

TABLE OF CONTENTS

1	INTRODUCTION	1-1
1.1	Project Background.....	1-1
1.2	Location and Scope of Project.....	1-1
1.3	Construction Programme	1-2
1.4	Purpose of this Manual	1-2
1.5	Project Organization	1-3
2	AIR QUALITY IMPACT	2-1
2.1	Introduction	2-1
2.2	Construction Phase.....	2-1
2.3	Operation Phase	2-8
2.4	Mitigation Measures.....	2-12
2.5	Audit Requirements	2-12
3	NOISE IMPACT	3-1
3.1	Construction Phase.....	3-1
3.2	Operation Phase	3-1
4	WATER QUALITY IMPACT	4-1
4.1	Introduction	4-1
4.2	Water Quality Parameters	4-1
4.3	Sampling Procedures and Monitoring Equipment	4-2
4.4	Laboratory Measurement / Analysis	4-4f
4.5	Water Quality Monitoring Stations	4-4
4.6	Details of Water Quality Monitoring	4-6
5	WASTE MANAGEMENT IMPLICATION	5-1
5.1	Introduction	5-1
5.2	Mitigation Measures.....	5-1
5.3	Audit Requirement	5-1
6	LAND CONTAMINATION	6-1
6.1	Introduction	6-1
6.2	Construction Phase.....	6-1
6.3	Operation Phase	6-1
7	ECOLOGY (TERRESTRIAL AND AQUATIC)	7-1
7.1	Construction Phase.....	7-1
7.2	Operational Phase	7-1
8	LANDSCAPE AND VISUAL IMPACT.....	8-1
8.1	Introduction	8-1
8.2	Mitigation Measures.....	8-1
8.3	Audit Requirements	8-1
9	HAZARD TO LIFE	9-1
9.1	Introduction	9-1
9.2	Mitigation Measures.....	9-1
9.3	EM&A Requirements	9-1
10	SITE ENVIRONMENTAL AUDIT	10-1
10.1	Site Inspections.....	10-1
10.2	Compliance with Legal and Contractual Requirements.....	10-1
10.3	Environmental Complaints	10-2
11	REPORTING.....	11-1
11.1	Introduction	11-1
11.2	Electronic Reporting of EM&A Information	11-1
11.3	Baseline Monitoring Report	11-1

11.4	Monthly EM&A Reports	11-2
11.5	Final EM&A Review Report for Construction Phase	11-6
11.6	EM&A Reports for Operation Phase	11-7
11.7	Data Keeping	11-9
11.8	Interim Notifications of Environmental Quality Limit Exceedances	11-9

List of Tables

Table 2.1	Proposed Construction Dust Monitoring Stations.....	2-4
Table 2.2	Summary of Construction Dust Monitoring Programme	2-5
Table 2.3	Action and Limit Levels for Air Quality (Construction Dust)	2-5
Table 2.4	Event and Action Plan for Air Quality (Construction Dust)	2-7
Table 2.5	Emission Limit for CHP Units	2-8
Table 2.6	Emission Limit for Boiler	2-8
Table 2.7	Analytical Parameters and Methodology	2-8
Table 2.8	Odour Intensity Levels	2-9
Table 2.9	Action and Limit Levels for Air Quality (Odour)	2-10
Table 2.10	Event and Action Plan for Air Quality (Odour)	2-11
Table 4.1	Parameters measured in the Marine Water Quality Monitoring	4-1
Table 4.2	Proposed Water Quality Monitoring Stations under Construction Phase.....	4-4
Table 4.3	Proposed Water Quality Monitoring Stations under Operation Phase (Urmston Road Outfall Discharge)	4-5
Table 4.4	Proposed Water Quality Monitoring Stations under Operation Phase (Tin Shui Wai Nullah Discharge)	4-5
Table 4.5	Mitigation Measures and Monitoring Requirement for Follow-up Emergency Discharge Exercise during Operation of the HSKEPP	4-8
Table 4.6	Action and Limit Levels for Water Quality	4-9
Table 4.7	Event and Action Plan for Water Quality Monitoring	4-10

List of Figures

Figure 1.1	Location of Hung Shui Kiu Effluent Polishing Plant (HSKEPP)
Figure 1.2	Project Organization
Figure 2.1	Locations of Construction Dust Monitoring Stations
Figure 4.1	Locations of Water Quality Monitoring Stations for Construction Phase
Figure 4.2	Locations of Water Quality Monitoring Stations for Operation Phase (Urmston Road Outfall Discharge)
Figure 4.3	Locations of Water Quality Monitoring Stations for Operation Phase (Tin Shui Wai Nullah Discharge)
Figure 10.1	Complaint Response Procedure

List of Appendices

Appendix A	Tentative Construction Programme
Appendix B	Implementation Schedule of Recommended Mitigation Measures
Appendix C	Sample Record Sheet
Appendix D	Sample of Interim Notification Record Sheet

1 INTRODUCTION

1.1 Project Background

- 1.1.1.1 The Government plans to develop Hung Shui Kiu / Ha Tsuen New Development Area (HSK/HT NDA) for providing land to meet the medium and long-term housing, social and economic needs. The HSK/HT DA is proposed to accommodate a population of approximately 176,000 persons and generate about 150,000 employment opportunities respectively on full development.
- 1.1.1.2 The purpose of the Project is to provide sewage treatment to the sewage collected from the HSK/HT DA and other developments in the North West New Territories (NWNT), and to subsequently dispose the treated effluent.
- 1.1.1.3 The Civil Engineering and Development Department (CEDD) commenced Agreement, namely the Agreement No. CE 2/2011 (CE) “Hung Shui Kiu New Development Area, Planning and Engineering – Investigation” in 2011, to formulate the detailed development proposals for the HSK/HT NDA. This Study recommends that the sewage generated from the HSK/HT NDA will be discharged to separate new sewage treatment work, namely the Hung Shui Kiu Effluent Polishing Plant (HSKEPP) which is located in the north-western side of the HSK/HT NDA.
- 1.1.1.4 The above study recommended preliminary treatment capacity, treatment level and discharge arrangement of HSKEPP taking into account the constraints for discharge to North Western Waters and Deep Bay. Further reviews of flow projection, treatment level, treated effluent discharge and sludge treatment scheme shall be carried out to formulate the preliminary design of HSKEPP to cater for the sewage collected from the new developments within the HSK/HT NDA and other developments in the North West New Territories (NWNT) to support the medium and long-term housing and economic needs of the NWNT.
- 1.1.1.5 AECOM Asia Co Ltd. was commissioned by Drainage Services Department (DSD) on 27 March 2020 to carry out this Assignment for the investigation for HSKEPP.

1.2 Location and Scope of Project

- 1.2.1.1 HSK/HT NDA has reserved about 5.2 hectares of land for the proposed HSKEPP, the location of which is shown in [Figure 1.1](#). According to the HSK/HT NDA's Revised Recommended Outline Development Plan (RODP), HSKEPP is located at the western part of HSK/HT NDA. It is bounded by Yuen Tau Shan and Kong Sham Western Highway at its southwest side and surrounded by logistic facilities at its north and west direction. HSKEPP is located within the Logistics, Enterprise and Technology Quarter. There will be a green belt to its south side.
- 1.2.1.2 The proposed rising main for raw sewage and emergency bypass pipe to Tin Shui Wai Nullah, as shown in [Figure 1.1](#), are not under the scope of the Project. The site formation works for the HSKEPP site (except the demolition of existing SWPTW) is also not under the scope of the Project.
- 1.2.1.3 The proposed works of the Project comprise:
- 1) Demolition of existing structures and buildings within San Wai Preliminary Treatment Works (SWPTW) for construction of HSKEPP facilities;
 - 2) Construction of a sewage treatment plant with a maximum capacity of Average Dry Weather Flow (ADWF) up to 90,000 m³/day;

- 3) Construction of sludge treatment facilities for treating sludge generated from Hung Shui Kiu (HSK) Effluent Polishing Plant (EPP) and additional sludge generated from the San Wai Sewage Treatment Works (STW) and other nearby STWs;
- 4) Construction of facilities for receiving and co-digesting pre-treated food or organic wastes;
- 5) Construction of effluent discharge pipe connecting to the existing discharge tunnel of San Wai STW; and
- 6) Associated ancillary works.

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

- Item F.1, Part I of Schedule 2 of the EIAO - Sewage treatment works with an installed capacity of more than 15,000 m³/day.

1.3 Construction Programme

1.3.1.1 The Project construction works are anticipated to commence in early 2027 with completion of the Project by 2031.

1.4 Purpose of this Manual

1.4.1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setups of an EM&A programme to ensure compliance with the EIA study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme for the construction and operational phases of the Project. It aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with construction works and operational activities.

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

1.4.1.3 This Manual contains the following information:

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

- 1.4.1.4 For the purpose of this Manual, the ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

1.5 Project Organization

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

The Contractor

- 1.5.1.2 The Contractor shall report to the ER. The duties and responsibilities of the Contractor comprise the following:
- Work within the scope of the contract and other tender conditions with respect to environmental requirements;
 - Operate and strictly adhere to the guidelines and requirements in this EM&A programme and contract specifications;
 - Provide assistance to ET in carrying out monitoring and auditing;
 - Participate in the site inspections undertaken by ET as required, and undertake correction actions;
 - Provide information / advice to ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;
 - Submit proposals on mitigation measures in case of exceedance of Action and Limit levels in accordance with the Event / Action Plans;
 - Implement measures to reduce impact where Action and Limit levels are exceeded; and
 - Adhere to the procedures for carrying out complaint investigation.

Environmental Team (ET)

- 1.5.1.3 A ET with an ET Leader shall be established by the Project Proponent before the commencement of construction of the Project. The ET Leader or the ET shall be an independent party from the IEC and the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the EPD. The ET shall be led and managed by the ET leader. The ET leader shall possess at least 7 years of experience in EM&A and/or environmental management.

- 1.5.1.4 The duties and responsibilities of the ET are:
- Monitor various environmental parameters as required in this EM&A Manual;
 - Analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
 - Carry out regular site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems; carry out ad hoc site inspections if significant environmental problems are identified;
 - Audit and prepare monitoring and audit reports on the environmental monitoring data and site environmental conditions;

- Report on the environmental monitoring and audit results to the Independent Environmental Checker, Contractor, the ER and EPD or its delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. on site;
- Timely submission of the EM&A report to the Project Proponent and the EPD; and
- Adhere to the procedures for carrying out complaint investigation in accordance with **Section 10.3** of this EM&A Manual.

Engineer or Engineer's Representative (ER)

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

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Participate in joint site inspection undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation.

Independent Environmental Checker (IEC)

1.5.1.6 An IEC shall be employed by the Project Proponent before the commencement of construction of the Project. The IEC shall be an independent party from the Contractor and the ET and possess at least 7 years' experience in EM&A and/or environmental management. The duties and responsibilities of the IEC are:

- Review the EM&A works performed by the ET (at least at monthly intervals);
- Carry out random sample check and audit the monitoring activities and results (at least at monthly intervals);
- Conduct random site inspection;
- Review the EM&A reports submitted by the ET;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- Adhere to the procedures for carrying out complaint investigation.

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

2 AIR QUALITY IMPACT

2.1 Introduction

- 2.1.1.1 Potential air quality impacts arising from the construction phase of the Project were addressed in the EIA Report. Results indicated that no adverse air quality impact arising from construction of the Project with the implementation of the mitigation measures. Dust monitoring and audit is proposed to be conducted during construction so as to check compliance with the legislative requirements.
- 2.1.1.2 Regular site environmental audit is recommended to be conducted during the entire construction phase of the Project so as to ensure the implementation of the proposed dust mitigation measures and the dust suppression measures stipulated in *Air Pollution Control (Construction Dust) Regulation*. Implementation schedule of mitigation measures are presented in [Appendix B](#).
- 2.1.1.3 Potential air pollutant emissions impacts from operation of the Project was assessed and no adverse air pollutant emissions impact would be anticipated during the operation phase of this Project. Nevertheless, it is recommended to conduct commissioning test at the combined heat and power (CHP) units and boiler to demonstrate compliance with the design emission limits.
- 2.1.1.4 In addition, potential odour emission impact from operation of the Project was also assessed. No adverse odour impact would be anticipated during operation phase of this Project. Odour monitoring in terms of hydrogen sulphide (H₂S) at the deodorizers is recommended upon commissioning and during first three years of operation to determine whether it can meet the odour removal performance requirement. In addition, odour patrol should be carried out during the period of maintenance or cleaning of the deodorization system to ensure no adverse odour impacts arisen from the operation of the Project.
- 2.1.1.5 This section presents the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact during the construction and operation phases of the Project.

2.2 Construction Phase

2.2.1 Monitoring Parameters

- 2.2.1.1 The major dusty construction activities of the Project would only involve the construction of superstructures and substructures (e.g. excavation, piling, internal roadworks) and wind erosion which would generate dust emissions. Therefore, 1-hour Total Suspended Particulates (TSP) is recommended to be monitored and audited at the proposed monitoring locations during construction phase.
- 2.2.1.2 The criteria against which ambient air quality monitoring to be assessed are 1-hour TSP limit of 500 µg m⁻³. This level is not to be exceeded at ASRs.
- 2.2.1.3 Monitoring and audit of the TSP levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action shall be undertaken to rectify such situation.
- 2.2.1.4 1-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels should be measured by following the standard method as set out in High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA (hereinafter referred to as “HVS method”). Upon approval of EPD and IEC, an alternative sampling method of using direct reading methods which are capable of producing comparable results as that by the high volume sampling method can be used to indicate short event impacts.

2.2.1.5 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site, etc., should be recorded down in detail. A sample data sheet is shown in [Appendix C](#).

2.2.2 Monitoring Equipment

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

- 0.6 - 1.7 m³ per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
- equipped with a timing / control device with ± 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm² ;
- flow control accuracy: $\pm 2.5\%$ deviation over 24-hour sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hour period.

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

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

2.2.2.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded on the data sheet as shown in [Appendix C](#).

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

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

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

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

2.2.3 Laboratory Measurement / Analysis

2.2.3.1 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 shall be the Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited or other internationally accredited laboratory.

2.2.3.2 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 verified by the IEC and approved by the ER. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC.

2.2.3.3 The IEC shall conduct regular audit of the measurement performed by the laboratory so as to ensure the accuracy of measurement results. The ET shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his/her reference.

2.2.3.4 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hour and be pre-weighed before use for the sampling.

2.2.3.5 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1mg. The balance shall be regularly calibrated against a traceable standard.

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

2.2.4 Monitoring Locations

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

Table 2.1 Proposed Construction Dust Monitoring Stations

Monitoring Station ID	EIA ID	Location
AM1	A601	Tseung Kong Wai
AM2	A602	Farm House
AM3	P1501	Planned Port Back-up, Storage and Workshop

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

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

- i. at the site boundary or such locations close to the major dust emission source;
- ii. close to the air sensitive receivers as defined in the EIAO-TM;
- iii. proper position/sitting and orientation of the monitoring equipment; and
- iv. take into account the prevailing meteorological conditions.

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

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

2.2.5 Baseline Monitoring

2.2.5.1 Baseline monitoring shall be carried out to determine the ambient 1-hour TSP levels at the monitoring locations prior to the commencement of the Project. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations. The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.

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

2.2.5.3 TSP baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works. 1-

hour TSP sampling shall be done at least three times per day at each monitoring station. During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources should also be recorded throughout the baseline monitoring period. A summary of baseline monitoring is presented in **Table 2.2**.

2.2.5.4 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring location shall be approved by the ER and agreed with IEC.

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

2.2.5.6 If the ET Leader considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels. The revised baseline levels, in turn, the air quality criteria, shall be agreed with the IEC and EPD.

2.2.6 Impact Monitoring

2.2.6.1 The ET shall carry out impact monitoring during construction phase of the Project. For 1-hour TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs. In case of non-compliance with the air criteria, more frequent monitoring, as specified in the Action Plan in the following section, should be conducted. This additional monitoring should be continued until the excessive dust emission or the deterioration in the air quality is rectified. The impact monitoring programme is summarized in **Table 2.2**.

2.2.6.2 The monthly schedule of the compliance and impact monitoring programme should be drawn up by the ET one month prior to the commencement of the scheduled construction period. Before commencing the impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the impact monitoring results.

Table 2.2 Summary of Construction Dust Monitoring Programme

Monitoring Period	Duration	Sampling Parameter	Frequency
Baseline Monitoring	Consecutive days of at least 2 weeks before commencement of major construction works	1-hour TSP	3 times per day
Impact Monitoring	Throughout the construction phase	1-hour TSP	3 times in every 6 days

2.2.7 Event and Action Plan

2.2.7.1 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 2.3** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, action in accordance with the Action Plan in **Table 2.4** shall be carried out.

Table 2.3 Action and Limit Levels for Air Quality (Construction Dust)

Parameter	Action Level [1]	Limit Level
TSP (1 hour average)	BL \leq 384 μgm^{-3} , AL = (BL * 1.3 + LL)/2 BL > 384 μgm^{-3} , AL = LL	500 μgm^{-3}

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

Table 2.4 Event and Action Plan for Air Quality (Construction Dust)

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

2.3 Operation Phase

2.3.1 Commissioning Test at the Exhausts of CHP and Boiler

2.3.1.1 Measurement of air quality parameters of concern due to stack emissions from the combined heat and power (CHP) units and boiler should be conducted at each stack during commissioning stage to demonstrate the process/facility is properly operated and the emissions can be minimized to meet the design emission limits as presented in **Table 2.5** and **Table 2.6**. The proposed analytical parameters and methodology for measured parameters are listed in **Table 2.7**. The proposed methods below are for reference only. The scopes and methods to be adopted shall be agreed with EPD at least one month before measurement. The monitoring can be conducted via on-site sampling and laboratory analysis, on-site monitoring by portable meters, or continuous monitoring, subject to availability of suitable equipment. The commissioning test scopes, including but not limited to measurement duration, frequency, equipment and methods to be adopted, shall be agreed with EPD at least one month before measurement.

Table 2.5 Emission Limit for CHP Units

Parameters	Maximum Emission Level (mg/Nm ³)
RSP	15
NO _x	250
SO ₂	50

Note:

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

Table 2.6 Emission Limit for Boiler

Parameters	Maximum Emission Level (mg/Nm ³)
RSP	15
NO _x	250
SO ₂	50

Note:

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

Table 2.7 Analytical Parameters and Methodology

Parameters	Method
Particulates (as RSP)	ISO 9096, ASTM D3685-98, USEPA Method 17
NO _x	USEPA Reference methods
SO ₂	USEPA Method 7 and associated methods

2.3.2 Hydrogen Sulphide Monitoring

2.3.2.1 The odour monitoring (in term of H₂S concentration) at the inlets and outlets of each deodourizing (DO) unit shall be conducted by H₂S sensor upon commissioning and during the first three years upon operation of the HSKEPP to determine whether the odour removal efficiency meet the requirements as stated in the EIA Report. Since H₂S is the major air pollutant releasing from effluent polishing plant, the H₂S concentration should be measured at inlet and outlet of each DO unit. The outlet odour concentration should be reduced by at least 95% based on the assessment. As a conservative approach, it is recommended that a removal efficiency of 99.5% shall be adopted to minimize the odour emission. The first odour monitoring shall be conducted within one month, after the operation of the HSKEPP. Subsequent odour monitoring shall be conducted quarterly, i.e. at the 4th, 7th and 10th month for the first year. For the second and third years, the frequency of the impact

monitoring could be reduced to once every 6 months subject to EPD’s approval, if no non-compliance is found. If there is any non-compliance, the operator should inspect the deodorization unit and the frequency of odour monitoring shall be resumed to quarterly. Upon the third year monitoring, the odour monitoring should be reviewed and agreed with EPD if the monitoring is required to be continued.

2.3.2.2 If there is any non-compliance, the operator should inspect the deodourizing unit, consider change of filter materials and replacing the DO unit. The H₂S concentration at DO inlet and outlet should be measured to ensure at least 99.5% H₂S removal efficiency. The frequency of odour monitoring shall be resumed to quarterly.

2.3.2.3 Upon the third year monitoring, the odour monitoring should be reviewed and agreed with EPD if the monitoring is required to be continued.

2.3.3 Odour Patrol

2.3.3.1 Odour patrol is proposed to monitor the potential odour impact from HSKEPP during the period of regular and ad hoc maintenance or cleaning of the deodorization system. The odour patrols will be conducted by an odour patrol team. The odour patrol team will patrol and sniff along an odour patrol route within the HSKEPP site boundary. The implementation of the odour patrols shall be subject to the prevailing weather forecast condition and should not be carried out during rainy days.

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

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

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

2.3.3.4 The perceived odour intensity is divided into 5 levels. **Table 2.8** describes the odour intensity for different levels.

Table 2.8 Odour Intensity Levels

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

Level	Odour Intensity
4	Extreme severe odour, and unacceptable odour level

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

2.3.4 Event and Action Plan

2.3.4.1 Table 2.9 shows the air quality criteria, namely Action and Limit levels to be used for the odour patrol. Should the action or limit level be reached, action in accordance with the Action Plan in **Table 2.10** shall be carried out.

Table 2.9 Action and Limit Levels for Air Quality (Odour)

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

Table 2.10 Event and Action Plan for Air Quality (Odour)

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

2.4 Mitigation Measures

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

2.5 Audit Requirements

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

3 NOISE IMPACT

3.1 Construction Phase

3.1.1.1 No existing/planned NSR is identified within the 300m assessment boundary. No adverse noise impact is anticipated due to the construction of the HSKEPP. Regular site audit as part of the EM&A programme should be conducted to ensure good site practice during construction period.

3.2 Operation Phase

3.2.1.1 No existing/planned NSR is identified within the 300m assessment boundary. No adverse noise impact is anticipated due to the operation of the HSKEPP. No operational noise monitoring is therefore deemed necessary.

4 WATER QUALITY IMPACT

4.1 Introduction

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

4.1.1.2 During operation phase, there is possibility of failure of power supply, or mechanical faults / equipment failures under the Project operation. Therefore, water quality monitoring is recommended in case of any emergency discharge events during the operation phase of this Project.

4.1.1.3 Under normal operation of the HSKEPP, treated effluent would be discharged through the NWNT Tunnel to Urmston Road submarine outfall. Water quality monitoring during the first year of the HSKEPP operation is recommended. During emergency or NWNT maintenance event, treated or untreated effluent would be discharged to Tin Shui Wai Nullah. Follow-up monitoring is recommended for these events. Monitoring of the treated effluent quality from the HSKEPP will be governed by the Water Pollution Control Ordinance (WPCO) license to ensure that the effluent quality would comply with the design standards.

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

- Water quality monitoring during the HSKEPP construction;
- Water quality monitoring during the first year operation of the HSKEPP;
- Water quality monitoring during the maintenance discharge of the NWNT Tunnel; and
- Follow-up water quality monitoring after any emergency discharge or event at any stage.

4.2 Water Quality Parameters

4.2.1.1 The parameters that have been selected for measurement in-situ and in the laboratory are those that were either determined in the EIA to be those with the most potential to be affected by the construction works or are a standard check on water quality conditions. Parameters to be measured in the construction phase, operation phase and emergency discharge are summarized in **Table 4.1**.

Table 4.1 Parameters measured in the Marine Water Quality Monitoring

Parameters	Unit	Abbre.	Remarks			
			Baseline	Construction	HSKEPP	Emergency Discharge (at any stage)
					Water Quality Monitoring	
<i>In-situ measurements</i>						
Dissolved Oxygen	mg/L	DO	✓	✓	✓	✓
Salinity	ppt	-	✓	✓	✓	✓
Temperature	°C	-	✓	✓	✓	✓
pH	-	-	✓	✓	✓	✓
Turbidity	NTU	-	✓	✓	✓	✓
<i>Laboratory measurements</i>						
Suspended Solids	mg/L	SS	✓	✓	✓	✓

Parameters	Unit	Abbre.	Remarks			
			Baseline	Construction	HSKEPP	Emergency Discharge (at any stage)
					Water Quality Monitoring	
Biochemical Oxygen Demand	mg/L	BOD ₅	✓		✓	✓
Ammonia Nitrogen	mg/L	NH ₃ -N	✓		✓	✓
Nitrite Nitrogen	mg/L	NO ₂ -N	✓		✓	✓
Nitrate Nitrogen	mg/L	NO ₃ -N	✓		✓	✓
Total Inorganic Nitrogen	mg/L	TIN	✓		✓	✓
Total Kjeldahl Nitrogen	mg/L	TKN	✓		✓	✓
Total Nitrogen	mg/L	TN	✓		✓	✓
Total Phosphorus	mg/L	TP	✓		✓	✓
<i>E.coli</i>	cfu/100mL	-	✓		✓	✓

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

4.2.1.3 In addition to the water quality parameters as shown in **Table 4.1**, other relevant data shall also be recorded, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, current velocity and direction, sea conditions, weather conditions and any special phenomena or work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in [Appendix C](#) for reference.

4.3 Sampling Procedures and Monitoring Equipment

Dissolved Oxygen and Temperature Measuring Equipment

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

- a DO level in the range of 0 - 20 mg L⁻¹ and 0 - 200% saturation; and
- a temperature of 0 - 45 degree Celsius.

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

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

Turbidity Measurement Instrument

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

Sampler

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

Water Depth Detector

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

Salinity

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

pH

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

Sample Containers and Storage

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

Monitoring Position Equipment

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

Current Velocity and Direction

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

Calibration of In-Situ Instruments

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

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

4.4 Laboratory Measurement / Analysis

- 4.4.1.1 Analysis of SS, BOD, TIN⁽¹⁾, NH₃-N, NO₂-N, NO₃-N, UIA⁽²⁾, TKN, TP and *E. coli* levels shall be carried out in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the necessary laboratory analysis. The analysis shall commence within 24 hours after collection of the water samples. The analyses shall follow the standard methods described in APHA Standard Methods for the Examination of Water and Wastewater, 19th edition or other approved methods. Detailed testing methods, pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limits and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall prepare to demonstrate the programmes to EPD or his representatives when requested.

4.5 Water Quality Monitoring Stations

4.5.1 Construction Phase

- 4.5.1.1 Water quality monitoring at designated locations are proposed to be carried out during the construction phase to monitor any sub-standard water discharge into the nearby water bodies from the HSKEPP.
- 4.5.1.2 It is recommended to establish control and impact monitoring stations to monitor water quality impact during construction phase. The impact monitoring stations have been selected at locations in vicinity to the construction site that may potentially be affected during the construction phase. Water quality at these locations shall be monitored during the construction. The control stations have been selected such that they are located within the same water body as the impact monitoring stations but are located outside the area of influence of the works. Data collected from the control stations enables a comparison of the water quality at the potentially impacted site with the ambient water quality. The proposed water quality monitoring stations are shown in **Table 4.2**. [Figure 4.1](#) indicates the approximate locations of the water quality monitoring stations. Station C1 is set at upstream location which serves as control station, while station M1 is the corresponding impact station at the downstream location.

Table 4.2 Proposed Water Quality Monitoring Stations under Construction Phase

Station	Purpose of the Monitoring Station	Easting	Northing
C1	Serve as the control station at upstream location of construction site	816 278	834 038
M1	Serve as the impact station at downstream location of construction site	816 571	833 970

(1) Total Inorganic Nitrogen (TIN) = Ammonia Nitrogen (NH₃-N) + Nitrate-N (NO₃-N) + Nitrite Nitrogen (NO₂-N)

(2) The level of Unionized Ammonia (UIA) shall be calculated from the Ammonia Nitrogen (NH₃-N) level, salinity, pH and temperature using the method proposed by Bower, C. E. and Bidwell, J. P. (1978)

4.5.2 Operation Phase

4.5.2.1 Two sets of monitoring stations are proposed depending on the discharge location under the operation phase of HSKEPP. For normal operation of HSKEPP, treated effluent will be discharged to Urmston Road outfall (North Western WCZ). In the course of NWNT Tunnel maintenance and emergency events, effluent will be discharged to Tin Shui Wai Nullah and eventually into Deep Bay.

Discharge in Urmston Road Outfall

4.5.2.2 During operation phase, water quality monitoring during the first year of the HSKEPP operation as well as emergency discharge are proposed to be conducted at 8 monitoring stations within the North Western WCZ, the indicative location of the proposed monitoring stations are illustrated in [Figure 4.2](#) and summarized in **Table 4.3**:

Table 4.3 Proposed Water Quality Monitoring Stations under Operation Phase (Urmston Road Outfall Discharge)

Station	Easting	Northing
<i>Impact Stations</i>		
W1	808 231	827 494
W2	807 469	828 888
W3	807 221	823 737
W4	806 309	829 988
W5	809 062	824 638
W6	807 066	825 034
W7	805 592	828 162
W8	805 412	829 400

Discharge in Tin Shui Wai Nullah

4.5.2.3 During operation phase, water quality monitoring during NWNT Tunnel maintenance and emergency discharge are proposed to be conducted at 6 monitoring stations within the Inner Deep Bay, the indicative location of the proposed monitoring stations are illustrated in [Figure 4.3](#) and summarized in **Table 4.4**.

- Five Impacts stations within Inner Deep Bay covering oyster culture area (E24), mangroves (Inner Deep Bay) (E25), Ma Po Marshes SSSI (E26), Mai Po Inner Deep Bay Ramsar Site / Inner Deep Bay SSSI (E27) and mangroves along Shan Pui River (E28), which represent the water sensitive receivers, which are likely affected by the Project during emergency discharge; and
- One Control Stations within Inner Deep Bay (DB1) to assist in the identification of the source of any impact.

Table 4.4 Proposed Water Quality Monitoring Stations under Operation Phase (Tin Shui Wai Nullah Discharge)

Station	Description	Easting	Northing
<i>Impact Stations</i>			
E24	Oyster Culture Area	816 047	837 277
E25	Mangroves (Inner Deep Bay)	820 238	838 028
E26	Ma Po Marshes SSSI	821 036	837 913

Station	Description	Easting	Northing
E27	Mai Po Inner Deep Bay Ramsar Site / Inner Deep Bay SSSI	820 025	838 830
E28	Mangroves along Shan Pui River	821 005	836 665
<i>Control Stations</i>			
DB1	Inner Deep Bay	814 631	836 460
SP1	Shan Pui River, upstream of discharge point	821 192	835 933
KT1	Kam Tin River, upstream of discharge point	821 526	836 682

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

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

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

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

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

4.6 Details of Water Quality Monitoring

4.6.1 Baseline Monitoring

4.6.1.1 Baseline conditions of water quality should be established by the ET and agreed with IEC and DEP. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works, to demonstrate the suitability of the proposed control and impact monitoring stations, and for establishment of the action and limit levels.

4.6.1.2 The baseline conditions should be established by measuring the water quality parameters including pH, salinity, temperature, turbidity, DO (in mg/L and % of saturation) and SS at the proposed monitoring stations as shown in [Figure 4.1](#) (see [Table 4.2](#)) and water quality parameters as specified in [Table 4.1](#) at the proposed monitoring stations as shown in [Figure 4.2](#) and [Figure 4.3](#) (see [Table 4.4](#) and [Table 4.4](#)), 3 days a week, for a period of 4 weeks prior to the commencement of construction works. The interval between two sets of monitoring shall not be less than 36 hours, and the baseline monitoring schedule shall be submitted to DEP and IEC at least one week prior to the commencement of the baseline

monitoring. The ET Leader shall seek approval from the ER, IEC and EPD on the alternative proposal prior to its implementation.

- 4.6.1.3 There shall not be any major construction activities in the vicinity of the stations during the baseline monitoring. The ET shall be responsible for undertaking the baseline monitoring and submitting the results within 10 working days from the completion of the baseline monitoring work.
- 4.6.1.4 In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from the ER, IEC and EPD on an appropriate set of data to be used as baseline reference.
- 4.6.1.5 For operation phase, the ET Leader shall seek approval from the ER, IEC and EPD on an appropriate set of data to be used as baseline reference, and if additional baseline monitoring is required, the baseline monitoring methodology for operation phase prior to the commencement of such monitoring.

4.6.2 Construction Monitoring

- 4.6.2.1 During the course of the construction works, impact monitoring shall be undertaken three days per week, with sampling/measurement at the monitoring stations as shown in [Figure 4.1](#) and [Table 4.2](#). The ET should carry out spot check to ensure that the Contractor has undertaken all recommended control measures to prevent direct contact of pollutants with rainwater or runoff, and measures to abate contaminants in the stormwater runoff. Parameters to be monitored include pH, salinity, temperature, turbidity, DO (in mg/L and % of saturation) and SS (see [Table 4.1](#)). The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency shall be increased.
- 4.6.2.2 Requirements as stated in [Section 4.5.2.5](#) shall be followed. Any change to the EM&A requirements or programme shall be justified by the ET Leader, agreed by the ER, verified by the IEC before seeking approval from EPD prior to its implementation.
- 4.6.2.3 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 baseline monitoring. The results of the monitoring shall be presented in the Final EM&A Summary Report.
- 4.6.2.4 Proposed water quality monitoring schedule shall be submitted to ER, IEC and EPD at least 1 week before the first day of the monitoring month. The ER, IEC and EPD shall also be notified immediately for any changes in schedule.

4.6.3 First Year Operation Phase

- 4.6.3.1 Upon commencement of the HSKEPP, an operation phase water quality monitoring exercise should be carried out for a minimum of once per week at mid-flood and mid-ebb tides for one-year.
- 4.6.3.2 The proposed water quality monitoring schedule should be submitted to ER, IEC and EPD at least 4 weeks before the first day of the monitoring month. The ER, IEC and EPD should also be notified immediately for any changes in schedule. Water quality parameters presented in [Table 4.1](#) should be monitored at the 8 proposed monitoring stations as shown in [Figure 4.2](#) and [Table 4.4](#).
- 4.6.3.3 After obtaining one year of monitoring results, the ET shall review against the baseline conditions to identify if there is any change to the overall water quality in Deep Bay and propose remedial action if there is any deterioration in water quality due to the Project.

4.6.4 Effluent Discharge During NWNT Tunnel Maintenance

4.6.4.1 A five-month baseline monitoring programme covering the period from November to March during the operation phase is proposed at a frequency of twice per month to establish the baseline water quality conditions at 6 designated stations as shown in [Figure 4.3](#) and [Table 4.4](#).

4.6.4.2 In case of NWNT Tunnel maintenance during the operational phases of this Project, water quality at 6 designated stations as shown in [Figure 4.3](#) and [Table 4.4](#) should be monitored at a frequency of 3 times per week throughout the maintenance period until the baseline water quality is restored or at least 1 month after termination of the effluent bypass (whichever is longer).

4.6.5 Emergency Discharge Follow-up Monitoring Exercise

4.6.5.1 The emergency discharge follow-up monitoring requirements will be proposed in the Emergency Response Plan that will be formulated prior to commissioning of HSKEPP. As a basic approach, in case of emergency discharge during operation phase of this Project, a follow-up water quality monitoring exercise shall be commenced within 24 hours after the start of the emergency discharge at all the 6 designated stations as shown in [Figure 4.3](#) and [Table 4.4](#). The monitoring shall be conducted by DSD or other agent appointed by the DSD. The result of the monitoring each day shall be compared with the baseline data collected under normal Project operation to identify the degree of impact caused by the emergency discharge. The monitoring exercise shall be repeated on the next day until the baseline water quality is restored for 2 consecutive days.

4.6.5.2 DSD or its appointed agent shall inform the mariculturists, relevant stakeholders and relevant government departments (e.g. AFCD, EPD) everyday on the latest results of the water quality monitoring exercise to allow these parties to make informed decisions. By the end of the follow-up water quality monitoring exercise, DSD or its appointed agent shall also inform these parties that the ambient water quality is restored at all WSRs for two consecutive days to signal the recovery of water quality. It is recommended that the DSD / Plant operators shall maintain good communications with various concerned parties. A list of address, email address, phone and fax number of key persons in various departments responsible for action shall be made available to the Plant operators. A summary of the mitigation measures and monitoring requirements for emergency discharge is provided in [Table 4.5](#).

Table 4.5 Mitigation Measures and Monitoring Requirement for Follow-up Emergency Discharge Exercise during Operation of the HSKEPP

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

4.6.6 Water Quality Compliance

4.6.6.1 Construction phase water quality monitoring will be evaluated against Action and Limit Levels. The proposed Action and Limit Levels for water quality is presented in **Table 4.7**. Action and Limit levels are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (**Table 4.7**) should be undertaken and a review of works will be carried out by the Contractor(s).

4.6.6.2 Any noticeable change to water quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Particular attention will be paid to the Contractor(s)'s implementation of the recommended mitigation measures.

Table 4.6 Action and Limit Levels for Water Quality

Parameters	Action	Limit
<i>Construction Phase Water Quality Monitoring</i>		
DO in mg/L (Surface, Middle & Bottom) ^b (1m below surface) ^d	Surface & Middle 5%-ile of baseline data for surface and middle layer. Bottom 5%-ile of baseline data for bottom layer. Mariculture Subzone of Deep Bay WCZ 5.1 mg/L or level at control station (whichever is lower)	Surface & Middle 4 mg/L or 1%-ile of baseline data for surface and middle layer Bottom 2 mg/L or 1%-ile of baseline data for bottom layer Mariculture Subzone of Deep Bay WCZ 5 mg/L or level at control station (whichever is lower)
SS in mg/L (depth-averaged ^a) ^c	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 ^a) ^c	95%-ile of baseline data or 120% of upstream control station's turbidity recorded on the same day	99%-ile of baseline data or 130% of upstream control station's turbidity recorded on the same day

Notes:

- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- For DO measurement in the Mariculture Subzone of the Deep Bay WCZ, samples should be taken 1m below surface

Table 4.7 Event and Action Plan for Water Quality Monitoring

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

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

4.6.7 Construction Site Audits

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

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

- Investigate the problems and the causes;
- Issue action notes to the Contractor which is responsible for the works;
- Implement remedial and corrective actions immediately;
- Re-inspect the site conditions upon completion of the remedial and corrective actions; and
- Record the event and discuss with the Contractor for preventive actions.

5 WASTE MANAGEMENT IMPLICATION

5.1 Introduction

5.1.1.1 Potential waste management implication arising from the construction and operational phases of the Project were addressed in the EIA Report. Waste management during construction phase will mainly be the contractor's responsibility to ensure that any wastes produced during the construction and demolition works are handled, stored and disposed of in accordance with good waste management practices and relevant EPD's regulations and other legislative requirements.

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

5.2 Mitigation Measures

5.2.1 Construction Phase

5.2.1.1 Mitigation measures for waste management recommended in the EIA Report should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor in the construction stage. A WMP, as a part of the Environmental Management Plan (EMP), should be prepared in accordance with *ETWB TC (W) No. 19/2005* and submitted to the Engineer for approval. The recommended mitigation measures should form the basis of the WMP. The monitoring and auditing requirement stated in *ETWB TC (W) No. 19/2005* should be followed with regard to the management of C&D materials.

5.2.2 Operation Phase

5.2.2.1 Wastes produced during operation phase would mainly comprise of grit and screenings, dewatered sludge, chemical waste and general refuse. With the implementation of the recommended mitigation measures for handling, transportation and disposal of the identified waste arisings, no adverse impacts are anticipated during operation phase of the Project. Therefore, no other specific waste monitoring during operation phase is required.

5.2.2.2 [Appendix B](#) provides the implementation schedule of the recommended mitigation measures during both construction and operational phases.

5.2.2.3 With the appropriate handling, storage and removal of waste arisings during the construction and operation of the Project as presented in [Appendix B](#), the potential to cause adverse environmental impacts would be minimized. During the site inspections, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has implemented the recommended good site practices, waste reduction measures and other mitigation measures.

5.3 Audit Requirement

5.3.1.1 Regular audits and site inspections should be carried out during construction phases by the ER, ET and Contractor to ensure that the recommended good site practices and the recommended mitigation measures listed in [Appendix B](#) are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

5.3.1.2 The requirements of the environmental audit programme are set out in **Section 11** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

6 LAND CONTAMINATION

6.1 Introduction

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

6.2 Construction Phase

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

6.3 Operation Phase

6.3.1.1 As any contaminated soil / groundwater would be identified and properly treated prior to the construction of the proposed HSKEPP, land contamination during the operation phase is not expected. As such, environmental monitoring and audit during operation phase for land contamination is considered not necessary.

7 ECOLOGY (TERRESTRIAL AND AQUATIC)

7.1 Construction Phase

7.1.1.1 Ecological indirect impacts arising from the construction of the Project, such as noise, dust, glare disturbances, water quality reduction etc, are anticipated to be low, and would be effectively alleviated with the implementation of recommended precautionary measures and enhancement opportunities. As such, specific environmental monitoring and auditing for ecological impact would not be necessary.

7.2 Operational Phase

7.2.1.1 Ecological indirect impacts arising from the operation of the Project, such as noise, dust, glare disturbances, water quality reduction etc, are anticipated to be low, and would be effectively alleviated with the implementation of recommended precautionary measures and enhancement opportunities. As such, specific environmental monitoring and auditing for ecological impact would not be necessary.

8 LANDSCAPE AND VISUAL IMPACT

8.1 Introduction

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

8.1.1.2 Site audit on landscape and visual aspects of the Project should be carried out during the construction phase and operation phase.

8.2 Mitigation Measures

8.2.1.1 The landscape and visual mitigation measures should be incorporated in the detailed design. The mitigation measures during construction and operation phases as recommended in the EIA Report are presented in [Appendix B](#). Where feasible, the construction phase mitigation measures should be implemented as early as possible in order to minimize the landscape impacts in the construction stage while the mitigation measures for the operation phase should be adopted during the detailed design and be built as part of the construction works so that they are in place before commissioning of the Project.

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

8.3 Audit Requirements

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

8.3.1.2 The ET shall audit the implementation of landscape construction works particularly during site clearance operations when the proposed tree felling will take place and subsequent tree maintenance operations and planting works.

8.3.1.3 Site inspections should be undertaken by the ET at least once every month during the construction period, and once every two months for the 12-month establishment period during operation phase.

9 HAZARD TO LIFE

9.1 Introduction

9.1.1.1 The EIA study concluded that no unacceptable risk is anticipated during the operation phase of the Project, no mitigation measures would be required.

9.2 Mitigation Measures

9.2.1.1 Good safety practices and design measures are recommended to further manage and minimize the potential risks during operation phases of the Project. They are summarized in the Implementation Schedule provided in [Appendix B](#).

9.3 EM&A Requirements

9.3.1.1 No environmental monitoring and audit requirements would be required.

10 SITE ENVIRONMENTAL AUDIT

10.1 Site Inspections

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

10.1.1.2 The ET Leader shall be responsible for formulating the environmental site inspection, the deficiency and remedial action reporting system, and for carrying out the site inspection works. He shall submit a proposal for site inspection and deficiency and remedial action reporting procedures to the Contractor for agreement, and to the ER for approval. The ET's proposal for rectification would be made known to the IEC.

10.1.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the works area which is likely to be affected, directly or indirectly, by the site activities. The ET shall make reference to the following information in conducting the inspection:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A program;
- works progress and programme;
- individual works methodology proposals (which shall include proposal on associated pollution control measures);
- contract specifications on environmental protection and pollution prevention control;
- relevant environmental protection and pollution control laws; and
- previous site inspection results undertaken by the ET and others.

10.1.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours for reference and for taking immediate remedial action. The Contractor shall follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

10.1.1.5 The ET shall also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

10.2 Compliance with Legal and Contractual Requirements

10.2.1.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.

10.2.1.2 In order that the works are in compliance with the contractual requirements, all works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarized in [Appendix B](#).

- 10.2.1.3 The ET Leader shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating laws can be prevented.
- 10.2.1.4 The Contractor shall regularly copy relevant documents to the ET Leader so that works checking could be carried out effectively. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary shall also be available for the ET Leader's inspection upon his request.
- 10.2.1.5 After reviewing the documentation, the ET Leader shall advise the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he shall also advise the Contractor accordingly.
- 10.2.1.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

10.3 Environmental Complaints

- 10.3.1.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any complaint:
- (i) log complaint and date of receipt onto the complaint database and inform the IEC immediately;
 - (ii) investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
 - (iii) identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
 - (iv) advise the Contractor if mitigation measures are required;
 - (v) review the Contractor's response to identified mitigation measures, and the updated situation;
 - (vi) if the complaint is transferred from the Environmental Protection Department (EPD), submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
 - (vii) undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
 - (viii) report investigation results and subsequent actions to complainant (if the source of complaint is identified through EPD, the results should be reported within the timeframe assigned by EPD); and
 - (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.
- 10.3.1.2 A flow chart of the complaint response procedure is shown in [Figure 10.1](#).

11 REPORTING

11.1 Introduction

11.1.1.1 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data (baseline and impact) shall also be submitted in electronic format.

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

11.2 Electronic Reporting of EM&A Information

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

11.3 Baseline Monitoring Report

11.3.1.1 Baseline Environmental Monitoring Report(s) shall be prepared and submitted to EPD before commencement of construction works of the Project. The report shall be certified by the ET Leader and verified by the IEC. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, ER and EPD. The report format shall be agreed with EPD prior to submission. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.

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

- (i) up to half a page executive summary;
- (ii) brief project background information;
- (iii) drawings showing locations of the baseline monitoring stations;
- (iv) an updated construction programme with milestones of environmental protection / mitigation activities annotated;
- (v) monitoring results (in both hard and soft copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - quality assurance (QA) / quality control (QC) results and detection limits.
- (vi) details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect results.

- (vii) determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- (viii) revisions for inclusion in the EM&A Manual; and
- (ix) comments, recommendations and conclusions.

11.4 Monthly EM&A Reports

11.4.1 General

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

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

11.4.2 First Monthly EM&A Report

11.4.2.1 The first monthly EM&A report shall include at least but not be limited to the following:

- i. executive summary (1-2 pages):
 - breaches of AL levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- ii. basic project information:
 - project organisation including key personnel contact names and telephone numbers;
 - construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
 - management structure, and
 - works undertaken during the month.
- iii. environmental status:
 - works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage of fines in the fill materials used, etc.); and
 - drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).

- iv. a brief summary of EM&A requirements including:
 - all monitoring parameters;
 - environmental quality performance limits (AL levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the Final EIA report; and
 - environmental requirements in contract documents.
- v. implementation status:
 - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule.
- vi. monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - graphical plots of the monitored parameters in the month annotated against:
 - o the major activities being carried out on site during the period;
 - o weather conditions that may affect the results; and
 - o any other factors which might affect the monitoring results;
 - any other factors which might affect the monitoring results; and
 - quality assurance (QA) / quality control (QC) results and detection limits.
- vii. report on non-compliance, complaints, notifications of summons and successful prosecutions:
 - record of all non-compliance (exceedances) of the environmental quality performance limits (AL levels);
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

viii. others:

- an account of the future key issues as reviewed from the works programme and work method statements;
- advice on the solid and liquid waste management status;
- a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
- compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies; and
- comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

11.4.3 Subsequent monthly EM&A Reports

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

- i. executive summary (1 - 2 pages):
 - breaches of AL levels;
 - complaints log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- ii. environmental status:
 - construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection / mitigation measures for the month;
 - works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
 - drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- iii. implementation status:
 - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule.
- iv. monitoring results (in both hard and diskette copies) together with the following information:

- monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - graphical plots of the monitored parameters in the month annotated against;
 - o the major activities being carried out on site during the period;
 - o weather conditions that may affect the results; and
 - o any other factors which might affect the monitoring results.
 - any other factors which might affect the monitoring results; and
 - quality assurance (QA) / quality control (QC) results and detection limits.
- v. report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- record of all non-compliance (exceedances) of the environmental quality performance limits (AL levels);
 - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
 - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- vi. others:
- an account of the future key issues as reviewed from the works programme and work method statements;
 - advice on the solid and liquid waste management status;
 - a forecast of the works programme, impact predictions and monitoring schedule for the next three months;
 - compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies; and

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

vii. appendix

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

11.5 Final EM&A Review Report for Construction Phase

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

11.5.1.2 Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/communities and/or District Boards). The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project Proponent followed by final approval from the Director of Environmental Protection.

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

- i. executive summary (1 - 2 pages);
- ii. basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- iii. a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (AL levels); and
 - environmental mitigation measures, as recommended in the Final EIA report.
- iv. advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation status proformas;

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

11.6 EM&A Reports for Operation Phase

- 11.6.1.1 Unless otherwise agreed by EPD, quarterly EM&A reports shall be submitted to record the results and findings of the hydrogen sulphide monitoring for the first 3 years of HSKEPP operation, odour patrol during the regular and ad hoc maintenance of the deodorization system, and the water quality monitoring during the first year of HSKEPP operation.
- 11.6.1.2 A final EM&A review report for operation phase shall be submitted after completion of operation monitoring. The final EM&A review report for operation phase should contain at least the following information:

- i. Executive summary (1-2 pages):
- ii. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and/or control stations;
- iii. Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- iv. A brief summary of EM&A requirements including:
- v. Environmental mitigation measures for operation stage, as recommended in the project EIA Report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit levels);
 - all monitoring parameters;
 - Event and Action Plans;
- vi. A summary of the implementation status of environmental protection and pollution control / mitigation measures for operation stage, as recommended in the project EIA Report and summarised in the updated implementation schedule;
- vii. Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- viii. A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- ix. A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- x. A description of the actions taken in the event of non-compliance;
- xi. A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;
- xii. A review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;
- xiii. Comments (for example, a review of the effectiveness and efficiency of the mitigation measures, the performance of the environmental management system, and the overall EM&A programme for operation stage); and
- xiv. Recommendations and conclusions (for example, a review of success of the overall EM&A programme for operational stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

11.7 Data Keeping

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

11.8 Interim Notifications of Environmental Quality Limit Exceedances

- 11.8.1.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in [Appendix D](#).