor level, from the first floor level, up to the highest level (maximum four floors for this Project) of the scaffolding where scaffolding is erected around the perimeter of a building under construction.
- 4.9.6 In order to minimize potential cumulative dust impacts, the Contractor(s) shall carry out site formation works in stages. Regular site watering will be applied within the construction site in order to effectively suppress dust emission, and that dusty materials will be properly covered to prevent wind erosion. Works area shall be properly covered at the end of working day to minimize wind erosion.
- 4.9.7 The concerned sediment at existing pond is intended to be left in place and not to be disturbed as far as possible. However, in case pond sediment is involved during construction at the abandoned pond area, the following precautionary measures are proposed:
- Exposed surface shall be filled by filling materials;
  - Malodorous materials, if any, will be placed as far as possible from any ASRs;
  - Malodorous materials should be covered by plastic tarpaulin sheets; and
  - Regular odour patrol shall be carried out by the ET and the Contractor to examine the effectiveness of the control measures.
- 4.9.8 The effectiveness of the above control measures shall be checked as part of the EM&A programme. An implementation schedule of the above is provided in Appendix I. If the measures adopted and implemented by the Contractor are found to be insufficient, the Contractor shall liaise with the ET Leader and IEC on the implementation of some other mitigation measures. The additional mitigation measures shall be approved by the ER before implementation.

#### **4.10 Recommended Operational Phase Mitigation Measures**

- 4.10.1 The proposed development can satisfy the HKPSG requirements in terms of buffer distance from nearby roads. Thus, no adverse air quality impacts due to vehicular emissions are anticipated.
- 4.10.2 Since the Project Site is not currently connected to existing public sewerage system, interim sewage treatment plant is proposed within the Project Site. The interim sewage treatment plant will only be operated if the future public sewerage system is not yet in place when the residential development of the Project is occupied and the proposed development will ultimately connect to the public sewerage system when it becomes available. The location of the interim sewage treatment plant is shown in the MLP and provided in **Figure 2-1** of the EIA report.
- 4.10.3 Detailed design of the interim STP has yet been carried out, but the interim sewage treatment plant will be within a totally enclosed building with biological treatment, membrane filtration and Reverse Osmosis processes to be located underground. Brine disposal during maintenance will be away from residential area as much as possible and close to the vehicular access connecting the nearby road.
- 4.10.4 The STP will be equipped with odour removal system (with an odour removal

efficiency of not less than 99.5%). In addition, the exhaust of the STP will be directed away from nearby ASRs.

- 4.10.5 During the detailed design phase, the minimisation of odour will be duly considered to further reduce any localized impact and no adverse odour impact due to operation of the interim sewage treatment plant is expected.
- 4.10.6 During operation, RCP will be provided for the residential development. A licensed waste collector shall be employed to collect domestic waste on a daily basis. Localized impact and minimization of odour nuisance will be considered during detailed design. With these measures, no adverse air quality impact is anticipated during operation.
- 4.10.7 The pond sediment at an abandoned pond within the Project Site is intended to be left in place, and not to be disturbed as far as possible. The future residential development will be located on the land formed by imported soil.
- 4.10.8 In terms of vehicular emission impacts, the required minimum separation distance between air quality sensitive uses of this Project and the edge of nearby roads surrounding the Project Site should be >5m as stipulated in Chapter 9 of HKPSG. The current proposed development (with separation distance of 7m to over 104m between air quality sensitive uses of this Project and the edge of nearby roads surrounding the Project Site) can satisfy the above-mentioned minimum separation distance (**Figure 3-1** refers).

## 5. NOISE

### 5.1 Noise Parameters

- 5.1.1 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (LAeq). LAeq(30 min.) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, LAeq(5 min) shall be employed for comparison with the NCO criteria. Percussive piling will require a Construction Noise Permit to be issued by EPD in advance.
- 5.1.2 As supplementary information for data auditing, statistical results such as L<sub>10</sub> and L<sub>90</sub> shall also be obtained for reference. A sample data record sheet is shown in Appendix II for reference.

### 5.2 Monitoring Equipment

- 5.2.1 As referred to in the Technical Memorandum issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration levels before and after the noise measurement agrees to within 1.0dB.
- 5.2.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.
- 5.2.3 The ET Leader is responsible for the availability of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

### 5.3 Monitoring Locations

- 5.3.1 The proposed location for noise monitoring during the construction phase is shown in Table 5-1 below, while their geographical location is also provided in **Figure 5-1**.

**Table 5-1 Locations of Construction Noise Monitoring Station**

Monitoring Station ID	Corresponding NSR in EIA Report	Representative for
NM1	N8	Bethel High School

- 5.3.2 The selection of the above monitoring location has taken into account the noise impact assessment results presented in the EIA report and the availability of the monitoring locations. The existing NSR that is worst affected by the Project works is selected for monitoring. The access permission to this location is subject to permission by the property owner.
- 5.3.3 The EIA study has identified there are planned development sites nearby (e.g. Planned RD Site and “V” zone), the ET Leader shall also review the status of these planned development projects and propose additional noise monitoring locations where necessary when these planned development sites are occupied at the time

of construction of this Project. The proposed monitoring locations shall be agreed with the IEC, ER and DEP.

- 5.3.4 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. The alternative monitoring locations proposed by the ET shall be approved by the ER and agreed by IEC. When alternative monitoring locations are proposed, the following criteria should be followed as far as practicable:
- At locations close to the major site activities which are likely to have noise impacts;
  - Close to the noise sensitive receivers; and
  - For monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.
- 5.3.5 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to free field measurement data. The ET Leader shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

## 5.4 Baseline Monitoring

- 5.4.1 Baseline monitoring shall be carried out by the ET prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least 14 consecutive days prior to the commissioning of the construction works. The ET Leader should inform the IEC, ER and DEP on the baseline monitoring programme before commencement such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.
- 5.4.2 There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.
- 5.4.3 In exceptional cases, such as insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with IEC and EPD for agreement on an appropriate set of data to be used as the baseline reference and submit to the ER for approval.

## 5.5 Impact Monitoring

- 5.5.1 Noise monitoring shall be carried out at all the designated monitoring stations during the construction phase of the Project. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway
- (a) one set of measurement between 0700-1900 hours on normal weekdays (i.e. Monday to Saturday);
- 5.5.2 General construction work carrying out during restricted hours is controlled by Construction Noise Permit (CNP) system under the NCO. Without a valid construction noise permit (CNP) issued by EPD under Noise Control Ordinance

(NCO), no construction work shall be carried out during restricted hours<sup>3</sup>. Once a valid CNP for the construction activities is issued by EPD, the ET Leader shall be appointed to carry out additional noise measurements and the IEC shall also be appointed to carry out additional site investigations and audits during the restricted hours specified in the CNP. Generally speaking, one set of measurement shall at least include 3 consecutive Leq(5min) results for construction works to be carried out during restricted hours or following the requirement specified in the CNP.

- 5.5.3 Moreover, the ET Leader shall propose an additional noise monitoring schedule certified by the IEC to the ER for approval before the commencement of the construction works during the restricted hours.
- 5.5.4 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

### 5.6 Event and Action Plan for Construction Noise

- 5.6.1 The Action and Limit Levels for construction noise are defined in Table 5-2. In case that a valid CNP is issued by EPD, the Action Level is the same as the non-restricted hours and the Limit Level shall be the same as the standard stated in the CNP.
- 5.6.2 Should non-compliance of the criteria occurs, actions in accordance with the Action Plan as shown in Table 5-3 should be carried out.

**Table 5-2 Action and Limit Levels for Construction Noise**

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75 <sup>*</sup> dB(A)
Restricted hours		Same as CNP

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

<sup>3</sup> All days during the evening 1900 to 2300 hours, and the night-time, 2300 to 0700 hours, and all hours of the general holidays including Sundays



**Table 5-3 Event and Action Plan for Construction Noise Monitoring**

EVENT	ACTION			
	ET Leader	IEC	ER	CONTRACTOR
	<b>ACTION LEVEL</b>			
Action Level	<ol style="list-style-type: none"> <li>1. Notify ER, IEC and Contractor</li> <li>2. Carry out investigation</li> <li>3. Report the results of investigation to the ER, IEC and Contractor</li> <li>4. Discuss with the IEC and Contractor, and formulate remedial measures</li> <li>5. Increase monitoring frequency to check mitigation effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly</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 analysed noise problem</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</li> <li>2. Implement noise mitigation proposals</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, EPD and Contractor</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. Inform IEC, ER and EPD the causes &amp; 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</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 Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly</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 analysed noise problem</li> <li>4. Ensure remedial measures are properly implemented</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</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated</li> </ol>

## 5.7 Noise Mitigation Measures (Construction Phase)

- 5.7.1 The EIA report has recommended various construction noise control and mitigation measures. These are summarised below for easy reference. An implementation schedule is also provided in Appendix I. The Contractor shall be responsible for the design and implementation of these recommended measures.
- 5.7.2 Noise emissions from construction sites can be minimized by adopting a number of practicable noise mitigation options, such as:
- Use of quiet/silenced equipment (QPMEs);
  - Use of movable noise barriers to shield construction activities;
  - Erecting temporary fixed noise barriers; and
  - Good site practice and noise management.

### Selecting Quiet/ Silenced PME

- 5.7.3 Quiet types of equipment for use in construction activities are available in Hong

Kong. Quiet type Powered Mechanical Equipment (QPMEs) are recommended to be used in the EIA report. It is advised that the Contractor should diligently seek equivalent models of quiet/ silenced PME with Sound Power Level (SWLs) similar to or less than that as presented in the EIA report as far as practicable.

- 5.7.4 Table 5-4 presents the QPMEs assumed in the EIA report that are likely required during the construction works of the Project, quiet/silenced plant with SWL similar to or less than those presented in the below table, shall be adopted by the Contractor as far as possible.

**Table 5-4 Inventory of QPMEs**

Quiet Type PME	Reference	SWL per unit, dB(A)
Asphalt Paver	VOLVO model. No. ABG5770 (EPD-01226)	104
Breaker, Excavator mounted	EPD *	115
Bulldozer	Komatsu model D21A-8	102
Dump Truck	EPD *	105
Excavator	KATO model HD820V (EPD-01233)	99
Lorry	EPD *	105
Mobile Crane	Hitachi Sumitomo SCX700, 132kW	101
Excavator, mini-robot mounted	EPD *	94
Poker, Vibratory, Hand-held	EPD *	102
Power Rammer (Petrol)	Dynapac model LT700 (EPD-00536)	107
Road Roller	HITACHI model CP220-3 (EPD-01183)	97
Roller, vibratory	SAKAI model SW250-1 (EPD-00509)	95

Remark:

The list of QPMEs is based on Appendix 4-4A of the EIA report. Please refer to Appendix 4-4A for the construction plants assumed during each construction phase.

QPMEs are based on EPD's quality powered mechanical equipment (QPME) inventory (available at: <http://www.epd.gov.hk/cgi-bin/npg/qpme/index.pl?lang=eng>).

\* EPD website: [http://www.epd.gov.hk/epd/english/application\\_for\\_licences/guidance/files/OtherSWLe.pdf](http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf)

#### Use of Temporary Noise Barriers

- 5.7.5 Erection of temporary noise barriers between noise sources and NSRs will be effective in reducing the potential construction noise impact, especially for the low-rise village houses which are the target NSRs to be protected.
- 5.7.6 Additional noise mitigation measures in terms of movable noise barriers are also proposed to shield construction plants. The movable noise barriers should have sufficient surface density of at least 10 kg/m<sup>2</sup> or material providing equivalent acoustic performance to block the line of sight from the sensitive receivers. There should not be any gaps and openings at the noise barriers to avoid noise leakage. The design of the noise barriers shall be proposed by the work contractor(s), and approved by the Engineer's Representative (ER) and the Environmental Team in accordance with the Project EM&A Manual.
- 5.7.7 Fixed temporary noise barrier is also proposed along a portion of western site boundary in order to alleviate elevated cumulative construction noise level at Bethel High School due to concurrent construction activities with nearby planned development projects. Locations of proposed fixed temporary noise barriers are shown in **Figure 5-2**. The exact location is subject to the contractor(s) and the prior

approval from the Engineer's Representative ER.

- 5.7.8 In order to ensure construction noise is controlled throughout the construction period, fixed temporary noise barriers shall be erected prior to site formation works. It is estimated that 3m high temporary fixed noise barriers shall be sufficient to shield the concerned school at Fairview Park (**Figures 5-2** refers). Erection of temporary fixed noise barriers will be carried out section by section and precast units will be used for the foundation of the noise barrier as much as possible. Since standard site hoarding will also be erected along the site boundary, the concerned temporary fixed noise barriers can be combined with the site hoarding.
- 5.7.9 The concerned temporary fixed noise barriers shall have sufficient surface density of at least 10 kg/m<sup>2</sup> or material providing equivalent acoustic performance. There shall not be any gaps and openings at the noise barriers and site hoardings to avoid noise leakage. The design of the noise barriers shall be proposed by the work contractor(s), and approved by the Engineer's Representative (ER) and the Environmental Team in accordance with the Project EM&A Manual.
- 5.7.10 It shall be noted that these proposed temporary fixed noise barriers are only required when this Project is constructed concurrently with the nearby approved EIA projects (namely, the approved cycle track project; and the approved public sewerage project).

#### Other Recommended Noise Mitigation Measures

- 5.7.11 It is also recommended that good housekeeping activities shall also be carried out to further minimize the potential construction noise impact, and these are summarised below. The following good site practices are also recommended for incorporation into the contractual requirements:
- Contractor shall comply with and observe the Noise Control Ordinance (NCO) and its current subsidiary regulations;
  - Before the commencement of any work, the Contractor shall submit to the ER for approval the method of working, equipment and sound-reducing measures intended to be used at the Project Area;
  - Contractor shall devise and execute working methods that will minimize the noise impact on the surrounding environment; and shall provide experienced personnel with suitable training to ensure that these methods are implemented;
  - Only well-maintained plants should be operated on-site;
  - Plants should be serviced regularly during the construction programme;
  - Machines that may be in intermittent use should be shut down or throttled down to a minimum between work periods;
  - Silencer and mufflers on construction equipment should be utilised and should be properly maintained during the construction programme;
  - Noisy activities can be scheduled to minimize exposure of nearby NSRs to high levels of construction noise. For example, noisy activities can be scheduled for midday or at times coinciding with periods of high background noise (such as during peak traffic hours);
  - Noisy equipment such as emergency generators shall always be sited as far away as possible from noise sensitive receivers;
  - Provision of mobile noise barriers in adjacent to construction plants, piling machine, or provision of acoustic screens by the Contractor(s);

- Mobile plants should be sited as far away from NSRs as possible; and
  - Material stockpiles and other structures should be effectively utilised as noise barrier, where practicable.
- 5.7.12 The Contractor is also encouraged to arrange construction activities with care so that concurrent construction activities are avoided as much as possible. The Contractor should closely liaise with the nearby school so that noisy activities are not undertaken during school's examination period.
- 5.7.13 EM&A will be carried out for this Project during the construction phase in order to monitor the construction noise level and to verify the effectiveness of the above noise mitigation measures. The ET shall closely monitor contractor's performance and the residual noise level at the school. Should unacceptable construction noise level be identified during the construction noise monitoring, necessary actions following the standard Event and Action Plan specified above, will be required.

### **5.8 Operational Phase Noise Mitigation Measures**

- 5.8.1 Proactive noise protection measures have already been incorporated into the design of the proposed development, which include setback from Kam Pok Road, placing noise tolerant uses such as the proposed STP (with 10.4mPD at roof level) between the proposed house and the industrial noise source; and a noise barrier along the remaining eastern site boundary with a minimum 4.5m tall solid boundary wall. The locations of the above-mentioned proactive measures are shown in **Figure 5-3**.
- During detailed design, the acoustic performance of the STP should be reviewed and acoustic treatments such as provision of acoustic silencer and acoustic enclosure shall be proposed so that the SWL of STP should be 74dB(A) or below in order to meet the noise criteria.
- 5.8.2 According to the approved "EIA and TIA Studies for the Stage 2 of PWP Item No. 215DS-Yuen Long and Kam Tin Sewerage and Sewage Disposal", maximum permissible SWLs at louver of sewage pumping station are reported to be in the range of 64 – 74dB(A) by the same noise mitigation measures such as acoustic silencer and enclosure.
- 5.8.3 No EM&A is required during the operational phase.

## 6. WATER QUALITY MONITORING

### 6.1 Introduction

- 6.1.1 The water quality assessment in the EIA indicated that no adverse impacts on water quality would be expected from the construction phase, with proper implementation of the recommended environmental mitigation measures.
- 6.1.2 In order to ensure proper implementation of mitigation measures, regular water quality monitoring and site auditing programme is proposed to be carried out during the construction phase.

### 6.2 EM&A Requirements

- 6.2.1 The Contractor shall adopt the Best Management Practices (BMPs) given in the Practice Notes for Professional Persons on “Construction Site Drainage” (ProPECC PN 1/94)) in controlling water pollution during the construction phase. During the operational phase, the control measures recommended in the EIA should be implemented.
- 6.2.2 Water quality monitoring at designated locations at the nearby inland water bodies are proposed to be carried out during the construction phase to monitor any sub-standard water discharge into the nearby water bodies from the Site.
- 6.2.3 Regular environmental audits in accordance with Section 11 of this Manual shall be undertaken during the construction works to ensure the proper implementation of the mitigation measures for potential construction water quality impact.
- 6.2.4 The environmental audit shall be undertaken by the ET during construction and shall include a walk over of the active works area and surroundings. It shall include: visual inspection of the implementation of the runoff and drainage control measures from the works area; inspections of water quality surrounding the site and the project discharge areas. In particular, any brown coloured water or suspended solids laden discharge shall be noted and considered to be unacceptable, triggering the Event and Action Plan.
- 6.2.5 The environmental audit shall include a review of the effectiveness of measures to minimize surface runoff and their effectiveness for reducing erosion and retaining suspended solids laden runoff within the site. The following will be included during the review:
- Inspection of the effectiveness of silt removal facilities and erosion and sediment control structures to ensure proper and efficient operation at all times and particularly during rainstorms;
  - Inspection of the effectiveness of control measures to prevent soil erosion and sediment laden run-off from the Site;
  - Inspection of the effectiveness of collection, handling, storage and disposal of materials to ensure they do not enter the nearby stormwater drainage system; and
  - Review of the Contractor’s compliance with discharge license requirements.

### 6.3 Control/ Mitigation Measures

#### Construction Phase

- 6.3.1 The EIA report has recommended mitigation measures during the construction and operational phases of the Project. In particular, the following mitigation measures are required to be implemented. The implementation schedule for the

recommended mitigation measures is also presented in **Appendix I**.

- 6.3.2 Control of potential water quality impact arising from the construction works shall be implemented based on the following principles:
- Minimisation of runoff;
  - Prevention or minimisation of the likelihood of the identified pollutants being in contact with rainfall or runoff; and
  - Measures to abate pollutants in the stormwater runoff.
- 6.3.3 The Contractor shall apply for a discharge licence under the WPCO and the discharge shall comply with the terms and conditions of the licence. Contractor(s) of this Project is required to submit a Construction Phase Drainage Management Plan with details such as design of the temporary site drainage system; wastewater treatment facilities; and maintenance of drainage system for the approval of the Engineers Representative (ER) and the Environmental Team in order to ensure that the mitigation measures are in place. The concerned drainage management plan should include recommended mitigation measures as well as best practices listed out below.
- 6.3.4 The Drainage Management Plan and recommended mitigation measures and best practices shall be implemented by the Contractor(s) and inspections shall be carried out regularly (e.g. weekly) by the Engineer's Representative (ER), and Environmental Team (ET) in order to ensure all mitigation measures are effectively implemented, in particular to ensure that no off-site spillage of runoff from the project site. Any deficiencies identified shall be timely rectified by the Contractor(s).

#### *Construction Runoff General Requirements*

- 6.3.5 Besides, the Best Management Practices (BMPs) given in the ProPECC PN 1/94 shall be implemented in controlling water pollution during the whole construction phase. The main practices provided in the above-mentioned document (i.e. ProPECC PN 1/94) are also summarized in the following paragraphs which should be implemented by the contractor during the construction phase, where practicable:
- High loading of suspended solids (SS) in construction site runoff shall be prevented through proper site management by the contractor;
  - The boundary of critical work areas shall be surrounded by ditches or embankment. Accidental release of soil or refuse into the adjoining land should be prevented by the provision of site hoarding or earth bunds, etc. at the site boundary. These facilities should be constructed in advance of site formation works and roadworks;
  - Consideration should be given to plan construction activities to allow the use of natural topography of the Project Area as a barrier to minimize uncontrolled non-point source discharge of construction site runoff;
  - Temporary ditches, earth bunds should be provided to facilitate directed and controlled discharge of runoff into storm drains via sand/ silt removal facilities such as sand traps and sedimentation basin. Oil and grease removal facilities should also be provided where appropriate, for example, in area near plant workshop/ maintenance areas;

- Sedimentation basins and sand traps designed in accordance with the requirements of ProPECC Note PN 1/94 should be installed at the construction site for collecting surface runoff;
- Sand and silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly by the contractor, and at the onset of and after each rainstorm to ensure that these facilities are functioning properly;
- Slope exposure should be minimized where practicable especially during the wet season. Exposed soil surfaces should be protected from rainfall through covering the temporary exposed slope surfaces or stockpiles with tarpaulin or the like;
- Haul roads should be protected by crushed rock, gravel or other granular materials (i.e. hard paved) to minimize discharge of contaminated runoff;
- Slow down water run-off flowing across exposed soil surfaces;
- Plant workshop/ maintenance areas should be bunded and constructed on a hard standing. Sediment traps and oil interceptors should be provided at appropriate locations;
- Manholes (including newly constructed ones) should be adequately covered or temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system;
- Construction works should be programmed to minimize soil excavation works where practicable during rainy conditions;
- Chemical stores should be contained (bunded) to prevent any spills from contact with water bodies. All fuel tanks and/ or storage areas should be provided with locks and be sited on hard surface;
- Chemical waste arising from the Project Area should be properly stored, handled, treated and disposed of in compliance with the requirements stipulated under the Waste Disposal (Chemical Waste) (General) Regulation;
- Drainage facilities must be adequate for the controlled release of storm flows;
- Vehicle wheel washing facilities should be provided at the site exit such that mud, debris, etc. deposited onto the vehicle wheels or body can be washed off before the vehicles leave the site area;
- Section of the road between the wheel washing bay and the public road should be paved with backfill to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains;
- Bentonite slurries, if any to be generated, shall be reconditioned and reused as far as practicable. Spent bentonite should be kept in a separate slurry collection system for disposal at a marine spoil grounds subject to obtaining a marine dumping licence from EPD. If used bentonite slurry is to be disposed of through public drainage system, it should be treated to meet the respective applicable effluent standards for discharges into sewers, storm drains or the receiving waters;
- Appropriate peripheral drainage system shall be constructed along the Project Site boundary to divert away surface runoff in accordance with requirements stipulated in ProPECC PN 1/94 in order to collect surface runoff and discharge it into the nearby existing stormwater drains, and via which into the existing NTMDC. A conceptual construction phase site drainage plan is provided in **Figure 6-2**, which is subject to detailed design;

- Sewage generated from the construction workforce should be contained in chemical toilets before connection to public foul sewer can be provided. Chemical toilets should be provided at a minimum rate of about 1 per 50 workers. The facility should be serviced and cleaned by a specialist contractor at regular intervals; and
- Spillage of fuel oils or other polluting fluids should be prevented at source. It is recommended that all stocks should be stored inside proper containers and sited on sealed areas, preferably surrounded by bunds.

6.3.6 A conceptual construction phase site drainage plan is provided in **Figure 6-2**, which is subject to detailed design.

#### *Site Specific Requirements*

6.3.7 During construction, temporary drains, peripheral site drainage comprising precast concrete u-channels, sedimentation basins, sand traps and similar facilities will be provided along the Site boundary. **Figure 6-2** shows the indicative site drainage during construction phase. The construction of water extraction facility for interim STP should be carried out in dry season so that to avoid affecting water quality at the channel. Silt curtain or sand bags should be provided to carve out the working area so as to bypass the channel flow and to avoid any solids/materials arising from the construction activities from entering the channel during construction phase. The work sites at the NTMDC for construction of water abstraction facilities should be maintained in dry conditions. Regular visual inspections should also be carried out by the Environmental Team and Contractor to ensure there is no spillage into the channel.

6.3.8 The existing abandoned pond will be filled up by imported fill materials. The pond sediment is intended to be left in place and not to be disturbed as far as possible. However, in case any sediment is encountered during construction, preventative measures are proposed. Temporary access roads of Project Site should be protected by crushed stone or gravel. Offsite disposal should be avoided and pond sediment should be re-used on-site. For the purpose of prevention of soil erosion, temporary exposed surfaces in interim should be covered by tarpaulin sheets to prevent materials from washing away. Appropriate site drainage should be provided, as part of the construction phase drainage system, to ensure surface runoff is properly collected and treated and there should be no spillage to offsite location. In addition, intercepting channels should be provided along the edge of pond to divert surface runoff away from this pond and to prevent storm runoff from washing across exposed surfaces (**Figure 5-3** refers). Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

#### *Draining of Pond Water*

6.3.9 During construction at the existing pond:

- As the concerned existing abandoned pond will be filled up to the proposed site formation level during construction, remaining water in the pond will be absorbed by soakaway mechanism and no discharge to off-site location is expected. Site drainage should be provided around the existing abandoned pond to divert surface runoff away from this pond during pond filling (**Figure 6-2** refers). Draining of pond water and discharge to surrounding area should be avoided as far as possible.



- The pond water will be on-site re-used for the construction activities such as dust suppression and wheel washing facilities to minimize the water usage of project as well as the volume of pond water that needs to be treated.
- In case there is a need for disposal, on-site treatment should be proposed by the Contractor(s) and the discharge of treated effluent will be subject to agreement with EPD and DSD, where necessary. The contractor(s) will be required to properly treat the water on-site with the quality of the treated water complying with the requirement of the discharge license to be issued by the EPD.

6.3.10 During construction period, in order to better control potential water pollution due to site runoff during inclement weather and emergencies, the Contractor(s) will be required to prepare and implement an Emergency Response Plan (ERP). As a general indication, the ERP should include but not limited to the design of drainage facilities/ system; maintenance of drainage system; recommended measures and best practices identified in the EIA study; an event and action plan during inclement weather condition and emergencies; emergency procedures and emergency contact details; and responsibility of relevant parties and follow up actions. In particular, the plan should provide details of procedure and actions required both before and after forecasted rainstorm such as checking/ inspection before onset of rainy season/ rainstorm that all drains are cleared from blockage and functioning properly; checking standby plant and equipment are ready for use; frequency of updating weather conditions; persons who will implement the measures and follow up actions; ensuring easily loose construction materials are well covered; more frequent inspection and cleansing preferably before and after every rainstorm event. In case of severe weather condition, upon the instruction from the Engineers' Representative (ER), to stop works for the sake of safety reasons. The ERP shall be submitted for the approval of the ER, the Environmental Team (ET), and the Independent Checker (Environment) (IEC), which shall be implemented by the Contractor(s) throughout the construction period. Its implementation will be monitored by the ER and the ET in order to ensure all measures are effectively implemented. Any deficiencies identified shall be timely rectified by the Contractor(s).

### **Operational Phase**

6.3.11 The project proponent or the developer shall be responsible for the following measures:

#### *Sewage Discharge from STP*

6.3.12 All domestic sewage generated will be discharged to the public sewerage system via a proposed rising main from the Project Site. An interim STP will be proposed with discharge of the treated effluent to the adjacent NTMDC in case the public sewerage is not available when the Project is in operation. The design of the interim STP will follow the requirement of no net increase of pollution loading. A discharge licence under the WPCO will be obtained for the interim STP and, and the discharge shall comply with the terms and conditions of the licence and the discharge standards for effluents specified in the licence as well as the conditions specified in the Environmental Permit of this Project. Samples of treated effluent will be taken regularly and tested according to the discharge licence under the Water Pollution Control Ordinance and the conditions in the Environmental Permit to ensure compliance with discharge standards.

6.3.13 The discharge from the club house and swimming pool shall apply for a discharge

licence under the WPCO, and the discharge shall comply with the terms and conditions of the licence and the discharge standards for effluent specified in the licence as well as the conditions specified in the Environmental Permit of this Project under the EIAO.

- 6.3.14 The proposed interim sewerage system will be designed in such a way to facilitate the future connection to the planned Ngau Tam Mei sewerage system with the flow direction to be controlled by several flow control devices such as valves or stop-log, etc. The interim STP will be decommissioned and converted to a sewage pumping station once the trunk sewer becomes available for connection. Small amount of residual sewage left in the interim STP would be tankered away. No sewage will be discharged into the nearby water body during decommissioning of the interim STP. Please also refer to Section 7 of this Manual.
- 6.3.15 Precautionary measures have also been proposed in Sections 6.10 and 6.6 of the EIA report (also in Section 7 of this Manual) to deal with any adverse water quality impact due to sewage overflow, emergencies discharge, and change in flow regime. In addition, equalization tank will be provided in the STP for temporary storage of sewage in case of outage of the interim STP, and tank away will be provided for proper disposal at designated sewage treatment works to be assigned by DSD.

#### *Storm Water Discharge*

- 6.3.16 Best Management Practices (BMPs) have been proposed for the development, which are summarised below:
- Exposed surface shall be avoided within the proposed development to minimize soil erosion. Development site shall be either hard paved or covered by landscaping area where appropriate;
  - The landscaped open area should be managed and maintained by the property management company (and its contractor) during operation;
  - Paved area of development has been minimized by a simpler and more effective internal road layout, at which proposed houses are allocated on both sides of the road. Thus hard paved area of internal access road as well as increase in surface runoff, can be minimized;
  - The roadside channel surrounding the Project Site will be retained to maintain the original flow path. The drainage system will be designed to avoid flooding;
  - **Figure 6-3** shows the indicative site drainage during operational phase. Drainage system of the development shall be designed in such a way that surface runoff from the residential area is directed towards the internal access road, where appropriate drainage system with control facilities have been proposed. Additional paved U-channels with screening facilities are also provided along the edge of residential portion to avoid uncontrolled spillage of runoff;
  - Street level tree planting should be introduced along roadside of internal access road, which can help to reduce soil erosion and as a buffer zone between the residential area and the drainage system along roadside;
  - Broadleaf and evergreen species, which in general generate relatively smaller amount of fallen leaves, should be selected where possible (e.g. at landscape berm at the periphery of the site);
  - Fertilizer will only be applied on landscape area when needed. If required, the fertilizer should be applied in early Spring and in later summer in order to avoid major rainy season as far as possible. Slow release fertilizer should be

- selected as far as possible to minimize the amount of nutrient to be washed out by rain. Application should not be arranged before forecasted heavy rainfall, and over dosing should be avoided. Application of fertilizer should be managed by an experienced contractor through the property management company;
- Screening facilities such as standard gully grating and trash grille, with spacing which is capable of screening off large substances such as fallen leaves and rubbish should be provided at the inlet of drainage system as well as at upstream location of the u-channels;
  - Road gullies with standard design and silt traps and oil interceptors should be incorporated during the detailed design to remove particles present in stormwater runoff;
  - Drainage outlet of any covered car park should be connected to foul sewers via petrol interceptors or similar facilities;
- 6.3.17 In the event of emergency (e.g. car accident) where there is a major spillage of oil, chemical or fuel, dispersants or fire-fighting foam, etc., a system of contaminant bunding is recommended as far as practicable;
- 6.3.18 Good management measures such as regular cleaning and sweeping of road surface/ open areas is suggested. The road surface/ open area cleaning should also be carried out prior to occurrence of rainstorm;
- 6.3.19 Stormwater gullies and ditches provided among the residential development will be regularly inspected and cleaned (e.g. monthly) by the property management company. Additional inspection and cleansing should be carried out if heavy rainfall is forecasted.
- 6.3.20 During operation, in order to control/ minimize water pollution during inclement weather and emergencies, an Emergency Response Plan should be established and implemented. As a general indication, the ERP should include but not limited to record plans of drainage facilities/ system; maintenance of drainage system; recommended measures and best practices identified in the EIA study; an event and action plan during inclement weather and emergencies condition; emergency procedures and emergency contact details; and responsibility of relevant parties and follow up actions. In particular, the plan should provide details of procedure and actions required both before and after forecasted rainstorm such as checking/ inspection before onset of rainy season/ rainstorm that all drains are cleared from blockage and functioning properly; checking standby plant and equipment are ready for use; frequency of updating weather conditions; persons who will implement the measures and follow up actions; more frequent inspection and cleansing preferably before and after every rainstorm event<sup>4</sup>. The ERP shall be prepared by the Environmental Team (ET) and submitted to the Independent Environmental Checker (IEC) for approval prior to occupation of project. The ERP shall be implemented by the property management company and its sub-contractor during operational phase. Any deficiencies identified shall be timely rectified. .

### **Mitigation Implementation Schedule**

- 6.3.21 The implementation schedules of mitigation measures for water quality control during construction and operational phases are presented in **Appendix I**. The

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<sup>4</sup> Advisory Note No. 3, "Protecting Your Premise from Flood Damages, an Easy Guide for reference of property managers and owners, published by HKSAR Gov. Drainage Services Department (available at: [http://www.dsd.gov.hk/EN/Files/publications\\_publicity/publicity\\_materials/leaflets\\_booklets\\_factsheets/Urban\\_Flooding\\_Notes\\_EN.doc](http://www.dsd.gov.hk/EN/Files/publications_publicity/publicity_materials/leaflets_booklets_factsheets/Urban_Flooding_Notes_EN.doc)).

mitigation measures listed above will be implemented by the Project Proponent.

- 6.3.22 During construction phase, the effectiveness of these water quality control measures shall be implemented by the Contractor and checked by the ET. If the above measures are not sufficient to restore the water quality to an acceptable levels, the Contractor shall liaise with the ET Leader, propose to ER, and IEC for approval, on the implementation of some other mitigation measures.
- 6.3.23 During operational phase, the management and maintenance will be carried out by the property management company/ Incorporated Owners. The Project Proponent would assume the responsibilities of all the mitigation measures contained in the EIA report until an agreement is reached between the Project Proponent and relevant parties on the funding, implementation, management and maintenance of mitigation measures.

#### 6.4 Water Quality Parameters

- 6.4.1 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.
- 6.4.2 The parameters shown **Table 6-1** are recommended to be recorded/ monitored in the routine monitoring programme.

**Table 6-1 Water Quality Parameters**

Phase	Water Quality Parameters
Construction	<ul style="list-style-type: none"> <li>• Temperature (°C)</li> <li>• pH (pH unit)</li> <li>• Turbidity (NTU)</li> <li>• Water Depth (m)</li> <li>• Dissolved oxygen (DO) (mg/L and % of saturation)</li> <li>• Suspended solids (SS) (mg/L)</li> </ul>

- 6.4.3 It is recommended to carry out sampling at least three times per week to measure turbidity, suspended solids, dissolved oxygen, pH, and water temperature at the control and impact monitoring locations recommended below. The monitoring frequency required shall be reviewed after the first three months and regularly thereafter.
- 6.4.4 In association, other relevant data such as monitoring locations/positions, time, water depth, water temperature, weather conditions, related observations and works that carried out in the project site should also be recorded. A sample monitoring record sheet is shown in Appendix II for reference.

#### 6.5 Monitoring Equipment

- 6.5.1 All monitoring equipment shall be provided by the ET and approved by the ER in consultation with the IE(C).

##### Dissolved Oxygen and Temperature Measuring Equipment

- 6.5.2 The instrument shall be a portable, weather proof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and use a DC power source. It should be capable of measuring:
- a dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation; and
  - a temperature of 0-45° C.

- 6.5.3 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 (e.g. YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

#### Turbidity Measurement Instrument

- 6.5.4 The instrument shall be a portable, weatherproof turbidity-measuring instrument complete with comprehensive operation manual. The equipment shall use a DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU and be complete with a cable (e.g. Hach model 2100P or an approved similar instrument).

#### Suspended Solids

- 6.5.5 A water sampler comprises a transparent PVC cylinder, with a capacity of not less than 2 litres and can be effectively sealed with latex cups at both ends. The sampler shall also 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 (e.g. Kahlsico Water Sampler or an approved similar instrument).
- 6.5.6 Water samples for suspended solids measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

#### pH Meter

- 6.5.7 Measurement of pH level will be recorded in-situ by a pH meter which shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. The range of pH value shall be 0 to 14 with 0.1 as the base unit.

#### Checking and Calibration of Equipment

- 6.5.8 All in-situ monitoring instrument shall be checked, calibrated accordingly before use. The DO meter shall be calibrated by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. 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.
- 6.5.9 For the on-site calibration of field equipment, the BS 127:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.
- 6.5.10 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.

### **6.6 Laboratory Measurement / Analysis**

- 6.6.1 Water samples for suspended solids (SS) analysis should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen), delivered to the laboratory, and analysed as soon as possible after collection within 24 hours.

- 6.6.2 Analysis of SS shall be carried out in a HOKLAS or other internationally accredited laboratory. The detection limit of SS shall be 2 mg/L or better. The SS determination shall follow APHA 17ed 2540D or equivalent methods subject to approval of DEP.
- 6.6.3 The testing laboratory shall be HOKLAS accredited (or if not, approved by the ER) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.
- 6.6.4 If a site laboratory is set up, or a non-HOKLAS and non-international accredited laboratory, is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control may require to be submitted to the DEP. The ET Leader shall provide the ER and IEC with one copy of the relevant chapters of the "Standard Methods for the Examination of Water and Wastewater" updated edition and any other relevant document for his reference.

### 6.7 Proposed Monitoring Locations

- 6.7.1 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.
- 6.7.2 The proposed water quality monitoring stations are shown in Table 6-2. The control stations (C1 to C2) are set at the upstream locations, while monitoring stations W1 to W2 are the corresponding impact stations at the downstream locations of the nearby water courses surrounding the Site. Figure 6-1 presents the approximate locations of the water quality monitoring stations.

**Table 6-2 Locations of Water Quality Monitoring Stations**

Phase	Monitoring Station ID	Description of Monitoring Station	Purpose of the Monitoring Station *	Coordinates of the Monitoring Station **
Construction Phase	C1	Ngau Tam Mei Drainage Channel	Serve as the control station at upstream location of construction site and impact station W1.	823596.6 837730.5
	W1	Ngau Tam Mei Drainage Channel	Serve as the impact station at downstream location of construction site and control station C1	823297.0 837074.5
	C2	Drainage ditch along Ha Chuk Yuen Road	Serve as the control station at upstream location of construction site and impact station W2.	823641.3 837126.6
	W2	Drainage ditch along Ha Chuk Yuen Road	Serve as the impact station at downstream location of construction site and control station C2.	823550.5 837375.2

Phase	Monitoring Station ID	Description of Monitoring Station	Purpose of the Monitoring Station *	Coordinates of the Monitoring Station **
	C3	Drainage ditch along Ha San Wai Road	Serve as the control station at upstream location of construction site and impact station W3.	823617.1 837016.3
	W3	Drainage ditch along Ha San Wai Road	Serve as the impact station at downstream location of construction site and control station C3.	823380.4 837091.9

**Remark:** \* With regard to the above control and impact monitoring stations, the ET Leader shall check the tidal condition at the water quality monitoring locations before each sampling in order to identify water flow direction (e.g. with reference to the tidal information from Hong Kong Observatory and the on-site observation on water flow direction). The tidal condition and water flow direction shall be taken into account in analysing the water sampling results. In case it is identified that the water flow direction is influenced by tidal condition, the ET Leader shall determine which station would represent the control station (upstream of construction site and outside the area of influence of the works) and which station would represent the impact station (downstream of construction site influenced by the works). The ET Leader shall report above findings in the EM&A report.

\*\* HK-Grid 1980 coordinates provided for reference only. Before commencement of water sampling, the ET Leader shall propose the exact monitoring locations and coordinates to the IEC and ER for approval.

6.7.3 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. The ET shall seek approval from the IEC, ER and DEP on the alternative monitoring locations proposed prior to the commencement of the baseline and construction phase sampling programme.

6.7.4 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 mixing zone of the major site activities, 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.

6.7.5 Given that the proposed water quality monitoring stations are mostly shallow water courses nearby, it is expected that water samples shall be collected at mid-depth level only. However, in case alternative monitoring stations are proposed by the ET, measurement shall be taken at 3 water depths, except where the water depth less than 6 m, the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station shall be monitored.

6.7.6 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.

6.7.7 The Contractor shall also submit the wastewater effluent discharge plan as

stipulated in the Water Discharge License to the ET and the IEC in order to better monitor the effluent discharge of the construction site.

- 6.7.8 It is required that the ET shall walk over of the active works area and the surroundings to carry out regular visual inspections during the construction phase. The visual inspection shall include inspection implementation of the runoff and drainage control measures from the works area; inspections of water quality surrounding the site and the project discharge areas. This would prevent potential impacts on nearby environs and ensure that the mitigation measures recommended in the EIA are properly implemented. In particular, any brown coloured water or suspended solids laden discharge is considered to be unacceptable, and will trigger the Event and Action Plan. The frequency of visual inspection shall be the same as the impact water quality monitoring (i.e. 3 times per week). Should any suspended solids laden or brown coloured water be identified, the procedures stated in the Event and Action Plan shall be followed and the inspection frequency shall be increased.

### **6.8 Baseline Monitoring**

- 6.8.1 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.
- 6.8.2 The baseline conditions should be established by measuring the water quality parameters specified in section 6.4 above. The measurements shall be taken at all the designated control and monitoring stations, 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. Alternative proposal including the sampling frequencies proposed by the ET should be agreed with IEC and DEP in prior.
- 6.8.3 There shall not be any major construction activities in the vicinity of the stations during the baseline monitoring.
- 6.8.4 In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from EPD on an appropriate set of data to be used as baseline reference.

### **6.9 Impact Monitoring**

- 6.9.1 During the course of the construction works, impact monitoring shall be undertaken three days per week, with sampling/measurement at the designated control and impact monitoring stations. 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.
- 6.9.2 Given that the proposed water quality monitoring stations are mostly shallow water courses nearby, it is expected that water samples shall be collected at mid-depth level and the water quality is measured. If the water depth is very limited that sampling of water will disturb the sediment at the bottom of the water quality monitoring location, the water sampling can be omitted subject to the ETL's professional advice and agreed with the IEC and DEP. Record of the condition of the monitoring location shall be taken and reported to justify the decision of not carrying out the sampling.
- 6.9.3 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 impact monitoring. The results of the monitoring shall be presented in the Final EM&A Summary Report.

- 6.9.4 Proposed water quality monitoring schedule shall be faxed to EPD at least 1 week before the first day of the monitoring month. EPD shall also be notified immediately for any changes in schedule by fax.

### 6.10 Event and Action Plan for Water Quality

- 6.10.1 The water quality criteria, namely Action and Limit levels shall be based on the results of baseline monitoring, the Water Quality Objectives, or based on the results of statistical analysis on the difference between impact monitoring results and the control station. The Action and Limit Levels for water quality is presented in Table 6-3. Should non-compliance of the action or limit levels occur, the ET and Contractor should review and identify the potential source(s) of impact, devise and implement appropriate mitigate measures in a collaborative manner.
- 6.10.2 When the monitoring results of the water quality parameters at any designated monitoring stations exceed the water quality criteria, the actions in accordance with the Event and Action Plan specified in Table 6-4 shall be carried out.

**Table 6-3 Typical Action and Limit Levels for Water Quality**

Parameters	Action	Limit
DO in mg/L (Surface, Middle & Bottom)	<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)	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)	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

**Remark:** The proposed water quality monitoring stations are mostly shallow water courses nearby, it is expected that water samples shall be collected at mid-depth level only (Section 6.9.2 refers). However, action and limit levels for other water depths are also provided in the above table in case alternative monitoring stations are proposed by the ET.

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

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>ACTION LEVEL</b>				
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform IEC, contractor and ER;</li> <li>3. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>4. Discuss mitigation measures with IEC and Contractor; and</li> <li>5. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and Contractor on the mitigation measures.</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC on the proposed mitigation measures; and</li> <li>2. Make agreement on the mitigation measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with ET and IEC and propose mitigation measures;</li> <li>6. Implement the agreed mitigation measures.</li> </ol>
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform IEC, contractor and ER;</li> <li>3. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>4. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>5. Ensure mitigation measures are implemented;</li> <li>6. Prepare to increase the monitoring frequency to daily;</li> <li>7. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and Contractor on the mitigation measures.</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC on the proposed mitigation measures; and</li> <li>2. Make agreement on the mitigation measures to be implemented.</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3 working days;</li> <li>6. Implement the agreed mitigation measures.</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>Limit Level</b>				
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Ensure mitigation measures are implemented; and</li> <li>6. Discuss mitigation measures with IEC, ER and Contractor;</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working methods;</li> <li>2. Discuss with ET and Contractor on possible mitigation measures; and</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation;</li> <li>3. Request Contractor to critically review the working methods;</li> <li>4. Make agreement on mitigation measures to be implemented; and</li> <li>5. Ensure mitigation measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC within 3 working days; and</li> <li>5. Implement the agreed mitigation measures.</li> </ol>
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat measurement on next day of exceedance to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented; and</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working methods.</li> <li>2. Discuss with ET and Contractor on possible mitigation measures;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; and</li> <li>4. Supervise the implementation of mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>2. Request Contractor to critically review the working methods;</li> <li>3. Make agreement on the mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented; and</li> <li>5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC within 3 working days;</li> <li>4. Implement the agreed mitigation measures;</li> <li>5. Resubmit proposals of mitigation measures if problem still not under control; and</li> <li>6. As directed by the ER, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>

## 7. SEWERAGE AND SEWAGE TREATMENT

### 7.1 Introduction

- 7.1.1 The sewage generated from the Project Area will be conveyed to the planned public gravity trunk sewer at the junction of Kam Pok Road and Pok Wai South Road via a rising main to be constructed by the subject development for eventual discharge to the existing YLSTW.
- 7.1.2 Provision of on-site sewage treatment plant (STP) as an interim scheme to handle the sewage generated from the development before the availability of public sewerage for connection is therefore proposed. To minimize disturbance to the residents, all sewers within the development for connection to the public system in the future will also be constructed together with the construction of this Project.
- 7.1.3 The on-site sewage treatment plant is for temporary use during the interim period only in case the public sewerage is not available at the time of occupation. The sewerage system within the development area will be designed to facilitate the future connection to the planned Ngau Tam Mei sewerage system with the flow direction to be controlled by flow control devices. Once the government public sewerage system becomes available, the on-site sewage treatment plant will be decommissioned and converted to a sewage pumping station.
- 7.1.4 The operation and maintenance requirements of the interim sewage treatment plant has been identified and summarised below.

### 7.2 EM&A Requirements

- 7.2.1 The sewage generated from the Project Area will be conveyed to a new terminal manhole at the immediate upstream of San Tin No.1 Sewage Pumping Station via a rising main for eventual discharge to the existing YLSTW. The tentative location of terminal manhole is shown in **Figure 7-1**. The proposed rising main will be in the form of twin rising mains, so as to provide continued operation of the pumping system when one of the mains is damaged. The section of rising main within the development will be constructed before the occupation intake to minimize disruption to the residents. The construction programme of the remaining rising main along public road will be discussed with relevant departments at later stage to cope with the construction programme of the trunk sewerage project. Agreements will be sought from all relevant authorities for the construction of the proposed sewerage, connection to the planned public sewerage system, and the associated future maintenance responsibility.
- 7.2.2 Since the timing which the sewerage system of the development could only be connected to the public sewerage system is uncertain, therefore, it is necessary to consider the provision of the on-site sewage treatment facility as an interim measure to handle the sewage generated from the development until connection to public sewerage by DSD is available.
- 7.2.3 The interim STP will be provided by the Project Proponent while the operation and maintenance will be responsible by the management office of the development and its contractors. The Project Proponent will also be responsible for connecting the sewerage system of the development to the public system when available and decommission the interim STP.
- 7.2.4 There are concerns regarding the no net increase in pollution loading in Deep Bay. In order to offset the pollution loads due to the development, it is proposed to abstract 200 m<sup>3</sup>/d water from Ngau Tam Mei Drainage Channel for co-treatment with the sewage generated from the development. The treated effluent will be discharged into the new drainage system within the development and conveyed to the adjacent Ngau Tam Mei Channel via existing twin cell box culvert. Considering the influent

characteristic, the process of biological treatment and membrane filtration (including MBR – Membrane Bioreactor), together with Reverse Osmosis (RO) is proposed for the interim STP. The proposed process is proven to be capable of producing high-quality effluent in terms of low turbidity, BOD<sub>5</sub>, TSS, nitrogen, and bacteria. The Target Effluent Quality of the interim STP could meet both the no net increase of pollutant loading to Deep Bay as per Town Planning Board Guidelines, as well as the Standards for effluents discharged into Group C inland Waters according to WPCO. After successful operation of the interim STP for a period not less than one year, and the end of year result showing no net increase in pollution loading is confirmed, the operation frequency of the RO system will then be reviewed. It is known that high quality of RO permeate is at the cost of high energy consumption. Upon stable performance of the interim STP with effluent quality compliance with the targets parameters, the RO system may be bypassed to conserve energy and promote environmental conservation. Before reviewing the performance of the RO system, sufficient performance data including influent quality and effluent quality of the RO system should be collected. The RO system can be served as a backup process to further polish the upstream effluent and eliminate the residual pollution loads of the STP, competent personnel will be responsible to constantly review the effluent water quality and decide the need of the RO system as it is readily available for operation when upstream system experienced deficiency in handling the fluctuation of the influent.

- 7.2.5 It should also be pointed out that the on-site sewage treatment plant is for temporary use during the interim period only in case the planned public sewerage is not available at the time of occupation. **Figure 7-2** refers. The sewerage system within the development area will be designed to facilitate the future connection to the planned Ngau Tam Mei sewerage system with the flow direction to be controlled by several flow control devices such as valves or stop-log, etc. The interim STP will be decommissioned and converted to a sewage pumping station once the trunk sewer becomes available for connection. Therefore, there should be no discharge of sewage discharge into the nearby water body during decommissioning of the interim STP. To minimize disturbance to the residents, all sewers within the development for connection to the public system in the future will also be constructed together with the construction of this Project.
- 7.2.6 Proper operation and maintenance of interim sewage treatment plant is essential to safeguard the quality of discharge effluent, an operation manual of the STP will be developed before commencement of the operation. The manual will include but not be limited to the details of the operation and maintenance, exact water quality monitoring points, procedures of pollution load offsetting calculations as well as emergency response plan to deal with emergencies such as malfunction of the STP, the following outlines the operation and maintenance aspects of the interim STP, where details will be covered in the operation manual:
- (i) Competent technicians to be employed by the development management office to operate the STP. They are to be fully conversant with the operating procedures as stipulated in the operation and maintenance manuals.
  - (ii) The proposed STP only serves the proposed development and thus the operation and maintenance (O&M) cost would be borne by the future management office of the development. The Applicant will ensure the design of STP is cost-effective such that the O&M cost imposed is reasonable.
  - (iii) The STP is to be kept in a tidy state. This includes regular hosing down, scraping of the walkways, whitewashing the walls, cleaning and painting the metalwork, and maintaining adequate lighting and ventilation.

- (iv) Where parts of the STP are sited beneath ground, forced ventilation will be provided.
  - (v) Online sensors will be installed in the STP to monitor the parameters of Ammonia, Nitrite & Nitrate, and TSS. Easily accessible sampling point will also be provided for sampling of the treated effluent for laboratory testing.
  - (vi) Turbidity meter will be installed at the outlet of membrane filtration as well as the outlet of Reverse Osmosis (RO) to indicate the efficiency of pollutant removal from the corresponding process units, adjustment of RO system can then be made to suit the variation of pollutants.
  - (vii) Samples of treated effluent and abstracted channel water will be documented weekly, such that the lows and highs of the pollutant variations can be captured. Results will be compared against the total annual loadings, adjustment of water abstraction amount, membrane backwash frequency, RO unit operation will be fine-tuned to ensure effluent quality meet discharge license under the Water Pollution Control Ordinance and the target effluent quality.
  - (viii) Based on the pollutant offsetting approach, co-treating sewage with abstracted channel water will be subject to the amount of pollutants in the channel water for offsetting. The proposed target effluent quality of the STP has taken it into account. The annual pollution loading in abstracted channel water (kg) and annual pollution loading in effluent of the interim STP (kg) would be balanced.
  - (ix) A check and balance system monitor the pollutant loading every week. Monthly or quarterly report shall be submitted. By the end of each year, the exceeding and shortcoming amount will be balanced to quantify no net increase in pollutant loading achieved based on total pollutant reduction of the year.
  - (x) The production of sludge is estimated to be approx. 4 m<sup>3</sup>/d. While the reject water from the RO unit is normally around 20% of the influent depends on the quality of RO influent. The sludge and reject water will be transported by tankers from the interim private STP to government's STW for offsite treatment. A storage tank with capacity of 150 m<sup>3</sup> will be provided for storage of the RO reject water.
  - (xi) The Project Proponent will be responsible for the future sewer connection upon its available in the future and STP decommissioning with connection details subject to agreement of DSD. Appropriate conditions could be imposed in the Environmental Permit (EP) to ensure the EP holder to take up the responsibility to ensure connection to public sewer when trunk sewer is ready.
  - (xii) The discharge of treated effluent from the interim STP should follow the discharge licence requirements under the WPCO as well as the terms and conditions specified in the EP under the EIAO.
- 7.2.7 Apart from ensuring the sewage discharge quality, the STP will also be provided with mitigation measures to avoid other nuisance to the resident. For example, an effective odour removal system as well as appropriate acoustic treatment at STP (Sections 3.7.2.3 and 4.4.3 of EIA refer).
- 7.2.8 The following measures will be adopted in order to eliminate adverse impact due to potential sewage overflow, emergencies discharge and change in flow regime beyond the expectation of this assessment:
- (i) Adequate spare parts for the plant will have to be made readily available by storage.
  - (ii) Qualified personnel will be hired to inspect the plant condition and carry out maintenance on a regular basis.

- (iii) Regular test, maintenance and replacement of membranes and plant equipment will be carried out in accordance to the recommendations from manufacturers or as recommended by the qualified personnel after inspection.
  - (iv) Equalization tank with capacity of 168 m<sup>3</sup> (~ 3 days of sewage storage depending on actual flow condition) will be provided in case of entire outage of the interim STP.
  - (v) Tank away will be provided for prolonged outage of the interim STP, for disposal of sewage at designated sewage treatment works to be assigned by DSD.
- 7.2.9 Also in case of abnormal effluent quality is detected from water sampling, discharge of treated effluent will be suspended and all sewage will be diverted to the equalization tank for temporary storage until the problem is rectified. And if prolonged outage of the interim STP is anticipated, tankers will be arranged to transport the sewage for disposal to Government operated public sewage treatment works.
- 7.2.10 Operation and maintenance requirements of the interim sewage treatment plant have been provided in the EIA, which are also reproduced in Appendix I for implementation. With these measures in place, the EIA indicates that no adverse sewerage impact will be incurred as a result of the development.
- 7.2.11 In order to offset the additional pollution load due to the development, it is proposed to abstract water from Ngau Tam Mei Drainage Channel for co-treatment in the interim STP. The water abstraction facility which is to be located within the application site is subject to detailed design and relevant approval for construction access and government land matters. The construction of water abstraction facility should be carried out in dry season. Silt curtain or sand bags should be provided to carve out the working area so as to bypass the channel flow and to avoid any solids/materials arising from the construction activities from entering the channel during construction phase. The work sites at the NTMDC for construction of water abstraction facilities should be maintained in dry conditions. Regular visual inspections should also be carried out by the Environmental Team and Contractor to ensure there is no spillage into the channel.
- 7.2.12 Measures regarding sewage generated by the workforce during the construction phase are already addressed in Chapter 6 above.

### **7.3 Monitoring Requirements for Effluent Quality and Pollution Loading**

- 7.3.1 During operation of the STP, samples of treated effluent will be taken regularly and tested according to the discharge licence under the Water Pollution Control Ordinance as well as the conditions specified in the Environmental Permit (EP) of this Project to ensure compliance with relevant discharge standards. Sampling should be carried out on weekly basis at both the STP as well as the Ngau Tam Mei Drainage Channel, such that the lows and highs of the pollutant variations can be captured. The proposed sampling point at the water abstraction point at Ngau Tam Mei Drainage Channel is shown in **Figure 7-2**. Report on effluent quality to be submitted monthly during the first 3 months' of operation of STP. After that, the STP operation is stabilised and report on effluent quality to be submitted quarterly. The monitoring frequency and parameters are subject to the discharge licence and the EP condition, but the following has provided a guideline.

**Table 7-1 Water Quality Monitoring Parameters**

Phase	Sampling Location	Monitoring Parameters	Sampling Frequency
Operation of STP	Treated effluent at STP; and Channel water at Ngau Tam Mei Drainage Channel	Key pollutants: BOD <sub>5</sub> ; TN-N; TP; Other pollutants: TSS; NH <sub>3</sub> -N; E.coli; and Volume of abstracted water.	Weekly

Note: The above parameters are selected for assessment in the EIA report (Table 6-6 of the EIA report, refers)

- 7.3.2 ET shall be responsible for the above-mentioned sampling works, and the sampling and testing shall be carried out by a HOKLAS or other internationally accredited laboratory. Should any in-situ measurements be required, all monitoring equipment shall be provided by the ET and approved by the IEC, and the equipment requirements stated in Sections 6.5 and 6.6 shall be followed. Prior to the commencement of sampling works, the ET Leader shall agree the sampling location(s) with the IEC and EPD. The EM&A results shall be prepared by the ET Leader and endorsed by the IEC, and submitted to EPD and other authorities which may be required in the EP/ licence. The frequency of reporting and the required time frame shall conform to the licence requirements under WPCO as well as requirements in the EP. Once the government public sewerage system becomes available and the on-site STP is decommissioned, ET Leader shall seek IEC and EPD's approval to cease the sampling works, and the EM&A works can be terminated.

*Event and Action Plan for Treated Effluent Quality*

- 7.3.3 The operation and maintenance of the STP will be carried out by the property management office and its contractors, ET shall liaise with the relevant parties to make sure the operation of the STP is effective and all the mitigation measures are implemented. Through regular monitoring, adjustment of water abstraction amount, membrane backwash frequency, RO unit operation can be fine-tuned to ensure the targeted treated effluent quality is achieved and can meet the discharge license under the Water Pollution Control Ordinance and the target effluent quality. The Action and Limit Levels for the monitoring of treated effluent from the STP is provided in **Table 7-2**.

**Table 7-2 Action and Limit Levels for Treated Effluent Discharge**

Parameters	Action Level*	Limit Level**
BOD <sub>5</sub>	2.7 mg/L	3.0 mg/L
TN-N	3.6 mg/L	4.0 mg/L
TP	0.45 mg/L	0.5 mg/L
TSS	9 mg/L	10 mg/L
NH <sub>3</sub> -N	1.8 mg/L	2 mg/L
E.coli	900 no./100mL	1,000 no./100mL

Notes:

\* The Action Level is based on 90%-ile of the Limit Level.

\*\* The Limit Level is based on the Target Effluent Quality of the interim STP in Table 6-6 of the EIA report of this Project.

- 7.3.4 In case exceedance of the Action Level/ Limit Levels, ET and the PMO (and its contractor(s)) should review and identify the potential source(s) of impact, devise and



implement appropriate mitigate measures in a collaborative manner. The event and action plan detailed below shall be implemented by the relevant parties. Should a confirmed exceedance of the Limit Level is identified, EPD shall be notified. Discharge of treated effluent will then be suspended and all sewage will be diverted to the equalization tank for temporary storage until the problem is rectified. And if prolonged outage of the interim STP is anticipated, tankers will be arranged to transport the sewage for disposal at designated sewage treatment works to be assigned by DSD.

#### *Event and Action Plan for Monitoring of Pollution Loading*

- 7.3.5 In order to ensure the compliance with no net increase in pollution loading requirement, a review should be carried out by comparing the recorded annual pollution loads in abstracted channel water (kg) with the recorded annual pollution loads in treated effluent of the interim STP (kg). Pollution loads of three key pollutants BOD<sub>5</sub>, TN and TP will be monitored to ensure compliance with the no net increase in pollution loads requirement. While other pollutants such as SS, NH<sub>3</sub>-N and E.coli will also be sampled as indicators for better understanding on the changes of solids, organic, nutrient and bacterial loads. The annual pollution loads of treated effluent discharge into Ngau Tam Mei Drainage Channel should not exceed the total pollution loads recorded in the abstracted channel water in the same year based on the 52 weeks water samples. The results of the review should be reported in the annual report.
- 7.3.6 Asides from the above-mentioned annual review, interim reviews on pollution loading should also be carried out on quarterly basis, and the findings should be reported in the quarterly report. The interim reviews would provide indication on the performance of the STP. If necessary, adjustment to the STP can then be carried out at early stage in order to ensure the compliance with no net increase in pollution loads requirement during the annual review. In case the pollution loads in treated effluent cannot be offset by the pollution loads in the abstracted channel water during the quarterly review, recommendations should be provided together with a plan to compensate the deficit. The event and action plan detailed in **Table 7-3** below shall be implemented by the relevant parties. Sewage generated from the development will then be diverted to the equalization tank for temporary storage, and tankers will be arranged to transport the sewage for disposal at designated sewage treatment works to be assigned by DSD. While, abstracted channel water will still be treated by the STP through the RO system without mixing with raw sewage, which then removes pollution loads in the abstracted channel water. By removing the pollution source as well as removing pollution loads in the abstracted water, it is expected that the pollution loads of this Project can be offset properly.
- 7.3.7 In very rare case when the annual pollution loading in treated effluent of interim STP cannot be offset by the annual pollution loading in abstracted channel water, EPD shall be notified. Discharge of treated effluent will then be suspended and all sewage will be diverted to the equalization tank for temporary storage until the problem is rectified. Tankers will be arranged to transport the sewage for disposal at designated sewage treatment works to be assigned by DSD. The event and action plan detailed in **Table 7-3** below shall be implemented by the relevant parties. The operation of the STP should be critically reviewed by a qualified person employed by the PMO (e.g. qualified engineer, manufacturer/ supplier). A proposal with recommendations on necessary adjustments to the plant to ensure that the pollution loads from the STP effluent can be offset by the pollution loads in the abstracted channel water, should be prepared and submitted to EPD for agreement. The proposal should also include a detailed plan with actions required to compensate the deficit recorded in the past year once operation of the STP is resumed. The resume of operation of the STP will be subject to further agreement with EPD.

**Table 7-3 Event and Action Plan During Operation of Interim STP**

EVENT	ACTION			
	ET	IEC	PMO (and its contractor) *	IO *
<b>Monitoring on Treated Effluent Quality</b>				
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Confirm findings with the laboratory;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, PMO and IO;</li> <li>4. Check with PMO that all plant, equipment, and working methods are properly implemented/ followed;</li> <li>5. Discuss follow up actions with IEC and PMO; and</li> <li>6. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and PMO on follow up actions.</li> <li>2. Review proposals on follow up actions submitted by PMO and advise the IO accordingly; and</li> <li>3. Assess the effectiveness of the implemented follow up actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all plant and equipment;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. Discuss with ET and IEC, and propose follow up actions; and</li> <li>4. Implement the agreed follow up actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with PMO and IEC on the proposed follow up actions; and</li> <li>2. Make agreement on the follow up actions to be implemented.</li> </ol>
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Confirm findings with the laboratory;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, PMO and IO;</li> <li>4. Check with PMO that all plant, equipment, and working methods are properly implemented/ followed;</li> <li>5. Discuss follow up actions with IEC and PMO;</li> <li>6. Repeat measurement on next day of exceedance; and</li> <li>7. Ensure follow up actions are implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and PMO on the follow up actions and agree on time frame.</li> <li>2. Review proposals on follow up actions submitted by PMO and advise the IO accordingly;</li> <li>3. Confirm with ET the implementation of follow up actions; and</li> <li>4. Assess the effectiveness of the implemented follow up actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all plant and equipment;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. Discuss with ET and IEC, and propose follow up actions; and</li> <li>4. Implement the agreed follow up actions and within the agreed time frame.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with PMO and IEC on the proposed follow up actions; and</li> <li>2. Make agreement on the follow up actions to be implemented.</li> <li>3. Assess the effectiveness of the implemented actions with the IEC.</li> </ol>

EVENT	ACTION			
	ET	IEC	PMO (and its contractor) *	IO *
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Confirm findings with the laboratory;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, PMO, IO, and EPD;</li> <li>4. Check with PMO that all plant, equipment and working methods are properly implemented/ followed;</li> <li>5. Discuss mitigation measures with IEC, PMO and IO;</li> <li>6. Ensure mitigation measures are implemented within the agreed time frame;</li> <li>7. Repeat measurement upon resume of operation of the STP.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and confirm monitoring data submitted by ET;</li> <li>2. Notify EPD;</li> <li>3. Discuss with ET, PMO and IO on mitigation measures;</li> <li>4. Review the proposed mitigation measures submitted by PMO and advise the IO accordingly;</li> <li>5. Confirm with ET the implementation of mitigation measures;</li> <li>6. Assess the effectiveness of the implemented mitigation measures; and</li> <li>7. In case of a confirmed exceedance of Limit Level, advise the PMO and IO to suspend the discharge of the treated effluent from the STP and to divert sewage to the equalization tank for temporary storage until the problem is rectified.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all plant and equipment;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. Discuss with ET and IEC on the proposed mitigation measures including necessary adjustment to the STP and the RO unit;</li> <li>4. Ensure mitigation measures are properly implemented within the agreed time frame; and</li> <li>5. Suspend the discharge of treated effluent upon a confirmed exceedance of Limit Level and the advice from the IEC and IO. Sewage to be diverted to equalization tank for temporary storage.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with PMO and IEC on the proposed mitigation measures;</li> <li>2. Make agreement on mitigation measures to be implemented and the time frame;</li> <li>3. Assess the effectiveness of the implemented actions with the IEC;</li> <li>4. Request PMO to critically review the operation of the plant and to make sure the plant operates effectively;</li> <li>5. Instruct the PMO to suspend the discharge of treated effluent upon advice from the IEC, and to divert sewage to the equalization tank for temporary storage.</li> </ol>
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Confirm findings with the laboratory;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, PMO, IO, and EPD;</li> <li>4. Check with PMO that all plant, equipment and working methods are properly implemented/ followed;</li> <li>5. Discuss mitigation measures with IEC, PMO and IO;</li> <li>6. Ensure mitigation measures are implemented within the agreed time frame;</li> <li>7. Repeat measurement upon resume of operation of the STP.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and confirm monitoring data submitted by ET;</li> <li>2. Notify EPD;</li> <li>3. Discuss with ET, PMO and IO on mitigation measures;</li> <li>4. Review the proposed mitigation measures submitted by PMO and advise the IO accordingly;</li> <li>5. Supervise the implementation of mitigation measures;</li> <li>6. Assess the effectiveness of the implemented mitigation measures;</li> <li>7. In case of a confirmed exceedance of Limit Level, advise the PMO and IO to suspend the discharge of the treated effluent from the STP and to divert sewage to the equalization tank for temporary storage until the problem is rectified; and</li> <li>8. In case of prolonged outage of the STP, advise the PMO and IO to transport sewage for disposal at designed sewage treatment works to be assigned by DSD.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all plant and equipment;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. Discuss with ET and IEC on the proposed mitigation measures including necessary adjustment to the STP and the RO unit;</li> <li>4. Ensure mitigation measures are properly implemented within the agreed time frame;</li> <li>5. Suspend the discharge of treated effluent upon a confirmed exceedance of Limit Level and the advice from the IEC and IO. Sewage to be diverted to equalization tank for temporary storage; and</li> <li>6. In case of prolonged outage of the STP to transport sewage for disposal at designed sewage treatment works to be assigned by DSD until operation of the STP has resumed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with PMO and IEC on the proposed mitigation measures;</li> <li>2. Make agreement on mitigation measures to be implemented and the time frame;</li> <li>3. Assess the effectiveness of the implemented actions with the IEC;</li> <li>4. Request PMO to critically review the operation of the plant and to make sure the plant operates effectively;</li> <li>5. Instruct the PMO to suspend the discharge of treated effluent upon advice from the IEC, and to divert sewage to the equalization tank for temporary storage; and</li> <li>6. In case of prolonged outage of the STP, instruct the PMO to transport sewage for disposal at designed sewage treatment works to be assigned by DSD.</li> </ol>

EVENT	ACTION			
	ET	IEC	PMO (and its contractor) *	IO *
<b>Monitoring on Annual Pollution Loading</b>				
Quarterly pollution loading in treated effluent of interim STP exceeds the corresponding pollution loading in abstracted channel water	<ol style="list-style-type: none"> <li>1. Confirm findings;</li> <li>2. Inform IEC, PMO, and IO;</li> <li>3. Check with PMO that all plant, equipment and working methods are properly implemented/ followed;</li> <li>4. Discuss mitigation measures with IEC, PMO and IO; and</li> <li>5. Ensure mitigation measures are implemented within the agreed time frame.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and confirm data submitted by ET;</li> <li>2. Discuss with ET, PMO and IO on mitigation measures;</li> <li>3. Review the proposed mitigation measures submitted by PMO and advise the IO accordingly;</li> <li>4. Confirm with ET the implementation of mitigation measures; and</li> <li>5. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all plant and equipment;</li> <li>2. Rectify unacceptable practice, if any;</li> <li>3. If required, replace parts of the STP to ensure its treatment capacity is optimised;</li> <li>4. Discuss with ET and IEC on the proposed mitigation measures;</li> <li>5. Sewage to be diverted to equalization tank for temporary storage;</li> <li>6. Transport sewage for disposal at designed sewage treatment works to be assigned by DSD;</li> <li>7. Abstract channel water and carry out treatment with RO to remove pollutants loads in abstracted channel water; and</li> <li>8. Ensure mitigation measures are properly implemented within the agreed time frame.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with PMO and IEC on the proposed mitigation measures;</li> <li>2. Make agreement on mitigation measures to be implemented and the time frame;</li> <li>3. Instruct the PMO to divert sewage to equalization tank for temporary storage; transport sewage for disposal at designed sewage treatment works to be assigned by DSD; and abstract channel water for treatment; and</li> <li>4. Assess the effectiveness of the implemented actions with the IEC.</li> </ol>
Annual pollution loading in treated effluent of interim STP exceeds the annual pollution loading in abstracted channel water	<ol style="list-style-type: none"> <li>1. Confirm findings;</li> <li>2. Inform IEC, PMO, and IO;</li> <li>3. Discuss mitigation measures with IEC, PMO and IO; and</li> <li>4. Ensure mitigation measures are implemented within the agreed time frame.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and confirm data submitted by ET;</li> <li>2. Notify EPD;</li> <li>3. Advise the PMO and IO to suspend the discharge of the treated effluent from the STP and to divert sewage to the equalization tank for temporary storage;</li> <li>4. Advise the PMO and IO to transport sewage for disposal at designed sewage treatment works to be assigned by DSD;</li> <li>5. Review the proposed mitigation measures submitted by PMO and advise the IO accordingly;</li> <li>6. Confirm with ET the implementation of mitigation measures; and</li> <li>7. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Suspend the discharge of treated effluent upon advice from the IEC and IO. Sewage to be diverted to equalization tank for temporary storage;</li> <li>2. Transport sewage for disposal at designed sewage treatment works to be assigned by DSD until the resume of operation of the STP;</li> <li>3. With assistance by a qualified person, critically review the operation of the STP and prepare a proposal with necessary recommendations;</li> <li>4. Follow the recommendations and execute the proposed plan to compensate the deficit once the operation of the STP is resumed;</li> <li>5. Discuss with ET, IEC and IO on the proposed mitigation measures; and</li> <li>6. Ensure mitigation measures are properly implemented within the agreed time frame.</li> </ol>	<ol style="list-style-type: none"> <li>1. Instruct PMO to suspend the discharge of treated effluent upon advice from the IEC, and to divert sewage to the equalization tank for temporary storage;</li> <li>2. Instruct the PMO to transport sewage for disposal at designed sewage treatment works to be assigned by DSD;</li> <li>3. Request PMO to critically review the operation of the plant, and to follow the proposed recommendations;</li> <li>4. Discuss with PMO and IEC on the proposed recommendations and mitigation measures;</li> <li>5. Make agreement on mitigation measures to be implemented and the time frame; and</li> <li>6. Assess the effectiveness of the implemented actions with the IEC.</li> </ol>

Note: \* The Project Proponent would assume the responsibilities of the IO and PMO until an agreement is reached between the Project Proponent and relevant parties on the funding, implementation, management and maintenance of mitigation measures.

## **8. WASTE MANAGEMENT**

### **8.1 General Requirements**

- 8.1.1 The contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and implementation of any mitigation measures to minimize waste or redress problems arising from waste generated on the site.
- 8.1.2 The Contractor shall also pay attention to the Waste Disposal Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance, and carry out the appropriate waste management work. The relevant licence/permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained.
- 8.1.3 Waste management measures have been proposed in the Project EIA report. These measures are also reproduced in Appendix I, which shall be implemented for this Project.
- 8.1.4 According to the EIA report, the Project Site was vacant and partially used at open air car parking. There was no known current and historic land use activity at the Project Site in accordance with Sections 3.1 and 3.2 of Annex 19 in the EIAO-TM that would have potential land contamination issue. Since there is no historic and/or existing land uses at the Project Site that would result in potential contamination of soil and underground water, land contamination at the Project Site is not expected.

### **8.2 During Detailed Design**

- 8.2.1 The demolition and construction work shall be considered in the planning and design stages to reduce the generation of Construction and Demolition (C&D) waste where possible. Landfill disposal shall only be considered as the last resort.
- 8.2.2 Construction methods with minimum waste generation quantity and other environmental impacts shall be considered in the detailed design.
- 8.2.3 During the detailed design, further investigation will be required to determine the exact extent and quantity of pond sediment concerned. Relevant contractual requirements will be put in place to request the contractor to properly excavate and disposal of the excavated sediment.
- 8.2.4 Refuse collection points (RCP) will be provided for the residential development. A licensed waste collector shall be employed to collect domestic waste on daily basis. To minimize odour nuisance, odour absorption system will be provided, details of which will be provided in the detailed design phase. In order to comply with Building Regulation, mechanical ventilation will also be provided at the RCP.
- 8.2.5 There is an abandoned pond (about 0.33 ha) within the Project Site (Figure 8-3 of EIA report refers) (assuming an average depth of sediment of 3m, the concerned quantity of sediment is about 9,900m<sup>3</sup>). During construction, the concerned abandoned pond within Project Site will be filled up. The concerned pond sediment is intended to be left in place and not to be disturbed as far as possible. However, should pond sediment be encountered during construction, it should be temporarily stored and re-used on-site, and no offsite disposal is expected (for example, re-use as fill material during site formation stage. Subject to detailed design stage, mixing pond sediment with cement material may be required so that its quality can meet the engineering requirements). It is understood that there is no specific environmental standard/ requirement for measuring/ controlling on-site re-use of pond sediment. If solidified materials will not be reused on-site and to be used as

public filling materials, prior approval from Public Fill Committee of Civil Engineering and Development Department should be sought beforehand in accepting the solidified materials at public fill.

- 8.2.6 As this Project will require imported fill materials in order to raise the site level to the proposed site formation level, this also provides an incentive for contractor(s) to reduce the amount of materials to be excavated provided that the materials can be re-used and its quality can meet the engineering requirements. The Contractor(s) will be required to minimize the amount of materials to be excavated and to re-use excavated materials on-site.

### **8.3 Waste Management Measures During Construction**

- 8.3.1 As discussed above, waste management/ control measures are provided in Appendix I for implementation. Some of the recommended waste management/ control measures are presented below.
- 8.3.2 Cross contamination of inert C&D materials by other waste categories shall be minimised as far as practicable through provision of storage facilities for storage of different categories of waste. Inert materials including soil, rock, concrete, brick, cement plaster/ mortar, inert building debris, aggregates and asphalt should be segregated from and stored separately from other waste categories to ensure proper handling and reuse. The on-site temporary facilities should be equipped with dust control measures where necessary. Wooden boards can be reused on-site or off-site, though the reusability and quantity of final waste will depend on the quality, size and shape of the boards. Those timbers which cannot be reused again shall be sorted and stored separately from all inert waste before disposed of at landfills.
- 8.3.3 Should construction site hoarding be erected, metal fencing or building panels, which are more durable than wooden panels, are recommended to be used as far as practicable. Opportunity shall also be sought to re-use any wooden boards used in site fencing on-site or off-site. Concrete and masonry can be crushed and used as fill material if practicable. On-site incineration of wooden waste is prohibited.
- 8.3.4 In order to avoid dust, odour and erosion impacts, all stockpile areas at the Project Area shall be covered with tarpaulin or impermeable sheets. Any vehicle carrying C&D waste shall have their load covered when leaving the works area. Vehicles shall be routed as far as possible to avoid sensitive receivers in the area.
- 8.3.5 Chemical waste that could be generated from construction works would primarily arise from chemicals used in operation and maintenance of on-site equipment. These may include fuel, oil, lubricants, cleaning fluids, and solvents arising from leakage or maintenance of on-site equipment and vehicles. Chemical generated from daily operation of the construction works shall be recycled/ reused on-site as far as practicable.
- 8.3.6 If off-site disposal of chemical waste is required, they should be collected and delivered by a licensed contractor, and disposed of strictly following the Waste Disposal (Chemical Waste) (General) Regulation.
- 8.3.7 The contractors shall register with EPD as chemical waste producers when chemical waste is produced. All chemical waste shall be properly stored, labelled, packaged and collected in accordance with the Regulation. Fossil fuel and used lubricants from trucks and machinery are classified as chemical waste.
- 8.3.8 Chemical waste generated has to be stored in suitable containers and away from water bodies so that leakage or spillage is prevented during the handling, storage, and subsequent transportation.

- 8.3.9 The Contractor shall prevent fuel and lubricating oil leakage from plant and storage sites from contaminating the construction site. All compounds in work areas shall be positioned on areas with hard paving and served by drainage facility. Sand/ silt traps and oil interceptors shall be provided at appropriate locations prior to the discharge points.
- 8.3.10 General refuse generated at the construction site shall be stored separately from construction and chemical wastes to avoid cross contamination. A reliable waste collector shall be employed by the Contractor to remove general refuse from the construction site on a daily basis where appropriate to minimize the potential odour, pest and litter impacts.
- 8.3.11 Open burning for the disposal of construction waste or the clearance of the Project Area in preparation for construction work is prohibited under the Air Pollution Control (Open Burning) Regulation.
- 8.3.12 Upon appointment, the main contractor of each construction contract shall prepare and implement a Waste Management Plan (WMP), which shall be developed and incorporated in the Environmental Management Plan (EMP) to be prepared for this Project in accordance with ETWB TCW No. 19/2005 – Environmental Management on Construction Sites which should describe the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The EMP should be submitted to the Engineer's Representative (ER) and the Project Environmental Team Leader (ETL) for approval. The contractor shall implement the waste management practices in the EMP throughout the construction stage of the Project. The EMP shall be reviewed regularly and updated (preferably monthly) by the contractor. The EMP shall take into account the recommended mitigation measures in the EIA Report.
- 8.3.13 The EMP shall provide recommendations for appropriate disposal routes if waste cannot be recycled. The EMP shall include the method statement for demolition and transportation of the excavated materials and other construction wastes. The EMP shall be approved before the commencement of construction. All mitigation measures arising from the approved EMP shall be fully implemented. The project proponent will ensure that the day-to-day operations comply with the approved EMP. According to the EMP, the project proponent shall control the disposal of public fill, C&D materials and C&D waste to public fill reception facilities, sorting facilities and landfills respectively through a trip-ticket system. The project proponent shall require the contractor to separate public fill from C&D waste for disposal at appropriate facilities. In addition, the project proponent shall record the disposal, reuse and recycling of C&D materials for monitoring purposes.
- 8.3.14 In formulating the EMP in respect to waste management, the following hierarchy should be considered:
- Avoidance and minimization to reduce the potential quantity of C&D materials generated;
  - Reuse of materials as practical as possible;
  - Recovery and Recycling as practical as possible;
  - Proper treatment and disposal in respect to relevant laws, guidelines and good practice; and
- 8.3.15 The EMP shall covers the followings and developed taking into account the recommended control measures given in this Chapter where appropriate:

- A waste management policy, organization chart, and responsibility;
  - An estimation on the location, type, nature, quality and quantity of different waste streams to be generated from the Project works, and the corresponding waste management methodology;
  - A method statement for demolition and transportation of the excavated materials and other construction wastes;
  - Potential for recycling or reuse should be explored and opportunities taken if waste generation is unavoidable;
  - Recommendations for appropriate disposal routes if waste cannot be recycled;
  - A system to control the disposal of C&D materials and C&D waste to public fill reception facilities, sorting facilities and landfills respectively through a trip-ticket system in accordance with the PNAP ADV-19; and
  - A system to record the C&D materials/ C&D waste to be generated, disposed of, reused, and recycled, respectively.
  - The EMP should be approved before the commencement of construction. All mitigation measures in the approved EMP should be fully implemented.
- 8.3.16 The Project Proponent/ ER will ensure that the day-to-day operations comply with the approved EMP. The Project Proponent/ ER shall require the contractor to separate public fill from C&D waste for disposal at appropriate facilities. In addition, the Project Proponent/ ER shall regularly audit Contractor(s)' records for the disposal, reuse and recycling of C&D materials for monitoring purposes.
- 8.3.17 Based on the above waste management options, a good management and control plan would be formulated. Good management and control can prevent the generation of significant amount of waste. On-site sorting of construction wastes will be recommended. Secondary on-site sorting can be achieved by avoiding the generation of "mixed waste" through good site control. Construction wastes shall be sorted to remove contaminants, with the inert materials broken up into small pieces before being transported to public fill reception facilities.
- 8.3.18 Chemical and oily wastes generated from the construction activities, vehicle and plant maintenance and oil interceptors should be disposed of as chemical waste in strict compliance with the Waste Disposal (Chemical Waste) (General) Regulations.
- 8.3.19 The demolition and construction work shall be considered in the planning and design stages to reduce the generation of C&D waste where possible. Landfill disposal shall only be considered as the last resort.
- 8.3.20 Construction methods with minimum waste generation quantity and other environmental impacts shall be considered.
- 8.3.21 In addition, the contractor(s) shall be required to reuse inert C&D materials (e.g. excavated soil) or in other suitable construction sites as far as possible, in order to minimize the disposal of C&D materials to public fill reception facilities. The project proponent shall encourage the contractor to maximize the use of recycled or recyclable C&D materials, as well as the use of non-timber formwork to further minimize the generation of construction waste.
- 8.3.22 The following additional control/ mitigation measures are recommended to be followed by the Contractor:



- Storage of different waste types – different types of waste should be segregated and stored in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal. An on-site temporary storage area equipped with required control measures (e.g. dust) should be provided;
- Trip-ticket system – in order to monitor the proper disposal of non-inert C&D waste to landfills and to control fly-tipping, a trip-ticket system should be included as one of the contractual requirements and audited by the Environmental Team;
- Records of Wastes – a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed;
- Training – The contractor should provide his workers with proper training of appropriate waste management procedure to achieve waste reduction as far as practicable and cost-effective through recovery, reuse and recycling and avoid contamination of reusable C&D materials;
- Incorporate the “Recommended Pollution Control Clauses for Construction Contracts” in respect to removal of waste material from the construction site into the contract of the contractor.

8.3.23 During construction, the concerned pond sediment at abandoned pond is intended to be left in place and not to be disturbed as far as possible. The contractor(s) shall refer to Sections 8.2.5 to 8.2.6 above regarding pond sediment.

#### *Waste Minimisation*

- 8.3.24 In addition to the above, the following construction waste pollution clauses shall be included in construction contracts. The Contractor shall submit to the ER for approval a waste management plan with appropriate mitigation measures including the allocation of an area for waste segregation and shall ensure that the day-to-day site operations comply with the approved waste management plan.
- 8.3.25 The Contractor shall minimize the generation of waste from his work. Avoidance and minimisation of waste generation can be achieved through changing or improving design and practices, careful planning and good site management.
- 8.3.26 The Contractor shall ensure that different types of wastes are segregated on-site and stored in different containers, skips or stockpiles to facilitate reuse/recycling of waste and, as the last resort, disposal at different outlets as appropriate.
- 8.3.27 The reuse and recycling of waste shall be practised as far as possible. The recycled materials shall include paper/cardboard, timber and metal etc.
- 8.3.28 The Contractor shall ensure that Construction and Demolition (C&D) materials are sorted into public fill (inert portion) and C&D waste (non-inert portion). The public fill which comprises soil, rock, concrete, brick, cement plaster/mortar, inert building debris, aggregates and asphalt shall be reused in earth filling, reclamation or site formation works. The C&D waste which comprises metal, timber, paper, glass, junk and general garbage shall be reused or recycled and, as the last resort, disposal of at landfills.
- 8.3.29 The Contractor shall record the amount of wastes generated, recycled and disposed of (including the disposal sites).
- 8.3.30 The Contractor shall implement a trip ticket system in accordance with the “Construction and Demolition Waste” in PNAP ADV-19 for public fill, C&D materials and C&D waste to public fill reception facilities, sorting facilities and landfills

respectively.

- 8.3.31 Training shall be provided for workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.
- 8.3.32 Spent bentonite slurries, if any, will be handled and disposed of properly in accordance with the requirements set out in the Practice Note for Professional Persons (PN1/94) Construction Site Drainage.

#### *Waste Nuisance Control*

- 8.3.33 The Contractor shall not permit any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the Project Area onto any adjoining land or allow any waste matter [or refuse] which is not part of the final product from waste processing plants to be deposited anywhere within the Project Area [or onto any adjoining land]. He shall arrange removal of such matter from the Project Area [or any building erected or to be erected thereon] in a proper manner to the satisfaction of the ER in consultation with the Director of Environmental Protection.

#### *Chemical Waste Control*

- 8.3.34 The Contractor shall observe and comply with the Waste Disposal (Chemical Waste) (General) Regulation for handling, storage and disposal of chemical wastes.
- 8.3.35 The Contractor shall apply for registration as chemical waste producer under the Waste Disposal (Chemical Waste) (General) Regulation when chemical waste is produced. All chemical waste shall be properly stored, labelled, packaged and collected in accordance with the Regulation.
- 8.3.36 The Contractor shall prevent fuel and lubricating oil leakage from plant and storage sites from contaminating the construction site. All compounds in work areas shall be positioned on areas with hard paving and served by drainage facility. Sand/ silt traps and oil interceptors shall be provided at appropriate locations prior to the discharge points.
- 8.3.37 If off-site disposal of chemical waste is required, they shall be collected and delivered by licensed contractors to Tsing Yi Chemical Waste Treatment Facility and be disposed of in strict accordance with the Waste Disposal (Chemical Waste) (General) Regulation. Contractors shall register with EPD as chemical waste producers when disposal of chemical waste is anticipated to be required. Chemical waste materials have to be stored on-site with suitable containers and away from water bodies so that leakage or spillage is prevented during the handling, storage, and subsequent transportation.

### **8.4 Waste Management Measures During Operation**

- 8.4.1 Refuse collection points (RCP) will be provided for the residential development. A licensed waste collector shall be employed to collect domestic waste on daily basis. To minimize odour nuisance, odour absorption system will be provided, details of which will be provided in the detailed design phase. In order to comply with Building Regulation, mechanical ventilation will also be provided at the RCP. With proper management and maintenance of the waste facilities, possible leachate impact from the RCP is not anticipated.
- 8.4.2 Collection bins for used aluminium cans, waste paper and glass bottles should be provided at strategic locations of the residential development area to promote and

encourage recycling by residents during the operational phase.

## **8.5 Site Audit**

- 8.5.1 The implementation schedule of the recommended mitigation measures is presented in Appendix I.
- 8.5.2 During the site inspections and the document review procedures as mentioned in this manual (Section 11 refers), the ET shall pay special attention to the issues relating to waste management, and check whether the Contractor has implemented the recommended mitigation measures.
- 8.5.3 Auditing should be carried out periodically to determine if waste is being managed in accordance with prescribed waste management procedures and the EMP. The audits should examine all aspects of waste management including waste generation, storage, recycling, treatment, transportation, and disposal. The general site inspections including waste management issues will be undertaken weekly by the ET to check all construction activities for compliance with all appropriate environmental protection and pollution control measures, including those set up in the EMP. Meanwhile, waste management audit will also be carried out as part of the monthly audit by the IEC.

## **9. LANDSCAPE AND VISUAL**

### **9.1 Introduction**

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

9.1.2 The proposed mitigation measures of landscape and visual impacts are summarised in the Project EM&A Implementation Schedule (PIS) in **Appendix I** and shown on **Figure 9-1 to 9-24**. These measures proposed will be incorporated in the detailed landscape, building and engineering design during design phase. The construction phase mitigation measures will be adopted and audited from the commencement of construction throughout the entire construction period. Mitigation measures for the operational phase will be adopted during the detailed design and be built as part of the construction works so that they are in place on commissioning of the Project.

### **9.2 Baseline Monitoring**

9.2.1 Baseline monitoring mainly comprises of checking and updating of any change on preserved trees within the site due to further development and implementation of the Project.

9.2.2 The baseline monitoring shall be carried out by the ET and audited by Architect, Engineer, Landscape Architect or a competent person, as a member of the ET. The qualification of proposed auditor shall be submitted to the ER for approval and agreed with the IEC the Landscape Mitigation Measures to be monitored.

### **9.3 Mitigation Measures**

9.3.1 The proposed landscape impact mitigation measures to be incorporated in the design, construction and operation phase, and relevant funding/implementation/management and maintenance agencies for the measures are summarized in **Table 9-1 and Table 9-2** and shown on **Figure 9-1 to 9-5**. Detailed requirements are also provided below.

**Table 9-1 Proposed Construction Phase Landscape Mitigation Measures**

ID No.	Landscape Mitigation Measure	Funding Agency	Implementation Agency
CP1	<p><i>Preservation of Existing Vegetation</i> - The proposed works shall avoid disturbance to the existing trees and vegetation as far as practicable within the works areas.</p> <p>The tree preservation proposals shall be coordinated with the layout and design of the engineering and architectural works.</p> <p>It is recommended that a full tree survey and felling application shall be undertaken and submitted for approval by the relevant government departments in accordance with LAO PN No. 7/2007 Tree Preservation and Tree Removal Application for Building Development in Private Projects during the detailed design phase of the Project.</p> <p>All preserved trees shall be protected by means of fencing where appropriate to prevent potential damage to tree canopies and root zones from vehicles and storage of materials. Specifications for tree protection measures will be formulated at detailed design stage and to be implemented by contractors before site formation/ construction works commenced.</p>	Project Proponent	Project Architect/ Landscape Architect/ Contractor
CP3	<p><i>Implementation of Mitigation Planting and Planting Species Selection</i> - Replanting of existing / disturbed vegetation will be undertaken at the earliest possible stage of the construction phase of the Project. Predominantly native and / or ornamental plant species shall be utilised.</p> <p>Proposed mitigation planting will not only be limited to conventional amenity planting, but also consider alternative greening measures such as vertical greening for screening and softening of the built structures and green roof on built structures for enhancing the visual amenity. Small shrubs, climbing plants, lawn and groundcovers shall be used in specific locations where technically feasible.</p>	Project Proponent	Project Landscape Architect/ Contractor
CP4	<p><i>Transplantation of Existing Trees</i> – Some specimens which have relatively higher amenity value will be considered for transplanting. The final recipient site will be in planting areas within the proposed development. These trees continue their contribution to the local landscape context as well as the future residential landscape.</p> <p>The transplanting proposal is subject to review at detailed design stage and seeks for the approval from the relevant government departments in accordance with LAO PN No. 7/2007 Tree Preservation and Tree Removal Application for Building Development in Private Projects.</p> <p>The implementation programme for the proposed works will reserve enough time for the advanced tree transplanting preparation works to enhance the survival of the transplanted trees.</p>	Project Proponent	Project Landscape Architect/ Contractor

**Table 9-2 Proposed Operational Phase Landscape Mitigation Measures**

ID No.	Landscape Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP1	<p><i>Roadside and Amenity Planting</i> – The planting proposals will utilise native and ornamental species and broadleaf trees in combination of shade tolerant shrub planting and climbing plants in proposed landscape buffer surrounding the site to soften the horizontal emphasis of proposed noise barrier and fence wall. It will form a continuous landscape buffer at the periphery of the development site in combination with tree preservation proposal.</p> <p>Enough soil depth of 1200mm will be reserved for tree planting area to ensure healthy planting establishment. High clearance tree planting will be utilised alongside of internal road and not to interfere the EVA requirement.</p> <p>The implementation of new planting shall be undertaken as soon as technically feasible after completion of building works to ensure the effectiveness of this mitigation during operational stage.</p> <p><b>(Figure 9-1 refer).</b></p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

ID No.	Landscape Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP2	<p><i>Compensatory Planting Proposals</i> – As the works are largely located within rural and low-rise development areas and alongside existing roads, the planting proposals have sought to utilise all of the available space for new tree and shrub planting to create a comprehensive landscape framework which is connected to areas of retained and preserved vegetation and designed to integrate the proposals within their future landscape setting.</p> <p>The new planting will be maintained in accordance with good horticultural practice in order to realise the objectives of the mitigation measures. This includes the replacement of defective plant species in the new planting areas to enhance the aesthetic, landscape and ecological quality of the proposals. Both native and ornamental species will be utilised.</p> <p>The compensatory planting proposal will be developed at detailed design stage in accordance with the requirements listed in the LAO PN No. 7/2007 'Tree Preservation and Tree Removal Application for Building Development in Private Project'. New tree planting will utilise heavy standard size trees at selected area as accent, standard to light standard size trees in general landscape and roadside planting areas. Smaller planting stock will be used on slope and landscape buffer. Figure 9-1 shows the indicative tree planting locations that will create an instant greening and screening effect to the proposed development.</p> <p>Based on a preliminary estimation, the planting proposal would achieve a replanting ratio of minimum 1:1 in terms of quantity and quality upon the completion of proposed development. The development has sought to preserve 274 existing trees (75.2%) through retention in their current locations or tree transplanting and plant 126 compensatory trees and 65 amenity trees. Upon the completion of the tree preservation and planting proposal, proposed development could accommodate 465 trees in combination of tree preservation and new tree planting; there is a net gain of 101 trees within the proposed development. The above recommendations are subject to change at detailed design stage.</p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

ID No.	Landscape Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
<p>OP2 (Cont')</p>	<p>The findings and recommendations on existing trees are subject to review at detailed design stage and a tree felling and transplanting application will be prepared in accordance with LAO PN 7/2007 Tree Preservation and Tree Removal Application for Building Development in Private Projects and submitted to DLO for approval.</p> <p>The planting proposal in proposed gardens and landscape buffer, which will utilise a combination of native and ornamental species, in addition bird-attracting and butterfly-attracting plant species will be introduced within and surrounding the landscape pond to further enhance the landscape and ecological value of the Site. For example, plants producing berry will enhance the food resources of birds. Nectar plants will also provide food resources for butterflies. Both fauna groups will benefit from landscape planting. The planting of trees will also provide roosting habitats for birds. There would be improvement in the environmental condition considering that the Project Site only supports low plant diversity and covered by mainly exotic species (including the invasive plant <i>Leucaena leucocephala</i>) in existing condition.</p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent
OP5	<p><i>Design of Engineering Structure –</i></p> <p>Alternative greening measures including greening on the roof and/or vertical greening on the structures and on regarded sloping areas will be used wherever possible to disguise their function appearance in both medium and long distance views and maximise the greening opportunities.</p> <p>Tree preservation, new tree planting and alternative greening measures on and adjacent to the engineering structures will create an instant greening effect soften the visual mass.</p> <p>(Figure 9-2 to 9-5 refer).</p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent



ID No.	Landscape Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP6	<p><i>Creation of Landscape Buffer</i> - Native and ornamental tree and shrub planting and climbing plants will be utilised for the creation of landscape buffer (5-8m wide) along noise barrier and sewage treatment plant at Ha Chuk Yuen Road as well as Kam Pok and Fung Chuk Road to enhance the aesthetic and landscape diversity of the local context. These measures provide screening effect to the noise mitigation measures and fence wall of proposed development.</p> <p>Treatment of Slopes should be aesthetically enhanced through the use of soft landscape works including tree and shrub planting to create a more natural appearance blending into the local rural landscape.</p> <p><b>(Figure 9-2 to 9-5 refer)</b></p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent
OP7	<p><i>Provision of Landscape Pond</i> – a landscape pond (wet garden) (110m<sup>2</sup>) will be designed within the Project Site. It will enhance the amenity and landscape value by planting a combination of native and ornamental, bird-attracting and butterfly-attracting plant species within and surrounding the pond area. Fauna, including birds and butterflies, living in the surrounding areas may extend their livelihood activities to the proposed water body and planting area.</p> <p><b>(Figure 9-1 and 9-24 refer)</b></p>	Project Proponent	Project Landscape Architects/ Contractor	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

## 9.4 Visual Mitigation Measures

9.4.1 The proposed visual impact mitigation measures in the construction and operation phase are summarized in **Table 9.3 and Table 9.4 and shown on Figure 9.6 to 9.23**. Detailed requirements are also provided below.

**Table 9-3 Proposed Construction Phase Visual Mitigation Measures**

ID No.	Visual Mitigation Measure	Funding Agency	Implementation Agency
CP1	<i>Preservation of Existing Vegetation</i> – The tree preservation proposals will coordinate with the layout and design of the engineering and architectural layout at detailed design stage. The preservation of existing trees will provide instant greening and screening effect for the works.	Project Proponent	Project Engineers/ Architects/ Landscape Architects/ Contractor
CP2	<i>Works Area and Temporary Works Areas</i> – The landscape of the works areas will be restored to their original condition or enhanced through the introduction of new amenity planting areas or open spaces following the completion of the construction phase. The construction sequence and construction programme will be optimized in order to minimise the duration of impact.  Construction site controls will be enforced including the storage of materials, the location and appearance of site accommodation and site storage; and the careful design of site lighting to prevent light spillage.  Hoarding designed with recessive colour will be set up around the construction site providing screening effect for the construction works.  The site office or temporary above-ground structures will be sited at less visual prominent locations.	Project Proponent	Project Architect/ Contractor
CP5	<i>Coordination with Concurrent Projects</i> - Coordinated implementation programme with concurrent projects to minimise potential impacts and where possible reduce the period of disturbance.	Project Proponent	Project Engineers/ Architects/ Landscape Architects/ Contractor

**Table 9-4 Proposed operational Phase Visual Mitigation Measures**

ID No.	Visual Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP3	<p><u>Responsive Design of Buildings</u> –</p> <p>The design of the proposed building structures, road network and utility facilities will incorporate features as part of visual mitigation measures including:</p> <p><u>Integrated design approach</u></p> <p>Responsive design of built structures considered the location of houses and utilities structures. The disposition and height profile of the houses and above ground utilities structures respond to the existing context. Design measures include the creation of setbacks, articulating the development frontage and incorporation of view corridors/breezeway, avoid abrupt transitions between the existing and proposed built environment, reduce the apparent visual mass to enhance the sense of visual integration with the existing low-rise development context.</p> <p><u>Building Treatment</u></p> <p>The architectural design seeks to reduce the apparent visual mass of the structures further through the use of recessive colour palette. Incorporation of alternative greening measures such as green roof /vertical greening on built structures where condition allows and particularly at where fronting to the public realm. Non-reflective finishes also recommended to reduce the potential glare effect.</p> <p><b>(Figure 9-6 to 9-23 refer)</b></p>	Project Proponent	Project Landscape Architects	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

ID No.	Visual Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP4	<p><i>Noise Mitigation Structures</i> – To implement the noise barriers along Ha Chuk Yuen Road.</p> <p>The design of noise barrier should reduce the visual effect of the structure through the use of form, materials and textures colours. Setting back with articulated alignment from the site boundary to create a continuous landscape buffer (5-8m wide) with both preserved and new planted trees forming an instant screening effect to the engineering structures. Introduction of landscape berms, by virtue of its height and natural form, would reduce the perceived scale and height of the noise barriers. Integrated the proposed sewage treatment plant with noise barrier to reduce the engineering mass making the appearance blending into the rural setting.</p> <p>The design of engineering structures should avoid unnecessary visual cluster, this would be achieved through the co-ordination of the various engineering disciplines involved to arrive at innovative design solutions.</p> <p>(Figure 9-6 to 9-23 refer)</p>	Project Proponent	Project Engineers/ Architects	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent
OP5	<p><i>Design of Engineering Structure</i> – Particularly attention on the design, the appearance and construction methods of the structures of proposed engineering structures such as fence wall, noise barrier, sewage treatment plant and regarded sloping areas etc.</p> <p>The landscape consultants will work in liaison with the engineers on the aesthetic aspects of the structures and their relationship with the landscape.</p> <p>Alternative greening measures including greening on the roof and/or vertical greening on the structures and on regarded sloping areas will be used wherever possible to disguise their function appearance in both medium and long distance views and maximise the greening opportunities.</p> <p>Tree preservation, new tree planting and alternative greening measures on and adjacent to the engineering structures will create an instant greening effect soften the visual mass.</p> <p>(Figure 9-6 to 9-23 refer)</p>	Project Proponent	Project Engineers/ Architects/ Landscape Architects	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

ID No.	Visual Mitigation Measure	Funding Agency	Implementation Agency	Management Agency	Maintenance Agency
OP6	<p><i>Creation of Landscape Buffer-</i> Native and ornamental tree and shrub planting and climbing plants will be utilised for the creation of landscape buffer along noise barrier and sewage treatment plant at Ha Chuk Yuen Road to enhance the aesthetic and landscape diversity of the local context. Appropriate height and form of the landscape buffer/ berm to integrate with the noise mitigation measures and provide screening effect to the built structures.</p> <p>Treatment of Slopes should be aesthetically enhanced through the use of soft landscape works including tree and shrub planting to create a more natural appearance blending into the local rural landscape.</p> <p>The creation of landscape buffer at the periphery of the site, the height and form of the landscape berms and planting proposals have key role in mitigating the visual mass of the external fence walls of 2.5m high, the sewage treatment plant of roof at 10.4mPD and the noise barriers of height at 10.1mPD high.</p> <p>(Figure 9-6 to 9-23 refer)</p>	Project Proponent	Project Engineers/ Architects/ Landscape Architects	Project Proponent/ Property Management Agent	Project Proponent/ Property Management Agent

## 9.5 Audit and Monitoring

- 9.5.1 Audits will be carried out during construction phase to ensure all the recommended landscape and visual mitigation measures in the EIA are properly and effectively implemented and to ensure compliance with the intended aims of the measures. The EM&A comprise of monitoring and auditing of proper site management to reduce visual nuisance, the protection of preserved and transplanted trees, the implementation and establishment of compensatory planting through site audit programme. The audit will be undertaken by a member of the ET who is a certified arborist or who has tree survey relevant experiences not less than 1 year for monitoring and auditing the landscape works, quarterly during the construction period (construction phase) and the planting establishment period (operation phase).
- 9.5.2 A qualified softworks contractor will be employed for the implementation of landscape works and the subsequent planting establishment works. The planting works will be conducted as soon as technically feasible upon the completion of the planting areas. At least 12 months establishment period should be provided for all planting works.
- 9.5.3 The landscape and visual baseline will be determined with reference to any tree survey report and the landscape and visual impact assessments included in the EIA and subsequent Government approval of tree treatment and landscape works.
- 9.5.4 The extent of the agreed works areas should be regularly checked. Any trespass by the Contractor outside the limit of the works, including any vandalism/damage by inclement weather to preserved and transplanted trees shall be noted.

## 10. ECOLOGICAL MITIGATION

### 10.1 Introduction

10.1.1 The ecological assessment carried out in the EIA study has addressed the ecological consequences of the development. The potential ecological impacts to surrounding habitats due to construction disturbance and runoff during construction phase were ranked as “Moderate” and “Minor to Moderate” respectively. Other impacts during construction and operation phases are ranked as “Insignificant”. The effectiveness of the recommended mitigation measures to minimise the potential impact to waterbirds utilising the Ngau Tam Mei Drainage Channel will be evaluated by ecological monitoring in winter. Implementation of recommended mitigation measures is described in the following sections.

### 10.2 EM&A Requirements

- 10.2.1 Utilisation of the Ngau Tam Mei Drainage Channel by birds will be monitored in overwintering months (October to March) during the construction phase. A baseline survey will be conducted a month before the commencement of site construction works of the Project.
- 10.2.2 A baseline survey will be conducted for three months in dry season. The survey will be finished not less than a month before the commencement of site construction works of the Project. Survey will be conducted twice a month: one at low tide and one at high tide. Transect count method will be used. Survey will cover the section of Ngau Tam Mei Drainage Channel falls within the Assessment Area (**Figure 10-1**). Bird species, their abundance, habitat utilization and behaviour in this section of Ngau Tam Mei Drainage Channel will be recorded during each survey.
- 10.2.3 A “baseline survey report” will be submitted within one week after completion of baseline survey. The report will summarise the survey results and any major changes in site condition that might affect bird uses of the channel.
- 10.2.4 The collected data will provide the baseline for the evaluation of effectiveness of the proposed mitigation measures.
- 10.2.5 Construction phase ecological monitoring will be conducted between October and March. Survey will be conducted twice a month: one at low tide and one at high tide. Transect count method will be used. Survey will cover the section of Ngau Tam Mei Drainage Channel falls within the Assessment Area (**Figure 10-1**). Abundance and their behaviour of bird species observed in the channel will be recorded. Bird species, their abundance, habitat utilization and behaviour in this section of Ngau Tam Mei Drainage Channel will be recorded during each survey. Any changes in site condition that will potentially affect utilisation of the channel by birds will also be reported.
- 10.2.6 A summary report will be submitted within one week after completion of monitoring surveys of each year. The report will summarise the survey results, any major changes in site condition that might affect bird uses of the channel and any significant changes in bird community in the surveyed section of Ngau Tam Mei Drainage Channel. Effectiveness of the proposed mitigation measures will also be evaluated.
- 10.2.7 Regular site audit will be conducted on weekly basis for checking the implementation of good site practice during construction phase. The ecological surveys and the audits should be undertaken by a qualified ecologist.
- 10.2.8 During the operation phase, adverse impacts are not expected to occur. No specific ecological EM&A is recommended.

### 10.3 Mitigation Measures during Design Stage

- 10.3.1 The Project Area is located outside the boundary of WBA, and is over 500m from the boundary of WCA. The proposed development has thus avoided encroachment on sensitive habitats such as the fishponds and wetlands in WCA, and the purposes of WBA on protecting the ecological integrity of WCA.
- 10.3.2 The Project Area has avoided habitats of higher ecological value such as continuous fishponds and wetlands, or other natural habitats. Only man-made habitats of very low ecological value, including plantation, urbanised/disturbed habitat and one small isolated abandoned fishpond, will be affected.
- 10.3.3 The Project Area will be accessed by existing road network during both construction and operation phases. There will be no impact due to temporary or permanent loss of habitats from construction of access.

### 10.4 Mitigation Measures for Construction Phase

- 10.4.1 Hoarding will be erected before wintering season of water birds (October to March) to properly delineate the works site boundary and screen disturbance to the nearby habitats during construction phase. In order to reduce the potential disturbance to wildlife utilizing habitats near the Project Area, the hoardings will be made of opaque, non-reflective materials and painted in colour that will blend in with the environment. The workers will be instructed not to disturb any nearby habitats. Furthermore, the site boundary will be clearly defined (i.e. fenced with the screening materials mentioned above) and any works beyond the boundary would be strictly prohibited.
- 10.4.2 Construction noise will be further minimised by the use of non-percussive construction method, quiet/silenced equipment (QPMEs), provision of mobile noise barriers in adjacent to construction plants, or provision of acoustic screens by the Contractor(s). Other measures proposed in compliance with the Noise Control Ordinance will also be enforced and monitored as a mitigation measure under the Noise Impact Assessment (details see **Chapter 4** of the EIA report)(also in Section 5 of this Manual).
- 10.4.3 Dust control measures listed in **Section 3.9.1** of the EIA report (also in Section 4 of this Manual), e.g. hard paving of the haul road, frequent watering, covering dusty materials, careful site formation scheduling etc. will reduce dust impact to an acceptable level. These measures will minimize the potential disturbance to the surrounding habitats and associated fauna.
- 10.4.4 As stated in Section 5.5 of the EIA report, contractor(s) of this Project will be required to submit a Construction Phase Drainage Management Plan with details such as design of the temporary site drainage system; wastewater treatment facilities; and maintenance of drainage system for the approval of the Engineers Representative (ER) and the Environmental Team in order to ensure that the mitigation measures are in place. The concerned drainage management plan will include recommended mitigation measures as well as best practices identified in Sections 5.5.1 and 5.5.2 of the EIA report.
- 10.4.5 Good site practice and precautionary measures (e.g. those in Section 5.5 of the EIA report)(also in Section 6 of this Manual) will be implemented to avoid the potential impact due to runoff.
- 10.4.6 Standard site practices listed below shall be implemented to minimise potential impacts of noise, dust and runoff:
- Regular checking should be undertaken to ensure that the work site boundaries are not exceeded and that no damage occurs to surrounding areas;

- Implementation of mitigation measures specified in ProPECC PN 1/94 to control site runoff and drainage at all work sites during construction;
- Implementation of noise control measures at all construction sites to reduce impacts of construction noise to wildlife habitats adjacent works areas;
- Implementation of dust control measures at all construction sites to minimise dust nuisance to adjacent wildlife habitats during construction activities;
- Construction debris and spoil should be covered up and/or properly disposed of as soon as possible to avoid being washed into nearby waterbodies by rain;
- Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed with the following approach in descending order;
- Dusty materials remaining after a stockpile is removed should be wetted with water;
- All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty material wet;
- Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified; and
- Supervisory staff should be assigned to station on site to closely supervise and monitor the works.

## **10.5 Mitigation Measures for Operational Phase**

- 10.5.1 Minimization of bird collision will be taken into account in the design of noise barrier. Materials which are opaque, non-reflective panels with colour will be used for construction of noise barriers to reduce the risk of bird collision, particularly under dim condition (e.g. dusk and dawn) to reduce bird collision.
- 10.5.2 The interim sewage treatment plant will also form part of the noise mitigation measures, and hence the extent of the noise barrier will be reduced. This will reduce the risk of bird collision.
- 10.5.3 Setback area (with houses at least 30m from the Ngau Tam Mei Drainage Channel) on the western side of the Project Area will increase the distance between houses and Ngau Tam Mei Drainage Channel. This layout design will minimise the potential disturbance to waterbirds in the channel due to human activities and noise.
- 10.5.4 A continuous 5-8m wide landscape buffer will be included in the northern, eastern and western boundary of the Project Area. This layout design will minimize the potential impact to wildlife in the surrounding areas, particularly waterbirds in the Ngau Tam Mei Drainage Channel, due to human activities and noise in the Project Area during operation phase.
- 10.5.5 The layout proposed will only involve the construction of low-rise buildings with a maximum height of 6.6m. This will minimize the potential barrier effect to bird flights.

## **10.6 Fisheries Impacts**

- 10.6.1 No significant impact was anticipated during both construction and operation phase.
- 10.6.2 Other than the water quality monitoring programme at nearby water courses/channels during the construction phase, no specific fisheries EM&A programme would be required during the construction and operation phases of the Project.

### *Mitigation Measures for Construction Phase*

- 10.6.3 Standard site practice detailed in Chapter 5 of the EIA report would be implemented



to avoid or minimise the impacts on water quality on site, which are summarized as follows:

- Implementation of mitigation measures specified in ProPECC PN 1/94 to control site runoff and drainage at all work sites during construction;
- Construction debris and spoil should be covered up and/or properly disposed of as soon as possible to avoid being washed into nearby waterbodies by rain;
- Construction effluent, site run-off and sewage should be properly collected and/or treated;
- Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified; and
- Supervisory staff should be assigned to station on site to closely supervise and monitor the works.

10.6.4 Provide adequate site drainage to ensure that site runoff and wastewater will be properly contained and treated prior to discharge into the surrounding water courses.

## 11. SITE ENVIRONMENTAL AUDIT

### 11.1 Site Surveillance

- 11.1.1 Site surveillance provides a direct means to trigger and enforce the specified environmental protection and pollution control measures are in compliance with the contract specifications. They shall be undertaken regularly and routinely by ET to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented by the Contractor in accordance with the EM&A recommendations. With well-defined pollution control and mitigation specifications and a well-established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.
- 11.1.2 The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspections under the EM&A works. He shall, in consultation with the IEC, prepare and submit a proposal on the site inspection, deficiency and action reporting procedures (including any checklists and forms) within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval. A preliminary site inspection, deficiency and action reporting system in form of a flow chart is prepared for reference. This is shown in Figure 11-1 for review and refinement by the ET Leader at the commencement of the Project.
- 11.1.3 Regular site inspections shall be carried out at least once per week for all works areas. 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 site area which is likely to be affected, directly or indirectly, by the site activities. The ET leader shall make reference to the following information in conducting the inspection:
- The EIA recommendations and requirements on environmental protection and pollution control mitigation measures;
  - Works progress and programme, and site plans;
  - Individual construction works methodology proposals (which shall include proposal on associated pollution control measures);
  - The contract specifications on environmental protection and pollution prevention control;
  - The relevant environmental protection and pollution control laws, ProPECC Notes; and
  - Previous site inspection results.
- 11.1.4 The satisfactory implementation of relevant recommended mitigation measures shall be checked during the ET's regular site inspections during the relevant phases of construction works.
- 11.1.5 The Contractor shall update with the ET Leader on all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted, in a site inspection proforma, to the IEC and the Contractor in a site inspection proforma within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.

11.1.6 *Ad hoc* site inspections shall also be carried out by the ET and/or IEC when 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 Environmental 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, which the construction activities shall comply.

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

11.2.3 The Contractor shall regularly copy relevant documents to the ET Leader so that the checking work can be carried out effectively. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the ET's inspection upon his request.

11.2.4 After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly. The review shall be copied to IEC for any follow-up action.

11.2.5 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall check that appropriate actions have been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

## **11.3 Environmental Complaints**

11.3.1 Complaints received on environmental issues shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET shall undertake the steps given below upon receipt of the complaints. The complaint investigation procedures are also presented in form of a flow chart in Figure 11-2 for easy reference.

- Log complaint and date of receipt onto the complaint database and inform the IEC immediately;
- Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- If a complaint is valid and due to works, identify mitigation measures in consultation with the IEC;
- If mitigation measures are required, advise the Contractor accordingly;
- Review the Contractor's implementation of the identified a required mitigation measures, , and the concurrent situation;
- If the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;

- Undertake additional monitoring and audit to verify the compliant if necessary, and ensure that any valid reason for complaint does not recur through proposed amendments to work methods, procedures, machines and/or equipment, etc.;
  - Report the investigation results and the subsequent actions to the source of complaint (If the source of complaint is identified through EPD, the results should be reported within the time frame assigned by EPD); and
  - Log a record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 11.3.2 The ER shall notify the Project Proponent of any complaints received and keep him well informed of the actions being taken to settle these complaints.
- 11.3.3 During the complaint investigation work, the Contractor and ER shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures (in consultation with the IEC, see Section 11.3 above) are required following the investigation, the Contractor shall promptly carry out the measures. The ER shall ensure that the measures have been carried out by the Contractor.

#### **11.4 Documentation**

- 11.4.1 All documentation is required to be filed in a traceable and systematically manner and ready for inspection upon request. Site document, such as monitoring field records, laboratory analysis records, meeting minutes, correspondences etc., shall be cross-referenced by the ET Leader and be ready for inspection upon request. All Construction Phase EM&A results and findings shall be documented in the Construction Phase EM&A report prepared by the ET Leader and endorsed by IEC prior to disseminate to the Contractor, ER and EPD.
- 11.4.2 All documentation to the Director of Environmental Protection shall be in paper form and/or electronic form (in the format in agreement with the Director) upon request. Prior to submission, the water quality data software format shall be agreed with EPD. All documents and data shall be kept for at least one year after the completion of the construction contract. All submissions (reports, data, and correspondences etc.) to the Director of Environmental Protection shall be liable to use freely for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.

## 12. REPORTING

### 12.1 General

- 12.1.1 The following reporting requirements based upon a paper-documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) shall also be submitted in diskettes in an agreed format. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

### 12.2 Baseline Monitoring Report

- 12.2.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties: the Contractor, the IEC, the ER, and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies needed. The format and content of the report, and the representation of the baseline monitoring data to be submitted shall be agreed with EPD.
- 12.2.2 The baseline monitoring report shall include at least the following:
1. Up to half a page executive summary;
  2. Brief project background information;
  3. Drawings showing locations of the baseline monitoring stations;
  4. An updated construction programme with milestones of environmental protection/mitigation activities annotated;
  5. Monitoring results (in both hard and diskette copies) together with the following information:
    - Monitoring methodology;
    - Name of laboratory and types of equipment used and calibration details;
    - Parameters monitored;
    - Monitoring locations (and depth);
    - Monitoring date, time, frequency and duration;
    - QA/QC results and detection limits.
  6. Details on influencing factors, including:
    - Major activities, if any, being carried out on the site during the period;
    - Weather conditions during the period;
    - Other factors which might affect the results.
  7. 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;
  8. Revisions for inclusion in the EM&A Manual; and
  9. Comments and conclusions.

### **12.3 Monthly EM&A Reports**

- 12.3.1 The results and findings of all EM&A work required in the Manual shall be recorded and submitted by the ET Leader. Based on this information, a monthly EM&A reports shall be prepared by the ET Leader and endorsed by the IEC, and submitted to EPD within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the four 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 exact number of copies and format of the monthly reports in both hard copy and electronic medium required.
- 12.3.2 The ET Leader shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

### **12.4 First Monthly EM&A Report**

- 12.4.1 The first monthly EM&A report shall include at least but not be limited to the following:
1. Executive Summary (1-2 pages);
    - Breaches of AL levels;
    - Complaint Log;
    - Notifications of any summons and successful prosecutions;
    - Reporting Changes;
    - Future key issues.
  2. 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;
    - Works undertaken during the month.
  3. Environmental Status
    - Works undertaken during the month with illustrations (such as location of works, daily, dredging/filling rates, percentage fines in the fill material used);
    - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
  4. Summary of EM&A requirements including:
    - All monitoring parameters;
    - Environmental quality performance limits (Action and Limit levels);
    - Event-Action Plans;
    - Environmental mitigation measures, as recommended in the project EIA study final report;
    - Environmental requirements in contract documents;

5. Implementation Status
  - Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological, and the landscape and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.
6. Monitoring Results (in both hard and diskette copies) together with the following information;
  - Monitoring methodology;
  - Name of laboratory and types of equipment used and calibration details;
  - 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:
  - Major activities being carried out on site during the period;
  - Weather conditions that may affect the results;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
7. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, result 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;
8. Others
  - An account of the future key issues reviewed from the works programme and work method statements;
  - Advice on the solid and liquid waste management status;
  - Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

## **12.5 Subsequent Monthly EM&A Reports**

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

1. Executive Summary (1-2 pages)
  - Breaches of AL levels;
  - Complaint Log;
  - Notifications of any summons and successful prosecutions;
  - Reporting Changes;
  - Future key issues.
2. 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;
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
3. Implementation Status
  - Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological, and landscape and visual impacts, as recommended in the project HA study report, summarised in the updated implementation schedule.
4. Monitoring Results to provide monitoring results (in both hard and diskette copies) together with the following information
  - Monitoring methodology;
  - Name of laboratory and types of equipment used and calibration details;
  - Parameters monitored;
  - Monitoring locations (and depth);
  - Monitoring date, time, frequency, and duration;
  - Weather conditions during the period;
  - Graphical plots of the monitored parameters in the month annotated against:
  - Major activities being carried out on site during the period;
  - Weather conditions that may affect the results;
  - Any other factors which might affect the monitoring results;
  - QA/QC results and detection limits.
5. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches,



investigation, follow-up actions taken, result 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;
- A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

6. Others

- An account of the future key issues reviewed from the works programme and work method statements;
- Advice on the solid and liquid waste management status.

7. 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:
  - Major activities being carried out on Site during the period;
  - Weather conditions during the period;
  - Any other factors which 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

## 12.6 Quarterly EM&A Summary Reports

- 12.6.1 The quarterly EM&A summary report, which should generally be around 5 pages (including about 3 pages of text and tables and 2 pages of figures) should contain at least the following listed 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.
1. Up to half a page executive summary;
  2. Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
  3. A brief summary of EM&A requirements including:
    - Monitoring parameters;
    - Environmental quality performance limits (Action and Limit levels); and
    - Environmental mitigation measures, as recommended in the project EIA study final report;
  4. Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
  5. Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures;
  6. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
  7. Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
    - The major activities being carried out on site during the period;
    - Weather conditions during the period; and
    - Any other factors which might affect the monitoring results;
  8. Advice on the solid and liquid waste management status;
  9. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  10. A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
  11. For project where measurement of suspended solids is required, quarterly assessment of construction impacts on suspended solids at the project site, including, but not limited to, a comparison of the difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline data or EPD data, of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 on water quality times of the ambient mean ( $p < 0.05$ );
  12. A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
  13. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

14. A summary record of all 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;
15. Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
16. Proponents' contacts and any hotline telephone number for the public to make enquiries.

## **12.7 Final EM&A Summary Reports**

12.7.1 Upon the completion of construction works and termination of construction phase EM&A programme of this Project, a final EM&A summary report shall be submitted. The final EM&A summary report shall include the following:

1. An executive summary;
2. Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the entire construction period;
3. A brief summary of EM&A requirements including:
  - Monitoring parameters;
  - Environmental quality performance limits (Action and Limit levels); and
  - Environmental mitigation measures, as recommended in the project EIA study final report;
4. Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation status proformas;
5. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
6. Graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations annotated against:
  - The major activities being carried out on site during the period;
  - Weather conditions during the period;
  - Any other factors which might affect the monitoring results; and
  - The return of ambient environmental conditions in comparison with baseline data.
7. Compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;
8. Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
9. Advice on the solid and liquid waste management status;
10. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
11. A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
12. A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
13. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

14. Review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
15. A summary record of all 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;
16. Review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), recommend any improvement in the EM&A programme; and
17. A conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

## **12.8 Operational Phase EM&A Reports**

- 12.8.1 Copies of the report shall be submitted to the relevant parties. Before submission of the report, the ET Leader shall liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium required.
- 12.8.2 During operation of the interim STP, monitoring on quality of treated effluent that is discharged from the STP shall refer to Section 7.3, and conform to the licence requirements under the WPCO as well as the conditions specified in the Environmental Permit. The monitoring results shall be submitted to EPD and other authorities which may be required in the EP/ licence. The frequency of reporting and the required time frame shall conform to the licence requirements under WPCO as well as requirements of the EP.

## **12.9 Forms to be Adopted**

- 12.9.1 To facilitate the management of the EM&A programme for the construction works, the ET Leader shall keep records of EM&A activities during the construction phase of the Project (including those presented in the preceding sections). These records shall be made available for inspection and audit by the ER/ IEC/ EPD during the entire construction phase. Sample record forms are presented in Appendix II which should be adopted where applicable, and amended by ET Leader where necessary. These forms are listed as follows:
  - Implementation Status Proforma;
  - Data Recovery Schedule;
  - Site Inspection Proforma;
  - Proactive Environmental Protection Proforma;
  - Regulatory Compliance Proforma;
  - Complaint Log;
  - Sample Template for Interim Notifications of Environmental Quality Limits Exceedances;
  - Data Sheet for TSP Monitoring;
  - Noise Monitoring Field Record Sheet; and
  - Water Monitoring Field Record Sheet.

## **12.10 Data Keeping**

- 12.10.1 The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and

systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

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

- 12.11.1 With reference to Event/Action Plans in previous sections, when the environmental quality limits are exceeded, the ET shall immediately notify the ER & EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Appendix II.