



# Alternative Ground Decontamination Works at the Proposed Kennedy Town Comprehensive Development Area Site

Environmental Monitoring and Audit Manual

January 2015  
Civil Engineering and Development Department



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# 1. Introduction

## 1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as “the Manual”) is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (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 proposed for the Alternative Ground Decontamination Works at the proposed Kennedy Town Comprehensive Development Area (CDA) Site (hereafter referred to as “the Project”).

## 1.2 Project Description

The Project site is situated next to Victoria Road and Cadogan Street, Kennedy Town, adjacent to Victoria Harbour. The project site boundary and EIA Study Area are shown in **Figure 1.1**.

The Project site has a total area of about 32,000 m<sup>2</sup>. The total estimated volume of soil requiring remediation within the site is projected to be around 112,666 m<sup>3</sup>. **Table 1-1** below shows the estimated volume of contaminated material according to the type of contamination (Heavy Metals, Hydrocarbons, or a mixture of both).

Table 1-1: Volumes of Contaminated Soil Requiring Excavation and Decontamination, by Type

Soil Type	Description	Vol. (m <sup>3</sup> )
Type A	Soil contaminated with Heavy Metals (HM)	57,254
Type B	Soil contaminated with Hydrocarbons (HC)	17,233
Type C	Soil contaminated with both HM and HC	38,179
	Total contaminated soil volume	112,666
	Soil not requiring decontamination (including concrete slab), but needs to be excavated	73,746
	Total excavated soil volume (including concrete slab)	186,412

The site has been divided into Zones 1A, 1B, 1C, 2, 3, 4, 5A, and 5B as shown in **Figure 1.2**.

Three different Reprovisioning Options, namely Option A, Option B, and Option C, have been identified for implementation of the Project, each of which has been assessed under the EIA report. Option A has a 13-year programme; Option B has a 7-year programme; and Option C has a 4.5-year programme. These three Reprovisioning Options are described in **Section 1.3** below. The excavated soil volumes and biopile details are shown in Section 2.5 of the EIA report.

## 1.3 Reprovisioning Options of Temporary Community Facilities

### 1.3.1 Reprovisioning Options

Three Reprovisioning Options for the existing temporary community facilities (Public Car Park, Refuse Collection Point (RCP) and Garden) within the Project site have been identified as follows.

**Reprovisioning Option A** – 13-year Project duration, to take place in two stages: Stage 1 involving decontamination of approximately 80% area of the site (the whole site except Cadogan Street Temporary Garden), and on-site reprovisioning (by others) of the existing public car park and RCP; Stage 2 involving decontamination of the remaining area of the site (Cadogan Street Temporary Garden) after construction of the proposed future waterfront promenade at a decontaminated area of the site (by others).

**Reprovisioning Option B** – 7-year Project duration, involving removal of the existing public car park, temporary garden, and RCP, and decontamination of the whole site in a single stage. Only public car park and RCP would be reprovisioned on-site (by others) during the ground decontamination works.

**Reprovisioning Option C** – 4.5-year Project duration, involving removal of the existing public car park, temporary garden, and RCP, and decontamination of the whole site in a single stage. There would be no reprovisioning of community facilities under this Option.

The tentative Project implementation programmes for the three Reprovisioning Options are shown in **Appendix 2.1a**, **Appendix 2.1b** and **Appendix 2.1c** of the EIA report respectively.

## 1.4 Project Organisation

The proposed project organisation is shown in **Figure 1.3**. The responsibilities of respective parties are:

### Civil Engineering and Development Department (CEDD)

CEDD will be the Project Proponent for the development of the Project and will assume overall responsibility for the Project.

### Environmental Protection Department (EPD)

EPD is the statutory enforcement body for environmental protection matters in Hong Kong.

### Engineer or Engineer's Representative (ER)

The ER is responsible for overseeing the decontamination works and for ensuring that the works are undertaken by the Contractor in accordance with the specification and contract requirements. The duties and responsibilities of the ER with respect to EM&A are:

- Monitor the Contractors' compliance with contract specifications, including the implementation and operation of the environmental mitigation measures and their effectiveness
- Employ an Independent Environmental Checker (IEC) to audit the results of the EM&A works carried out by the Environmental Team (ET)
- Monitor Contractors', ET's and IEC's compliance with the requirements in the Environmental Permit (EP) and EM&A Manual
- Facilitate ET's implementation of the EM&A programme
- Participate in joint site inspection by the ET and IEC
- Oversee the implementation of the agreed Event / Action Plan in the event of any exceedance
- Adhere to the procedures for carrying out complaint investigation

### The Contractor

The Contractor should report to the ER. The duties and responsibilities of the Contractor are:

- Comply with the relevant contract conditions and specifications on environmental protection
- Employ an ET to undertake monitoring, laboratory analysis and reporting of EM&A
- Facilitate ET's monitoring and site inspection activities
- Participate in the site inspections by the ET and IEC, and undertake any corrective actions
- Provide information / advice to the ET regarding works programme and activities which may contribute to the generation of adverse environmental impacts
- Submit proposals on mitigation measures in case of exceedances of Action and Limit level in accordance with the Event / Action Plans
- Implement measures to reduce impact where Action and Limit levels are exceed
- Adhere to the procedures for carrying out complaint investigation

### Environmental Team (ET)

The ET shall not be in any way an associated body of the Contractor, and shall be employed by the Project Proponent / Contractor to conduct the EM&A programme. The ET should be managed by the ET Leader. The ET Leader shall be a person who has at least 7 years' experience in EM&A and has relevant professional qualifications. The appointment of ET Leader should be subject to the approval of EPD. Suitably qualified staff should be included in the ET, and resources for the implementation of the EM&A programme should be allocated in time under the Contract, to enable fulfilment of the Project's EM&A requirements as specified in the EM&A Manual during the Project. The ET shall report to the Project Proponent and the duties shall include:

- Monitor and audit various environmental parameters as required in this EM&A Manual
- Analyse the environmental monitoring and audit data, review the success of EM&A programme and the adequacy of mitigation measures implemented, confirm the validity of the EIA predictions and identify any adverse environmental impacts arising
- Carry out regular site inspection to investigate and audit the Contractors' site practice, equipment / plant and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems
- Monitor compliance with conditions in the EP, environmental protection, pollution prevention and control regulations and contract specifications
- Audit environmental conditions on site
- Report on the environmental monitoring and audit results to EPD, the ER, the IEC and Contractor or their delegated representatives
- Recommend suitable mitigation measures to the Contractor in case of exceedance of Action and Limit levels in accordance with the Event and Action Plans
- Liaise with the IEC on all environmental performance matters and timely submit all relevant EM&A pro forma for approval by IEC
- Advise the Contractor on environmental improvement, awareness, enhancement measures etc., on site
- Adhere to the procedures for carrying out complaint investigation

### Independent Environmental Checker (IEC)

The IEC should not be in any way an associated body of the Contractor or the ET for the Project. The IEC should be employed by the Project Proponent / Engineer prior to the commencement of the Project. The  
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IEC should have at least 7 years' experience in EM&A and have relevant professional qualifications. The appointment of IEC should be subject to the approval of EPD. The IEC should:

- Provide proactive advice to the ER and the Project Proponent on EM&A matters related to the project, independent from the management of decontamination works, but empowered to audit the environmental performance of works
- Review and audit all aspects of the EM&A programme implemented by the ET
- Review and verify the monitoring data and all submissions in connection with the EP and EM&A Manual submitted by the ET
- Arrange and conduct regular, at least monthly site inspections of the works during the carrying out of the Project, and ad hoc inspections if significant environmental problems are identified
- Check compliance with the agreed Event / Action Plan in the event of any exceedance
- Check compliance with the procedures for carrying out complaint investigation
- Check the effectiveness of corrective measures
- Feedback audit results to ET by signing off relevant EM&A pro forma
- Check that the mitigation measures are effectively implemented
- Report the works conducted, the findings, recommendation and improvement of the site inspections, after reviewing ET's and Contractor's works, and advices to the ER and Project Proponent on a monthly basis

## 2. Air Quality and Health Impact

### 2.1 Air Quality and Human Health Risk Monitoring

In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact, and associated human health risks associated with the Project are presented.

Monitoring for dust and gaseous emissions is considered necessary during the carrying out of the Project, and regular site inspections are required to ensure that the relevant control measures recommended in the Air Quality Impact Assessment are properly implemented.

The objectives of the air quality monitoring are:

- To identify the extent of construction dust impact on sensitive receivers;
- To determine the effectiveness of mitigation measures in controlling fugitive dust emission and Volatile Organic Compounds (VOCs) emissions;
- To audit the compliance of the Contractor with regard to dust control, contract conditions and the relevant dust impact criteria;
- To recommend further mitigation measures if found to be necessary; and
- To comply with Action and Limit Levels for air quality as defined in this Manual.

Mitigation measures, good practice and recommendations for reducing/avoiding dust and gaseous emissions, set out in the Air Quality Impact Assessment are also applicable to the Human Health Risk Assessment.

The Air Quality Impact Assessment shows that no significant odour impacts are predicted. Further, odour is not considered to be a likely health risk. Therefore, no mitigation or monitoring measures are recommended. Also, the Human Health Risk Assessment has concluded that the human health risk at offsite receptors is expected to be acceptable during Stages 1 and 2 of the Project.

#### 2.1.1 Monitoring Requirements

##### 2.1.1.1 Ambient Dust Monitoring at Sensitive Receivers

Monitoring and audit of 24-hour Respirable Suspended Particulates (RSP or  $PM_{10}$ ) and 24-hour Fine Suspended Particulates (FSP or  $PM_{2.5}$ ) levels are not proposed. This is because even under the hypothetical worst case Tier 1 mitigated scenario both 24-hour RSP and 24-hour FSP would comply with the corresponding Air Quality Objectives (AQO) at all Air Sensitive Receivers (ASR) throughout the construction period. Hence no significant RSP or FSP impacts are anticipated. Therefore, only 1-hour Total Suspended Particulates (TSP) will be monitored and audited at the proposed monitoring locations.

One-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval of the IEC, one-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the HVS method, to indicate short event impacts.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, other special phenomena and work progress of the concerned project area, etc should be recorded. A sample data record sheet is shown in **Appendix A**. The ET may develop a project specific record sheet to suit this EM&A programme.

#### **2.1.1.2 Biopiling System Discharge Emissions and Ambient Hydrocarbon Monitoring**

The emission limit at the discharge vent(s) of the biopiling system adopted for the purpose of this Manual is 20 mg/m<sup>3</sup> (at 0°C, 101.325 kPa, 11% O<sub>2</sub> and dry conditions) for the concentration limit of VOC.

VOC emissions from biopile vent(s) shall be monitored. Continuous Emission Monitoring (CEM) system to be proposed by the Contractor shall be able to measure VOC emission and other plant performance parameters, such as oxygen, carbon dioxide and carbon monoxide. The measurement results shall be recorded properly such that timely remedial action can be implemented in case of exceedance of emission standard.

The biopile exhausted air quality (measured as VOC) shall also be monitored at the site boundary. Benzo(a)pyrene have been predicted as a maximum of 82% of the associated criteria. Therefore it is recommended that these pollutants are monitored. All other hydrocarbons are predicted to be well below the relevant criteria and therefore are not recommended to be monitored.

### **2.1.2 Monitoring Equipment**

#### **2.1.2.1 Ambient Dust Monitoring Equipment**

High Volume Sampler (HVS) or equivalent approved sampler shall be used for carrying out the 1-hour TSP monitoring.

The ET is responsible for provision of the monitoring equipment. They should ensure that sufficient numbers of samplers with an appropriate calibration kit are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The samplers should be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc., should be clearly labelled.

Initial calibration of dust monitoring equipment should be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard should be traceable to the internationally recognised primary standard and be calibrated annually. Concerned parties, such as the IEC, should properly document the calibration data for future reference. All the data should be converted into standard temperature and pressure condition.

The flow-rate of the sampler before and after the sampling exercise with the filter in position should be verified to be constant and be recorded in the data sheet, shown in **Appendix A**.

If the ET proposes to use a direct reading dust meter to measure 1-hour TSP levels, sufficient information should be submitted to the IEC to prove that the instrument is capable of achieving a comparable result to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling should be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method.

Wind data monitoring equipment should be provided and set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location should be proposed by the ET and agreed with the IEC. For installation and operation of wind data monitoring equipment, the following points should be observed:

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

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

#### **2.1.2.2 Biopiling System Discharge Emissions Monitoring Equipment**

Monitoring of VOC emission from the discharge vent(s) of the biopile shall be accomplished by a CEM system. The specification and detection range of the CEM system shall be proposed by the Contractor / ET for the IEC approval before the CEM system commences.

Monitoring of VOC at the site boundary is recommended. The specification and detection range of the system shall be proposed by the Contractor / ET for the IEC approval before the monitoring commences.

#### **2.1.3 Laboratory Measurement / Analysis**

A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, should be available for sample analysis, equipment calibration and maintenance. The laboratory should be a HOKLAS accredited or other internationally accredited laboratory.

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

Filter paper of size 8" x 10" should be labelled before sampling. It should be a clean filter paper with no pinholes, and should be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.

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

All collected samples should be kept in good condition for six months before disposal.

## 2.1.4 Monitoring Location

### 2.1.4.1 Ambient Dust Monitoring Locations

Three air quality monitoring locations are proposed and summarised in **Table 2-1** and shown in **Figure 2-1**, subject to approval from the occupiers / owners of the premises for dust monitoring equipment installation. The status and locations of dust sensitive receptors may change after issuing this Manual. If such cases arise, the ET Leader should propose updated monitoring locations and seek agreement from ER, IEC and EPD before baseline monitoring commences.

Table 2-1: Air Quality Monitoring Stations

ID	Description
AM1	St Luke's Settlement Neighbourhood Elderly Centre
AM2	The Merton (Block 2)
AM3	Centenary Mansion (Block 1)

When alternative monitoring locations are proposed, the proposed site should, as far as practicable:

- be at the site boundary or such locations close to the major dust emission source;
- be close to the sensitive receptors, and;
- take into account the prevailing meteorological conditions.

Monitoring equipment must be positioned, sited and orientated properly. The ET should agree with the ER in consultation with the IEC on the position of the samplers for the installation of the monitoring equipment. When positioning the samplers, the following points should be noted:

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

The ET may, depending on site conditions and monitoring results, decide whether additional monitoring locations should be included or any monitoring locations could be removed / relocated during any stage of the carrying out of the Project.



**2.1.4.2 Biopiling System Discharge Emissions Monitoring**

Emissions of biopile vent(s) shall be measured during remediation phase upon commissioning of the biopiling system within the Project site. The monitoring point(s) and frequencies shall be at the discharge vent location(s) after the treatment process, and ET should seek agreement with the IEC and the ER before such monitoring commences.

**2.1.4.3 Ambient Benzo(a)pyrene Emissions Monitoring**

Benzo(a)pyrene levels at the site boundary shall be monitored during the excavation and decontamination process. ET should seek agreement with the IEC and the ER regarding the monitoring locations and frequencies before such monitoring commences.

**2.1.5 Baseline Monitoring**

**2.1.5.1 Ambient Dust Baseline Monitoring**

Baseline monitoring should be conducted at all designated monitoring locations (see **Table 2-1**) for at least 14 consecutive days before commencement of decontamination work to obtain ambient 1-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the stations. One-hour sampling should also be conducted at least three times per day. 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. General meteorological conditions (wind speed, wind direction and precipitation) and notes regarding any significant adjacent dust producing sources should also be recorded throughout the baseline monitoring period. The summaries of the monitoring requirements are shown in **Table 2-2**.

Table 2-2: Ambient Dust Baseline Monitoring Requirements

Monitoring Location	Parameter	Sampling hours	Duration	Sampling Details	Frequency
(Refer to <b>Table 2-1</b> )	TSP	1-hour	14 consecutive days before commencement of decontamination work	HVS / equivalent approved sampler	At least 3 times per day

Before commencing baseline monitoring, the ET should inform the IEC of the baseline monitoring programme such that IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results. During the baseline monitoring, there should not be any dust generating activities in the vicinity of the monitoring stations.

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

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

reference and submit to the ER for approval. If the ET 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 and air quality criteria, after consultation and agreement with the ER, IEC and EPD.

Ambient conditions may vary seasonally and should be reviewed once every six months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels; the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC and EPD.

**2.1.5.2 Biopiling System Discharge Emissions Monitoring**

Before commencement, the biopiling system shall be subject to a satisfactory commissioning test on the system performance and emission compliance. Upon the commissioning test result, compliance standards of system performance parameters, such as VOC shall be determined and shall be checked against during impact monitoring.

**2.1.6 Impact and Compliance Monitoring**

**2.1.6.1 Ambient Dust Impact and Compliance Monitoring**

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 decontamination works. Monitoring requirements are summarised in **Table 2-3**.

The ET should carry out impact monitoring at all the proposed monitoring stations, throughout the entire decontamination work period. 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. Highest dust impacts will be determined by the actual construction site condition, program and the works to be carried out. Before commencing impact monitoring, ET should inform the IEC of the impact monitoring programme. The IEC can carry out on-site audit to ensure accuracy of the impact monitoring results.

In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan, should be conducted within 24 hours after the result is obtained. This additional monitoring should be continued until the excessive dust emission or the deterioration in air quality is rectified and agreed with ER and the IEC.

Table 2-3: Ambient Dust Impact and Compliance Monitoring Requirements

Monitoring Location	Parameter	Sampling hours	Duration	Frequency
(Refer to <b>Table 2-1</b> )	TSP	1-hour	Throughout entire decontamination work period	At least 3 times or 3 consecutive hours in every six days

**2.1.6.2 Biopiling System Discharge Emissions Impact and Compliance Monitoring**

VOC emissions from the discharge vent(s) of the biopiling system are to be measured by a CEM system. Monitoring requirements are summarised in **Table 2-4**. Ambient VOC shall be measured. ET should seek agreement with the IEC and the ER regarding the monitoring points, frequencies, sampling hours, and sampling methods before such monitoring commences.

Table 2-4: Biopiling System Discharge Emissions Impact and Compliance Monitoring Requirements

Sampling Point	Parameter	Sampling hours	Sampling Methods	Frequency
Biopile Discharge Vent	VOC, Oxygen, CO <sub>2</sub> , CO	1-hour	Refer to USEPA document Method TO-14A (EPA/625/R-96/010b) <sup>(1)</sup> or equivalent	Twice every week (for 1 <sup>st</sup> month) Weekly (after 1 <sup>st</sup> month)

Source: (1): Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition Compendium Method TO-14A Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS) <http://www.epa.gov/ttnamti1/files/ambient/airtox/to-14ar.pdf>

**2.1.6.3 Impact and Compliance Monitoring of Ambient Benzo(a)pyrene Concentration during Excavation**

Ambient Benzo(a)pyrene concentration are to be measured at the site boundary during excavation. Monitoring requirements are summarised in **Table 2-5**. Ambient Benzo(a)pyrene shall be measured. ET should seek agreement with the IEC and the ER regarding the monitoring points, frequencies, sampling hours, and sampling details before such monitoring commences.

Table 2-5: Ambient Benzo(a)pyrene Emissions Impact and Compliance Monitoring Requirements

Monitoring Location	Parameter	Sampling hours	Sampling Details	Frequency	Detection Limit
Site Boundary	Benzo(a)pyrene	1-hour	Refer to USEPA document Method TO-13A (EPA/625/R-96/010b) <sup>(1)</sup> or equivalent	At least 3 times or 3 consecutive hours in every six days	0.01µg/m <sup>3</sup>

Source: (1): Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition Compendium Method TO-13A Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS) <http://www.epa.gov/ttnamti1/files/ambient/airtox/to-13arr.pdf>

**2.1.7 Event and Action Plan**

Baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET should compare the impact monitoring results with air quality criteria set up for 1-hour TSP level. Air quality criteria which name Action and Limit (AL) Levels to be used are shown in **Table 2-6**, **Table 2-7**, and **Table 2-8**, AL are to be agreed between the ET, IEC and the ER prior to air monitoring

commencement. The Event and Action Plan (**Table 2-9 & Table 2-10**) lists the actions that should be carried out when non-compliance of the air quality criteria occurs.

Table 2-6: Typical Action and Limit Level for Ambient Dust Monitoring

Parameter	Action Level	Limit Level
1-hr TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = (130% of baseline level + Limit level)/2 For baseline level $> 384 \mu\text{g}/\text{m}^3$ , Action level = Limit Level	500 $\mu\text{g}/\text{m}^3$

Table 2-7: Limit Levels for Biopile Emissions Monitoring

Emission Point	Parameter	Limit Level
Biopile Discharge Vent	VOC	20 ppm

Table 2-8: Limit Levels for Ambient VOC Monitoring at Site Boundary

Parameter	Limit Level
Benzo(a)pyrene (1-hour average)	0.03 $\mu\text{g}/\text{m}^3$

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Table 2-9: Typical Event and Action Plan for Ambient Dust Monitoring

Event	ET	IEC	ER	Contractor
<b>Action Level</b>				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method.	1. Notify Contractor	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
2. Exceedance for two or more consecutive samples	1. Identify source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET on the effectiveness of the proposed remedial measures; 5. Monitor the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER within three working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.
<b>Limit Level</b>				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Monitor the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within three working days of notification; 3. Implement the agreed proposals; 4. Amend proposal if appropriate.

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Event	ET	IEC	ER	Contractor
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, Contractor and EPD;</li> <li>2. Identify source;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>5. Monitor the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within three working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

Table 2-10: Event and Action Plan for Biopiling System Discharge Emissions Monitoring and Ambient VOC Monitoring

Event	ET	IEC	ER	Contractor
1.Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source and investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform Contactor, IEC and ER;</li> <li>3. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposal if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify source and investigate the causes of exceedance;</li> <li>2. Inform Contractor, IEC, ER and EPD;</li> <li>3. Discuss with IEC and Contractor on remedial actions required;</li> <li>4. Assess the effectiveness of</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Supervise implementation of</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and IEC on proper remedial actions;</li> <li>2. Submit proposals for remedial actions to ER and IEC within three working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still</li> </ol>

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Event	ET	IEC	ER	Contractor
	Contractor's remedial actions; 5. If exceedance continues, arrange meeting with IEC and ER.		remedial measures; 5. Conduct meeting with ET and IEC if exceedance continues and instruct the Contractor to slow down or stop the process until the exceedance is abated.	not under control; 5. Slow down or stop the process as determined by the ER until the exceedance is abated.

### **2.1.8 Mitigation Measures**

To reduce dust nuisance during the carrying out of the project, the relevant requirements stipulated in the *Air Pollution Control (Construction Dust) Regulation* as well as the good practices for dust control should be implemented to reduce the dust impact. A control programme can be instigated to monitor the construction process in order to enforce dust controls and modify methods of works where feasible to reduce the dust emission down to acceptable levels. The implementation schedule of recommended air quality mitigation measures is presented in **Appendix B**.



## 3. Noise Impact

### 3.1 Noise Monitoring

#### 3.1.1 Monitoring Requirements

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq}$  (30 minutes) shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods,  $L_{eq}$  (5 minutes) shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

Supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in **Appendix A**. The ET Leader may modify the data record sheet for this EM&A programme, of which the format should be agreed by the ER and the IEC.

#### 3.1.2 Monitoring Equipment

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

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

The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

#### 3.1.3 Monitoring Locations

The noise monitoring locations (refer to **Figure 3.1**) are summarised in **Table 3.1**. The status and locations of noise sensitive receivers may change after issuing this Manual. If such cases arise, the ET Leader should propose updated monitoring locations and seek agreement from ER, IEC and EPD before baseline monitoring commences

Table 3-1: Noise Monitoring Locations

ID	Description
KT-N1	Cheong Kat Mansion
KT-N2	The Merton (Block 2)
KT-N3	Centenary Mansion
KT-N4	Cayman Rise
KT-N5	Bayanihan Kennedy Town Centre
KT-N6	Kennedy Town Jockey Club Clinic
KT-N7	Lui Ming Choi Memorial Primary School
KT-N8	No. 60 Victoria Road
KT-N9	No.37A Cadogan Street

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

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the noise sensitive receivers (any domestic premises, temporary housing accommodation, educational institution, place of public worship, should be considered as a noise sensitive receiver); and
- For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station should normally be at a point 1 m from the exterior of the sensitive receivers building façade and be at position 1.2 m above the ground. If there is a problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements should be made. For reference, a correction of +3 dB(A) should be made to the free field measurements. The ET Leader should agree with the IEC on the monitoring positions and the correction adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring should be carried out at the same positions.

### 3.1.4 Baseline Monitoring

The ET shall carry out baseline noise monitoring prior to the commencement of the decontamination works. The baseline monitoring shall be carried out daily for a period of at least two weeks. Before commencing the baseline monitoring, the ET shall develop and submit to the IEC the baseline monitoring programme such that the IEC can conduct on-site audit to check accuracy of the baseline monitoring results.

There shall not be any decontamination / construction activities in the vicinity of the stations during the baseline monitoring.

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

### 3.1.5 Impact Monitoring

Noise monitoring shall be carried out at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the decontamination activities. The following is an initial guide on the regular

monitoring frequency for each station on a weekly basis when noise generating activities are underway:

- One set of measurements between 0700 and 1900 hours on normal weekdays;

If decontamination works are extended to include works during the hours of 1900 – 0700 on normal weekdays as well as all day on public holidays and Sundays, additional weekly impact monitoring shall be carried out during respective restricted hour periods. Applicable permits under NCO shall also be obtained by the Contractor.

If a school exists near the decontamination activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school’s personnel and/or the Hong Kong Examinations and Assessment Authority (HKEAA) as appropriate to ascertain the exact dates and times of all examination periods during the course of the contract. The relevant Limit Levels presented in **Table 3.2** shall apply when these examination are being conducted.

In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan in **Table 3.3**, shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or demonstrated to be unrelated to the decontamination activities.

### 3.1.6 Event and Action Plan

The Action and Limit (AL) Levels for construction noise are defined in **Table 3.2**. Should non-compliance of the criteria occurs, action in accordance with the Event and Action Plan in **Table 3.3**, should be carried out.

Table 3-2: Typical Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one valid documented complaint is received.	75dB(A)*

Note: (\*) 70 dB(A) for school during normal periods; 65 dB(A) for school during examination periods.  
If works are to be carried out during restricted hours, the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.

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

Event	ET	IEC	ER	Contractor
<b>Action Level</b>	1. Notify ER, IEC and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the IEC and Contractor on remedial measures required; 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the investigation results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; 3. Advise the ER on the effectiveness of the proposed remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise the implementation of remedial measures.	1. Submit noise mitigation proposals to IEC and ER; 2. Implement noise mitigation proposals.
<b>Limit Level</b>	1. Inform IEC, ER, Contractor and EPD; 2. Repeat measurements to confirm findings; 3. Increase monitoring frequency; 4. Identify source and investigate the cause of exceedance; 5. Carry out analysis of Contractor's working procedures; 6. Discuss with the IEC, Contractor and ER on remedial measures required; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Supervise the implementation of remedial measures; 5. If exceedance continues, consider stopping the Contractor to continue working on that portion of work which causes the exceedance until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification; 3. Implement the agreed proposals; 4. Submit further proposal if problem still not under control; 5. Stop the relevant portion of works as instructed by the ER until the exceedance is abated.

### **3.1.7 Mitigation Measures**

The EIA Report has recommended project noise control and mitigation measures. The Contractor should be responsible for the design and implementation of these measures under the supervision of the ER and monitored by the ET. The implementation schedule of the recommended noise mitigation measures is presented in **Appendix B**.

## 4. Water Quality Impact

### 4.1 Introduction

As identified in the EIA Report, a key water quality issue of the decontamination phase would be pipe piling works and excavating in the vicinity of the seawall. Marine water quality monitoring should be carried out during pipe pile installation / excavation works in vicinity of seawall to ensure that any unacceptable increase in heavy metals and turbidity, and decrease in dissolved oxygen due to pipe pile / excavation works could be readily detected and timely action be taken to rectify the situation.

### 4.2 Water Quality Parameters

Monitoring of Dissolved Oxygen (DO), Dissolved Oxygen Saturation (DO%), turbidity, as well as suspended solids (SS) and heavy metals should be undertaken at all designated monitoring locations.

The monitoring locations are described in **Section 4.5**. All parameters should be measured in-situ, whereas SS and heavy metals should be determined by laboratory. DO should be presented in mg/L and in % saturation.

Other relevant data should also be recorded, including monitoring location, time, tidal stages, weather conditions, sea conditions and any special phenomena and work underway at the construction site.

### 4.3 Sampling Procedures and Monitoring Equipment

Water samples for all monitoring parameters should be collected, stored, preserved and analysis according to the Standard Methods, APHA 22<sup>nd</sup> ed. and/or other methods as agreed by the EPD. In-situ measurements at monitoring locations, including DO, turbidity and water depth should be collected by equipment with the characteristics and functions listed in the following sections.

Sample data record sheets are shown in **Appendix B**.

The monitoring equipment and facilities should be provided by the ET.

#### 4.3.1 Dissolved Oxygen Equipment

The instrument should be portable and weatherproof using a DC power source. It should have a membrane electrode with automatic temperature compensation complete with a cable. The equipment should be capable of measuring:

- A dissolved oxygen level in the range of 0-20 mg/L and 0-200 % saturation

#### 4.3.2 Turbidity Measurement Instrument

The instrument should be portable and weatherproof using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU.

#### **4.3.3 Suspended Solids and Heavy Metals**

A water sampler comprises a transparent PVC cylinder, with a capacity of not less than two litres, and could be effectively sealed with latex cups at both ends should be used. The sampler should 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 (Kahsico Water Sampler or a similar instrument approved by the ET and ER).

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

#### **4.3.4 Water Depth Detector**

A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. The unit would either be handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

#### **4.3.5 Positioning Device**

A hand-held or boat-fixed type digital Global Positioning System (dGPS) with way point bearing indication or other equivalent instrument of similarly accuracy should be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

#### **4.3.6 Calibration of In-situ Instruments**

All in-situ monitoring instrument should be checked, calibrated and certified by a laboratory accredited under HOKLAS (or other international accreditation scheme that is HOKLAS-equivalent) before use, and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use.

Wet bulb calibration for a DO meter should be carried out before measurement at each monitoring location. A zero check in distilled water should be performed with the turbidity probe at least once per monitoring day. The probe should then be calibrated with a solution of known NTU. In addition, the turbidity probe should be calibrated at least twice per month to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/L).

For the on-site calibration of field equipment, the BS 127:1993, Guide to Field and On-site Test Methods for the Analysis of Waters should be observed.

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

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

Analysis of SS and heavy metals should be carried out in a HOKLAS laboratory (or other international accredited laboratory that is HOKLAS-equivalent). Sufficient water samples should be collected at the monitoring stations for carrying out the laboratory heavy metals determination. The SS and heavy metals

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determination work should start within 24 hours after collection of the water samples. The analysis of SS and heavy metals should follow the standard methods summarised in **Table 4-1**.

Table 4-1: Laboratory analysis for heavy metals

Parameters	Instrumentation	Analytical Method	Reporting Limit
Suspended Solid (SS)	Analytical Balance	APHA 2540D	2 mg/L
<b>Heavy Metals</b>			
Cadmium (Cd)	ICP-MS	USEPA 6020A	0.2 µg/L
Copper (Cu)	ICP-MS	USEPA 6020A	0.2 µg/L
Zinc (Zn)	ICP-MS	USEPA 6020A	1 µg/L

If in-house or non-standard methods are proposed, details of the method verification should, if required, be submitted to EPD. In any circumstances, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should be prepared to demonstrate the quality control programmes to EPD or their representative if and when required.

Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for three months in case repeat analysis is required.

If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by EPD. All the analysis shall be witnessed by the ER. The ET Leader shall provide the ER and IEC with one copy of the relevant chapters of the “APHA Standard Methods for the Examination of Water and Wastewater” 22<sup>nd</sup> edition and any other relevant document for their reference.

## 4.5 Monitoring Locations

A total of 4 water quality monitoring locations (comprising one impact station, one sensitive receiver station and two control stations) have been proposed during pipe pile installation / excavation works in vicinity of seawall (within 15m from seawall coping). The coordinates are shown in **Table 4-2** and the locations are shown in **Figure 4.1**. The final locations and number of monitoring points should be agreed with EPD at least two weeks before undertaking any works.

Table 4-2: Water Quality Monitoring Stations

Monitoring Stations	Description	Coordinates	
		Easting	Northing
C1	Control	830581	815945
C2	Control	831023	816096
IM1	Impact	830887	816052
SR1	Kennedy Town Flushing Water Intake	830706	815990

The status and locations of water sensitive receivers may change after issuing this Manual. If such case exists, the ET Leader should propose updated monitoring locations and seek approval from the IEC and EPD. The selection of these locations should follow the below criteria:



- Impact (IM) stations should be within the 50 m envelope of the pipe pile installation / excavation works;
- Sensitive receivers (SR) stations should be at close proximity to key sensitive receivers; and
- Control stations (C), as far as practicable, should be at representative locations of the water body being monitored while undisturbed by the project.

## 4.6 Baseline Monitoring

Baseline conditions for water quality shall be established and agreed with EPD prior to the commencement of works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the pipe pile and excavation works in the vicinity of the seawall (within 15m of seawall coping) and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall be established by measuring DO, turbidity, SS and heavy metals at all designated stationary monitoring stations. The measurements should be taken three days per week, at mid-flood and mid-ebb tides, for at least four weeks prior to the commencement of pipe pile and excavation works in the vicinity of the seawall (within 15m of seawall coping). The commencement date of baseline monitoring shall be agreed between the ET / IEC / ER to ensure timely submission of the baseline monitoring report to EPD. Duplicate water samples should be taken and analysed.

There should not be any marine construction activities in the vicinity of the stations during the baseline monitoring.

In exceptional cases when insufficient baseline monitoring data or questionable results are obtained, the ET should seek approval from the IEC and EPD on an appropriate set of data to be used as baseline reference. This may include additional baseline monitoring work and the relevant project works should not proceed until the causes of the anomalies have been determined.

Baseline monitoring schedule should be faxed to EPD at least two weeks prior to the commencement of baseline monitoring. The interval between two sets of monitoring should be not less than 36 hours.

Table 4-3: Proposed Baseline Monitoring Programme

Monitoring Station	Monitoring Period	Monitoring Frequency	Monitoring Parameters	Interval Between 2 sets of Monitoring
C1	At least 4 weeks before commencement of pipe pile and excavation works in the vicinity of seawall (within 15m of seawall coping)	3 times per week at mid-flood and mid-ebb	DO (% and mg/L)	Not less than 36 hours
C2			Turbidity (mg/L)	
IM1			SS (mg/L)	
SR1			Heavy metals(Cd, Cu, Zn) (µg/L)	

## 4.7 Impact Monitoring

During pipe pile installation / excavation works in vicinity of seawall (within 15m from seawall coping), impact monitoring should be undertaken at all designated monitoring stations three days per week (refer to Table 4-4 for the parameters to be monitored). Monitoring should be undertaken at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, with sampling / measurement at the designated stationary monitoring stations. The interval between two sets of monitoring

should be not less than 36 hours except when the Action and/or Limit levels is/are exceeded, in which case the monitoring frequency should be increased.

Two consecutive measurements of DO concentrations (mg/L), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25 % of the value of the first reading, the reading should be discarded and further readings would be taken. Water samples for SS (mg/L) and heavy metals (µg/L) measurements should be collected at the same depths. Duplicate water samples should be taken and analysed.

The monitoring location / position, time, weather conditions and any special phenomena should also be recorded.

During the monitoring period, if there is no project-related exceedance for twelve months, as confirmed by the ET and verified by the IEC, the project proponent may apply for reduction in monitoring frequency by submitting a revised plan with justifications for consideration by EPD. The project proponent will need to continue with the monitoring programme unless written approval has been issued by EPD.

Table 4-4: Proposed Impact Monitoring Programme

Monitoring Station	Monitoring Period	Monitoring Frequency	Monitoring Parameters	Interval Between 2 sets of Monitoring
C1	During pipe pile installation / excavation works in vicinity of seawall (within 15m from seawall coping)	3 times per week at mid-flood and mid-ebb	DO (% and mg/L)	Not less than 36 hours
C2			Turbidity (mg/L)	
IM1		SS (mg/L)		
SR1		Heavy metals(Cd, Cu, Zn) (µg/L)		

## 4.8 Event and Action Plan for Water Quality

The action and limit (AL) levels for water quality are defined in **Table 4-5**.

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

Parameters	Action Level	Limit Level
DO (mg/L) (Surface, middle, bottom)	<u>WSD Seawater Intakes</u> 2 mg/L <u>Other Impact Monitoring Stations</u> 5 percentile of baseline data	<u>Surface and Middle</u> <u>WSD Seawater Intakes</u> 2 mg/L <u>Other Impact Monitoring Stations</u> 4 mg/L or 1 percentile of baseline data <u>Bottom</u> 2 mg/L or 1 percentile of baseline data
Turbidity (mg/L)	<u>WSD Seawater Intakes</u> 10 NTU <u>Other Impact Monitoring Stations</u> 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	<u>WSD Seawater Intakes</u> 10 NTU <u>Other Impact Monitoring Stations</u> 99 percentile of baseline data or 130% of upstream control station at the same tide of the same day
SS (mg/L)	95 percentile of baseline data or 120% of	99 percentile of baseline data or 130% of

Parameters	Action Level	Limit Level
	upstream control station at the same tide of the same day	upstream control station at the same tide of the same day
<b>Heavy Metals</b>		
Cadmium (Cd) (µg/L)	0.8 µg/L or 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	1 µg/L
Copper (Cu) (µg/L)	0.8 µg/L or 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	1 µg/L
Zinc (Zn) (µg/L)	8 µg/L or 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	10 µg/L

Notes:

1. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.
2. For parameters other than DO, non-compliance of water quality results when monitoring results is higher than the limits.
3. Depth-averaged results are used unless specified otherwise.

The actions in accordance with the Event and Action Plan in **Table 4-6** should be carried out if the water quality assessment criteria are exceeded at any designated monitoring points.

Table 4-6: Event and Action Plan for Water Quality

Event	Action			
	ET	IEC	ER	Contractor
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Identify reasons for non-compliance and sources of impact;</li> <li>2. Inform IEC and Contractor;</li> <li>3. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>4. Discuss mitigation measures with IEC and Contractor;</li> <li>5. Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise ER accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC on the proposed mitigation measures;</li> <li>2. Make agreement on the mitigation measures to be implemented;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with ET and IEC and propose mitigation measures.</li> </ol>
Action Level being exceeded by more than two consecutive sampling days	<ol style="list-style-type: none"> <li>1. Identify reasons for non-compliance and sources of impact;</li> <li>2. Inform IEC and Contractor;</li> <li>3. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>4. Discuss mitigation measures with IEC and Contractor;</li> <li>5. Ensure mitigation</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and Contractor on the mitigation measures;</li> <li>2. Review proposals on mitigation measures submitted by Contractor and advise ER accordingly;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC on the proposed mitigation measures;</li> <li>2. Make agreement on the mitigation measures to be implemented;</li> <li>3. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment;</li> <li>4. Consider changes of working methods;</li> <li>5. Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
	measures are implemented; 6. Prepare to increase the monitoring frequency to daily; 7. Repeat measurement on next day of exceedance.			working days; 6. Implement the agreed mitigation measures.
Limit Level being exceeded by one sampling day	1. Identify reasons for non-compliance and sources of impact; 2. Inform IEC, Contractor and EPD; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss mitigation measures with IEC, ER and Contractor; 5. Ensure mitigation measures are implemented; 6. Increase the monitoring frequency to daily until no exceedance of limit level.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures.	1. Inform ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IEC and ER and propose mitigation measures to IEC and ER within three working days; 6. Implement the agreed mitigation measures.
Limit Level being exceeded by more than one consecutive sampling days	1. Identify reasons for non-compliance and sources of impact; 2. Inform IEC, Contractor and EPD; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss mitigation measures with IEC, ER and Contractor; 5. Ensure mitigation measures are implemented; 6. Increase the monitoring frequency to daily until no exceedance of limit level for two consecutive days.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the pipe pile installation / excavation works until no exceedance of limit level.	1. Inform ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IEC and ER and propose mitigation measures to IEC and ER within three working days; 6. Implement the agreed mitigation measures; 7. As directed by ER, to slow down or to stop all or part of the pipe pile installation / excavation works.

## **4.9 Mitigation Measures**

The implementation schedule of the recommended water quality mitigation measures is presented in **Appendix C**.

## 5. Waste Management Implications

### 5.1 Introduction

Wastes generated by the Project are likely to include Construction and Demolition (C&D) material from site clearance within the Project boundary, chemical waste from the maintenance of plant and equipment and from the decontamination process, as well as general refuse from the workforce. Provided that these identified waste arisings are handled, transported and disposed of using approved methods, and that the recommended good site practices are strictly followed, significant adverse environmental impacts would not be expected during the carrying out of the Project.

Waste management would be the contractor's responsibility to ensure that all wastes produced during the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractor in the carrying out of the Project. The WMP shall be prepared and implemented in accordance with ETWB TC (W) No. 19/2005 Environmental Management on Construction Site.

### 5.2 Waste Management Implications

During the carrying out of the Project, regular site inspection as part of the EM&A procedures should be carried out to determine if wastes are being managed in accordance with approved procedures and the site WMP. It should look at different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

#### 5.2.1 Mitigation Measures

The implementation schedule of the recommended waste management mitigation measures is presented in **Appendix B**.

## 6. Land Contamination

### 6.1 Introduction

The land contamination assessment has been carried out which included a review of historical/ current land uses, desktop review and site inspection. Other relevant information was also collected from related Government Departments during the assessment exercise.

Based on the findings of the site appraisal on the existing and historical land uses in the Study Area, there were some adverse land contamination impacts associated with the proposed Project works. Areas within the Study Area with contaminated soil exceeding certain Risk-Based Remediation Goals (RBRGs) have been identified and the estimated volumes of soil to be excavated and decontaminated have been calculated based on an evaluation of the previous site investigation (SI) results as well as additional SI findings. Treatment of contaminated soil by cement solidification and/or biopiling has been recommended in the EIA Report, depending on the types of contaminants found in the soil in each designated grid.

In terms of identified soil contamination, the proposed land decontamination methods would remove contaminated soils from the grid concerned by excavation, followed by decontamination and testing to meet the requisite RBRGs and clean-up targets by the relevant methods recommended and then on-site backfilling. After completion of soil decontamination, no residual impact in respect land contamination on future users of the Study Area is anticipated.

### 6.2 Land Contamination

Since bulk excavation of soil for land decontamination is anticipated, environmental monitoring in relation to land decontamination should be considered. Land contamination monitoring could be carried out in the form of regular site inspections. All related procedures and facilities in handling/ storing chemicals and chemical wastes should be audited regularly to make sure they are in order and intact and reported in the EM&A Reports.

#### 6.2.1 Mitigation Measures

The implementation schedule of the recommended land contamination mitigation measures is presented in **Appendix B**.

## 7. Ecological Impact

### 7.1 Introduction

The ecological impact assessment has evaluated the ecological impacts of the proposed Project and has concluded that no unacceptable ecological impact will be resulted. No specific ecological mitigation measure is required; however, precautionary measure for site inspection of active bird nest and bat roost is recommended to be carried out prior to site clearance works, and such measures should be checked as part of the EM&A programme for the Project.

In addition, the mitigation measures for air, noise, water and landscape aspects proposed in respective sections which are indirectly beneficial to the local ecology shall be checked as part of the environmental monitoring and audit procedures as presented in this EM&A Manual.

### 7.2 Ecological Monitoring and Audit

Although no adverse ecological impact resulting from the Project is anticipated, it is possible that some common bird species inhabiting the urban open areas such as Red-whiskered Bulbul may form an active nest on tree present within the Project site during the breeding season. All wild birds, including their nests and eggs, are protected by the Wild Animals Protection Ordinance (Cap. 170). Therefore, it is recommended as precautionary measure that before conducting site clearance works, the Project site should be inspected to confirm no active nest is present. If any active bird nest is observed, suitably sized buffer area should be established to minimise human or machinery disturbance until the nest is abandoned.

It is also possible that some Short-nosed Fruit Bats may utilise Chinese Fan-palms within the Project site as roost. Therefore, it is recommended as precautionary measure that before conducting site clearance works, daytime inspection should be carried out to confirm no Short-nosed Fruit Bat is present on the fronds of Chinese Fan-palms within the Project site. If any Short-nosed Fruit Bat is observed roosting on tree, suitably sized buffer area should be established around the tree to minimise human or machinery disturbance until the bat has left.

The implementation schedule of the recommended precautionary measures is presented in **Appendix B**.



## 8. Fisheries Impact

### 8.1 Introduction

It is identified that no fish pond is present within the Project site or in the vicinity, and no marine fish culture zone is present within the Victoria Harbour Phase Three Water Control Zone, the Project is unlikely to have indirect impacts on the fisheries capture activities at the offshore water of Kennedy Town.

### 8.2 Fisheries Monitoring and Audit

As the Project is unlikely to have indirect impacts on the fisheries capture activities at the offshore water of Kennedy Town, no EM&A programme for fisheries impact is considered necessary.

## 9. Landscape Impact

### 9.1 Introduction

The implementation of the landscape mitigation measures proposed in the EIA report will be checked as part of the EM&A procedures during the decontamination works. Good site practices shall be employed to minimise potential landscape impacts. The implementation and maintenance of landscape mitigation measures will be checked to ensure that they are properly implemented and that the potential conflicts between the proposed measures and any other project works and operational requirements are resolved at the earliest practical date and without compromising the intention of the mitigation measures.

### 9.2 Monitoring and Audit Requirements

A qualified person of the ET will audit all landscape mitigation measures undertaken to ensure compliance with the aims of the proposed measures during the carrying out of the Project. This will include regular site inspections (at least once a month) throughout the decontamination period.

The scope of the site inspection to be undertaken by the ET will include the following:

- To check the extent of the agreed works areas regularly during the carrying out of the Project. Any trespass by the Contractor outside the limits of the work areas, including any damage to existing trees outside the works areas, will be reported in the audit report; and
- To check if necessary horticultural operations and replacement are undertaken throughout the decontamination period to ensure that landscape planting, if provided, are properly maintained.

### 9.3 Mitigation Measures

Potential landscape impacts have been carefully considered during the development of project design to achieve the following:

- Avoid impacts on important landscape resources;
- Lessen unavoidable impacts by location, design and reducing the extent of works; and
- Enhancement of existing landscape resource.

Recommended landscape mitigation measures for impacts during the carrying out of the Project are summarised in **Table 9.1**.

Table 9-1: Proposed Landscape Mitigation Measures during Decontamination Works

Mitigation Code	Mitigation Measure
CP1	<b>Landscape planting around the Works Areas</b> - Landscape planting should be considered to be placed areas along the screen hoarding where space is available and feasible, and properly maintained during the carrying out of the Project in order to partially screen and soften the hard structure of the screen hoarding. Species with high tolerance to wind, sun and salt, such as <i>Ipomoea pes-caprae</i> , <i>Lantana montevidensis</i> , <i>Melastoma dodecandrum</i> , <i>Rusellia equisetiformis</i> and <i>Wedelia trilobata</i> , should be used for such planting.

Recommended landscape mitigation measures for impacts upon completion of the Project are summarised in **Table 9.2**.

Table 9-2: Proposed Landscape Mitigation Measures during Decontamination Works

Mitigation Code	Mitigation Measure
OP1	<p><b>Compensatory tree planting</b> – Compensatory tree planting in the proposed future waterfront promenade will be implemented for all three Reprovisioning Options, so that the felled trees as described in <b>Section 10.6.2</b> of the EIA report will be compensated with a minimum ratio of 1:1 in terms of quantity by tree planting in accordance with DevB TC(Works) No. 10/2013. Since a total of 196 nos. of trees are proposed to be felled for the implementation of the proposed decontamination works, at least 196 nos. of trees will be required to fully compensate for the lost trees in terms of quantity. An Environmental Permit condition requiring the submission of a landscape plan showing the design of the waterfront promenade and details of the tree compensatory proposal to EPD will be included to ensure the implementation of this mitigation measure.</p>

# 10. Environmental Auditing

## 10.1 Site Inspections

Site inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They should be undertaken routinely by the ET to inspect the decontamination activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the site.

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

Regular site inspections led by the ET Leader 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 Project sites 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
- the Environmental Permit conditions
- ongoing results of the EM&A programme
- works progress and programme
- individual works methodology proposals (which shall include proposal on associated pollution control measures)
- contract specifications on environmental protection
- relevant environmental protection and pollution control laws
- previous site inspection results undertaken by the ET and others

The Contractor shall keep the ET Leader updated with all relevant information on the 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 action. The Contractor shall follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

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.

## 10.2 Compliance with Legal and Contractual Requirements

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

In order that the works are in compliance with the contractual requirements, relevant sections (e.g. sections related to environmental measures) of 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 ET Leader shall also keep himself informed of the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violation can be prevented.

The Contractor shall regularly copy relevant documents to the ET Leader so that works checking can be carried out. 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 made available for the ET Leader's inspection upon his request.

After reviewing the documentation, the ET Leader shall advise the Contractor of any noncompliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions, including any potential violation of requirements.

Upon receipt of the advice, the Contractor shall undertake immediate action to correct 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

The handling of environmental complaints should follow the environmental complaint flow diagram and reporting channel as presented in **Appendix C**.

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

# 11. Reporting

## 11.1 Introduction

The reporting requirements of EM&A are based upon a paper-documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the IEC, the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach.

For carrying out of the Project, the types of EM&A reports that the ET Leader shall prepare and submit include the Baseline Monitoring Report, Monthly EM&A Report, Quarterly EM&A Summary Report and Final EM&A Review Report. In accordance with Annex 21 of the EIAO-TM, the Monthly, Quarterly Summary and Final Review EM&A Reports shall be submitted to the Director for Environmental Protection. The exact details of the frequency, distribution, number of copies and time frame for submission shall be agreed with the IEC, ER and EPD prior to commencement of decontamination works.

## 11.2 Baseline Monitoring Report

The ET Leader shall prepare and submit a Baseline Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Monitoring Report shall be submitted to the Contractor, the IEC, the ER, CEDD and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the IEC, the ER and EPD prior to submission.

The Baseline Monitoring Report shall include at least the following:

- (i) up to half a page executive summary
- (ii) brief project background information
- (iii) drawings showing locations of the baseline monitoring stations
- (iv) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology
  - name of laboratory and types of equipment used and calibration details
  - parameters monitored
  - monitoring locations (and depth)
  - monitoring date, time, frequency and duration
  - quality assurance (QA) / quality control (QC) results and detection limits
- (v) details of influencing factors, including:
  - major activities, if any, being carried out on the site during the period/monitoring
  - weather conditions during the period/monitoring
  - other factors which might affect results
- (vi) determination of the Action and Limit 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
- (vii) revisions for inclusion in the EM&A Manual
- (viii) comments, recommendations and conclusions

### **11.3 Monthly EM&A Reports**

The results and findings of all EM&A work carried out during each month of decontamination works shall be recorded in the Monthly EM&A Reports prepared by the ET Leader. The Monthly EM&A report shall be prepared and submitted within 10 working days from the end of each reporting month. Each Monthly EM&A Report shall be submitted to the following parties: the Contractor, the IEC, the ER, CEDD and the EPD. Before submission of the first Monthly EM&A Report, the ET Leader shall liaise with the parties on the required number of copies and format of the reports in both hard copy and electronic medium.

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

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

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 Action and Limit levels
  - complaint log
  - notifications of any summons and status of prosecutions
  - changes made that affect the EM&A
  - future key issues
- (ii) basic project information:
  - project organisation including key personnel contact names and telephone numbers
  - scope of works of the Project
  - Project programme
  - works undertaken during the month with illustrations (such as location of works, etc)
  - 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)
- (iii) a brief summary of EM&A requirements including:
  - all monitoring parameters
  - environmental quality performance limits (Action and Limit levels)
  - Event-Action Plans
  - environmental mitigation measures, as recommended in the project EIA study final report
  - environmental requirements in contract documents
- (iv) environmental status:
  - advice on status of compliance with environmental permit including the status of submissions under the environmental permit
- (v) implementation status:
  - implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report

- (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
  - monitoring date, time, frequency, and duration
  - weather conditions during the period/monitoring
  - graphical plots of the monitored parameters in the month annotated against
    - the major activities being carried out on site during the period
    - weather conditions that may affect the monitoring results
    - any other factors which might affect the monitoring results
    - QA/QC results and detection limits
- (vii) Analysis of monitoring results, non-compliance, complaints, and notifications of summons and status of prosecutions:
  - analysis and interpretation of monitoring results in the month
  - any non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
  - changes made that affect the EM&A during the month
  - 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
  - notification of summons and status of prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
  - reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
  - actions taken in the event of non-compliance and deficiency, and follow-up actions related to earlier non-compliance
- (viii) others
  - an account of the future key issues as reviewed from the works programme and work method statements
  - comment on the solid and liquid waste management status during the month including waste generation and disposal records
  - outstanding issues and deficiencies
  - comments on effectiveness of the environmental management systems, practices, procedures and mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions
- (ix) appendices
  - monitoring schedule for the present and next reporting period
  - cumulative statistics on complaints, notifications of summons and successful prosecutions
  - outstanding issues and deficiencies
  - results of WPCO discharge licence required monitoring



### 11.3.2 Subsequent Monthly EM&A Reports

Subsequent Monthly EM&A Reports shall include the following:

- (i) summary (1-2 pages):
  - breaches of Action and Limit levels
  - complaint log
  - notifications of any summons and status of prosecutions
  - changes made that affect the EM&A
  - future key issues
- (ii) environmental status:
  - advice on status of compliance with environmental permit including the status of submissions under the environmental permit
- (iii) implementation status:
  - implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report
- (iv) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology
  - name of laboratory and types of equipment used and calibration details
  - parameters monitored
  - monitoring locations
  - monitoring date, time, frequency, and duration
  - weather conditions during the period/monitoring
  - graphical plots of the monitored parameters in the month annotated against:
    - the major activities being carried out on site during the period
    - weather conditions that may affect the monitoring results
    - any other factors which might affect the monitoring results
    - QA/QC results and detection limits
- (v) analysis of monitoring results, non-compliance, complaints, and notifications of summons and status of prosecutions:
  - analysis and interpretation of monitoring results in the month
  - any non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
  - changes made that affect the EM&A during the month
  - 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
  - notification of summons and status of prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
  - reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures

- actions taken in the event of non-compliance and deficiency, and follow-up actions related to earlier non-compliance
- (vi) others
  - an account of the future key issues as reviewed from the works programme and work method statements
  - comment on the solid and liquid waste management status during the month including waste generation and disposal records
  - outstanding issues and deficiencies
  - comments on effectiveness of the environmental management systems, practices, procedures and mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions
- (vii) appendices
  - monitoring schedule for the present and next reporting period
  - cumulative statistics on complaints, notifications of summons and successful prosecutions
  - outstanding issues and deficiencies
  - results of WPCO discharge licence required monitoring

Some information concerning the EM&A works, such as the EM&A requirements, would remain unchanged throughout the EM&A programme. In the subsequent Monthly EM&A Reports, the First Monthly EM&A Report can be referred to instead of repeating the description of the unchanged information.

## 11.4 Quarterly EM&A Summary Reports

A Quarterly EM&A Summary Report shall be produced and shall contain at least the following information. In addition, the first Quarterly EM&A Summary Report should also confirm if the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

- (i) up to half a page executive summary
- (ii) basic project information including a synopsis of the project organisation and programme, and a synopsis of works undertaken during the quarter
- (iii) a brief summary of EM&A requirements including:
  - monitoring parameters
  - environmental quality performance limits (Action and Limit levels)
  - environmental mitigation measures, as recommended in the project EIA Final Report
- (iv) drawings showing the project area, environmental sensitive receivers and the locations of the monitoring and control stations
- (v) implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA Report
- (vi) graphical plots of the monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period
  - weather conditions during the period
  - any other factors which might affect the monitoring results

- (vii) advice on the solid and liquid waste management status during the quarter including waste generation and disposal records
- (viii) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- (ix) a brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures
- (x) a summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance
- (xi) a summary of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken
- (xii) comments on the effectiveness and efficiency of the mitigation measures); recommendations on any improvement in the EM&A programme and conclusions for the quarter

### **11.5 Final EM&A Review Report**

The EM&A programme could be terminated upon completion of those decontamination activities that have the potential to cause significant environmental impacts.

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

The Final EM&A Review Report should include, inter alia, the following information:

- (i) an executive summary
- (ii) basic project information including a synopsis of the project organisation and programme, contacts of key management, and a synopsis of work undertaken during the entire decontamination period
- (iii) a brief summary of EM&A requirements including:
  - monitoring parameters
  - environmental quality performance limits (Action and Limit levels)
  - environmental mitigation measures, as recommended in the project EIA study final report
- (iv) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- (v) advice on the implementation status of environmental and pollution control/mitigation measures, as recommended in the project EIA study final report, summarised in the updated implementation status proformas
- (vi) graphical plots of the monitored parameters over the decontamination period for representative monitoring stations, including the post-project monitoring 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
  - the baseline condition
- (vii) compare the EM&A data with the EIA
- (viii) Effectiveness of the solid and liquid waste management

- (ix) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- (x) a brief account of the reasons the non-compliance including a review of pollution sources and working procedures
- (xi) a summary of the actions taken against the non-compliance
- (xii) a summary of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken
- (xiii) a review of the monitoring methodology adopted and with the benefit of hindsight, comment its effectiveness (including cost effectiveness)
- (xiv) a summary of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results
- (xv) a review of the practicality and effectiveness of the EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), and recommendation on any improvement in the EM&A programme
- (xvi) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings

## **11.6 Data Keeping**

No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the EM&A reporting documents. However, any such document shall be well kept by the ET Leader / Monitoring Team and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with the IEC, the ER, CEDD and EPD. All documents and data shall be kept for at least one year following completion of the EM&A programme.

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

With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC, the ER and EPD, as appropriate and shall keep them informed of the results of the investigation, proposed remedial measures, actions taken, updated situation on site, need for further follow-up proposals, etc. A sample template for the interim notifications is shown in **Appendix D**. The ET Leader may modify the interim notification form for this EM&A programme, the format of which should be approved by the ER and agreed by the IEC.