

## TABLE OF CONTENT

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Purpose of this Manual .....	1
1.2	Objectives of EM&A Program .....	1
1.3	Background of the Project .....	2
1.4	Project Time Table.....	3
1.5	Structure of this Manual .....	3
<b>2</b>	<b>PROJECT ORGANIZATION.....</b>	<b>4</b>
2.2	Architect’s Representative (AR) .....	4
2.3	The Contractor .....	4
2.4	Environmental Team (ET) .....	4
2.5	Independent Checker (Environment) (ICE) .....	5
<b>3</b>	<b>KEY ENVIRONMENTAL ISSUES.....</b>	<b>6</b>
3.2	Air Quality.....	6
3.3	Noise .....	6
3.4	Land Contamination .....	6
3.5	Waste Management .....	6
3.6	Water Quality.....	7
3.7	Landscape and Visual Issues .....	7
3.8	Hazard to Life.....	7
<b>4</b>	<b>AIR QUALITY MONITORING .....</b>	<b>8</b>
4.1	Monitoring Parameters and Locations.....	8
4.2	Baseline Monitoring .....	9
4.3	Air Quality Action and Limit Levels .....	9
4.4	Impact Monitoring.....	10
4.5	Reporting .....	10
4.6	Monitoring Methodology .....	11
4.7	Monitoring Equipment .....	11
4.8	Laboratory Measurement / Analysis.....	12
4.9	Equipment Calibration.....	12
4.10	Operation Monitoring.....	13
4.11	Mitigation Measures to Reduce Adverse Environmental Impacts .....	13
<b>5</b>	<b>NOISE MONITORING .....</b>	<b>14</b>
5.1	Monitoring Parameters and Locations.....	14
5.2	Baseline Monitoring .....	15
5.3	Noise Action and Limit Levels.....	15
5.4	Impact Monitoring.....	16
5.5	Reporting .....	16
5.6	Monitoring Methodology .....	16
5.7	Monitoring Equipment .....	17
5.8	Equipment Calibration.....	17
5.9	Noise Mitigation Measures for Construction and Demolition Works .....	17
<b>6</b>	<b>LAND CONTAMINATION.....</b>	<b>19</b>
6.1	Introduction .....	19
6.2	Proposed Remediation Action Plan .....	19
6.3	Potential for Future Land Contamination .....	22
<b>7</b>	<b>WASTE MANAGEMENT .....</b>	<b>24</b>
7.1	Introduction .....	24
7.2	Mitigation of Adverse Environmental Impacts for Construction and Demolition Phase .....	24

7.3	Mitigation of Adverse Environmental Impacts for Operation Phase.....	32
<b>8</b>	<b>LANDSCAPE AND VISUAL IMPACT.....</b>	<b>34</b>
8.1	Introduction .....	34
8.2	Monitoring Requirements.....	34
8.3	Measures to Mitigate Landscape and Visual Impacts.....	34
<b>9</b>	<b>WATER QUALITY .....</b>	<b>35</b>
9.1	Introduction .....	35
9.2	Mitigation of Adverse Environmental Impacts .....	35
<b>10</b>	<b>HAZARD TO LIFE.....</b>	<b>38</b>
10.1	Introduction .....	38
10.2	Recommended Safety Measures.....	38
<b>11</b>	<b>ENVIRONMENTAL AUDITING .....</b>	<b>41</b>
11.1	Auditing/Inspection Approach.....	41
11.2	Compliance with Legal and Contractual Requirements .....	41
11.3	Environmental Complaints.....	42
<b>12</b>	<b>REPORTING .....</b>	<b>43</b>
12.1	General	43
12.2	Baseline Monitoring Report .....	43
12.3	Monthly EM&A Reports .....	44
12.4	First Monthly EM&A Report .....	44
12.5	Subsequent Monthly EM&A Reports.....	45
12.6	Quarterly EM&A Summary Reports .....	47
12.7	Final EM&A Summary Report.....	48
12.8	Data Keeping.....	49
12.9	Interim Notification of Environmental Quality Limit Exceedances.....	49

## APPENDICES

<b>Appendix A</b>	<b>Proposed Project Programme</b>
<b>Appendix B</b>	<b>Environmental Mitigation Implementation Schedule</b>
<b>Appendix C</b>	<b>Event/Action Plan for Action/Limit Level Exceedance (Air and Noise)</b>
<b>Appendix D</b>	<b>Dust and Noise Monitoring Field Log Sheets</b>
<b>Appendix E</b>	<b>Notification of Exceedance Form</b>

### List of Tables

Table 4.1	Air Quality Monitoring Locations.....	8
Table 4.2	Action and Limit Levels for Air Quality .....	10
Table 4.3	Recommended Air Quality Monitoring Equipment .....	12
Table 5.1	Noise Sensitive Receiver Identified as Possible Location for Noise Monitoring .....	14
Table 5.2	Noise Action and Limit Levels.....	15
Table 5.3	Noise Monitoring Equipment.....	17
Table 6.1	Requirements for Supplementary Site Investigations .....	20
Table 6.2	Requirement for Confirmatory Site Investigations .....	20
Table 7.1	Further Contamination Investigation Requirements.....	26
Table 7.2	Proposed Contamination Classification for Ash Waste with DCM/HMCM/PAHCM .....	27
Table 7.3	Demolition, Handling, Treatment and Disposal of Moderately Contaminated DCM and Moderately/Severely Contaminated HMCM / PAHCM.....	28
Table 7.4	Demolition, Handling, Treatment and Disposal of Severely Contaminated DCM .....	29

### List of Figures

Figure 1.1	Project Site Plan
Figure 2.1	Project Organization
Figure 4.1	Sampling Locations for TSP Baseline and Impact Monitoring
Figure 5.1	Representative Noise Monitoring Locations
Figure 6.1	Location of Exploratory Holes
Figure 6.2	Summary of the Remediation Works

## List of Abbreviations

AL	Action/Limit
AR	Architect ' s Representative
Arch SD	Architectural Services Department
ASRs	Air Sensitive Receivers
CAR	Contaminated Assessment Report
CAR	Contamination Assessment Report
CFR	Code of Federal Regulations
CLAP	China Light and Power
CNP	Construction Noise Permit
DGO	Dangerous Goods Ordinance
EIA	Environmental Impact Assessment
EM&A	Environmental Monitoring and Audit
EPD	Environmental Protection Department
ET	Environmental Team
FEHD	Food and Environmental Hygiene Department
HEPA	High Efficiency Particulate Air
HKPSG	Hong Kong Planning Standards and Guidelines
HVS	High Volume Sampling
ICE	Independent Checker (Environmental)
NCO	Noise Control Ordinance
NSRs	Noise Sensitive Receivers
PAH	Polycyclic Aromatic Hydrocarbons
PAHCM,	Polycyclic Aromatic Hydrocarbons Containing Materials
PCB	Polychlorinated Biphenyls
PCBCM	Polychlorinated Biphenyls Containing Materials
RAP	Remediation Action Plan
RAP	Remediation Action Plan
SLMs	Sound Level Meters
TCLP	Toxicity Characteristic Leaching Procedure
TM	Technical Memorandum
TPH	Total Petroleum Hydrocarbon
TPHCM	Total petroleum Hydrocarbon Containing Materials
TSP	Total Suspended Particulates
WPCO	Water Pollution Control Ordinance

## **1 INTRODUCTION**

### **1.1 Purpose of this Manual**

- 1.1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Reprovisioning of Diamond Hill Crematorium 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 Project involves the demolition of the Diamond Hill Crematorium (hereafter referred to as Existing Crematorium) as well as to construct and operate a new crematorium (hereafter referred to as the New Crematorium) *in situ* as a replacement.
- 1.1.2 This Manual outlines the monitoring and audit programme to be undertaken this Project. The Manual aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction, demolition and operation activities.
- 1.1.3 Findings, recommendations and requirements of the EIA, the technical Memoranda and guidelines of all environmentally related legislation comprise the environmental standards and guidelines were used in the preparation of this EM&A Manual.
- 1.1.4 This EM&A Manual contains the followings:
- (a) Duties of the Environmental Team (ET) Leader, the Independent Checker (Environment) (ICE), Architect's Representative (AR) and Contractor, in relation to the Project's environmental monitoring and audit requirements during construction and demolition
  - (b) Information on the Project organization and programming of construction activities
  - (c) The Project construction, demolition and operation schedule and the necessary environmental monitoring and audit programme to track the environmental impacts
  - (d) Definition of Action and Limit levels
  - (e) Establishment of event and action plans
  - (f) Requirements for the review of pollution sources and working procedures in the event of non-compliance of the Project's environmental performance criteria
  - (g) Environmental auditing procedures
  - (h) Requirements for the documentation of environmental monitoring and audit data, and appropriate reporting procedures
- 1.1.5 For the purpose of this Manual, the "Architect" shall refer to the Architect as defined in the Contract. The Architect's Representative (AR), in cases where the Architect's powers have been delegated to the AR, shall be assigned in accordance with the Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

### **1.2 Objectives of EM&A Program**

- 1.2.1 The objectives of carrying out EM&A for the Project are as follows:
- (a) To establish a database of any short or long term environmental impacts of the Project

- (b) To provide an early indication if any of the environmental control measures or practices fail to achieve the acceptable standards
- (c) To monitor the performance of the environmental mitigation measures of the Project and the effectiveness of mitigation measures
- (d) To verify the environmental impacts predicted in the EIA of the Project
- (e) To determine Project compliance with regulatory requirements, standards and government policies
- (f) To take remedial action if unexpected problems or unacceptable impacts arise
- (g) To provide data to enable an environmental audit

### **1.3 Background of the Project**

1.3.1 The Project site is shown in Figure 1.1. The Project site is located along Po Kong Village Road in Diamond Hill, between Hammer Hill Road and Po Leung Lane. To the North of the Project site is an urn cemetery. The Diamond Hill Columbarium lies on the Eastern and Western sides of the Project site. The Northern part of the Project site is higher than the Southern part, making it sloping in nature.

1.3.2 The tentative construction and demolition programme of the Project will be divided into two phases: Phase I (from September 2004 to February 2006) and Phase II (from October 2006 to November 2007). Details of the two Phases of works are as follows:

#### **Phase I**

- (a) Demolition of facilities in Existing Crematorium in the southern side of the Project site, including
  - Existing sitting out area
  - Garden of remembrance
  - Existing building structure, including CLP secondary substation, toilets, pavilion and retaining walls
- (b) Construction of the New Crematorium main facilities, including:
  - One (1) cremator plant room housing six (6) cremators
  - Three (3) fuel tanks (with total capacity of 34,000 L)
  - Two (2) service halls (each can hold 120 people)
  - One (1) pulverizing room
  - One (1) mortuary
  - One (1) office
  - Toilets for public
  - Ancillary service rooms including battery fork lift, transformer and switch room, emergency generator room and joss burners
  - Two (2) automatic transportation systems for coffins and part of an underground service tunnel for coffin circulation
  - Vehicular loading bay for coffin van, coach
  - Landscape area
  - Dangerous goods store
  - Installation of temporary CLP electricity transformer at Phase II boundary

#### **Phase II**

- (c) Demolition of Existing Crematorium main facilities, including:
  - Two (2) service halls

- One (1) cremation room with six (6) cremators
- One (1) transformer room
- One (1) underground oil fuel storage tank (9,092 L)
- One (1) mortuary
- One (1) machine room
- One (1) general store plus water tank
- One (1) dangerous goods store
- One (1) chimney (10 m in height)

(d) Construction of the rest of the New Crematorium, including:

- Two (2) service halls (each can hold 120 people)
- Two (2) automatic transportation systems for coffins and part of an underground service tunnel for coffin circulation
- Vehicular loading bay for coffin van, coach etc.
- Landscape area

1.3.3 The columbarium next to the Project site will remain untouched throughout both Phase I and Phase II.

1.3.4 To handle the cremation demand, operation of the Existing Crematorium will be maintained until the full operation of the New Crematorium main facilities provided under Phase I of the Project. However, to prevent deterioration of environmental performance, in particular air quality, measures are recommended in *Section 4* so as to minimize any cumulative impact.

1.3.5 To maintain continuous electricity supply, a temporary electricity transformer will be installed during Phase I (at Phase II site boundary) before the existing CLP secondary substation is decommissioned. As polychlorinated biphenyls (PCBs) containing materials will not be utilized, no land contamination issues related to the installation, operation, decommission and demolition is expected.

1.3.6 The Architectural Services Department (Arch SD), being the works agent for implementing the project, will be responsible for the demolition of the Existing Crematorium and for constructing the New Crematorium. Upon completion of the construction and demolition works, Food and Environmental Hygiene Department (FEHD) will be responsible for operation of the New Crematorium.

## 1.4 Project Time Table

1.4.1 The proposed programme of the Project is shown in Appendix A.

## 1.5 Structure of this Manual

1.5.1 Following this introductory section, this Manual is set out as follows:

<i>Section 2</i>	describes the organization structure for managing environmental matters of this Project
<i>Section 3</i>	describes key environmental issues of this Project; the implementation schedule for mitigation and management measures
<i>Sections 4 to 6</i>	describe details of baseline and impact monitoring of air quality, noise and water quality; Action and Limit levels, and contingency procedures
<i>Section 7 to 10</i>	describes the proper management practices for waste management, land contamination, visual and landscape aspects as well as hazard to life
<i>Section 11</i>	describes the scope, approach and frequency of site auditing
<i>Section 12</i>	describes the reporting requirements, data keeping requirements, electronic reporting of EM&A information as well as the procedures of the issue of Notification of Exceedances to relevant parties in case exceedance in the measurement result is recorded

## **2 PROJECT ORGANIZATION**

2.1.1 Figure 2.1 presents the organization structure of the Project, identifies key members of the Project Team with environmental responsibilities, and illustrates their lines of communication. Responsibilities of the key Project Team members are described below.

### **2.2 Architect's Representative (AR)**

2.2.1 The AR shall:

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans
- Employ an Independent Checker (Environment) (ICE) to audit the results of the EM&A works carried out by the ET
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 11.3* of this EM&A Manual

### **2.3 The Contractor**

2.3.1 The Contractor shall:

- Employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit
- Provide assistance to ET in carrying out monitoring
- Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plan
- Implement measures to reduce impact where Action and Limit levels are exceeded
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 11.3* of this EM&A Manual

### **2.4 Environmental Team (ET)**

2.4.1 The ET shall:

- Monitor various environmental parameters as required in the EM&A Manual;
- Analyse the EM&A data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising
- Carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems
- Audit and prepare audit reports on the environmental monitoring data and site environmental conditions
- Report on the EM&A results to the ICE, Contractor, the AR and Environmental Protection Department (EPD) or its delegated representative
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 11.3* of this EM&A Manual



## **2.5 Independent Checker (Environment) (ICE)**

### 2.5.1 The ICE shall:

- Review the EM&A works performed by the ET (at not less than monthly intervals)
- Audit the monitoring activities and results (at not less than monthly intervals)
- Audit contaminated soil and materials remediation works to be carried out during demolition
- Report the audit results to the AR and EPD in parallel
- Review the EM&A reports (monthly and quarterly summary reports) submitted by the ET
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 11.3* of this EM&A Manual

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

### **3 KEY ENVIRONMENTAL ISSUES**

3.1.1 The key environmental issues identified by the EIA study that are pertinent to the Project are described below. These issues are to be monitored and/or audited throughout the construction, demolition and operation period. The implementation schedule of mitigation measures is shown in Appendix B.

#### **3.2 Air Quality**

3.2.1 The EIA Study has determined that with effective implementation of the appropriate mitigation measures, the air quality impacts at all Air Sensitive Receivers (ASRs) can comply with established air quality acceptable criteria. Monitoring and audit are required in construction, demolition and operation stages.

#### **3.3 Noise**

3.3.1 The EIA Study has determined that effective implementation of the appropriate mitigation measures can reduce noise levels at all Noise Sensitive Receivers (NSRs) to within established limits. Monitoring and audit are required in construction and demolition stages.

#### **3.4 Land Contamination**

3.4.1 The site investigation carried out under the Contamination Assessment Plan (CAP) endorsed by EPD revealed that soil remediation at locations S3 and S5 is required. Relevant remediation methodology is recommended in Contamination Assessment Report and Remediation Action Plan (CAP/RAP). Supplementary site investigation of soil at CLP secondary substation during Phase I of the works is recommended to assess whether there is any contamination of polychlorinated biphenyls (PCB) or total petroleum hydrocarbon (TPH) (diesel range).

3.4.2 In addition, confirmatory site investigation is also recommended for:

- Soil samples at locations S1 to S6 during Phase II for dioxin, heavy metals and polyaromatic hydrocarbons (PAH)
- Soil samples underneath underground fuel tank during Phase II (if visual or olfactory evidence of fuel contamination is identified) for TPH.

3.4.3 Site investigations are required during demolition stage, while audits are required. The current results of the land contamination assessment showed that with effective implementation of appropriate mitigation measures, impact from handling contaminated soil would not become unacceptable.

#### **3.5 Waste Management**

3.5.1 Wastes generated from this Project during construction and demolition works include excavated material, construction and demolition waste, contaminated materials (including asbestos containing materials (ACM), dioxin containing materials (DCM), heavy metal containing materials (HMCM), polyaromatic hydrocarbons containing materials (PAHCM), total petroleum hydrocarbon containing materials (TPHCM) and polychlorinated biphenyls containing materials (PCBCM)), chemical waste and general refuse. Additional site investigation at cremator room is proposed and relevant mitigation measures were recommended. Audit is required during construction and demolition stages. The EIA Study has determined that with effective implementation of the appropriate mitigation measures, impact from these wastes would not become unacceptable.

### **3.6 Water Quality**

- 3.6.1 The EIA Study has determined that with effective implementation of the appropriate mitigation measures, water quality near the Project site can be maintained within established limits. No monitoring and audit work is required.

### **3.7 Landscape and Visual Issues**

- 3.7.1 The EIA Study has determined that with effective implementation of the appropriate mitigation measures, the landscape and visual impacts would not become unacceptable. Monitoring and audit works are required during construction stage as well as during the first year of operation stage.

### **3.8 Hazard to Life**

- 3.8.1 The EIA Study has determined that with effective implementation of the safety/precautionary measures, the hazard level will be kept to minimal. No monitoring and audit work is required.

## 4 AIR QUALITY MONITORING

### Monitoring During Construction and Demolition Phases

#### 4.1 Monitoring Parameters and Locations

- 4.1.1 In this Project, environmental impacts are expected from construction and demolition activities and representative monitoring locations are to be established in the vicinity.
- 4.1.2 Monitoring and audit of the Total Suspended Particulates (TSP) levels shall be carried out by the ET during construction and demolition phases and ensure that any deteriorating air quality can be readily detected and timely action taken to rectify the situation.
- 4.1.3 TSP levels of in 1-hr and 24-hr shall be measured to indicate the impacts of construction dust on air quality. TSP levels shall be measured by following the standard high volume sampling (HVS) method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B.
- 4.1.4 Upon approval from the AR/ICE, 1-hr TSP can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short events impacts.
- 4.1.5 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the construction site etc. shall be recorded in detail. The sample monitoring field log is shown in Appendix D.
- 4.1.6 The location is listed in Table 4.1 below.

Table 4.1 Air Quality Monitoring Locations

ASR No.	Station I. D.	Description	Air Quality Monitoring and Methodology
A8	TSP-1	Po Leung Kok Grandmont Primary School, near the north tip of the construction site	Monitoring of 1-hour and 24-hour TSP levels in accordance with 40 CFR 50 App B.
A17	TSP-2	Staff Quarters of Diamond Hill Crematorium, near the south tip of the construction site	

- 4.1.7 The said monitoring location is shown in Figure 4.1. The status and locations of dust sensitive receivers may change after issuing this manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from AR/ICE and agreement from EPD on the proposal.
- 4.1.8 The following criteria, as far as practicable, should be followed when alternative monitoring locations are proposed, in that position should be:
- At the site boundary or such locations close to the major dust emission source
  - Close to the sensitive receivers
  - Take into account the prevailing meteorological conditions
- 4.1.9 The ET Leader shall agree with the AR/ICE on the position of the HVS for installation of the monitoring equipment. The following points shall be considered when positioning the samplers.
- A horizontal platform with appropriate support to secure the samplers against gusty wind should be provided

- No two samplers should be placed less than 2 metre apart
- The distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler
- A minimum of 2 metres of separation from any supporting structure, measured horizontally is required
- No furnace or incinerator flue is nearby
- Airflow around the sampler is unrestricted
- The sampler is more than 20 metres from the dripline
- Any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring
- Permission must be obtained to set up the samplers and to obtain access to the monitoring stations
- A secured supply of electricity is needed to operate the sampler

## 4.2 Baseline Monitoring

### Baseline Monitoring for Construction/Impact

- 4.2.1 Baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days shall be conducted prior to the commencement of the construction/demolition works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be conducted at least three times per day while the highest dust impact is expected. A schedule on the baseline monitoring shall be submitted to AR/ICE for approval before the monitoring starts.
- 4.2.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.
- 4.2.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the AR/ICE and agreed with EPD.
- 4.2.4 In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD to agree on an approved set of data to be used as a baseline reference and submit to AR/ICE for approval.
- 4.2.5 Ambient conditions may vary seasonally and shall be reviewed at six month's intervals. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring shall be carried out 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 ICE and EPD.

## 4.3 Air Quality Action and Limit Levels

- 4.3.1 Air quality Action Levels are to be established from baseline monitoring results. Subsequent impact monitoring results are to be compared against the Action and Limit Levels. Table 4.2 presents the methodology for determining Action Levels. The Limit Levels are also listed in this Table.
- 4.3.2 Exceedance of Action Level during construction impact monitoring would indicate that environmental quality is deteriorating. Exceedance of Limit Level during construction impact monitoring would indicate that environmental quality has become unacceptable. Procedures for responding to exceedance of Action and Limit levels are described in *Sections 4.4* and *12.9*.

**Table 4.2 Action and Limit Levels for Air Quality**

<i>Parameter</i>	<i>Action Level</i>	<i>Limit Level</i>
24-hr. TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action level = (average of baseline level plus 30% + Limit level)/2 For baseline level $> 200 \mu\text{g}/\text{m}^3$ , Action level = Limit Level	260
1-hr. TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = (average of baseline level plus 30% + Limit level)/2 For baseline level $> 384 \mu\text{g}/\text{m}^3$ , Action level = Limit Level	500

#### **4.4 Impact Monitoring**

- 4.4.1 The ET shall conduct impact monitoring during the course of the construction and demolition works. Regular monitoring is to be performed once every six days. Regular monitoring consists of one set of 24-hr TSP and three sets of 1-hr TSP sampling on a six-day cycle basis. The specific time to start and stop the 24-hr TSP monitoring shall be clearly defined for each location and be strictly followed by the operator.
- 4.4.2 Weather monitoring of wind speed and wind direction during the course of air quality monitoring shall be carried out by setting up weather station monitor at the vicinity of the site. The location of the weather station monitor is proposed to be at the site office in the future, which is to be approved from the AR and agreed from ICE.
- 4.4.3 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Event/Action Plan in Appendix C, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

#### **4.5 Reporting**

- 4.5.1 Monitoring data (including the monitoring field logs, measurement raw data and calculations) is to be reviewed by the designated personnel appointed by the ET Leader. The duly checked monitoring results are to be provided by the ET to the Contractor via fax or e-mail for submission to Arch SD within seven working days after the completion of measurement. In case of the receipt of measurement exceedances, the ET Leader shall issue the Notification of Exceedances in accordance with the requirements as shown in *Section 12.9* of the Manual. Monthly EM&A reports prepared by ET shall be submitted to Arch SD within five working days of the end of the reporting month. The details of the EM&A report are shown in *Section 12* of this Manual.

## **4.6 Monitoring Methodology**

- 4.6.1 24-hr TSP level is to be measured in accordance with the standard high volume sampling method as set out in Title 40 of the Code of Federal Regulations (40CFR), Chapter 1 (Part 50), Appendix B. This method involves the drawing of air at a controlled rate into a high volume sampler (HVS) fitted with a pre-conditioned and pre-weighted filter paper of size 8" x 10". After sampling for 24 hours, the filter paper with retained particles is to be folded in half lengthwise, placed in a labelled plastic bag and returned to the ET's laboratory for drying in a desiccator before being weighed on an electronic balance with accuracy to 0.1 mg. The 24-hr TSP levels are then calculated from the ratio of the mass of particles retained on the filter paper to the total volume of air sampled. All the collected samples shall be kept in good condition for 6 months before disposal.
- 4.6.2 1-hr TSP level is to be measured with a hand-held real time aerosol monitor subject to the approval of ICE. This meter uses optical sensors to analyze the incoming air stream, providing real time readout of particulate concentrations.
- 4.6.3 The wind sensors for wind speed and wind direction monitoring shall be installed at an elevated level so that they are clear of obstructions or turbulence caused by the buildings. The wind data shall be captured by a data logger and to be downloaded for processing at least once per month. In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data upon approval from the AR and agreement from the AR and agreement from the ICE.
- 4.6.4 Field information such as general meteorological conditions and any significant adjacent dust producing sources at each monitoring location are to be recorded during monitoring.
- 4.6.5 Monitoring field log sheets for 1-hr and 24-hr TSP are documented in Appendix D.

## **4.7 Monitoring Equipment**

- 4.7.1 TSP levels of 1-hr and 24-hr shall be measured with high volume samplers conforming to the standard high volume sampling method as set out in Title 40 of the Code of Federal Regulations (40CFR), Chapter 1 (Part 50), Appendix B.
- 4.7.2 If the ET Leader proposes to use direct-reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the AR/ICE to prove that the instrument is capable for achieving a comparable result with that of the HVS to confirm that it may be used for the 1-hr sampling. The instrument should also be calibrated regularly, and the 1-hr sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by a direct reading method.
- 4.7.3 Wind data monitoring equipment shall also be provided and set up at strategic locations for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET Leader and agreed with AR/ICE. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- The wind sensors should be installed on masts at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings
  - The wind data should be captured by a data logger and to be downloaded for processing at least once a month
  - The wind data monitoring equipment should be re-calibrated at least once every six months
  - Wind direction should be divided into 16 sectors of 22.5 degrees each
- 4.7.4 In exceptional situations, the ET Leader may propose alternative methods to obtain representative wind data upon approval from the AR and agreement from EPD.
- 4.7.5 Details of the recommended monitoring equipment are given in Table 4.3.

**Table 4.3 Recommended Air Quality Monitoring Equipment**

<i>Parameter</i>	<b>Equipment Model</b>
24-hr TSP Measurement	GRASEBY GMWS-2310-105 High Volume Air Sampling System
1-hr TSP Measurement	GRASEBY GMWS-2310-105 High Volume Air Sampling System, or portable dust meter, subject to the approval AR/ICE

**4.8 Laboratory Measurement / Analysis**

- 4.8.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory is preferably be HOKLAS accredited.
- 4.8.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory for TSP is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ICE/AR and the measurement procedures shall be witnessed by the ICE/AR. The ET Leader shall provide the AR with one copy of Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.
- 4.8.3 Filter paper of size 8” x 10” shall be labelled before sampling. It shall be a clean filter paper with no pin holes, and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighted before use of the sampling.
- 4.8.4 After sampling, the filter paper, loaded with dust, shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 4.8.5 All the collected samples shall be kept in good condition for six months before disposal.

**4.9 Equipment Calibration**

- 4.9.1 High volume samplers are to be calibrated with orifice calibrator. Five-point calibration is to be carried out on a bi-monthly basis, after the replacement of carbon brush or after installation. Orifice calibrator shall be calibrated with recognized primary standard at annual basis. For the handheld real-time aerosol monitor, calibration is to be conducted on a monthly basis or in accordance with the frequency as stipulated in the manual provided by the manufacturer, as appropriate. The electronic balance used for the weighing of filter paper is to be calibrated regularly with a traceable weight standard. The wind data monitoring equipment shall be re-calibrated once every six months. Calibration records maintained by the ET are to be included in the monthly EM&A reports and available for inspection.



#### **4.10 Operation Monitoring**

4.10.1 Crematorium is defined as Specified Process under the Air Pollution Control Ordinance, a Specified Process (SP) Licence has to be obtained from EPD. Furthermore, the operation of the New Crematorium should comply with the requirements of “*A Guidance Note on the Best Practicable Means for Incinerators (Crematoria)*”, BPM 12/2, EPD. The operator shall carry out regular monitoring of chimney emission in accordance with the requirements of BPM and the future SP Licence. The air pollution monitoring programme shall be determined according to the requirements of BPM and the SP License with the approval of ICE and EPD.

#### **4.11 Mitigation Measures to Reduce Adverse Environmental Impacts**

4.11.1 According to the EIA Report on the Project, a number of mitigation measures are required for the construction, demolition and operations phases. The recommended mitigation measures are summarized as follows:

##### **Construction and Demolition Works of Phase I & II**

4.11.2 The fugitive dust emission would be the most significant impact to the air quality during the Phase I and Phase II Construction and Demolition Works. According to the Air Pollution Control (Construction Dust) Regulation, the following mitigation measures should be implemented:

- Erect a site barrier with the height of no less than 2.4 m to enclose the construction site
- Apply frequent water spraying to ensure the surface of the construction site sufficiently wet to reduce fugitive dust due to wind erosion and transportation on unpaved haul road
- Cover up stockpiles of fill material and dusty material
- Install a vehicle-cleaning system at the main entrance of the construction site to clean up the vehicles before leaving the site

##### **Commissioning and Operation of Phase I Crematorium**

4.11.3 The proposed new cremators would be designed with advanced technology in combustion as well as equipped with appropriate air pollution control system, the chimney emissions would not impose significant impact on the nearby environment. The most important mitigation measures would be ensuring proper operation and maintenance of the New Crematorium and the air pollution control system. In case of failure of any part of the cremator system, suspend the operation and rectify the failure as soon as possible.

4.11.4 There would be no more than six cremators (existing or new) in simultaneous operation during the testing and commissioning of the new cremator system in order to avoid imposing additional air pollutants to the atmosphere.

## 5 NOISE MONITORING

### 5.1 Monitoring Parameters and Locations

- 5.1.1 In this Project, environmental impacts are expected from construction and demolition activities at the site areas. Noise mitigation and preventive measures are recommended in the EIA report to reduce potential impacts to the acceptable limits. This section addressed the monitoring parameters as well as the representative monitoring locations selected for baseline measurement and evaluation of the performance of the proposed measures.
- 5.1.2 The construction and demolition noise shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{Aeq}$ ).  $L_{eq(30min)}$  shall be used as the monitoring parameters for the time period between 0700 – 1900 hours on normal weekdays. For all other time periods,  $L_{eq(5min)}$  shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.
- 5.1.3 According to the EIA report, three (3) representative Noise Sensitive Receivers (NSR) in vicinity to the project site have been identified as the possible location for conducting noise monitoring of the baseline during the construction and demolition works. The location is listed in Table 5.1 below.

Table 5.1 Noise Sensitive Receiver Identified as Possible Location for Noise Monitoring

Monitoring Location	Monitoring Parameters	Description	Frequency	Measurement Condition
SR 3	$L_{Aeq}$	(New school under construction) Po Kong Village Road School Village	Once every week during the construction and demolition period	Facade measurement facing the project site
SR 4	$L_{Aeq}$	Po Leung Kuk Grandmont Primary School	Once every week during the construction and demolition period	Facade measurement facing the project site
SR 6	$L_{Aeq}$	Staff Quarter for Diamond Hill Crematorium, Tsz Wan Shan	Once every week during the construction and demolition period	Facade measurement facing the project site

- 5.1.4 The said monitoring locations are shown in Figure 5.1.
- 5.1.5 The status and locations of noise sensitive receivers may change after issuing this Manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from AR/ICE and agreement from EPD for the proposal.
- 5.1.6 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria in that they should be:
- At locations close to the major site activities which are likely to have noise impacts
  - Close to the noise sensitive receivers
  - For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring

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

**5.2 Baseline Monitoring**

5.2.1 Prior to the commencement of the site works of the Project, baseline monitoring shall be conducted for seven consecutive days at each monitoring location to determine pre-construction/demolition ambient noise level in terms of A-weighted equivalent continuous sound pressure levels ( $L_{Aeq}$ ) measured in decibels (dB). Continuous  $L_{Aeq(30min)}$  for hours between 0700 – 1900 hrs shall be taken. From the measurements, statistical sound levels  $L_{10}$  and  $L_{90}$  respectively are to be derived. A schedule on the baseline monitoring shall be submitted to AR/ICE for approval before the monitoring starts.

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

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

**5.3 Noise Action and Limit Levels**

5.3.1 The applicable noise Action and Limit Levels for all monitoring locations in this Project are listed in Table 5.2.

5.3.2 Exceedance of the Action Levels during the construction and demolition phases would indicate that environmental quality is deteriorating. Exceedance of the Limit Levels during the construction and demolition phases would indicate that environmental quality has become unacceptable. Procedures for responding to exceedance of Action and Limit levels are described in *Section 12.9*. Necessary mitigation measures are shown in *Section 5.9*.

Table 5.2 Noise Action and Limit Levels

<b>Time Period</b>	<b>Action Level</b>	<b>Limit Level</b>
0700 - 1900 hours on weekdays	When one documented complaint is received	75 dB(A) for Residential Premises; 70 dB(A) for Schools <sup>(1)</sup>

Note: (1) Reduced to 65 dB(A) during school examination periods

## 5.4 Impact Monitoring

- 5.4.1 The ET shall conduct impact monitoring during the course of the construction and demolition works. Regular monitoring shall be performed once every week. For monitoring of construction/demolition works undertaken between 0700 - 1900 hours, Monday to Saturday, six sets of consecutive 5-minute noise measurements in terms of  $L_{Aeq}$  (as six consecutive  $L_{Aeq, 5 \text{ min}}$  readings) levels are to be taken <sup>1</sup>. From the measurements, two statistical sound levels  $L_{10}$  and  $L_{90}$  are to be derived respectively. Considering the close vicinity of the schools, noise monitoring for these nearby school premises during the examination periods shall be conducted. The ET shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination period during the course of the Project. In addition, the ET shall note that general construction or demolition works carried out within the restricted hours is controlled by Construction Noise Permit (CNP) system under the Noise Control Ordinance.
- 5.4.2 In case of non-compliance with the construction criteria, more frequent monitoring as specified in the Event/Action Plan in Appendix C shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction/demolition activities.

## 5.5 Reporting

- 5.5.1 Monitoring data (including the monitoring field logs, measurement raw data and calculations) is to be reviewed by the designated personnel appointed by the ET Leader. The duly checked monitoring results are to be provided by the ET to the Contractor via fax or e-mail for submission to Arch SD within one working day after the completion of measurement. In case of the receipt of measurement exceedances, the ET Leader shall issue the Notification of Exceedances in accordance with the requirements as shown in *Section 12.9* of the Manual. Monthly EM&A reports prepared by ET shall be submitted to Arch SD within five working days of the end of the reporting month. The details of the EM&A report are shown in *Section 12* of this Manual.

## 5.6 Monitoring Methodology

- 5.6.1 Impact monitoring shall be carried out at the designated monitoring stations during construction and demolition works of the Project. The regular monitoring frequency of each station on a basis of once every week when noise-generating activities are underway is as follows:
- One set of  $L_{Aeq (30min)}$  as six consecutive  $L_{Aeq (5min)}$  between 0700 – 1900 hours on normal weekdays
- 5.6.2 Noise measurement shall be carried out at the assessment point located under facade conditions. Field information such as general meteorological conditions and any dominant noise sources at each monitoring location are to be recorded during monitoring. Wind speed measurements are to be taken with a portable wind speed meter during monitoring. Noise measurement is not to be conducted under a steady wind exceeding 5m/s or gust exceeding 10 m/s. Noise monitoring shall not be conducted in the presence of fog and rain as well.
- 5.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event/Action Plan in Appendix C shall be carried out. This additional monitoring shall be continued until the noise problems levels are rectified or proved to be irrelevant to the construction activities.
- 5.6.4 Monitoring field log sheet for noise is documented in Appendix D.

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<sup>1</sup>It should be noted that general construction works during restricted hours (1900-0700 hrs, Monday to Saturday and at any time on Sundays and public holidays) are controlled by Construction Noise Permit system under Noise Control Ordinance.

## 5.7 Monitoring Equipment

- 5.7.1 As referred to in the Technical Memorandum (TM) issued under the NCO, sound level meters (SLMs) are to comply with specifications of the International Electrical Commission Publication 651:1979 (Type 1) and 804:1995 (Type 1). Wind shield is to be fitted on the monitor during use.
- 5.7.2 Details of the recommended monitoring equipment are given in Table 5.3.

Table 5.3 Noise Monitoring Equipment

Equipment Function	Equipment
Noise Level Measurement	RION Precision Integrating Sound Level Meter NL-14 or equivalent
Calibration of Sound Level Meter	RION NC-73 Sound Level Calibrator or equivalent
Wind Speed Measurement	SPER SCIENTIFIC Anemometer 840003 or equivalent

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

## 5.8 Equipment Calibration

- 5.8.1 Before and after each measurement, the reading of SLM is to be checked with the acoustic calibrator and the measurements can only be accepted as valid if the calibration levels from before and after the noise measurement agree to within 1.0 dB. Also, calibrations of the SLM and acoustic calibrator are to be carried out annually. Calibration records maintained by the ET are to be included in the monthly EM&A Reports and available for inspection.

## 5.9 Noise Mitigation Measures for Construction and Demolition Works

- 5.9.1 The predicted noise levels in the EIA report show that both Phase I and II construction and demolition works would give rise to adverse daytime noise impacts to some of the NSRs, practicable mitigation measures to alleviate noise impact are required and outlined below.

### Selection of Quiet Plant

- 5.9.2 Quiet plant is defined as PME with a sound power level lower than that specified in GW-TM. Examples of quiet plant can be referred to those listed in British Standard BS5228. Various items of silenced plant are available in Hong Kong. However, the Noise Control Authority, when processing a CNP application, would refer to the noise levels stipulated in the relevant TM unless the noise emission of the claimed quiet plant can be validated by certificate or demonstration.
- 5.9.3 Since the use of quiet plant is generally considered to be one of the most effective ways of alleviating construction/ demolition noise, this control measures is recommended as the first level mitigation (Mitigation 1) for the construction/ demolition works.

### **Use of Movable (Mobile) Barriers**

- 5.9.4 Where practicable, movable (mobile) barriers can be used to screen NSRs from particular items of plant or noisy operations. Movable barriers of 3 to 5 m height with a small cantilevered upper portion and skid footing can be located within a few metres from a stationary plant (e.g. generator, compressor, etc.) and within about 5 m for a mobile equipment (e.g. breakers, excavator, etc.), such that the line of sight to the NSRs is blocked by the barriers. It would be possible for the Contractor to provide purpose-built noise barriers or screens constructed of appropriate material with a minimum superficial density of 15 kg/m<sup>2</sup> located close to the operating equipment.
- 5.9.5 For those activities which still potentially affect the NSRs after applying the quiet plant, the use of movable (mobile) noise barriers on the construction equipment is recommended as the second level mitigation (Mitigation 2). Such mitigation should be applied to the site activities that are in close proximity to NSRs, specifically to SR3 (the new school), SR4 (Po Leung Kuk Grandmont Primary School) and SR6 (Staff Quarter for Diamond Hill Crematorium) during the site formation works of Phase I and II and demolition works in Phase II.

### **Good Site Practice**

- 5.9.6 Good site practice and noise management can be readily applied and achieve additional reductions in the construction noise emissions, which include:
- Only well-maintained plant should be operated on site and plant should be regularly serviced during the construction works
  - Plant that is used intermittently, should be turned off or throttled down when not in active use
  - Plant that is known to emit noise strongly in one direction should be oriented to face away from NSRs
  - Silencers, mufflers and enclosures for plant should be used where possible and maintained adequately throughout the works
  - Where possible mobile plant should be sited away from NSRs
  - Stockpiles of excavated materials and other structures such as site buildings should be used effectively to screen noise from the works

## **6 LAND CONTAMINATION**

### **6.1 Introduction**

- 6.1.1 Desk-top review and site walkover survey carried out during the EIA study have identified potential locations of contaminated land. No areas of extensive contamination were found, with the main areas of concern being the fuel storage tank, dangerous goods store, CLP secondary substation, cremators and former crematorium.
- 6.1.2 The CAP has been submitted and endorsed by EPD and the site investigation was carried out in March 2003. Subsequent laboratory analysis was completed and contamination of lead and tin was found in locations S3 and S5. The results of site investigation is reported in Contaminated Assessment Report (CAR) and relevant remediation measures were recommended in Remediation Action Plan (RAP) and listed below.
- 6.1.3 All remediation actions as recommended in the RAP shall be fully implemented. No work on the identified potentially contaminated sites shall be carried out unless and until the RAP has been approved by the EPD.

### **6.2 Proposed Remediation Action Plan**

#### **Extent of Contamination**

- 6.2.1 The assessment criteria for certain metals were exceeded in 2 surface samples, taken from S3 (lead and tin) and S5 (tin only).
- 6.2.2 In accordance with ProPECC Note PN 3/94, remedial works are required in the areas where contamination has been identified.
- 6.2.3 The remaining samples showed no evidence of metal or organic contamination, suggesting that the two samples where contamination was present represent isolated hot-spots. It should be noted that the concentrations of lead and tin in these two samples, whilst exceeding the Dutch B Level, are below the Dutch C Level, and are therefore not indicative of severe contamination.
- 6.2.4 It has been assumed that the contamination observed at S3 and S5 extends to a depth of 0.5m below surface, and within a radius of 5m from each location. The total volume of affected soil is therefore estimated at  $0.5 \times 5 \times 5 \times 3.14 =$  approximately  $40 \text{ m}^3$  in each location, giving a total of  $80 \text{ m}^3$  for the two locations.

#### **Removal of Underground Fuel Tank**

- 6.2.5 During removal of the underground fuel storage tank, appropriate precautions should be taken to avoid contamination. All fuel tanks and associated pipework should be emptied prior to any demolition work being undertaken. Any remaining sludge or sediment in the tanks or pipework should be removed and disposed of as chemical waste in accordance with the appropriate regulations for disposal of such material.
- 6.2.6 The base of the excavations will be inspected by a suitably experienced environmental specialist in order to determine whether there is any visual or olfactory evidence of fuel contamination. If such contamination is suspected, then confirmatory soil sampling will be carried out, and the samples analysed for TPH.

### Supplementary Investigations

6.2.7 As the CLP secondary substation is not available for site investigation, the scope of supplementary investigations is to recover soil samples from around the CLP substation during the Phase I works. Once access to these areas is available, a sampling and analysis plan should be prepared for approval by EPD, additional investigations will take place, and the need for remedial works will be determined. The requirements for testing are summarized in Table 6.1 below.

Table 6.1 Requirements for Supplementary Site Investigations

Location	Parameters to be Tested
CLP Secondary Substation: (soil samples) During Phase I	Polychlorinated biphenyls (PCBs) Total petroleum hydrocarbon (TPH) (diesel range)

6.2.8 In addition, as the Existing Crematorium will not be demolished until 2006, confirmatory site investigations are also recommended and are shown in Table 6.2.

Table 6.2 Requirement for Confirmatory Site Investigations

Location	Parameters to be Tested
Locations S1 to S6: (soil samples) During Phase II	Dioxin Heavy metal (Dutch "B" List) Polycyclic aromatic hydrocarbon (PAH)
Underneath underground fuel tank (if visual or olfactory evidence of fuel contamination by experienced environmental specialist) (soil samples) During Phase II	Total petroleum hydrocarbon (TPH) (diesel range)

6.2.9 The locations of S1 to S6 is provided in Figure 6.1.

### Objectives of Remediation Works

6.2.10 The objectives of the remediation works are to remove contamination from those areas where concentrations of contaminants exceed the Dutch B Levels.

### Design and Implementation of Remediation Works

6.2.11 Possible remedial techniques for treating soil contaminated with metals include;

- Landfill disposal
- Solidification/Stabilisation

6.2.12 Since the likely volume of soil that is contaminated is small (less than 100m<sup>3</sup>), it is considered that landfill disposal is the most appropriate remedial technique.

6.2.13 The remedial works will consist of removing soil from an area of 5m radius around sample locations S3 and S5, to a depth of 0.5m, and disposing of this material to landfill.

6.2.14 Toxicity Characteristic Leaching Procedure (TCLP) testing has been undertaken, and the concentrations of lead and tin in the TCLP tests were several orders of magnitude lower than the Landfill Disposal Criteria. Hence pre-treatment of the soil prior to landfill disposal is not deemed necessary. Further TCLP testing (for the full suite of parameters listed in Table E1 of EPD/TR1/99) will be carried out on the confirmatory samples recovered from locations S1-S6 after decommissioning of the crematorium in 2006, for those samples which require landfill disposal.



6.2.15 Remediation site investigation will be carried out following excavation at locations S3 and S5, in order to confirm that all contaminated material has been removed. The remediation site investigation will consist of five samples in each location, situated immediately to the north, south, east and west of S3 and S5, and at the base of the excavation, to be analysed for lead and tin. If the results of analysis are less than the Dutch B Levels, no further excavation will be required. If the concentrations exceed the Dutch B Level, then the area of excavation should be extended, and further confirmatory testing should be carried out following this excavation. In this event, the area of excavation should be extended by a further 5m radius in the quadrant where the contaminated sample is encountered, or by a further 0.5m depth if the contaminated sample is from the base of the excavation. This procedure should be followed until no further contamination is encountered. A schematic presentation of the proposed remedial works is shown in the Figure 6.2.

### **Potential Additional Remedial Requirements**

- 6.2.16 Should contamination be encountered beneath the fuel tank or the CLP secondary substation, further remedial work will be required. Such potential contamination would consist of either TPH (in the case of the fuel tank) or PCBs (in the case of the CLP substation).
- 6.2.17 Although there is no evidence to date of contamination associated with the fuel tank, and the drillholes around the fuel tank do not indicate contamination, there is the possibility that the material directly underlying the fuel tank may be contaminated with TPH. A realistic worst case estimate is that the volume of contaminated material would no more than 105m<sup>3</sup> (i.e. approximately 7m x 5m x 3m depth). For this volume of material, treatment by bioremediation is likely to be uneconomic, and the recommended remedial strategy would be landfill disposal. The actual remedial strategy to be adopted is subject to the findings of the supplementary investigations.
- 6.2.18 The likelihood of significant widespread PCB contamination beneath the substation is considered to be low, due to the low mobility of PCBs in the environment and the low likelihood of a spillage occurring. As a realistic worst-case estimate, it could be assumed that less than 25m<sup>3</sup> (i.e. 5m x 5m x 1m depth) of material could be contaminated, and may require stabilisation with cement prior to disposal to landfill. The actual remedial strategy to be adopted is subject to the findings of the supplementary investigations.

### **Particular Requirements for Remedial Works**

#### Health and Safety Precautions

- 6.2.19 The site workers engaged in the remedial works should be provided with adequate personal protective equipment, which should include:
- Protective footwear;
  - Gloves;
  - Dust masks; and
  - Overalls.
- 6.2.20 A clean area should be provided, equipped with washing facilities. Eating, drinking and smoking should only be permitted within designated “clean” areas after washing. Excavated material should not be stockpiled, but should immediately be treated/transported to landfill on a daily basis.

Avoidance of Impacts on Water Quality

- 6.2.21 In order to avoid impacts on water quality during remedial works, care will be taken to minimize the mobilisation of sediment during excavation and transport. Measures to be adopted will be based on the recommendations set out in Practice Note for Professional Persons ProPECC PN1/94 “Construction Site Drainage”. The results of the site investigation suggest that there is unlikely to be any requirement for dewatering of excavations, since groundwater was not encountered in any of the exploratory holes.
- 6.2.22 The contractor carrying out the remedial works will be required to submit a method statement detailing the measures to be taken to avoid water quality impacts. Typical measures would include;
- Carry out the works during the dry season (i.e. October to March) if possible;
  - Use bunds or perimeter drains to prevent run-off water entering excavations;
  - Sheet or otherwise cover excavations whenever rainstorms are expected to occur;
  - Minimise the requirements for stockpiling of material and ensure any stockpiles are covered;
  - Temporary on-wit stockpiling of contaminated materials should be avoided, and all excavated contaminated soils/materials should be disposed of on a daily basis;
  - Ensure that any discharges to storm drains pass through an appropriate silt trap.

Waste Disposal Requirements

- 6.2.23 An application for permission to dispose of excavated material should be made to the Facilities Management Group of EPD three months prior to disposal. A “trip-ticket” system should be implemented.
- 6.2.24 Each load of contaminated soil despatched to landfill should be accompanied by an admission ticket.
- 6.2.25 Vehicles leaving the site should be adequately sheeted to prevent dispersion of contaminated material during transport. The wheels of vehicles should be cleaned prior to leaving site, to prevent contaminated material leaving site on the wheels of vehicles.

Compliance Report

- 6.2.26 Following completion of remediation works, a Remediation Report should be compiled and submitted, to demonstrate that the remediation works have been carried out in accordance with the Remediation Action Plan. The Remediation Report should include details of the excavation works carried out, records of material taken to landfill, and results of confirmatory testing, and should be submitted to EPD for approval before the commencement of building works.

**6.3 Potential for Future Land Contamination**

- 6.3.1 The proposed development is a replacement for the Existing Crematorium. There is the potential for the development to give rise to land contamination in the future, if appropriate environmental standards are not followed.
- 6.3.2 The most potentially significant future sources of contamination are:
- Spills or leakage of fuel stored for the cremators; and
  - Aerial deposition of metals and dioxins.
- 6.3.3 Provided the crematorium complies with the prescribed air emissions limits, it is considered very unlikely that aerial deposition would give rise to significant land contamination, due to the very small quantities of metals and dioxins that would be emitted.

6.3.4 The fuel storage facilities to be provided in the New Crematorium should be constructed, maintained and inspected in accordance with the provisions of the Dangerous Goods (General) Regulations (Cap. 295B) and the guidelines presented in “Guidance for the Design, Construction, Modification and Maintenance of Petrol Filling Stations” (Institute of Petroleum, 1999), and with the necessary approvals from the Fire Services Department. To mitigate the environmental impacts from operational land contamination, the following mitigation measures shall be implemented for installation and operation of any underground fuel tanks:

- The underground fuel tank(s) shall be of a specified durability and placed within a concrete pit to avoid direct contact of the tank surface with soil.
- The concrete pit shall be accessible to allow tank integrity test be carried out on an annual basis, or when deemed necessary by an independent qualified surveyor or structural engineer. Any potential problems such as potential cracking shall be rectified as far as practicable.
- Diesel fuel pipelines are preferably to be installed above ground. If underground piping is unavoidable, concrete lined trenches shall be constructed to contain the pipelines. The distance between the cremators and the underground tanks shall be minimized as appropriate to avoid the need for long pipelines.
- Proper installation and use of meters (e.g. at the two ends of any pipeline) would allow any unexpected pressure drop or difference and signs of leakage be detected from routine inspection or during diesel fuel pumping. Any identified leakage shall be reported to the plant manager in-charge.
- Any spillage of fuel shall be removed immediately by portable pump when the quantity is large or by absorbing materials when the quantity is low or with similar effective tools as appropriate. Used absorbing material shall be properly stored and disposed of as chemical waste.
- The underground tanks refueling (from tank trucks) shall only be undertaken by authorized staff of the fuel company using the company's standard procedures to avoid spillage of diesel fuel.

## **7 WASTE MANAGEMENT**

### **7.1 Introduction**

7.1.1 The Contractor shall be responsible for waste control within the Project, removal of the waste material produced from the site and implementation of any mitigation measures to minimise waste or redress problems arising from waste generated on the site during the construction and demolition phases. The waste materials may include excavated material, construction and demolition material, contaminated materials, chemical waste and general refuse.

7.1.2 When handling the waste materials, the following measures shall be undertaken:

- The Contractor should incorporate recommendations into a comprehensive on-site Waste Management Plan (WMP), which is to be submitted to the EPD for approval within one month after commencement of construction and demolition work. This should include all factors dependent on individual works sites including designation of areas for the segregation and temporary storage of materials for future use or recycling. Such provision cannot be specified at this stage. The Contractor should follow the recommendations of WBTC No. 29/2000 for on-site separation of waste, and 21/2002 for trip-ticket system for disposal of construction and demolition material. The WMP shall also define clearly the hierarchy for waste management on and off-site as well as a complete list of mitigation measures for handling excavated works.
- Under the proposed scheme, the Contractor would be required to separate wastes to ensure maximum reuse of materials and minimise adverse impact on the environment.

7.1.3 During the operation phase, FEHD shall be responsible for the management of waste materials, which include ash and non-combustible residues, chemical waste and general refuse.

7.1.4 The environmental mitigation measures for waste management during the construction and demolition phase as well as during the operation phase are summarised in the following section.

### **7.2 Mitigation of Adverse Environmental Impacts for Construction and Demolition Phase**

#### **General - Good Site Practice and Waste Reduction Measures**

7.2.1 If good site practices are strictly followed, it is expected that adverse environmental impacts due to waste generation would not arise. The following recommendations for good site practice should be included in the Contract Specifications for the Project during the construction activities:

- Obtain relevant waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354) and the Land (Miscellaneous Provision) Ordinance (Cap. 28)
- Prepare a Waste Management Plan approved by the Engineers/Supervising Officer in the Project in accordance with Environment, Transport and Works Bureau Technical Circular (Works) (ETWBTC(W)) 15/2003, Waste Management On Construction Sites
- Nominate an approved person, such as site manager, to be responsible for good site practice, arrangements for collection and effective disposal of all types of wastes generated on-site to appropriate facility
- Use waste haulier authorized or licensed to collect specific category of waste
- Establish trip ticket system as contractual requirement (with reference to Works Branch Technical Circular (WBTC) No. 21/2002) for monitoring of public fill and C&D waste at public filling facilities and landfills. Such activities should be monitored by the Environmental Team
- Provide training to site staff in terms of proper waste management and chemical waste handling procedures
- Separate chemical wastes for special handling and dispose them at licensed facility for treatment

- Establish routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors
- Provide sufficient waste disposal points and regular collection for disposal
- Adopt measures to minimize windblown litter and dust during transportation of waste such as covering trucks or transporting wastes in enclosed containers
- Establish recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites)

7.2.2 The contractor should submit the Waste Management Plan to Engineer/Supervising Officer of the Project for approval. The Waste Management Plan should describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the activities of the Project and indicate the disposal location(s) of all waste. A trip ticket system shall be included in the Waste Management Plan.

7.2.3 Waste reduction is the most effective when considered during planning and design stage, provided those suggested measures are implemented. Good management and control can prevent the generation of significant amount of waste. It is therefore recommended to include the following practice in the Contract Specifications to ensure waste reduction:

- Minimize the damage or contamination of construction material by proper storage and site practices
- Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste
- Prior to disposal of C&D waste, wood, steel and other metals should be separated for reuse and / or recycling to minimize the quantity of waste to be disposed of to landfill
- Minimize use of wood and reuse non-timber formwork to reduce the amount of C&D waste
- Recycle any unused chemicals or those with remaining functional capacity as far as practicable
- As far as practicable, segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal
- Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors, separate labeled bins should be provided to help segregate this waste from other general refuse generated by the work force

7.2.4 In addition to the above, specific mitigation measures are recommended below for the identified waste to minimize environmental impacts during handling, transportation and disposal of these wastes.

#### **Excavated Material**

7.2.5 Rock and soil generated from excavation should be reused for site formation as far as possible. In addition, excavated material from foundation work can be reused for landscaping as far as practicable to avoid disposal off-site.

#### **Construction and Demolition Material**

7.2.6 Careful design, planning and good site management can minimize over-ordering and generation of waste materials such as concrete, mortar and cement grouts. Standard formwork should be used as far as practicable, wooden formwork should be replaced by metal ones whenever possible. Alternatives such as plastic fencing and reusable site office structures can also minimize C&D waste generation.

7.2.7 The contractor should recycle as much as possible of the C&D material on-site. Public fill and C&D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Materials such as concrete and masonry can be crushed and used as fill and steel reinforcing bar can be used by scrap steel mills. Different areas of sites should be designated for such segregation and storage.

7.2.8 To maximize landfill life, government policy discourages the disposal of C&D materials with more than 20% inert material by volume (or 30% inert material by weight) at landfill. Inert C&D material (public fill) should be directed to an approved public filling area, where it has the added benefit of offsetting the need for removal of materials from borrow areas for reclamation purposes.

**Contaminated Materials**

Further Contamination Investigation

7.2.9 After decommissioning but prior to demolition of the Existing Crematorium, further contamination investigation should be carried out to confirm the quality and quantity of ash waste, building structures and contaminated soil requiring treatment and disposal (see Table 7.1 for details). Further contamination investigation shall provide information on the extent of contamination (DCM / HMCM / PAHCM ) at cremators /flues / chimney as well as the quantity of contaminated materials requiring treatment and disposal. Regarding ACM, future AIR, AMP/AAP should be submitted to EPD for approval under the APCO.

Table 7.1 Further Contamination Investigation Requirements

<b>Location</b>	<b>Investigation Parameter</b>	<b>Investigation Period</b>	<b>Responsible Party</b>
Cremators / flue / chimney and surrounding areas	Asbestos (building structures)	Phase II	The contractor
Cremators / flue / chimney and surrounding areas	Dioxins, heavy metals, PAH (ash waste)	Phase II	The contractor

7.2.10 For DCM / HMCM / PAHCM in ash waste, samples of ash/particulate matters should be collected from within the cremators (including the bottom ash), chimney walls, flues and surrounding area of the Existing Crematorium for analysis of dioxin , heavy metals and PAH by a HOKLAS accredited laboratory. It is recommended that a consultant experienced in the abatement of chemical wastes particularly the handling of DCM, should be appointed in order to assist with the evaluation of the information and prepare an abatement plan for the ash waste. Such a plan shall be submitted to EPD and the Labour Department (LD) to establish an acceptable and safe method for these potentially hazardous waste. The abatement plan of ash waste should identify the method of abatement, the performance criteria for the protection of workers and the environment and any emergency procedures and contingency measures required. The plan should also quantify the amount of material that will require removal. The abatement plan should be agreed with EPD and LD.

7.2.11 It must be ensured that the treatment of ash wastes will comply with all routine construction site safety procedures as well as statutory requirements under the Occupational Safety and Health Ordinance and Factories and Industrial Undertakings Ordinance. Due to the difficulties in establishing permanent and effective engineering controls, the protection of workers is likely to be at the worker level. A safe system of work must be provided, and training and suitable personal protective equipment as well as hygienic decontamination facilities should be provided. It is recommended that the methods to be adopted by the contractor for disposal of the ash waste should be agreed with LD and EPD.

7.2.12 Sufficient time should be allocated to abate all ash waste with DCM/HMCM/PAHCM. The contractor should ensure the implications of dust containing DCM/HMCM/PAHCM on air quality and workers health during the clean up work are mitigated.

7.2.13 Since DCM is chemically related to Polychlorinated Biphenyl (PCB) wastes, the requirements of the *Code of Practice on the Handling, Transportation and Disposal of (PCB) Wastes* should be referenced when developing the abatement plan. Reference should also be made to the safety procedure mentioned in *Section 6* of EM&A Manual.

7.2.14 The key measures for handling, transportation, treatment and disposal of ACM/DCM/HMCM/PCBCM/PAHCM and TPHCM are described below:

*Asbestos Containing Materials (ACM)*

7.2.15 Further asbestos assessment should be carried out when access to the cremators /flue /chimney is accessible after decommissioning and before demolition. An AMP should be prepared. The AAP should be prepared and submitted to EPD for approval prior to commencement of demolition works in accordance to the APCO. It is preferable to remove all ACM before actual demolition. A registered asbestos removal contractor should be employed to remove all ACM in accordance with the approved AAP which will be prepared in due course in accordance with the *Code of Practice (COP) on Asbestos Control for Safe Handling of Low Risk ACM and Asbestos Work Using Full Containment or Mini Containment Method* published by EPD. A registered asbestos consultant should also be employed to supervise abatement works. For the disposal of ACM, the contractor should observe the *COP on Handling, Transportation and Disposal of Asbestos Waste* under the *Waste Disposal (Chemical Waste) (General) Regulation*.

*Dioxin Containing Materials (DCM) / Heavy Metal Containing Materials (HMCM) / Polyaromatic Hydrocarbon Containing Materials (PAHCM) from Demolition of the Existing Crematorium*

7.2.16 According to the experience in Kwai Chung Incineration Plant (KCIP) and Tang Siu Kin Hospital (TSKH), the level of dioxin was the prime factor affecting the ash waste treatment and disposal options. With references to the remediation and disposal methods in KCIP and TSKH clinical waste incinerator, different contamination classifications based on the levels of DCM/HMCM/PAHCM in ash waste are proposed in Table 7.2, and their corresponding handling, transportation, treatment and disposal methodologies are described in the subsequent paragraphs.

Table 7.2 Proposed Contamination Classification for Ash Waste with DCM/HMCM/PAHCM

<b>Classification of Contamination</b>	<b>Dioxin Level in Ash Waste</b>	<b>Heavy Metal Level / Polyaromatic Hydrocarbon in Ash Waste</b>
Low/Non Contaminated DCM / HMCM / PAHCM	< 1 ppb TEQ	< Dutch "B" List
Moderately/Severely Contaminated HMCM / PAHCM	< 1 ppb TEQ	≥ Dutch "B" List
Moderately Contaminated DCM	≥ 1 and <10 ppb TEQ	Any level
Severely Contaminated DCM	≥ 10 ppb TEQ	Any level

*Demolition, Handling, Treatment and Disposal of Low/Non Contaminated DCM / HMCM / PAHCM from Demolition of Existing Crematorium*

7.2.17 Where the ash waste contains low/non contaminated DCM/HMCM/PAHCM, the contractor should avoid ash waste becoming airborne during demolition. General dust suppression measures mentioned in *Section 4* should be followed. All such ash waste can be directly disposal of at landfill.

7.2.18 Subject to the findings of the further asbestos investigation, building structures where such ash waste is found but contaminated with asbestos should be dealt in accordance to *Section 7.2.15*.

*Demolition, Handling, Treatment and Disposal of Moderately Contaminated DCM and Moderately/Severely Contaminated HMCM / PAHCM from Demolition of the Existing Crematorium*

7.2.19 The demolition, handling, treatment and disposal of moderately contaminated DCM and moderately/severely contaminated HMCM / PAHCM with reference to the *Demolition of Kwai Chung Incineration Plant EIA Report* and the *Project Profile for the Decommissioning and Disposal of a Clinical Waste Incinerator at Tang Siu King Hospital* is given in Table 7.3.

**Table 7.3 Demolition, Handling, Treatment and Disposal of Moderately Contaminated DCM and Moderately/Severely Contaminated HMCM / PAHCM**

Item	Procedure
Site Preparation	<p>The contractor should ensure the impacts of dust containing dioxin and/or heavy metals on air quality and workers health during the handling and transportation of the contaminated materials are mitigated. Except the cremators/flue/chimney, all removable items where moderately contaminated DCM or moderately/severely contaminated HMCM / PAHCM is identified should be removed as far as practicable to avoid obstructing the decontamination activities. Preliminary site decontamination of all debris shall be carried out using (High Efficiency Particulate Air) HEPA vacuum cleaner. The top portion of the chimney above the roof shall be enclosed by a chamber with three layers of polyethene sheets. At the entrance to the cremators /flues /chimney, a 3-chamber decontamination unit shall be constructed for entry and exit from the work area. The 3-chamber decontamination unit shall comprise a dirty room, a shower room and a clean room of at least 1m x 1m base each with 3 layers of fire retardant polyethene sheet where all workers shall carry out decontamination procedures before leaving the work area. Warning signs in both Chinese and English should be put up in conspicuous areas.</p> <p>All workers shall wear full protective equipment, disposable protective coverall (such as Tyvek) (with hood and shoe covers), nitrile gloves, rubber boots (or boot covers), and full-face positive pressure respirators equipped with a combination cartridge that filters particulate and removes organic vapour. The organic vapour protection is an added protection against the unlikely exposure to any vapour.</p> <p>If ACM is identified in building structures where moderately contaminated DCM or moderately/severely contaminated HMCM / PAHCM is found, relevant abatement measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented prior to the above site preparation.</p>
Demolition and handling	<p>The cremators/flue/chimney shall be removed from top down starting from the chimney. Any ash or residues attached to the cremators/flue/chimney or any other building structures shall be removed by scrubbing and HEPA vacuuming.</p> <p>Wastes generated from the containment or decontamination unit including the protection clothing of the workers such as the coverall, nitrile glove, rubber boots and materials used for wet wiping shall be disposed of at landfill site.</p> <p>After completion of removal, decontaminate all surfaces by HEPA vacuum.</p> <p>If ACM is identified in building structures where moderately contaminated DCM or moderately/severely contaminated HMCM / PAHCM is found, relevant abatement measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented prior to the above decontamination, demolition and handling measures.</p>
Treatment	<p>The ash waste contains dioxin/heavy metals and in its untreated state would be classified as a chemical waste under the <i>Waste Disposal (Chemical Waste) (General) Regulation</i>. While the quantity of DCM/HMCM is not expected to be significant, the levels of dioxin and heavy metals would affect the treatment option. With reference to the <i>Demolition of Kwai Chung Incineration Plant EIA Report</i>, immobilization of the contaminated materials by mixing with cement followed by disposal at landfill (if landfill disposal criteria can be met) would be the most preferable option.</p>



Item	Procedure
	Rather than treating the already incinerated ash waste by incineration, the ash waste with moderately contaminated DCM or moderately/severely contaminated HMCM / PAHCM should be collected and stabilized to meet landfill disposal criteria of the Facilities Management Group (FMG) of EPD. In this case it is envisaged that the process would involve collection and mixing of the ash waste with cement. Pilot mixing and TCLP tests should be carried out done to establish the appropriate ratio of cement to ash waste to the satisfaction of EPD. It is envisaged that the pilot tests would involve the mixing of say 5%, 10% and 15% ratios of cement to ash waste and three replicate of 300 mm cube blocks for each ratio. TCLP tests should then be used to establish the correct ratio of cement to ash waste to the satisfaction of EPD.
Disposal	<p>After immobilization of the ash waste by mixing with cement in the correct ratio as determined by the pilot mixing and TCLP test, the waste materials should be placed inside polyethene lined steel drums for disposal at landfill. Transparent plastic sheeting of 0.15 mm thickness low-density polyethene or PVC should be employed. The drums should be 16 gauge steel or thicker and fitted with double bung fixed ends adequately sealed and well labelled in new or good condition. The drums should be clearly marked "DANGEROUS CHEMICAL WASTE" in English and Chinese. Prior agreement of the disposal criteria from the FMG of EPD and agreement to disposal from the landfill operator must be obtained.</p> <p>As a fall back option, if the landfill disposal criteria cannot be met after immobilization of the ash waste, disposal at the CWTC should be considered.</p> <p>The building structures will be disposal of at landfill.</p> <p>If ACM is identified in building structures where moderately contaminated DCM or moderately/severely contaminated HMCM / PAHCM is found, relevant disposal measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented instead.</p>

*Demolition, Handling, Treatment and Disposal of Severely Contaminated DCM from Demolition of the Existing Crematorium*

7.2.20 The areas with severely contaminated DCM shall be removed under containment as a prudent approach to avoid the release of any ash waste to the environment, which could be generated during the demolition of cremators/flue/chimney of the Existing Crematorium. The demolition, handling, treatment and disposal of severely contaminated DCM with reference to the *Project Profile for the Decommissioning and Disposal of a Clinical Waste Incinerator at Tang Siu King Hospital* is given in Table 7.4.

Table 7.4 Demolition, Handling, Treatment and Disposal of Severely Contaminated DCM

Item	Procedure
Site Preparation	Except the cremators/flue/chimney, all removable items where severely contaminated DCM is identified should be removed from the cremator room as far as practicable to avoid obstructing the decontamination activities. Preliminary site decontamination of all debris shall be carried out using HEPA vacuum cleaner. The walls, floor and ceiling of the cremator room where severely contaminated DCM located shall be lined with 3 layers of fire retardant polyethene sheets. The top portion of the chimney above the roof shall be enclosed by a chamber with three layers of polyethene sheets. At the entrance to the cremators/flues/chimney, a 3-chamber decontamination unit shall be constructed for entry and exit from the work area. The 3-chamber decontamination unit shall comprise a dirty room, a shower room and a clean room of at least 1m x 1m base each with 3 layers of fire retardant polyethene sheet where all workers shall carry out decontamination procedures before leaving the work area. Warning signs in both Chinese and English should be put up in conspicuous areas.

Item	Procedure
	<p>Air movers should be installed at the cremator room, and at the bottom of the chimney to exhaust air from the work area. A stand-by air mover shall also be installed with each of the air movers. Sufficient air movement shall be maintained to give a minimum of 6 air changes per hour to the work area, and maintain a negative pressure of 0.05-0.15 inches of water within the work area throughout the entire course of the decommissioning works. A pressure monitor with printout records and audible alarm shall be installed at an easily accessible location to demonstrate that negative pressure is maintained. New pre-filters and HEPA filters shall be used on the air movers.</p> <p>A copy of the maintenance records of the air movers should be kept on site for inspection upon request. The appointed contractor shall also check the differential pressure of the air mover to make sure the filter is not blocked. A differential pressure above 0.2 inches of water indicates that the filters would need to be changed.</p> <p>Smoke Test: before commencement of the decommissioning work, a smoke test with non-toxic smoke shall be carried out to ensure the air-tightness of the containment. Also check whether there are stagnant air pockets indicated by an aggregate of smoke that cannot effectively be extracted. After a successful test, switch on the air mover to exhaust smoke from the containment and to give a minimum of 6 air changes per hour, and check visually to see that the filters screen out the smoke effectively and if the pressure gauges read normal. If not, the air mover shall be sealed up and returned to the supplier workshop for necessary servicing, and replaced by a tested air mover. The normal reading pressure range for maintaining 6 air changes per hour shall be 1.5-4 mm/0.05-0.15 inches of water or equivalent (negative pressure). The audible alarm's integrity should also be checked and the trigger shall be at &lt;1.5 mm/0.05 inches of water (negative pressure). Otherwise securely seal up all openings before switching off the air mover.</p> <p>Treatment of Waste/Workers Safety Protection: the contractor shall be required to register as a Chemical Waste Producer. All workers shall wear full protective equipment, disposable protective coverall (such as Tyvek) (with hood and shoe covers), nitrile gloves, rubber boots (or boot covers), and full-face positive pressure respirators equipped with a combination cartridge that filters particulate and removes organic vapour. The organic vapour protection is an added protection against the unlikely exposure to any vapour as a necessary measure. If ACM is identified in building structures where severely contaminated DCM is found, relevant abatement measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented prior to the above site preparation.</p>
Demolition and handling	<p>The cremators/flue/chimney shall be removed from top down starting from the chimney. Any ash or residues attaching to the cremators/flue/chimney or any other building structures shall be removed by scrubbing and HEPA vacuuming.</p> <p>The detached sections of the building structures where severely contaminated DCM is located shall be wrapped with 2 layers of fire retardant polyethene sheets. A third layer shall then be wrapped and secured with duct tape. Decontaminate the outer layer of the wrapped flue sections by wet wiping.</p> <p>Wastes generated from the containment or decontamination unit including the fire retardant polyethene sheets, protection clothing of the workers such as the coverall, nitrile glove, rubber boots and materials used for wet wiping shall be disposed of at landfill site.</p> <p>The quantity of wastewater generated from the decontaminated process will be very small but the contractor should take precautionary measures as to minimize the quantity of contaminated water arising. Nevertheless, if any contaminated wastewater needs to be discharged out of the site, it has to be properly treated to WPCO requirements with prior agreement from EPD on discharge standards.</p> <p>After completion of removal, decontaminate the surface where severely contaminated DCM was located, including the wrapped incinerator furnace and flue sections left within the containment, by wet wiping and HEPA vacuum. Then spray the innermost layer of the fire retardant polyethene sheet covering the wall, ceiling and floor with PVA. Upon drying, peel off this innermost layer of the polyethene sheet covering the containment and dispose of at landfill site.</p>

Item	Procedure
	<p>Repeat the above decontamination procedure for the second innermost layer of fire retardant polyethene sheet by wet wiping and HEPA vacuuming. After spraying with PVA, peel off this second innermost layer of the polyethene sheet covering the wall, ceiling and floor and dispose of at landfill site. Finally, the last layer of polyethene sheet shall then be taken down after spraying with PVA and be disposed as contaminated wastes.</p> <p>If ACM is identified in building structures where severely contaminated DCM is found, relevant abatement measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented prior to the above decontamination, demolition and handling measures.</p>
Treatment and disposal	<p>Waste to be disposed to CWTC: all contaminated ash waste with severely contaminated DCM removed and the used HEPA filters shall be sent to CWTC in Tsing Yi. The total volume should be confirmed by further site investigation.</p> <p>Waste to be Disposed of at Landfill: other wastes including the building structures and its associated panels as well as wastes generated from this decommissioning works are also considered as contaminated waste and shall be disposed of at a designated landfill. Wastes generated from this decommissioning works refer to the polyethene wrapping sheets for the building structures, waste generated from the dismantlement of the containment and decontamination units, and cloth used in wet wrapping, etc. as previously described in this section. They shall be placed into appropriate containers such as drums, jerricans, or heavy duty and leak-proof plastic as a prudent approach. A disposal permit has to be obtained from the Authority. The disposal trip ticket is required to be made available as record after disposal. If ACM is identified in building structures where severely contaminated DCM is found, relevant disposal measures for building structures described in the AAP (see <i>Section 7.2.15</i>) should be implemented in prior to the above disposal measures.</p>

*Dioxin Containing Materials (DCM) / Heavy Metal Containing Materials (HMCM) / Polyaromatic Hydrocarbon Containing Materials (PAHCM) / Total Petroleum Hydrocarbon Containing Materials (TPHCM) / Polychlorinated Biphenyls Containing Materials (PCBCM) from Soil Remediation at the Project Site*

- 7.2.21 According to the CAR and RAP provided in *Appendix C2* of the EIA Report, less than 100 m<sup>3</sup> of soil would require disposal at landfill. Relevant health and safety procedure, waste disposal requirements and compliance report are as detailed in *Appendix C2*. Mitigation measures to avoid fugitive dust emission mentioned in *Section 4* of the EM&A Report should also be observed.
- 7.2.22 In addition, after decommissioning but before demolition of the Existing Crematorium, further investigations during Phase I of the works at the vicinity of CLP secondary substation should also be carried out to determine if additional remediation (in addition to the current RAP) is required. Confirmatory test on levels of DCM, HMCM and PAHCM in locations S1 to S6 during Phase II of the works is also required to determine any further remediation /treatment/disposal. In addition, the ash waste in cremator/chimney/flues should also be collected for the testing of DCM/HMCM/PAHCM during Phase II of the works. The sampling and analysis plan should be prepared and submitted to EPD for approval.
- 7.2.23 All the aforementioned ACM / DCM / HMCM / PAHCM / TPHCM / PCBCM are classified as chemical waste. In addition to the measures mentioned above, the packaging, labelling and storage practices of chemical waste as stipulated in the following paragraphs should also be applied to these contaminated materials.

**Chemical Waste**

- 7.2.24 All the chemical waste should be handled according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. The chemical waste should be stored and collected by an approved contractor for disposal at a licensed facility in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*. Containers used for the storage of chemical waste should:

- Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed;
- Have a capacity of less than 450 L unless the specifications have been approved by the EPD; and
- Display a label in English and Chinese in accordance with instructions prescribed in *Schedule 2 of the Waste Disposal (Chemical Waste) (General) Regulation*.

7.2.25 The storage area for chemical waste should:

- Be clearly labeled and used solely for the storage of chemical waste;
- Be enclosed on at least 3 sides;
- Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- Have adequate ventilation;
- Be covered to prevent rainfall from entering (water collected within the bund must be tested and disposal as chemical waste if necessary); and
- Be properly arranged so that incompatible materials are adequately separated.

7.2.26 The chemical waste should be disposed of by:

- A licensed waste collector;
- A facility licensed to receive chemical waste, such as the CWTC at Tsing Yi, which offers chemical waste collection service and can supply the necessary storage containers; and/or
- A waste recycling plant as approved by EPD.

### **General Refuse**

7.2.27 General refuse should be stored in enclosed bins or compaction units separated from C&D and chemical wastes. A reliable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D and chemical wastes, on a daily or every second day basis to minimize odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.

7.2.28 Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible. Therefore, separately labeled bins for deposit of these cans should be provided if feasible. Similarly, plastic bottles and carton package material generated on-site should be separated for recycling as far as practicable. Site office waste should be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.

## **7.3 Mitigation of Adverse Environmental Impacts for Operation Phase**

### **Ash and Non-combustible Residues**

7.3.1 The disposal of bone ash and non-combustible residues should be properly collected and handled to avoid dust emissions. In line with the current practices, the bone ash will be stored in covered containers for collection by the deceased's relatives within 2 months upon appointment while the non-combustible residues will be collected in sealed heavy-duty polyethene bags for disposal at landfill.

### **Chemical Waste**

- 7.3.2 The chemical wastes generated from the air pollution control system would mainly include used activated carbon and un-reacted lime and collected particulate matter. To prevent health hazards to operators, all such chemical wastes should be carefully collected and handled to avoid dust emissions.
- 7.3.3 All the chemical wastes generated from the air pollution control system as well as from machinery maintenance and servicing should be dealt with according to the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* under the provisions of the *Waste Disposal (Chemical Waste)(General) Regulation*. The chemical wastes should be collected by drum-type containers and removed by a licensed chemical waste contractor. In addition, the relevant measures as provided in *Section 7.2* should be followed.

### **General Refuse**

- 7.3.4 Waste generated in offices should be reduced through segregation and collection of recyclable waste materials (such as paper and carton packages) if the volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.
- 7.3.5 To promote recycling of waste paper, aluminum cans and plastic bottles by the visitors, it is recommended to place clearly labeled recycling bins (such as those available from EPD) at convenient locations within the New Crematorium area. The recyclable waste materials should then be collected by reliable waste recycling agents on a regular basis.
- 7.3.6 The general refuse (other than those segregated recyclable wastes) should be separated from any chemical wastes and stored in covered waste skips. FEHD should remove general refuse from the site, separately from chemical wastes, on daily basis to minimize odour, pest and litter impacts. Burning of refuse must be strictly prohibited.

## **8 LANDSCAPE AND VISUAL IMPACT**

### **8.1 Introduction**

8.1.1 The EIA has recommended the landscape and visual impact mitigation measures to be undertaken during the construction, demolition and operation phases of the Project. The following sections outlines the relevant requirements.

### **8.2 Monitoring Requirements**

8.2.1 Audit of the implementation of the landscape and visual mitigation measures should be carried out by inspections at weekly intervals during the construction and demolition work phases by a Landscape Architect appointed by Arch SD. Further monitoring shall be carried out after the first, the sixth and twelfth month of the completion of all recommended planting works. The Landscape Architect shall be responsible for inspection of the growth of plants in accordance with the Landscape Master Plan to make sure mitigation measures are effective and the landscape of the Project area has been enhanced.

### **8.3 Measures to Mitigate Landscape and Visual Impacts**

- 8.3.1 Tree transplanting: The tree survey has identified the trees which will be affected by the development and which could be considered for transplanting prior to commencement of construction work. Felling will only be considered as a last resort and every effort should be made to transplant the many good trees of high amenity value to either nearby suitable sites within the cemetery or in the Wo Hop Shek Cemetery in the New Territories.. The feasibility of transplanting will depend on a number of factors such as size, health and species of the tree. Adequate time (a minimum of 4 months) should be allowed for preparing trees for transplanting. Particular care should be taken to save the 9 nos. mature and semi-mature protected tree species and 12 nos. protected shrub and immature tree species identified. To give the protected species the best possible chance of survival it is recommended that they are relocated to sheltered and well maintained planted areas within the cemetery, ideally within Phase I of the reprovisioned crematorium. In addition, weekly inspection of tree protection measures as well as monitoring of tree transplant operations during both phases should be implemented.
- 8.3.2 Tree protection: Trees to be retained adjacent to works areas will be carefully protected by strong hoarding and if necessary additional protection to individual tree trunks to avoid damage by machinery. The hoarding will also prevent contractors from compacting soil around tree roots or dumping materials. Reference should be made to the guidelines for tree protection in the Government publication: Webb, R., (ed.) *Tree Planting and Maintenance in Hong Kong* (Hong Kong: Hong Kong Government, 1991).
- 8.3.3 Topsoil conservation: Any topsoil excavated during construction will be carefully saved and stored to one side of the works area for reuse upon completion.
- 8.3.4 Replanting: Upon completion planting of ornamental trees and shrubs will be provided to the periphery of the New Crematorium building to help screen and soften the overall appearance of the structure. In addition, a reprovisioned memorial garden with a lotus pond and ornamental planting will be incorporated in the deck area of the building, refer Figure 8.3 for the Indicative Master Landscape Plan. Since the majority of the new planting will be on the deck structure the selection of species will be more limited with emphasis on smaller trees and ornamental shrubs to comply with loading restrictions.
- 8.3.5 Crematorium Architecture: The building profile has been designed in response to the site terraced topography to minimise site formation which greatly reduces the overall visual impact, (refer to Figures 2.2-2.5 and 8.3 for building plan and master landscape plan). In addition, it is recommended that the material finishes be non-reflective and low-key in nature using predominantly recessive tones to blend in as far as possible with the surrounding vegetation.

## **9 WATER QUALITY**

### **9.1 Introduction**

- 9.1.1 The EIA Study indicated that no adverse impacts would be expected from the construction and demolition activities with proper implementation of the environmental mitigation measures as outlined in the following sections. No adverse water quality impacts to nearby receiving water body would be anticipated during the operation phase as only sewage/wastewater from toilets and general cleaning activities will be generated, which will be directed to foul sewer leading to the government's Sewage Treatment Work.
- 9.1.2 Water quality monitoring for the construction and demolition phase as well as the operation phase of the Project shall only be confined to the relevant effluent discharge licensing requirements to be issued by EPD under the Water Pollution Control Ordinance, CAP 358.

### **9.2 Mitigation of Adverse Environmental Impacts**

#### **Construction and Demolition Phase**

- 9.2.1 To safeguard the water quality of the WSRs potentially affected by the Project works, the contractor should implement appropriate mitigation measures with reference to the *Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94)* published by EPD. Such measures are highlighted as follows.

#### *Construction and Demolition Run-off and Drainage*

- 9.2.2 Exposed soil areas should be minimized to reduce the potential for increased siltation, contamination of run-off and erosion. Any effluent discharge from the Project site is subject to the control of Water Pollution Control Ordinance (WPCO) discharge license and should be treated to meet the discharge standard set out in the relevant license. In addition, no site run-off should enter the stream on the eastern side of the Project site. Run-off impacts associated with the construction and demolition activities can be readily controlled through the use of appropriate mitigation measures, which include:
- Temporary ditches should be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond
  - Boundaries of earthworks should be marked and surrounded by dykes
  - Open material storage stockpiles should be covered with tarpaulin or similar fabric to prevent material washing away
  - Exposed soil areas should be minimized to reduce the potential for increased siltation and contamination of run-off
  - Earthwork final surfaces should be well compacted and subsequent permanent work should be immediately performed
  - Use of sediment traps wherever necessary
  - Maintenance of drainage systems to prevent flooding and overflow

- 9.2.3 All temporary drainage pipes and culverts provided to facilitate run-off discharge should be adequately designed to facilitate rapid discharge of storm flows. All sediment traps should be regularly cleaned and maintained. The temporarily diverted drainage should be reinstated to its original condition, when the construction/demolition work is completed.
- 9.2.4 Sand and silt in wash water from wheel washing facilities should be settled out and removed from discharge into temporary drainage pipes or culverts. A section of the haul road between the wheel washing bay and the public road should be paved with backfall to prevent wash water or other site run-off from entering public road drains.
- 9.2.5 Oil interceptors should be provided in the drainage system downstream of any significant oil and grease sources. They should be regularly maintained to prevent the release of oil and grease into the storm water drainage system after accidental spillage. The inceptor should have a bypass to prevent flooding during periods of heavy rain, as specified in *ProPECC PN 1/94*.

General Construction and Demolition Activities

- 9.2.6 All the solid waste and chemical waste generated on site should be collected, handled and disposed of properly to avoid affecting the water quality of the nearby WSRs. The proper waste management measures are detailed in *Section 7.2*.

Sewage Generated from On-site Workforce

- 9.2.7 The sewage from construction work force is expected to be handled by portable chemical toilets if the existing toilets in the Project site are not adequate. Appropriate and adequate portable toilets should be provided by licensed contractors who will be responsible for appropriate disposal and maintenance of these facilities.

Soil Remediation Activities

- 9.2.8 Mitigation measures will need to be implemented during the currently identified soil remediation activities. If further land contamination investigation results (at CLP secondary substation during Phase I and at locations S1 to S6 during Phase II) confirm the needs for further soil remediation prior to demolition of the Existing Crematorium, relevant water quality mitigation measures (in addition to the current RAP) will need to be identified and implemented by the contractor. In addition, the mitigation measures recommended for minimizing water quality impacts for construction and demolition run-off and drainage as well as for general construction and demolition activities should also be adopted where applicable.
- 9.2.9 In order to avoid impacts on water quality during further remedial works, care will be taken to minimise the mobilisation of sediment during excavation and transport. Measures to be adopted will be based on the recommendations set out in *Practice Note for Professional Persons ProPECC PNI/94 "Construction Site Drainage"*. The results of the site investigation suggest that there is unlikely to be any requirement for dewatering of excavations, since groundwater was not encountered in any of the exploratory holes.
- 9.2.10 The contractor carrying out the remedial works will be required to submit a method statement detailing the measures to be taken to avoid water quality impacts. Typical measures would include:
- Carry out the works during the dry season (i.e. October to March) if possible
  - Use bunds or perimeter drains to prevent run-off water entering excavations
  - Sheet or otherwise cover excavations whenever rainstorms are expected to occur
  - Minimise the requirements for stockpiling of material and ensure any stockpiles are covered
  - Temporary on-site stockpiling of contaminated materials should be avoided, all excavated contaminated soils/materials should be disposed of on a daily basis
  - Ensure that any discharges to storm drains pass through an appropriate silt trap



### **Operation Phase**

- 9.2.11 While the sewage generation in the New Crematorium (28 m<sup>3</sup> per day) is estimated to be doubled that of the Existing Crematorium (14 m<sup>3</sup> per day), the quantitative increase in sewage generation is not substantial. At this stage the actual location of public sewerage connection in the New Crematorium has not been fixed yet. However, Arch SD will, during detail design stage, ensure the public sewer where the connection will be made is capable of handling the extra sewage (i.e., 14 m<sup>3</sup> per day) generated by the New Crematorium. Given that this extra quantity is not substantial, it is expected that the sewerage system of the corresponding Government Sewage Treatment Work will be able to accommodate the loading, and hence no adverse impacts to the receiving water body would result.

## **10 HAZARD TO LIFE**

### **10.1 Introduction**

10.1.1 The EIA has recommended the safety measures to be undertaken during the operation phase of the Project. The following sections outlines the relevant requirements.

### **10.2 Recommended Safety Measures**

#### **Fuel Tanks Design**

10.2.1 The total design capacity (34,000 L) of the fuel tanks in New Crematorium is larger than that in Existing Crematorium (9,000 L). However, the total capacity in New Crematorium is substantially lower than the threshold of 10,000 tones or approximately 12,000,000 L, which is considered as potential hazardous installations for petrol filling stations under the Hong Kong Planning Standards and Guidelines (HKPSG). The purpose of increasing the capacity of the fuel tanks is to reduce the frequency of refilling from once per 10 days in the Existing Crematorium to once per month in the New Crematorium. With less frequent refilling, the associated potential hazards and disturbance to normal operation can be significantly reduced.

10.2.2 In addition, the following safety provisions are included in the fuel tank designs of the New Crematorium:

#### *Underground Fuel Tank for Cremators (30,000 L)*

- The underground fuel tank will be buried underground in concrete chamber with vent pipe (vent pipe outlet will be at a level about 4 m above ground)

#### *Daily Service Fuel Tank for Cremators and Fuel Tank for Emergency Generator (2,000 L each)*

- For generator, vent pipe with outlet will be at a distance of 1.5 m from other air intake louvers and public access
- For cremators installation, the daily services fuel tank will be located at roof top
- Door louvers equipped with electro-thermal link will be provided at the fuel tank room (with door sill) for natural ventilation
- Fire services installations including heat detection system, auto-spray unit and sand buckets will be provided for genset room
- Quick closing mechanism (fuel shut off valve) will be installed outside the fuel tank room of generator to cut the diesel supply in case of fire at fuel tank room /generator room

#### **Fuel Storage and Transportation**

10.2.3 The storage, transportation and handling of diesel fuel is under the control of Dangerous Goods Ordinance (DGO) (Cap 295) and compliance with DGO requirements should be ensured. Diesel leaks from the diesel fuel tanks or pipework systems may seep into the ground and enter chambers such as tunnels, drains and sewers. The undetected build-up of diesel in a confined space will create a fire hazard. The following safety measures should be observed around the diesel storage tanks during operation of the New Crematorium:

- Inventory check should be conducted by staff regularly to identify any signs of fuel leakage
- Regular visual inspections to detect any early signs of fuel spillage
- Precautionary exercises, including fire drills, should be regularly undertaken to enhance staff capability to handle emergencies

## **DG Storage**

10.2.4 The design of DG store and its operation must comply with the requirements set in Cap 295. Precautionary measures mentioned below should also be followed, when relevant chemical is stored at the dangerous goods storage:

### Handling and Labeling

- Obtain details for the handling, storage and control of impurities and spills from supplier or manufacturer (e.g. MSDS<sup>(1)</sup>).
- Obtain details of the chemical composition of the substances, and correct treatment with eyes, skin, ingestion, etc from the supplier or manufacturer (usually available in a MSDS)
- Ensure the correct and complete labelling and classification of chemical substances and guidelines are adopted (see Labour Department's reference booklet on "Labelling and Classification of Dangerous Substances Commonly used in Industry")
- Ensure that the information is up to date, provided to the relevant staff, and easily accessible in case of emergency in accordance with the site safety guidelines
- Register dates (receiving date, manufacturing date, expiry date, shelf life whereas applicable) and quantities of all purchases on receipt to minimise surplus and spoilt orders

### Containers for Storage of Chemicals and Dangerous Goods (DGs)

10.2.5 The following practices shall be followed in ensuring the use of suitable containers for chemicals.

- Designed to minimise spills
- Ensure container is appropriate for its contents, resistant to corrosions, maintained in good conditions and securely closed
- Provide proper labelling

### Storage Requirements

10.2.6 The following practices shall be followed in ensuring suitable storage (including temporary store for goods to be delivered) and transportation of chemicals and DGs.

- No smoking in storage areas
- No naked light and no heating equipment shall be used in any store.
- No electrical equipment shall be used or installed in any store other than equipment of a type approved by the Authority.
- There shall be at all times conspicuously displayed outside any store a notice, in English and Chinese, prohibiting smoking and the use of naked light
- Segregate chemical substances to prevent reaction and contamination
- Use proper racks, storage bins and shelves to contain leaks
- Storage areas must be locked to prevent unauthorised access, clearly labelled and solely for the storage (except for the temporary store for goods to be delivered) of chemicals/dangerous goods
- Adequate ventilation in storage areas as necessary
- Provide appropriate equipment and manpower to avoid the likelihood of spillage
- DGs must be stored in the designated stores and the storage quantities must be within limits
- All containers shall be kept upright to minimise the likelihood of spillage

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<sup>(1)</sup> Material Safety Data Sheet

*Handling and Spill Prevention*

10.2.7 The following practices shall be followed in ensuring suitable handling and spill prevention of chemicals and dangerous goods:

- Follow the safety instructions provided by site management and chemical label
- Do not misuse or interfere with safety equipment or appliance provided
- Do not smoke, eat or drink in any place where chemical substances / DGs are stored or used

## **11 ENVIRONMENTAL AUDITING**

### **11.1 Auditing/Inspection Approach**

11.1.1 Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction 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 Project site.

11.1.2 The ET Leader shall be responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal endorsed by ICE on the site inspection, deficiency and action reporting procedures within 21 days of the construction/demolition contract commencement to the Contractor for agreement and to the AR for approval.

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

- The EIA recommendations on environmental protection and pollution control mitigation measures (Appendix B)
- Works progress and programme
- Individual works methodology proposals (which shall include proposal on associated pollution control measures)
- The contract specifications on environmental protection
- The relevant environmental protection and pollution laws
- Previous site inspection results

11.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution works shall be submitted to ICE and the Contractor within 24 hours after the completion of site inspection. The Contractor shall follow the procedures and time-frame as 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 inspection.

11.1.5 Ad hoc site inspection shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation works, as stipulated in the Event Action Plan.

### **11.2 Compliance with Legal and Contractual Requirements**

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

11.2.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the AR for approval shall be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.

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

### **11.3 Environmental Complaints**

- 11.3.1 Environmental complaints shall be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader shall undertake the following procedures upon receipt of the environmental complaints:
- Log complaint and date of receipt onto the complaint database and inform the ICE immediately via the AR
  - Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities
  - If a complaint is valid and due to works, identify mitigation measures
  - If mitigation measures are required, advise the Contractor accordingly
  - Review the Contractor's response on the identified mitigation measures, and the updated situation
  - If the complaint is transferred from EPD, submit interim report to EPD after endorsement by ICE on status of the complaint investigation and follow-up action within the time frame assigned by EPD
  - Undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur
  - Report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD)
  - Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports
- 11.3.2 During the complaint investigation work, the Contractor and AR shall cooperate with the ET Leader in providing all the 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. The AR shall ensure that the measures have been carried out by the Contractor.

## **12 REPORTING**

### **12.1 General**

12.1.1 The following reporting requirements for the construction and demolition phases of the Project are based upon a paper document approach. However, the same information can be provided in an electronic medium upon agreeing the format with the AR and EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

### **12.2 Baseline Monitoring Report**

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

12.2.2 The baseline monitoring report shall include at least the following:

- (a) Up to half a page executive summary
- (b) Brief Project background information
- (c) An updated construction programme with milestones with milestones of environmental protection /mitigation activities annotated
- (d) Drawings showing locations of the baseline monitoring stations;
- (e) 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
  - Quality assurance (QA) / quality control (QC) results and detection limits
- (f) Details of influencing factors, including:
  - Major activities, if any, being carried out at the site during the period
  - Weather conditions during the period
  - Other factors which might affect results
- (g) 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 (if applicable)
- (h) Revisions for inclusion in the EM&A Manual
- (i) Comments and conclusions

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

- 12.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and endorsed by ICE and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the ICE, the AR and the EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.
- 12.3.2 The ET Leader shall review the number and location of monitoring stations and parameters to monitor every six months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

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

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

(a) 1-2 pages Executive Summary

- Breaches of Action/Limit (AL) levels
- Complaint Log
- Notification of any summons and successful prosecutions
- Reporting Changes
- Future key issues

(b) Basic Project Information

- Project organisation including key personnel contact names and telephone numbers;
- Construction Program with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month
- Management structure
- Works undertaken during the month

(c) Environmental Status

- Works undertaken during the month with illustrations (such as location of works, percentage fines in the fill material used)
- Drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations

(d) Summary of EM&A requirements

- 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

(e) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the Project EIA study report, summarised in the updated implementation schedule.



(f) Monitoring Results

To provide monitoring results (in both hard and diskettes 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
- Graphical plots of the monitored parameters in the month annotated against
- The major activities being carried out on site during the period
- Weather conditions that may affect the results
- Any other factors which might affect the monitoring results
- QA/QC results and detection limits

(g) Report on Non-compliance, Complaints, Notification of Summons and Successful Prosecutions

- Records of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels)
- Record of all complaint received (written or verbal) for each media, including locations and nature for complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
- Record of all notification of summons and successful prosecutions for beaches of the current environmental protection/pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
- Review of the reasons for and the implications of non-compliance complaints, summons and prosecutions including review of pollution sources and working procedures
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures relating to earlier non-compliance

(h) Others

- An account of the future key issues as reviewed from the works program and work method statements
- Advice on the solid and liquid waste management status
- Summary on the implementation status of environmental mitigation measures, proactive environmental mitigation measures, environmental licencing and permits status, environmental monitoring schedule and complaint log summarising the EM&A of the period

## 12.5 Subsequent Monthly EM&A Reports

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

(a) Executive Summary (1-2 pages)

- Breaches of AL levels
- Complaint Log
- Notification of any summons and successful prosecutions
- Reporting Changes
- Future key issues

(b) Environmental Status

- Construction program with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month
- Works undertaken during the month with illustrations including key personnel contact names and telephone numbers
- Drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations

(c) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the Project EIA study report, summarised in the updated implementation schedule.

(d) Monitoring Results

To provide monitoring results (in both hard and diskettes 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
- Graphical plots of the monitored parameters in the month annotated against
- The major activities being carried out on site during the period
- Weather conditions that may affect the results
- Any other factors which might affect the monitoring results
- QA/QC results and detection limits

(e) Report on Non-compliance, Notification of Summons and Successful Prosecutions

- Records of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels)
- Record of all complaint received (written or verbal) for each media, including locations and nature for complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary
- Record of all notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary
- Review of the reasons for and the implications of non-compliance complaints, summons and prosecutions including review of pollution sources and working procedures
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures relating to earlier non-compliance

(f) Others

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

(g) Appendix

- AL levels

- Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  - Major activities being carried out during the period
  - Weather conditions during the period
  - Any other factors that might affect the monitoring result
- Monitoring schedule for the present and next reporting period
- Cumulative statistics on complaints, notification of summons and successful prosecutions
- Outstanding issues and deficiencies
- Details of complaints, outstanding issues and deficiencies

## 12.6 Quarterly EM&A Summary Reports

12.6.1 The quarterly EM&A summary report which should generally be around five pages (including about three of text and tables and two of figures) should contain at least the following listed information:

- (a) Up to half page executive summary
- (b) Basic Project information including a synopsis of the Project organisation, program, contacts of key management, and a synopsis of work undertaken during the quarter
- (c) 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
- (d) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report, summarised in the updated implementation schedule
- (e) Drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- (f) Graphical plots of the trends of monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - The major activities being carried out on site during the period
  - Weather conditions during the period
  - Any other factors which might affect the monitoring results
- (g) Advice on the solid and liquid waste management status
- (h) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- (i) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures
- (j) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance
- (k) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

- (l) A summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation, locations and nature of the breaches, investigation, follow-up actions taken and results
- (m) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A program) and conclusions for the quarter
- (n) Proponents contacts and any hotline telephone number for the public to make enquiries

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

12.7.1 The termination of EM&A program for the construction and demolition works of the Project shall be determined on the following basis:

- (a) Completion of all construction and demolition activities and insignificant environmental impacts of the remaining outstanding construction works
- (b) Trends analysis to demonstrate the narrow down of monitoring exceedances due to construction/demolition activities and the return of ambient environmental conditions in comparison with baseline data
- (c) No environmental complaint and prosecution involved

12.7.2 The proposed termination may be required to consult related local community such as village representative/committee and/or District Board and the proposal should be endorsed by the ICE, AR and the Project proponent prior to final approval from EPD.

12.7.3 The final EM&A summary report should include, inter alia, the following:

- (a) An executive summary
- (b) Basic Project information including a synopsis of the Project organisation, program, contacts of key management, and a synopsis of work undertaken during the entire construction and demolition period
- (c) 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
- (d) Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the Project EIA study report, summarised in the updated implementation status proformas
- (e) Drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations
- (f) Graphical plots of the trends of monitored parameters over the construction and demolition period for representative monitoring stations annotated against:
  - The major activities being carried out on site during the period
  - Weather conditions during the period
  - Any other factors which might affect the monitoring results
  - The return of ambient environmental conditions in comparison with baseline data

- (g) Compare the EM&A data with the EIA predictions and annotate with expansions for any discrepancies
- (h) Provide clear-cut decisions on the environmental acceptability of the Project with reference to the specific impact hypothesis
- (i) Advice on the solid and liquid waste management status
- (j) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
- (k) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures
- (l) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance
- (m) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken
- (n) Review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness)
- (o) A summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation, locations and nature of the breaches, investigation, follow-up actions taken and results
- (p) Review the practicality and effectiveness of the EIA process and EM&A program (e.g. effectiveness and efficiency of the mitigation measures), recommended any improvement in the EM&A program
- (q) A conclusion to state the return of ambient and/or the predicted scenario as per the EIA findings

## **12.8 Data Keeping**

12.8.1 The site document such as the monitoring field records, laboratory analysis records, site inspection forms etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. All the documents and data shall be kept for at least one year after completion of the construction contract.

## **12.9 Interim Notification of Environmental Quality Limit Exceedances**

12.9.1 With reference to Event/Action Plans, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the AR, ICE and EPD, as appropriate by issuing the duly completed Notification of Exceedance Form. The notification shall be followed up with advice to EPD after endorsement of ICE, on the results of the investigation, proposed action and success of action taken, with any necessary follow-up proposals. The Notification of Exceedance Form is shown in Appendix E.