

Drainage Services  
Department

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**Agreement No.  
CE 66/2001(EP)**

**EIA and TIA Studies for  
the Stage 2 of PWP  
Item No. 215DS - Yuen  
Long and Kam Tin  
Sewerage and Sewage  
Disposal (YLKTSSD)**

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Final Environmental  
Monitoring and Audit  
Manual

Agreement No. CE 66/2001(EP)

EIA and TIA Studies for the Stage 2 of PWP Item No. 215DS -  
Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD)

FINAL ENVIRONMENTAL MONITORING & AUDIT MANUAL

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## CONTENT

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	Purpose of the Manual .....	1
1.2	Background .....	1
1.3	Description of EIA Study .....	2
1.4	Environmental Monitoring & Audit Requirements .....	3
1.5	Project Organisation.....	3
1.6	Programme .....	4
1.7	Structure of the EM&A Manual .....	4
<b>2</b>	<b>AIR QUALITY</b> .....	<b>6</b>
2.1	Air Quality Monitoring Requirements .....	6
2.2	Air Quality Parameters .....	6
2.3	Monitoring Equipment.....	6
2.4	Laboratory Measurement/Analysis .....	7
2.5	Monitoring Locations.....	7
2.6	Baseline Monitoring.....	8
2.7	Impact Monitoring .....	9
2.8	Event and Action Plan For Air Quality .....	9
2.9	Dust Mitigation Measures.....	10
2.10	Operational Phase .....	11
<b>3</b>	<b>NOISE</b> .....	<b>12</b>
3.1	Noise Monitoring Requirement .....	12
3.2	Noise Parameters.....	12
3.3	Monitoring Equipment.....	12
3.4	Monitoring Locations.....	12
3.5	Baseline Monitoring.....	13
3.6	Impact Monitoring .....	14
3.7	Event and Action Plan for Noise .....	14
3.8	Noise Mitigation Measures.....	14
3.9	Operational Phase .....	15
<b>4</b>	<b>WATER QUALITY</b> .....	<b>16</b>
4.1	Introduction .....	16
4.2	Construction Phase.....	16
4.3	Operational Phase .....	16
<b>5</b>	<b>WASTE MANAGEMENT</b> .....	<b>17</b>
<b>6</b>	<b>LAND CONTAMINATION</b> .....	<b>18</b>
<b>7</b>	<b>ECOLOGICAL ASSESSMENT</b> .....	<b>20</b>
7.1	Designated Elements.....	20
7.2	Non Designated Elements.....	20
<b>8</b>	<b>LANDSCAPE AND VISUAL ASSESSMENT</b> .....	<b>21</b>
<b>9</b>	<b>CULTURAL HERITAGE</b> .....	<b>22</b>
9.1	Archaeology .....	22
9.2	Built Features .....	22
<b>10</b>	<b>FISHERY</b> .....	<b>24</b>
<b>11</b>	<b>SITE ENVIRONMENTAL AUDIT</b> .....	<b>25</b>
11.1	Site Inspection .....	25
11.2	Compliance with Legal and Contractual Requirement.....	25
11.3	Environmental Complaints .....	26

<b>12</b>	<b>REPORTING</b> .....	<b>27</b>
12.1	General .....	27
12.2	Baseline Monitoring Report .....	27
12.3	Monthly EM&A Reports .....	27
12.4	Data Keeping.....	29

**APPENDICES**

Appendix 1	Implementation Schedule
Appendix 2	Project Organisation
Appendix 3	Sample Data Sheets of Monitoring
Appendix 4	Proposed Monitoring Locations at Tin Shui Wai Area (2A-1T) and Lau Fau Shan Area (2A-3T)
Appendix 5	Proposed Monitoring Locations at Shap Pat Heung Area (2B-2T)
Appendix 6	Proposed Monitoring Locations at Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)
Appendix 7	Sample of Complaint Proforma

**FIGURES**

Figure 1.0	General overview of the sewerage system in the North NT
Figure 1.0a	Works packages and work items under the Study
Figure 1.1	Site Plan for Tin Shui Wai Area (2A-1T) and Lau Fau Shan Area (2A-3T)
Figure 1.2	Site Plan for Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)
Figure 1.3	Site Plan for Shap Pat Heung Area (2B-2T)
Figure 1.4	Site Plan for Conforming Scheme of 2A-1T
Figure 7.1	Recommendations for various Works Package
Figure 9.1	Map Showing The Identified Area For Archaeological Monitoring At The Sewer Alignment from YLEPS to Wang Chau
Figure 10.1	Complaint Response Procedure

## ABBREVIATIONS

AAB	Antiquities Advisory Board
AMO	Antiquities and Monuments Office
ANLs	Acceptable Noise Levels
APCO	Air Pollution Control Ordinance
AQOs	Air Quality Objectives
Arup	Ove Arup and Partners
ASR	Air Sensitive Receptors
BNLs	Base Noise Levels
BOD5	5 day Biochemical Oxygen Demand
CNP	Construction Noise Permit
COD	Chemical Oxygen Demand
DB	Decibels
DEP	Director of Environmental Protection
DO	Dissolved Oxygen
DPWCZ	Deep Bay Water Control Zone
DSD	Drainage Services Department
EIA	Environmental Impact Assessment
ESO	Environmental Impact Assessment Ordinance
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit
EPD	Environmental Protection Department
FMC	Fill Management Committee
HKPSG	Hong Kong Planning Standards and Guidelines
NWWCZ	North Western Water Control Zone
NCO	Noise Control Ordinance
NSRs	Noise Sensitive Receivers
OZP	Outline Zoning Plan
PCW	Prescribed Construction Work
PME	Powered Mechanical Equipment
ProPECC PN	Practice Note for Professional Person
PRCRG	Peoples' Republic of China Regulations and Guidelines
RPCC	Recommended Pollution Control Clauses for Construction Contracts
RSP	Respirable Suspended Particulates
SPME	Specified Powered Mechanical Equipment
SPS	Sewage Pumping Station
SWL	Sound Power Level
SWSTW	San Wai Sewage Treatment Works
TIN	Total Inorganic Nitrogen
TMs	Technical Memoranda
TM-CW	Technical Memorandum on Noise from Construction Work other than Percussive Piling
TM-DA	Technical Memorandum on Noise from Construction Work in Designated Areas
TM-PP	Technical Memorandum on Noise from Percussive Piling
TM-ESO	Technical Memorandum on Environmental Impact Assessment Process
TM-IND	Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites
TM-Water	Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters
TOC	Total Organic Carbon
TSP	Total Suspended Particulates
VSR	Visually Sensitive Receivers
WCZ	Water Control Zone
WDO	Waste Disposal Ordinance
WPCO	Water Pollution Control Ordinance
WQI	Water Quality Index
WQO	Water Quality Objectives
WSRs	Water Sensitive Receivers
YLEPS	Yuen Long Effluent Pumping Station

YLSTW          Yuen Long Sewage Treatment Works  
YLKTSSD        Yuen Long and Kam Tin Sewerage and Sewage Disposal

## 1 INTRODUCTION

### 1.1 Purpose of the Manual

The purposes of this Environmental Monitoring and Audit (EM&A) Manual are:

- to guide the setup of an EM&A programme; and
- to ensure compliance with the recommendations suggested in the Environmental Impact Assessment (EIA) Report.

This Manual outlines the monitoring and audit programme to be undertaken for the Stage 2 of PWP Item No. 215DS - Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD). It aims to provide systematic procedures for monitoring, auditing and minimising the environmental impacts associated with the construction of pumping stations and gravity sewers/rising mains.

Relevant information in the Hong Kong environmental regulations, EPD's generic EM&A manual, and recommendations in the EIA report for the Stage 2 of PWP Item No. 215DS - Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD) have been used to set up this Manual. This Manual contains the following:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET) with respect to the EM&A requirements during construction of gravity sewers;
- Information on project organization and programming of the project;
- Requirements with respect to the implementation schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Full details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance;
- Definition of Action and Limit levels;
- Establishment of event and action plans;
- Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints;
- Requirements for review of EIA predictions, implementation of mitigation measures, and the effectiveness of the environmental protection and pollution control measures adopted;
- Requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract or the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, 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 Background

The design and construction supervision of the Project are/will be undertaken by the in-house staff of DSD. The Chief Engineer/Sewerage Projects, DSD, is responsible for the civil engineering works while the Chief Engineer/Electrical and Mechanical Projects, DSD, is responsible for the electrical and mechanical works.

The Project is part of the "Yuen Long and Kam Tin Sewerage and Sewage Disposal" (YLKTSSD) scheme as recommended in the "Review of Yuen Long and Kam Tin Sewerage and Sewage Treatment Requirements" study. The YLKTSSD scheme is aimed at phased implementation of sewerage extension in the Northwest New Territories to cope with the existing and planned developments. This Stage 2 Project involves the following key items of works: -

- to provide a pumping system for conveying treated effluent from Yuen Long Sewage Treatment Works (YLSTW) to San Wai Sewage Treatment Works (SWSTW);
- to provide a trunk sewerage system consisting of gravity sewers, rising mains and pumping stations for San Tin areas, for conveying sewage to the YLSTW via another downstream trunk sewerage system;
- to provide a trunk sewerage system consisting of gravity sewers, rising mains and pumping stations for conveying sewage generated from Lau Fau Shan areas, to SWSTW; and



- to provide a trunk sewerage system consisting of gravity sewers, rising mains and pumping stations for Yuen Long South areas for collection and conveyance of sewage generated from the areas to SWSTW via another trunk sewerage system and the existing Ha Tsuen Pumping Station.

### 1.3 Description of EIA Study

Ove Arup & Partners Hong Kong Ltd (Arup) was commissioned by the Drainage Services Department (DSD) of the Government of the Hong Kong Special Administrative Region to provide consultancy services in respect of the environmental and traffic impacts arising from the Stage 2 of PWP Item No. 215DS - Yuen Long and Kam Tin Sewerage and Sewage Disposal (YLKTSSD) under Agreement No CE 66/2001(EP), on 30 April 2002 for a study period of about 18 months.


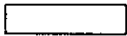
EIAO controls several Designated Elements (DE) within the project. EIA report will be prepared to compile with the technical requirements listed in the EIA Study Brief (ESB-082/2001 issued on 21 Sept 2001) and the Technical Memorandum of EIAO.

The general overview of the sewerage system in the North NT is illustrated in Figure 1.0. The Project is divided into several works packages (Figure 1.0a). Each works package comprises several works items which are detailed in Table 1.1 and Figures 1.1 to 1.4.

**Table 1.1** Details of works packages

Works Package	Works Item	Location
Works Packages and Works Items for Stage 2 Works		
Tin Shui Wai and San Wai Areas		
2A-1T	<b>OP1</b>	<b>Pumping station in the north of YLSTW (Yuen Long Effluent Pumping Station) where treated effluent will be handled</b>
	<b>OS1</b>	<b>Twin rising mains from item OP1 to Tin Tsz Road in Tin Shui Wai</b>
	OS2	Twin rising mains from Tin Tsz Road via Tin Wah Road to Tin Ying Road in Tin Shui Wai
	OS3	Twin rising mains along Tin Ying Road in Tin Shui Wai
	OS4	Twin rising mains from Tin Ying Road to Ping Ha Road
	OS5	Twin rising mains from Ping Ha Road via Tin Ha Road to SWSTW
Tin Shui Wai and San Wai Areas		
Alternative scheme of 2A-1T	<b>AP1</b>	<b>Pumping station in the north of YLSTW (Yuen Long Effluent Pumping Station) where treated effluent will be handled</b>
	<b>AS1</b>	<b>Twin rising mains in the northwestern side of YLSTW</b>
	AS2	Twin rising mains from item AS1 to Fuk Shun Street
	AS3	Twin rising mains from Fuk Shun Street to Tin Wah Road in Tin Shui Wai
	AS4	Twin rising mains between Tin Wah Road and Tin Ying Road in Tin Shui Wai
	AS5	Twin rising mains from item AS4 to Ping Ha Road
	AS6	Twin rising mains from Ping Ha Road to SWSTW
Ngau Tam Mei and San Tin Areas		
2A-2T and 2B-1T	<b>P1</b>	<b>Ngau Tam Mei sewage pumping station</b>
	S1	Sewers along Ngau Tam Mei Main Drainage Channel Phase 1 from P1 to Nam San Wai sewage pumping station (SPS)
	S2	Branch sewers from Fairview Park to S4 along Ngau Tam Mei Main Drainage Channel Phase 1 opposite to S1
	P2	Tam Mei Barracks SPS (Tam Mei Camp SPS)
	S3	Branch sewers from P2 to P1 along Main Drainage Channel for Ngau Tam Mei Phase 2
	S4	Sewers from P3 to P1 along Castle Peak Road-San Tin near Yau Mei San Tsuen, Mai Po San Tsuen and Mai Po Lo Wai
	P3	San Tin SPS
	S5	Sewer upstream of P3 near Tsing Lung Tsuen
	P4	San Lung Tsuen SPS
	S6	Branch sewers from P4 to S5 along the village tracks in Fan Tin Tsuen
P5	San Tin Barracks sewage pumping station (Cassino Line SPS)	
S7	Sewer from P5 to S5	
Lau Fau Shan and Mong Tseng Areas		
2A-3T	A1	Lau Fau Shan SPS
	G1	Sewers from A1 to Tin Shui Wai Reserved Zone pumping station (TSWRZPS)
	A2	Mong Tseng SPS
	G2	Sewers along Lau Fau Shan Road from A2 to TSWRZPS
Shap Pat Heung Area		
2B-2T	B1	Shan Ha Tsuen SPS
	H1	Sewers from B1 to the connection sewer at Yuen Long Highway
	B2	Muk Kiu Tau Tsuen SPS
	H2	Sewers along Kung Um Road from B2 to the connection sewer at Yuen Long Highway
B3	Sham Chung Tsuen SPS	

Works Package	Works Item	Location
2B-2T	H3	Sewers from B3 to the connection sewer at Yuen Long Highway
	B4	Shui Tsiu San Tsuen SPS
	H4	Sewers from B4 to B3
	H5	Sewers from Tai Tong Tsuen to B4
	B5	Shung Ching San Tsuen SPS
	H6	Sewers along Tai Tong Road from Hung Tso Tin Tsuen to B5
	H7	Sewers from B5 to the connection sewer at Yuen Long Highway
	B6	Nga Yiu Tau SPS
	H8	Sewers along Tai Shu Ha Road East from Tong Tau Po Tsuen to B6
	H9	Sewers along Tai Shu Ha Road East from B6 to the connection sewer at Yuen Long Highway
	B7	Pak Sha Tsuen SPS
H10	Sewers along Kung Um Road from Wong Nai Tun Tsuen to B7	
H11	Sewers from B7 to B2	

Legend:  - Designated Elements  
 - Non-Designated Elements

## 1.4 Environmental Monitoring & Audit Requirements

The assessment results have been reported in the EIA report. A summary of the recommendations and the implementation schedule is attached in Appendix 1 for reference.

## 1.5 Project Organisation

The project should form an organization consisting of the ET, ER and Contractor to take the responsibilities of the environmental protection matters. The ET should not be any associated body of the Contractor. The project organization and lines of communication with respect to environmental protection works are shown in Appendix 2. The responsibilities of respective parties are detailed in the following sub-sections.

### 1.5.1 Environmental Team

The Environmental Team should be led by an Environmental Team Leader (ET Leader), who should have at least 7 years experience in EM&A or environmental management. The duties of the Environmental Team are:

- To meet the agreed objectives and deadlines as set out in this EM&A Manual;
- To monitor the various environmental parameters as required by this Manual;
- To follow up and close out the non-compliance actions;
- To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation and to anticipate environmental issues that may require mitigation before the problem arises;
- To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions; and
- To report the environmental monitoring and audit results to the Contractor, the Engineer and EPD.

### 1.5.2 Engineer/Engineer's Representative

The Engineer's Representative (ER) shall:

Appoint an ET to undertake monitoring and reporting of EM&A, and to arrange laboratory analysis as necessary:

- Monitor the Contractor's compliance with contract specifications, including the effective implementation and operation of the environmental mitigation measures;
- Instruct the Contractor to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints; and
- Comply with the agreed Event Contingency Plan in the event of any exceedance.

### 1.5.3 Contractor

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 Contingency Plan;
- Implement measures to reduce impact where Action and Limit levels are exceeded; and
- Work within the scope of the construction contract and other tender conditions with respect to environmental requirements.

### 1.6 Programme

It is scheduled to commence the construction works in mid 2005 for completion in late 2007.

### 1.7 Structure of the EM&A Manual

The structure of this EM&A Manual is outlined below for easy reference:

**Table 1.2:** Report structure

Section	Title	Aims
1	Introduction	An introduction of the background information and the layout of the EM&A Manual
2	Construction Noise	Outline the requirements, methodology, equipment, monitoring locations, and criteria for noise monitoring
3	Air Quality	Outline the requirements, methodology, equipment, monitoring locations, and criteria for air quality monitoring
4	Water Quality	Outline the licensing policy and mitigation measures proposed in EIA.
5	Waste Management	List the information reviewed in the EIA study
6	Land Contamination	List the information reviewed in the EIA study
7	Ecological Impact	List the information reviewed in the EIA study
8	Landscape and Visual Impacts	List the information reviewed in the EIA study
9	Cultural Heritage	List the information reviewed and requirements suggested in the EIA study
10	Fishery Impact	List the information reviewed in the EIA study
11	Site Environmental Audit	Present the requirement and recommendations for the site environmental audit
12	Reporting	Present the requirement and recommendations for reporting

Appendices	Description
1	Implementation Schedule
2	Project Organisation

Appendices	Description
3	Sample Data Sheets of Monitoring
4	Proposed Monitoring Locations at Tin Shui Wai Area (2A-1T) and Lau Fau Shan Area (2A-3T)
5	Proposed Monitoring Locations at Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)
6	Proposed Monitoring Locations at Shap Pat Heung Area (2B-2T)
7	Sample of Complaint Proforma

## 2 AIR QUALITY

### 2.1 Air Quality Monitoring Requirements

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

### 2.2 Air Quality Parameters

Monitoring and audit of the Total Suspended Particulate (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation. 1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, USA, Chapter 1 (Part 50), Appendix B. Upon approval by the ER, 1-hour TSP levels 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 event impacts.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc. shall be recorded down in details. A sample data sheet is shown in Appendix 3.

### 2.3 Monitoring Equipment

High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

- 0.6-1.7 m<sup>3</sup>/min (20-60 SCFM) adjustable flow range;
- equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm<sup>2</sup> (63 in<sup>2</sup>);
- flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hr period.

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

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

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet as mentioned in Appendix 3.

If the ET Leader proposes to use a direct reading dust meter to measure 1-hr TSP levels, he shall submit sufficient information to the ER to prove that the instrument is capable of achieving a comparable result as that of the HVS and 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 direct reading method.

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

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

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

## 2.4 Laboratory Measurement/Analysis

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

If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the ER. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

Filter paper of size 8"x10" shall be labeled 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-weighed before use for the sampling.

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

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

## 2.5 Monitoring Locations

The dust monitoring locations are shown in Appendices 4 to 6. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD on the proposal.

The ET shall also write to the relevant private owners or owner's incorporation for their agreement to install the HVS at suitable location at least 3 months before construction works. The purpose of monitoring (to minimize potential impact and to safeguard the residential) should be clearly stipulated. The specification, wiring, fixing, maintenance, communication and payment of electricity cost shall be detailed in the letter. If there is objection from the owner, alternative monitoring location at premises in the vicinity shall be identified and agreed with EPD and ER.

**Table 2.1** : Description of dust monitoring locations

Package	AML ID	EIA ASR Ref	Description	Land Uses	Approx. Distance to Sewer/Pumping Station (m) <sup>1)</sup>
Tin Shui Wai Area (2A-1T)	AM1	AT11	Tin Wah Estate, Wah Long House	R	26
	AM2	AT21	Jade Court, Block A	R	15
	AM3	AT15	Maywood Court, Block 8	R	32
	AM4	AT29	Dunwell Group	C	53

Package	AML ID	EIA ASR Ref	Description	Land Uses	Approx. Distance to Sewer/Pumping Station (m) <sup>1)</sup>
Lau Fau Shan Area (Alternative 2A-3T)	AM5	AL01	Deep Bay Road, workshop	C	17
	AM6	AL07	San Hing Tseun, No.37	R	16
	AM7	AL13	Tin Ying Road, Interin Housing, Block 2	R	128
	AM8	AL24	Mong Tseng Tseun, No.1	R	18
Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)	AM9	AN02	Kam Pok Road, Man Yuen Chuen No.19	R	12
	AM10	AN10	Castle Peak Road Tam Mei, village house	R	32
	AM11	AN15	Ngau Tam Mei, village house	R	25
Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)	AM12	AN23	Castle Peak Road Mai Po, No.55, Koon Ying School	G/IC	18
	AM13	AN29	Castle Peak Road San Tin No.128/ Future School	G/IC	36
	AM14	AN40	Fan Tin Tseun, Lun Fung Ming Ancestral Hall	G/IC	11
	AM15	AN46	Ka Lung Road, village house	R	10
	AM16	AN51	Ka Lung Road, No.54, San Tin Barrack	G/IC	16
Shap Pat Heung Area (2B-2T)	AM17	AS04	Sha Ha Tseun, No.548	R	26
	AM18	AS17	Muk Kiu Tau Tseun, No.1	R	18
	AM19	AS23	Pak Sha Tseun, No.62	R	32
	AM20	AS25	Wong Nai Tun Tseun, No.47C	R	16
	AM21	AS36	Shun Ching San Tseun, No.211	R	12
	AM22	AS40	Shui Tsiu San Tseun, No.181	R	19
	AM23	AS52	Shung Ching San Tseun	R	20
	AM24	AS64	Tai Kei Leng, No.702	R	13
	AM25	AS70	Tong Tau Po Tseun, No.1	R	24

Remark: <sup>1)</sup> The setback distance is calculated in Appendix 6.1 of the EIA Report

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

- At the site boundary or such locations close to the major dust emission source;
- Close to the sensitive receptors; and
- Account for the prevailing meteorological conditions.

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

- a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- no two samplers should be placed less than 2 meter apart;
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 metres separation from walls, parapets and penthouses is required for rooftop samplers;
- a minimum of 2 metres 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 drip-line;
- any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- a secured supply of electricity is needed to operate the samplers.

## 2.6 Baseline Monitoring

The ET Leader shall carry out baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days prior to the commencement of the construction works to obtain daily 24-hr TSP samples. 1-hour sampling shall also be done at least 3 times per day while the highest dust impact is expected. During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

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

In exceptional case, 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 to ER for approval.

If the baseline level for air quality exceeds the limit level, the ET shall carry out an investigation to determine the cause of the exceedance in consultation with EPD. Regardless of whether the exceedance was caused by poor weather condition (e.g. high API) or as a result of inadequate control measures on construction activities being carried out on other nearby construction sites, a second set of baseline monitoring shall be conducted by the ET to determine an appropriate baseline level for the EM&A programme in agreement with EPD.

Ambient conditions may vary seasonally and shall be reviewed at every three months. If the ET Leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be 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 EPD.

## 2.7 Impact Monitoring

The ET Leader shall carry out impact monitoring during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, shall be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs. 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.

In case of non-compliance with the air quality criteria, more frequent monitoring exercise, as specified in the Action Plan in Section 2.8, 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.

## 2.8 Event and Action Plan For Air Quality

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET Leader shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. Table 2.2 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occurs, the ET, the ER and the Contractor shall undertake the relevant action in accordance with the Action Plan in Table 2.3.

**Table 2.2 : Action and limit levels for air quality**

Parameters	Action	Limit
24-hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ , Action level = $(130\% \text{ of baseline level} + \text{Limit level})/2$ For baseline level $> 200 \mu\text{g}/\text{m}^3$ , Action level = Limit level	260
1-hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = $(130\% \text{ of baseline level} + \text{Limit level})/2$ For baseline level $> 384 \mu\text{g}/\text{m}^3$ , Action level = Limit level	500

**Table 2.3 : Event/Action plan for air quality**

EVENT	ACTION		
	ET	ER	CONTRACTOR
ACTION LEVEL			
1. Exceedance for one sample	1. Identify source 2. Inform ER 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily	1. Notify Contractor 2. Check monitoring data and Contractor's working methods	1. Rectify any unacceptable practice 2. Amend working methods if appropriate



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

## 2.9 Dust Mitigation Measures

The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures:

- The work programme will be staggered and the active work area will be limited to 50m segments in order to avoid cumulative impact from any nearby concurrent construction site;
- Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the pumping station;
- Use of side enclosure and covering of any aggregate or dusty material storage to reduce emission. Where it is impracticable owing to frequent access and usage, watering should be adopted to reduce the fugitive emission. Open stockpiles should be avoided, covered or placed far away from sensitive receivers;
- Use of movable wind shield closed to the site and air sensitive receiver;
- Every vehicle should be washed to remove any dusty materials from its body and wheels immediately before leaving a construction site;
- Use of speed control for vehicles on dusty site area.

- All dusty materials on the transport vehicle should be covered entirely with tarpaulin to ensure that the dusty materials do not disperse from the vehicle;
- Water should be continuously sprayed on the surface where any mechanical breaking operation that causes dust emission is carried out, unless the process is accompanied by the operation of an effective dust extraction and filtering device; and
- The working area of excavation should be sprayed with water immediately before, during and immediately after the operation so as to maintain the entire surface wet.

If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and implement the mitigation measures.

## 2.10 Operational Phase

The following odour precautionary measures should be considered during operation of SPS in order to minimize any potential odour impact:

- The entire SPS; especially wet wells and screening collection areas should be enclosed in a building structure (Similar to that shown in Figure 14.62 of the EIA report);
- Discharge point of the odour removal system should be directed away from the adjacent sensitive uses, and the discharge height should not be less than those assumed in Table 7.4 of the final EIA report;
- Screened material from SPS should be stored in a covered container;
- The transportation of screened material during maintenance should be transported in an enclosed type vehicle and disposed off on the same working day;
- Checking and maintenance of the odour removal system should be implemented at least once every half year to maintain the removal efficiency; and
- Odour removal systems, e.g activated carbon filters, should be provided to reduce the odour emissions. Filtering systems with H<sub>2</sub>S removal efficiency to meet the following requirements shall be provided to minimize any potential odour nuisance:
  - of not less than 99.5% for the YLEPS (OP1/AP1) (where OP1/AP1 is a D.E.);
  - of not less than 99.5% for all SPS at 2A-2T and 2B-1T (P1 to P5) (where P1 is a D.E.);
  - of not less than 95% for all SPS at 2A-3T (A1 to A2); and
  - of not less than 95% for all SPS at 2B-2T (B1 to B7).

With the implementation of the above precautionary measures, there is no EM&A requirement during operational phase.

### 3 NOISE

#### 3.1 Noise Monitoring Requirement

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

#### 3.2 Noise Parameters

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

As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in Appendix 3 for reference.

#### 3.3 Monitoring Equipment

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

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding  $5\text{ms}^{-1}$  or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

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

#### 3.4 Monitoring Locations

The noise monitoring locations are shown in Appendices 4 to 6 and Table 3.1. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal.

**Table 3.1** : Description of noise monitoring locations

Package	NML ID	EIA NSR Ref	Represent No of Dwelling in the area	Remark/Description
Tin Shui Wai Area (2A-1T)	NM1	NT08	9	-
	NM2	NT09	-	school
	NM3	NT15	256	-
	NM4	NT21	3	-
Lau Fau Shan Area (Alternative 2A-3T)	NM5	NL03	-	-
	NM6	NL08	15	-
	NM7	NL13	3	-
	NM8	NL22	6	-
Ngau Tam Mei and San Tin Areas (2A-2T and 2B-1T)	NM9	NN02	42	-
	NM10	NN09	21	-
	NM11	NN14	3	-
	NM12	NN23	87	-
	NM13	NN27	12	-
	NM14	NN29	3	-
	NM15	NN30	-	-
	NM16	NN35	-	-
	NM17	NN40	12	-
	NM18	NN46	6	-
	NM19	NN51	9	-

Package	NML ID	EIA NSR Ref	Represent No of Dwelling in the area	Remark/Description
Shap Pat Heung Area (2B-2T)	NM20	NS01	3	-
	NM21	NS11	3	-
	NM22	NS17	3	-
	NM23	NS21	3	-
	NM24	NS26	12	-
	NM25	NS31	6	-
	NM26	NS35	6	-
	NM27	NS40	15	-
	NM28	NS46	15	-
	NM29	NS51	9	-
	NM30	NS52	12	-
	NM31	NS54	3	-
	NM32	NS60	3	-
	NM33	NS64	12	-
	NM34	NS72	21	-
	NM35	NS37b	12	-
	NM36	NS42a	9	-
	NM37	NS70a	3	-
NM38	NS49b	-	-	School

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

- at locations close to the major site activities which are likely to have noise impacts;
- close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
- for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The ET shall also write to the relevant private owners or owner's incorporation for their site access arrangement (no installation of equipment is required) at least 3 months before construction works. The purpose of monitoring (to minimize potential impact and to safeguard the residential) should be clearly stipulated. If there is objection from the owner, monitoring location at alternative premises in the vicinity shall be identified and agreed with EPD and ER.

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

### 3.5 Baseline Monitoring

The ET Leader shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out continuously over the daytime period (0700-1900) for every weekday and Saturday for at least two consecutive weeks using the  $L_{Aeq,(30mins)}$  parameters. Monitoring during the restricted periods shall comprise 3 consecutive  $L_{Aeq,(5mins)}$  readings at least once in every restricted period (1900-2300 and 2300-0700). 3 consecutive  $L_{Aeq,(5mins)}$  readings shall also be measured in Sunday/General Holiday for each period of 0700-1900, 1900-2300 and 2300-0700 of next day. A schedule on the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. If the baseline level for noise monitoring exceeds the limit level, the ET shall carry out an investigation to determine the cause of the exceedance in consultation with EPD. An appropriate noise budget shall be established for the EM&A programme in agreement with EPD. A second set of baseline monitoring shall be carried out by the ET.

In other 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 to the ER for approval.

### 3.6 Impact Monitoring

As no construction works will be carried out in restricted or general holiday, the monitoring is only required to be conducted during normal working hour (0700-1900 Monday to Saturday) for the measurement of  $L_{Aeq,30min}$  noise levels (as six consecutive  $L_{Aeq,5min}$  readings) at the agreed monitoring locations. The monitoring shall be carried out once per week in accordance with the methodology in the TM.

In relation to the monitored noise levels, other noise sources such as road traffic may make a significant contribution to the overall noise environment. Therefore, the results of noise monitoring activities will take into account such influencing factors, which may not be presented during the baseline-monitoring period. All measurements shall be recorded to the nearest 0.1dB.

If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 3.7 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

### 3.7 Event and Action Plan for Noise

The Action and Limit levels for construction noise are defined in Table 3.2. Should non-compliance of the criteria occur, actions in accordance with the Action Plan in Table 3.3 shall be carried out.

**Table 3.2 : Action and Limit Levels for construction noise**

Time period	Action	Limit
0700-1900hrs on normal weekdays	When one documented complaint is received	When one documented complaint is received and the noise level exceeds 75* dB(A)

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

**Table 3.3 : Event/ action plan for construction noise**

Event	Action	
	ET Leader or ER	Contractor
<b>Action Level</b>		
When one documented complaint is received	1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness	1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative 2. Implement noise mitigation proposals
<b>Limit Level</b>		
When one documented complaint is received and the noise level exceeds 75* dB(A)	1. Notify Contractor 2. Notify EPD 3. Require contractor to implement mitigation measures 4. Increase monitoring frequency to daily and check mitigation effectiveness until the complaint is resolved.	1. Implement mitigation measures 2. Prove to Environmental Team Leader ER effectiveness of measures applied is the best practicable means

### 3.8 Noise Mitigation Measures

The EIA report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures:

### Good Site Practice

- Only well-maintained plant shall be operated on site and plant shall be serviced regularly during the construction work;
- Machines and plant that may be for intermittent use (such as breakers) shall be shut down between work periods or should be throttled down to a minimum;
- Silencers or mufflers on construction equipment shall be utilised and be properly maintained during the construction works;
- Mobile plant shall be sited as far away from NSRs as possible;
- Material stockpiles and other structures shall be effectively utilised, where practicable, to screen noise from on-site construction activities;
- Silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works; and
- Use of movable barrier closed to PME to reduce excessive noise impact.

### Sewer and Rising Main using Open Trench Method

- Use of quiet PME;
- Replacing excavator mounted breakers with handheld breakers during initial road opening activities;
- the sewers and the rising mains should be constructed in segments of up to a maximum 50m in length at any one time; and
- Use of acoustic shed for handheld breaker during the initial road opening activities where there are NSRs located within 50m of the works area.

### Sewer and Rising Main using Pipe Jacking Method

- Use of quiet PME

### Construction of Pumping Stations

- Use of quiet PME; and
- Erection of 3m high site hoarding along site boundary of the pumping stations.

A rigorous EM&A programme should be undertaken, and should focus on those NSRs of particular concern, in order to identify and rectify any problems at the earliest possible stage.

If the above measures are not sufficient to restore the construction noise quality to an acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures. Details of implementation schedule is presented in Appendix 1.

## **3.9 Operational Phase**

In order to ensure that compliance with the noise limits specified in the EIA are achieved, noise commissioning at the site boundary and louvres at all the proposed sewage pumping stations shall be conducted as a requirement for Practical Completion. The measurement data during commissioning should be submitted to the Environmental Team (ET) Leader for checking against the noise design criteria.

## **4 WATER QUALITY**

### **4.1 Introduction**

This section presents the EM&A recommendations for auditing water quality mitigation measures during the construction and operational phases of this Project.

### **4.2 Construction Phase**

As stated in the Environmental Impact Assessment report of Stage 2 of YLKTSSD (EIA), no water quality monitoring is required for the construction phase. However, as part of the regular audit procedures (see Section 11), it is recommended that the ET Leader will confirm that the Contractor has implemented the mitigation measures, as described in Section 10 of the EIA Report.

In addition to implementing the specified mitigation measures, the contractor shall also obtain WPCO discharge licence should any wastewater discharges be released from the site. This may require the Contractor to undertake monitoring of the quality / quantity of the discharges to show compliance with the conditions of the licence. The contractor should review and develop an updated monitoring programme and requirement for the agreement with ER, if required.

### **4.3 Operational Phase**

No monitoring of water quality would be required during the operational phase of the Project.

Routine monitorings of the quality of the treated sewage effluent from the Yuen Long STW and San Wai STW are currently being carried out by the Drainage Services Department (DSD) in order to satisfy the conditions of the WPCO discharge licence. Such monitoring would continue following the upgrade / expansion of the STW. Such monitoring would not form part of the EM &A programme for this project.

## 5 WASTE MANAGEMENT

The Contractor is responsible for waste control within the construction site, removal of the waste material produced from the site and to implement any mitigation measures to minimize waste or redress problems arising by the waste produced from the site. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land, storm sewer, sanitary sewer, or any waste matter or refuse to be deposited anywhere within the site or onto any adjoining land.

When handling the waste material, the following measures shall be undertaken:

- Provide on-site waste separation facilities;
- Provide storage areas for construction and demolition material;
- Separate non-inert and inert waste and dispose of to appropriate locations;
- Store chemical waste separately and engage licensed chemical contractors to dispose of the waste; and
- Provide on-site refuse collection point.

The implementation schedule of mitigation measures is presented in Appendix 1.

The Contractor shall also pay attention to the Waste Disposal Ordinance, the Dumping at Sea Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance, and carry out the appropriate waste management work. The relevant licence/permit, such as the effluent discharge licence, the chemical waste producer registration, etc. shall be obtained. The Contractor shall refer to the relevant booklets issued by EPD when applying for the licence / permit. The Contractor should also prepared a Waste Management Plan and conducted the requirement accordingly. A trip-ticket system should be established in accordance with Works Bureau Technical Circular No. 21/2002 to monitor the disposal of public fill and solid wastes at public filling facilities and landfills, and to control fly-tipping.

During the site inspections and the document review procedures as mentioned in Section 10 of this manual, the ET Leader shall pay special attention to the issues relating to waste management, and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong.



## 6 LAND CONTAMINATION

A land contamination assessment has been conducted as part of the EIA study. The historical information indicated that the potential of land contamination of the subject site is very low.

Although the risk of land contamination of the subject site area is very low, selection of confirmatory sampling locations should be made in areas where the industrial activities are most active. The collected soil samples shall be analysed for TPH, and the test results shall be compared with the Dutch List to evaluate any potential contamination.

The following precautionary measures shall also be implemented to minimise any potential hazard on the workers during construction of gravity sewers.

- Personal Protective Equipment (PPE) such as safety hat, chemical protective gloves, masks (for both dust and vapour) eye goggles, protective clothing and protective footwear etc. shall be provided to staff who would be involved in the construction works. No works should be allowed without the suitable PPE;
- Workers shall inspect and check their PPE before, during and after use. In cases where any of the PPE is impaired, the worker shall stop work immediately and inform the site agent. The worker shall not be allowed to re-start his work until the impaired PPE is replaced;
- Workers shall always maintain basic hygiene standard (e.g. hand wash before leaving the contaminated work zone). Workers shall also be responsible for cleaning and storing their own PPE in a secured place before leaving the site;
- Eating, drinking and smoking must be strictly prohibited within the site area;
- The construction works, particularly the breaking of the concrete chamber of the diesel storage tank and removal of the broken concrete, shall be carried out in dry weather condition to prevent any surface run-off. The construction works shall be stopped immediately once surface water run-off caused by rainfall or otherwise is observed;
- Stockpiling of excavated material (i.e. broken concrete and the associated soils) shall be avoided. Where this cannot be avoided, temporary cover such as tarpaulin shall be provided for the stockpile material (if any);
- The contractor's representatives must be informed if any workers feel uncomfortable physically or mentally during the construction works. All workers shall leave the work areas and the work shall be temporarily suspended until the reason for the uncomfortable feeling has been identified; and
- The construction works shall be stopped or discontinued when any typhoon signals or storm signal (amber, red or black) is hoisted. All stockpile materials (if any) shall be covered immediately by tarpaulin or other similar protective and waterproof materials.

In the event that any suspected petroleum contaminated soils (e.g. discoloured soil or visual/olfactory signs of contamination) were observed, apart from the above precautionary measures, the following procedures shall also be followed:

- The contractor's representatives shall stop the construction works immediately and inform the relevant party (e.g. EPD Local Control Office).
- A minimum of 2 samples of the potential petroleum contaminated soils from each suspected area shall be collected for the analysis of Total Petroleum Hydrocarbon (TPH) to confirm whether the soil is contaminated. A qualified Land Contamination Specialist, who has at least 7-year experience in land contamination assessment, shall be engaged to supervise the soil sampling and interpret the laboratory results for evaluation of the contamination level.
- If the soils is confirmed as contaminated (i.e. exceed the Dutch B value), a 2m-diameter boundary and 2.5m depth (around the sampling point where the contaminated soils was identified) of the soil shall be excavated. All excavation works of the contaminated soils shall be carried out in dry weather condition to prevent any contaminated pond and surface runoff.
- The contaminated soils shall be excavated by mechanical excavators. Manual excavation shall be avoided.
- Stockpiling of the excavated contaminated soils shall be avoided. However, if stockpiling is required, the contaminated soils shall be stockpiled in a designated concrete paved and bunded area.
- The stockpiled contaminated soils shall be covered by water proving material (i.e. tarpaulin) to prevent contaminated surface runoff. Fencing with warning sign shall be erected around the stockpiled area to prevent unauthorised entry.

- Following the excavation of the contaminated soils, confirmatory soil samples shall be collected from the base and perimeter of excavation and tested for TPH. A minimum of 5 samples (4 boundary and 1 from the centre of the excavation) shall be collected from each location of excavation. All sampling works shall be supervised and the results interpreted by a qualified Land Contamination Specialist. If the analytical results of any one sample exceeded the Dutch B value, the excavation must be extended by a 0.5m increment (vertically and horizontally) and the sampling regime repeated until all contaminated soils are excavated.
- Contaminated TPH soil shall be handled properly. For soils of very high concentrations of contaminants (much more exceeding Dutch B value), it may be considered as chemical waste and Waste and Water Management Group of EPD should be consulted. For those contaminated soils which exceed the Dutch B value, approval from the Facilities Management Group of EPD shall be obtained prior to disposal of the contaminated soils at co-disposal landfill or other authorised disposal sites. Materials shall be tested to check whether the contaminant has met the landfill disposal criteria before disposal at landfill site. Nevertheless, in-situ remediation methods should be adopted wherever possible and disposal to landfill should always be the last resort. A licensed contractor shall be appointed for the collection, transportation and disposal of the contaminated soils.

## 7 ECOLOGICAL ASSESSMENT

The implementation of standard site practice stated in Section 13.6 of the EIA, such as use of quiet machinery and prevention of site runoff, shall also be checked as part of the environmental monitoring and audit procedures during the construction period.

The following recommendations are also made for the Works Package (Figure 7.1).

### 7.1 Designated Elements

- Restriction of construction period to April through October for elements within WCA, i.e. AP1 and 430m of AS1, to minimise disturbance to wintering birds
- Reinstatement of temporary works area to its original conditions, in particular, for the three fish ponds along AS1. Appropriate construction method will be adopted to ensure that no dewatering of nearby fishpond is required. Such construction method shall be agreed by DSD before commencement of works.
- Provision of a detailed replanting plan during the detailed design stage for the 0.35ha of replanting area at San Pui Ponds to compensate for the loss of 0.23ha of 60CD mitigation planting area to YLEPS (See Section 13.6.1 of the main EIA for details).

The above conditions shall be complied as part of in the construction contract.

### 7.2 Non Designated Elements

- Restriction of construction period to April through October for elements within WCA, i.e., section of S1 to minimise disturbance to wintering birds;
- Restriction of construction period to September through March for sewer alignment sections S4/S5 within 100m from Mai Po Village and Mai Po Loong Egrettries to minimise disturbance to the egrettries during the breeding season
- Reinstatement of temporary works area to its original conditions, in particular, for mixed woodland habitats along AS3. The contractor should refer to the results of vegetation surveys conducted at the mixed woodland habitat by the consultants during the detailed design phase for reinstatement.

The above conditions shall be complied as part of in the construction contract.

No other ecology-specific measures are considered necessary.

## **8 LANDSCAPE AND VISUAL ASSESSMENT**

With the implementation of mitigation measures as stated in Section 14 of the EIA report, potential impacts will not be significant. Therefore, no specific landscaping and visual EM&A requirements are considered necessary.

## 9 CULTURAL HERITAGE

### 9.1 Archaeology

The assessment has concluded that the construction of the proposed works may adversely impact on areas of archaeological potential in areas not available at the field evaluation stage.

The mitigation recommendation is two-fold:

1. Pre-testing is required at the following locations
  - Sewer alignment north of Tung Tau Tsuen (non-designated element). The pre-testing should comprise a minimum of 20 auger hole tests and two test pits measuring no less than 2 by 2 meters; and
  - Mong Tseng Tsuen PS (non-designated element). The pre-testing should comprise a minimum of one test pit, measuring no less than 2 by 2 meters.
2. Pre-testing should be undertaken prior to construction, but after land resumption at Mong Tseng and North of Tung Tau Tsuen and surface removal of concrete and asphalt at north of Tung Tau Tsuen.

Archaeological monitoring is recommended at the sewer alignment around the historical village of Tai Tseng Ng Uk Tsuen, Tai Tseng Wai and Shing Uk Tsuen (Figure 9.1). The archaeological evaluation and archaeological monitoring should be conducted by a qualified archaeologist, who should be licensed by the Antiquities Authority before the evaluation or archaeological monitoring takes place. The contractor should inform AMO the time schedule of the archaeological evaluation or archaeological monitoring and notify AMO two weeks prior to the commencement of the evaluation or archaeological monitoring so as to allow AMO to arrange the on-site monitoring. The licensed archaeologist, when conducting the archaeological monitoring during construction phase, should adopt a minimum 5% sampling strategy.

If the conforming scheme 2A-IT of the Yuen Long sewage treatment works effluent pipeline is preferred an archaeological impact assessment will have to be conducted prior to construction.

The ET team leader should check whether a qualified archaeologist has been employed by the Contractor to take up the archaeological work. The survey methodology and locations should be checked against with the requirements agreed between the qualified archaeologist and AMO.

### 9.2 Built Features

The assessment has concluded that impacts will occur during both the construction and operational phases. The mitigation required to minimise the impacts is as follows:

#### 9.2.1 Construction Phase

Mitigation measures for the construction stage including condition surveys and the implementation of monitoring and precautionary measures for the following resources in Fan Tin Tsuen: Man Lun Fung Ancestral Hall (AAHB-405), Ming Yuen Tong (AAHB-433) and the Shun Yue Tong and San Yeh Man Tong AAHB-486 and 487.

Shrine AAHB-21 (Lau Fau Shan Road), Shrine AAHB-419 (Fan Tin Tsuen), Shrine AAHB-262 (Kung Um Road), Shrine AAHB-224 (Tai Shu Ha Road East), Shrine AAHB-207 (Tai Tong Road), Shrine AAHB-242 (Yau Mei Tsuen) and Shrine AAHB-357 (Fuk Shun Street): a buffer zone should be provided of minimum 1 m, marked out by high visibility fencing and access to the shrines should be maintained through the provision of walkways separated from the works area by metal barriers.

Temple AAHB-226: Access from Tai Shu Ha road should be maintained throughout the construction phase.

Temple and shrine AAHB 227: the contractor must carry out a condition survey of the building. This survey must be carried out in advance of works and a report must be compiled, containing description of the types of construction, identification of fragile elements, an appraisal of the condition and working methods for any proposed monitoring and precautionary measures that are recommended. The report must be submitted to AMO for approval before construction activities commence. Upon approval the contractor shall implement the approved monitoring and precautionary measures. The shrine is located at a sufficient distance as to not require

any protective measures during the construction phase. Access to the temple and shrine should be maintained through the provision of walkways separated from the works areas by metal barriers.

### **9.2.2 Operational Phase**

Mitigation measures including landscaping of the area around the pumping station by planting of foliage complimentary to the existing environmental setting and application of appropriate colour treatment of the pumping stations will be required for the following:

- Lau Fau Shan to Mong Tseng: Village structures (AAHB-29 – 53) in Mong Tseng Tsuen
- San Tin to Ngau Mei Tsuen: Man Lung Fung Ancestral Hall (AAHB-528) and Ming Yuen Tong (AAHB-433) in Fan Tin Tsuen
- Tai Shu Ha Road: Temple (AAHB-226) in Tai Shu Ha Road East (Nga Yiu Tau)

## 10 FISHERY

With the implementation of mitigation measures as stated in Section 16 of the EIA report, potential impacts will not be significant. Therefore, no specific fishery EM&A requirements are considered necessary.

## **11 SITE ENVIRONMENTAL AUDIT**

### **11.1 Site Inspection**

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 construction site.

The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

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

- the EIA recommendations on environmental protection and pollution control mitigation measures;
- 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 control laws; and
- previous site inspection results.

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

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

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

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

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

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

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.

After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/permit application



and any environmental protection and pollution control preparation works may not cope with the works programme, or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

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

### 11.3 Environmental Complaints

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 complaints:

- log complaint and date of receipt onto the complaint database;
- 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 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 from EPD, the results should be reported within the time frame assigned by EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and ER 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 ER shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaint response procedures is shown in Figure 10.1. An example of a complaints proforma is given in Appendix 7.

## **12 REPORTING**

### **12.1 General**

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

### **12.2 Baseline Monitoring Report**

The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they want. The format of the report and the format of the baseline monitoring data in CD to be submitted to EPD shall be agreed with EPD.

The baseline monitoring report shall include at least the following:

- up to half a page executive summary;
- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology
  - equipment used and calibration details
  - parameters monitored
  - monitoring locations (and depth), with photographic identity, where appropriate;
  - monitoring date, time, frequency and duration;
- details on influencing factors, including:
  - major activities with photographic identity, if any, being carried out on the site during the period
  - weather conditions during the period
  - other factors which might affect the results, with supporting photographic evidence, where applicable;
- determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- revisions for inclusion in the EM&A Manual; and
- comments and conclusions.

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

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

The ET leader shall review the number and location of monitoring stations and parameters every 6 months or on an as needed basis, in order to cater for the changes in surrounding environment and nature of works in progress.

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

The first monthly EM&A report shall include at least the following :

- 1-2 pages executive summary;
- basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;
- a brief summary of EM&A requirements including:
  - all monitoring parameters
  - environmental quality performance limits (Action and Limit levels)

- Event-Action Plans
- environmental mitigation measures, as recommended in the project EIA study final report
- environmental requirements in contract documents;
- advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarized in the updated implementation schedule;
- drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology
  - equipment used and calibration details
  - parameters monitored
  - monitoring locations (and depth)
  - monitoring date, time, frequency, and duration;
- advice on the solid and liquid waste management status;
- a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;
- a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and
- An account of the future key issues as reviewed from the works programme and work method statements.

### 12.3.2 Subsequent EM&A Reports

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

- Title Page;
- Executive Summary (1-2 pages)
  - Breaches of AL levels
  - Complaint Log
  - Reporting Changes
  - Future key issues;
- Contents Page;
- Environmental Status
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
  - Summary of non-compliance with the environmental quality performance limits
  - Summary of complaints;
- Environmental Issues and Actions
  - Review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies)
  - Description of the actions taken in the event of non-compliance and deficiency reporting
  - Recommendations (should be specific and target the appropriate party for action)
  - Implementation status of the mitigation measures and the corresponding effectiveness of the measures;
- Future Key Issues; and
- 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:
    - i) major activities being carried out on site during the period, with supporting photographic evident
    - ii) weather conditions during the period
    - iii) any other factors which might affect the monitoring results, with supporting photographic evident, where applicable.
  - Monitoring schedule for the present and next reporting period

- Cumulative complaints statistics
- Details of complaints, outstanding issues and deficiencies.

#### **12.4 Data Keeping**

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 soft copy can be made available upon request. All the documents and data shall be kept for at least one year after completion of the construction contract.