路政署
HIGHWAYS DEPARTMENT
主要工程管理處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

# Highways Department
# Major Works Project Management Office

**Agreement No.CE58/2000**
**Design and Construction Assignment for**
**Widening of Tolo Highway / Fanling Highway**
**Between Island House Interchange and Fanling**

**Supplementary Agreement No. 3**

## Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling
## Stage 2 (between Tai Hang and Wo Hop Shek Interchange)

## Updated EM&A Manual
September 2009

Hyder ARUP BLACK & VEATCH

**Hyder-Arup-Black & Veatch Joint Venture**

# HIGHWAYS DEPARTMENT
# MAJOR WORKS PROJECT MANAGEMENT OFFICE

## AGREEMENT NO. CE58/2000
## DESIGN AND CONSTRUCTION ASSIGNMENT
## FOR WIDENING OF TOLO HIGHWAY / FANLING HIGHWAY BETWEEN ISLAND HOUSE INTERCHANGE AND FANLING

## SUPPLEMENTARY AGREEMENT NO. 3

# Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling
# Stage 2 (between Tai Hang and Wo Hop Shek Interchange)

# Updated EM&A Manual

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# 1 INTRODUCTION

## 1.1 Background

1.1.1 Tolo Highway and Fanling Highway are the expressways in the North East New Territories (NENT) connecting Sha Tin, Tai Po and Fanling. These highways form a vital part of the strategic Route 9, which links Hong Kong Island to the boundary at Shenzhen. At present, this section of Route 9 is a dual 3-lane carriageway. However, at several major interchanges along this section of Route 9, the highway is a dual-2 lane carriageway only. Severe congestion is a frequent occurrence during the peak periods, particularly in the Kowloon-bound direction.

1.1.2 The North East New Territories (NENT) Development Strategy Review indicated that by 2006, Tolo Highway and Fanling Highway between Island House Interchange and Fanling would have to be widened to a dual 4-lane carriageway, in phases, by the end of 2013 to alleviate the current traffic congestion problems and to cope with the increasing transport demands to and from the urban areas and also cross-boundary traffic.

1.1.3 The proposed widening of Tolo Highway and Fanling Highway between Island House Interchange and Fanling (the Project) is a Designated Project under the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO). An Environmental Impact Assessment (EIA) Report (the approved EIA Report) together with an Environmental Monitoring and Audit (EM&A) Manual (the approved EM&A Manual) were completed and approved under the EIAO on 14 July 2000 (Register Number: EIA-043/2000).

1.1.4 After the approval of the EIA, Hyder-Arup-Black & Veatch Joint Venture (HABVJV) was appointed in March 2001 to undertake the Design and Construction Assignment for the Project under Agreement No. CE 58/2000. An Environmental Review Report (ERR) was conducted, based on the approved EIA Report, to review the latest traffic forecasts and environmental impacts arising from the Project.

1.1.5 An Environmental Permit (EP) was applied for by the Highways Department (HyD) in November 2008, based on the final version of the ERR (revision 6 dated November 2008). The EP (EP-324/2008) was granted on 23 December 2008.

1.1.6 HABVJV will be the Engineer's Representative (ER) of HyD for the Project and the Project will be divided in two stages with the following tentative programme[1]:

1. Stage 1 - Construction works between Island House Interchange and Tai Hang, the construction works will be commenced in third quarter 2009 and completed in mid 2013; and
2. Stage 2 - Construction works between Tai Hang and Wo Hop Shek Interchange, the construction works will be commenced in late 2010 and completed in 2014.

## 1.2 Purpose of the Manual

1.2.1 Because the original approved EM&A Manual in 2000 was designed for the whole Project, and the Project will now be constructed in two stages, the EM&A Manual needs to be split into separate documents for Stage 1 and Stage 2.

[1] http://www.hyd.gov.hk/eng/major/road/projects/6720th/index.htm

1.2.2 Moreover, in accordance with Clause 2.4 of the EP, an updated EM&A Manual to be certified by the Environmental Team (ET) Leader and the Independent Environmental Checker (IEC) shall be submitted to EPD for approval.

1.2.3 In order to facilitate compliance with the EP, the EM&A Manual for Stage 2 has been updated by HABVJV and will be certified by the ET Leader and verified by the IEC at the commencement of Stage 2.

1.2.4 The purpose of the EM&A Manual, hereafter referred to as the Manual, is to guide the setup of an EM&A programme to ensure compliance with the recommendations in the ERR, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action.

1.2.5 This Manual outlines the monitoring and audit programme to be undertaken for the Stage 2 of the Project. This Manual contains the following:

a) responsibilities of the Contractor, the Engineer or Engineer's Representative (ER) Independent Environmental Checker (IEC) and Environmental Team (ET) with respect to the environmental monitoring and audit requirements during the course of the project;

b) information on project organization and programming of construction activities for the project;

c) the hypotheses of potential impacts, the basis for and description of the broad approach underlying the environmental monitoring and audit programme;

d) requirements with respect to the construction schedule and the necessary environmental monitoring ad audit programme to track the varying environmental impacts;

e) the specific questions and testable hypotheses that the monitoring programme is designed to answer;

f) details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance and quality control programme;

g) the rationale on which the environmental monitoring data will be evaluated and interpreted and the details of the statistical procedures that will be used to interpret the data;

h) definition of Action and Limit levels (AL levels);

i) establishment of event and action plans;

j) requirements for reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints;

k) requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and

l) requirements for review of ERR predictions and effectiveness of the environmental monitoring and audit programme.

1.3 Works Areas of Stage 1 and Stage 2

1.3.1 The works areas of Stage 1 and Stage 2 of the Project are shown in the location plan enclosed in ***Appendix A***.

1.4 Environmental Monitoring and Audit Requirements

1.4.1 In this Section, a summary of the ERR findings is presented, and the requirements and scope of the EM&A are discussed below. Details of the recommended mitigation measures are described in the updated implementation schedule extracted from the ERR as enclosed in ***Appendix B***.

**Air Quality**

1.4.2 The construction work will inevitably lead to dust emissions, mainly from blasting, concrete batching, excavation, truck haulage and material handling. It is predicted that the dust generated will exceed the hourly and daily criteria of 500 $\mu gm^{-3}$ and 260 $\mu gm^{-3}$, respectively, at the some air sensitive receivers (ASRs). Dust control measures have been recommended to be incorporated in the Contract Specification of the Stage 2 of the Project to minimise dust nuisance arising from the works.

**Noise**

1.4.3 Monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. It was recommended that noise monitoring be carried out as part of the EM&A programme during the construction period of the Stage 2 of the Project.

**Water Quality**

1.4.4 It has been recommended that water quality monitoring should be carried out to ensure protection of marine waters when construction works over water such as river training works and demolition and reconstruction of bridges are carried out.

**Waste Management**

1.4.5 It has been recommended that auditing of each waste stream shall be carried out periodically by the Contractor of Stage 2 of the Project to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits shall look at all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. An appropriate audit programme would be to undertake a first audit at the commencement of the construction works, and then to audit quarterly thereafter.

**Ecology**

1.4.6 The mitigation measures shall be included into contract clauses for Stage 2 of the Project. The implementation of the measures shall be checked as part of the environmental monitoring and audit procedures during the construction period.

**Cultural Heritage**

1.4.7 As concluded in the ERR (Section 10.5 of the ERR refers), the archaeological monitoring is no longer required.

**Sensitive Receivers**

1.4.8 Representative air and noise sensitive receivers as identified in the Technical Memorandum on Environmental Impact Assessment (EIAO-TM) have been identified in the approved EIA Report and updated in the ERR using, *inter alia*, the information sources given in ***Table 1-1*** and are listed in ***Table 1-2*** to ***Table 1-3***. Both the existing and planned receivers are included in the list. The locations of these sensitive receivers are shown in ***Appendix C***.

| **Outline Zoning Plan (OZP) No.** | **Date** |
|---|---|
| Kau Lung Hang – OZP S/NE-KLH/1 | 24 June 1994 |
| Draft Kau Lung Hang – OZP S/NE-KLH/2 | 6 August 1999 |
| Kau Lung Hang OZP S/NE-KLN/11* | 27 October 2006 |
| Proposed Amendment on the Draft Kau Lung Jang – OZP S/NE-KLH/1 | 12 September 1997 |
| Fanling / Sheung Shui – OZP S/FSS/7 | 27 February 1998 |
| Fanling / Sheung Shui – OZP S/FSS/8 | 2 July 1999 |
| Fanling/Sheung Shui OZP S/FSS/13* | 31 March 2006 |
| Tai Po – OZP S/TP/9 | 27 January 1998 |
| Tai Po OZP S/TP/19* | 18 November 2005 |
| Proposed Amendment on the Tai Po – OZP S/TP/7 | 21 November 1997 |
| Proposed Amendment on the Tai Po – OZP S/TP/9 | 13 November 1998 |
| Tai Po – OZP S/TP/10 | 23 March 1999 |
| Draft Tai Po OZP S/TP/11 | 20 August 1999 |
| Lam Tsuen OZP S/NE-LT/11* | 10 November 2006 |
| **Outline Development Plan No.** | **Date** |
| Tai Po New Town Outline Development Plan D/TP/A (Provisional) | 20 March 1990 |
| Fanling / Sheung Shui Outline Development Plan D/FSS/A (Provisional) | 20 March 1990 |

Note: *OZPs are the updated information referred in the ERR

Table 1-1 List of Outline Zoning Plans and Outline Development Plans Referenced

| **ASRs** | **Description** | **ASRs** | **Description** |
|---|---|---|---|
| SR1 | Avon Park | SR11B* | Kiu Tau |
| SR2 | Fanling Gov't Sec School | SR17B | Tai Hang 3 |
| SR3 | Dawning Views | SR75 | Wong Kong Shan |
| SR7N* | Tong Hang | SR77 | Yuen Leng 2 |
| SR9 | Wo Hop Shek 2 | SR83A | Yuen Leng |
| SR11A* | Kiu Tau | | |

Note: * SR7 and SR11 near Tong Hang as stated in the Approved EIA Report were replaced by SR7N, SR11A and SR11B, respectively. Please refer to Table 2-1 of ERR for details.

Table 1-2 Selected Air Sensitive Receivers (ASRs) between Pak Wo Road and Hong Lok Yuen Road

| NSR | Description | NSR | Description |
|---|---|---|---|
| SR1 | Avon Park | SR81N | Tai Hang 5 |
| SR2 | Fanling Government Secondary School | SR82N | Tai Hang 6 |
| SR3 | Dawning Views 1 | N1 | Tai Hang 7 |
| SR3A | Dawning Views 2 | SR19 | Hong Lok Yuen 1 |
| SR7N (2) | Tong Hang | SR20 | Hong Lok Yuen 2 |
| SR8 (1) | Wo Hop Shek 1 | SR21 | Hong Lok Yuen 3 |
| SR9 (1) | Wo Hop Shek 2 | SR22 | Wai Tau Tsuen 1 |
| SR1012 (2) | Tong Hang | SR22N | Wai Tau Tsuen (New) |
| SR1015 (2) | Tong Hang | SR80 | Wai Tau Tsuen 3 |
| SR11A (2) | Kiu Tau | SR88 | Wai Tau Tsuen 4 |
| SR11B (2) | Kiu Tau | SR89 | Wai Tau Tsuen 5 |
| SR86N | Tong Hang | SR90 | Wai Tau Tsuen 6 |
| SR12 | Nam Wa Po 1 | SR75 | Wong Kong Shan |
| SR84 | Nam Wa Po 2 | SR76 | Yuen Leng 1 |
| SR85 | Nam Wa Po 3 | SR77 | Yuen Leng 2 |
| SR13 | West Tai Wo | SR83A | Yuen Leng |
| SR1013 (2) | West Tai Wo (New) | SR83N (2) | Yuen Leng 3 |
| SR14 | Tai Wo 1 | SR96 | Village Zone near Hong Lok Yuen |
| SR87 | Tai Wo 2 | SR97 | Village Zone at Tai Wo 1 |
| SR108 | Tai Hang Village House | SR98 | Village Zone at Tai Wo 2 |
| SR1082 (2) | Tai Hang (New) | SR107 | Village House near Hong Lok Yuen |
| SR17A | Tai Hang 2 | SR109 | Village House Near Nam Wa Po |
| SR17B | Village Houses of Tai Hang | N4 | Village House near Tai Wo Village 5 |
| SR81 | Tai Hang 4 | N8 | Village House near Nam Wa Po |

Note: (1) Based on site observation, structures located closer to the highway are used for industrial activities. Hence SR8 and SR9 are chosen for assessment.

(2) SR7, 10, 11, 83 and 86 near Tong Hang as stated in Approved EIA Report, were/ will be abandoned due to land resumption of DS project. The abandoned NSRs have been replaced by 7 new NSRs, namely, 7N, 1012, 1015, 83N, 86N, 11A and 11B.

Table 1-3 Selected Representative Noise Sensitive Receivers (NSRs) between Pak Wo Road and Hong Lok Yuen Road

## 1.5 Project Organization

1.5.1 The project organization and lines of communication with respect to environmental protection works is shown in ***Figure 1-1***.

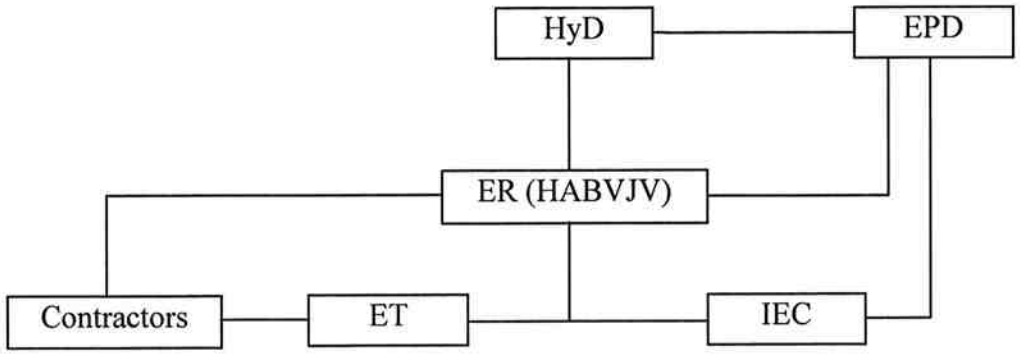



Figure 1-1 Project Organization and Lines of Communication

1.5.2 The Environmental Team (ET) shall not be in any way an associated body of the Contractors or IEC. The ET Leader shall a person who has at least 7 years of experience in environmental monitoring and auditing (EM&A) or environmental management as required under Clause 2.1 of the EP.

1.5.3 Appropriate staff shall be included in the ET, under the supervision of the ET Leader, to fulfil the EM&A duties of the ET Leader specified in this Manual. Basically the duties comprise the following:

a. To monitor the various environmental parameters as required in ERR;

b. To investigate and audit the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;

c. To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions; and;

d. To report on the environmental monitoring and audit results to the Contractor, the ER and the EPD or its delegate.

1.5.4 Appropriate resources shall also be allocated under the Contractor and the ER to fulfil their duties specified in this Manual.

1.5.5 The Independent Environmental Checker (IEC) shall be a person who has at least 7 years of experience in EM&A or environmental management. The IEC shall be responsible for duties defined in the EM&A Manual and shall audit the overall EM&A performance, including the implementation of all environmental mitigation measures, submissions required in the EM&A Manual, and any other relevant requirements under the EP.

## 1.6 Construction Programme

1.6.1 As mentioned in ***paragraph 1.1.6***, the Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling will be constructed in two packages (Stage 1 and Stage 2), and the construction works for Stage 1 and Stage 2 are expected to be 2009 – 2013 and 2010 – 2014, respectively.

1.6.2 The major construction activities are excavation, demolition and reconstruction of bridges, erection of noise barriers, road widening and paving / finishing.

# 2 AIR QUALITY

## 2.1 Introduction

2.1.1 In this section, the methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during the construction stage of the Project are explained. Dust is expected to be the key pollutant during construction of Stage 2 of the Project.

2.1.2 The impact of fugitive dust on ambient air pollution depends on the quantity, as well as the drift potential of the dust particles injected into the atmosphere. Large dust particles will settle out near the source and particles that are 30 - 100 μm in diameter are likely to settle within a distance of 100 m from the source depending on atmospheric turbulence. The main dust impact will arise from the fine particles of a diameter less than 30 μm, measured as Total Suspended Particulates (TSP), dispersed over great distance from the sources. TSP levels shall, therefore, be monitored to evaluate the dust impact during the construction. The objectives of TSP monitoring shall be to:

- Identify the extent of construction dust impacts on sensitive receiver;
- Determine the effectiveness of mitigation measures to control dust from construction activities;
- Recommend further mitigation measures if found to be necessary; and
- Comply with AL Levels for air quality as defined in this Manual.

2.1.3 The Contractors shall follow the Air Pollution Control (Construction Dust) Regulation to implement dust mitigation measures during construction to minimise the dust impact to the nearby air sensitive receivers and to ensure the effectiveness of the implementation of dust mitigation measures recommended in the EIA Report.

## 2.2 Air Quality Parameters

2.2.1 Monitoring and audit of the TSP levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely actions taken to rectify the situation.

2.2.2 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval 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.

2.2.3 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 D***.

## 2.3 Monitoring Equipment

2.3.1 A high volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hour and 24-hour monitoring:

- 0.6 - 1.7 $m^3$/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 $cm^2$ (63 $in^2$);
- Flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
- Equipped with a shelter to protect the filter and sampler;
- Incorporated with an electronic mass flow rate controller or other equivalent devices;
- Equipped with a flow recorder for continuous monitoring;
- Provided with a peaked roof inlet;
- Incorporated with a manometer;
- Able to hold and seal the filter paper to the sampler housing at horizontal position;
- Easy to change the filter; and
- Capable of operating continuously for 24-hour period.

2.3.2 The ET Leader shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit be available for carrying out the baseline, regular impacts monitoring and *ad-hoc* monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual and as described below. All the equipment, calibration kit, filter papers, etc shall be clearly labelled.

2.3.3 Initial calibration of dust monitoring equipment shall be conducted upon installation. Recalibration of the HVSs (5-point calibration) shall be carried out after motor maintenance, at least once every six months which is about the expected life of carbon brush whilst 1-point calibration shall be carried out at bi-monthly intervals. The transfer data shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by the concerned parties such as the IEC. All the data shall be converted into standard temperature and pressure condition.

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

2.3.5 Should a direct reading instrument be proposed to measure 1-hour TSP levels, the ET Leader shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that by the HVS and may be used for the 1-hr sampling. The instrument shall also be calibrated regularly, preferably in a yearly basis, and the 1-hour sampling shall be determined periodically by HVS to check the validity and accuracy of the results once a year measured by direct reading method.

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

## 2.4 Laboratory Measurement / Analysis

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

2.4.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC. IEC shall conduct regular audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. 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 this reference.

2.4.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be clean without pin holes and shall be conditioned in a humidity controlled chamber for over 24-hour and be pre-weighed before use for the sampling.

2.4.4 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 read-out down to 0.1mg. The balance used for weighing filter paper shall be calibrated in accordance with the laboratory's own QA/QC policy or HOKLAS requirement.

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

## 2.5 Monitoring Locations

2.5.1 The six dust monitoring locations as listed in Table 2.1 of the approved EM&A Manual have been reviewed by conducting a site visit on 19 June 2009. Two dust monitoring locations are identified for the Stage 2 of the Project. The monitoring locations are summarized in ***Table 2-1*** and shown in ***Appendix C***. ***Appendix E*** shows the photos of the dust monitoring stations.

| Location | Monitoring Station | Description |
|---|---|---|
| Yuen Leng | AM1 (SR83A)* | Residential |
| Fanling Government Secondary School | AM2 (SR2) | School |

Note: * SR11 near Tong Hang as stated in the approved EIA Report and EM&A Manual was abandoned due to land resumption of DS project and SR11 was replaced by SR11A and SR11B (***Table 1-2*** refers). Based on the site visit on 19 June 2009, SR83A is considered to be more representative because it is closer to the project boundary (***Appendix C-2*** refers). Dust monitoring at SR11 is proposed to change to SR83A.

Table 2-1 Dust Monitoring Stations

2.5.2 As approval is needed from the landlord of the premises for dust monitoring equipment installation, it is not certain that these locations will be able to be used. The status and locations of dust sensitive receivers may be changed after issuing this

Manual. In this case, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from the IEC.

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

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

2.5.4 The ET Leader shall agree with the ER in consultation with the IEC the position of the HVS. When positioning the samplers, the following points shall be noted:

- A horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
- No two samplers shall be placed less than 2 metres apart;
- The distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- A minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- A minimum of 2 metres separation from any supporting structure, measured horizontally is required;
- No furnace or incinerator flue or building vent is nearby;
- Airflow around the sampler is unrestricted;
- The sampler is more than 20 metres from the dripline of any tree;
- Any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
- Permission must be obtained to gain access to the monitoring stations; and
- A secured supply of electricity is needed to operate the samplers.

## 2.6 Baseline Monitoring

2.6.1 The ET Leader shall carry out baseline monitoring at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be carried out at least 3 times per day while the highest dust impact is expected. Before commencing the baseline monitoring, the ET Leader shall inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.

2.6.2 During the baseline monitoring, there shall not be any construction or dust generation activities in the vicinity of the monitoring stations.

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

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

2.6.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly 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 at times when the contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, shall be revised. The revised baseline levels and air quality criteria shall be agreed with IEC and EPD.

## 2.7 Impact Monitoring

2.7.1 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-hour TSP monitoring, the sampling frequency of at least three times in every six-days shall be undertaken when the highest dust impact occurs. Before commencing the impact monitoring, the ET Leader shall inform the IEC of the impact the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the impact monitoring results.

2.7.2 The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and be strictly followed by the operator.

2.7.3 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

2.8.1 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 and 1-hour TSP. ***Table 2-2*** shows the air quality criteria, namely Action and Limit (AL) Levels to be used. Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in ***Table 2-3*** shall be carried out.

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

Table 2-2 Action and Limit Levels for Air Quality

## 2.9 Dust Mitigation Measures

2.9.1 The ERR has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

2.9.2 The dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation shall be incorporated in the Contract Specification and implemented to reduce dust impact to within the acceptable dust criteria of 500 $\mu g/m^3$ arising from the works. Typical control measures are:

- Where breaking of rock/concrete is required, watering shall be implemented to suppress dust generation, water spray shall be used during the handling of excavated material at the site and at active cuts, tunnel construction works, excavation and fill sites where dust is likely to be created;
- The heights from which excavated materials are dropped shall be controlled to a minimum practical height to limit fugitive dust generation from unloading;
- All dusty materials shall be sprayed with water immediately prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet:
- Any stockpiles of aggregate or spoil shall be covered and water applied;
- Vehicle travel on haul road shall reduced the speed to 20 kph,
- Every vehicle shall be washed to remove any dusty materials from its body and wheels before leaving a construction site;
- The load on the vehicles shall be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle; and
- The working area of any excavation shall be sprayed with water before, during and immediately after the operation so as to maintain the entire surface wet.

2.9.3 According to the EPD's *Best Practicable Means Requirements for Cement Works (Concrete Batching Plant)*, the following mitigation measures are required for concrete batching plant (if any):

- The loading, unloading, handling, transfer of storage of cement, pulverised fuel ash or other equally dusty materials shall be carried in a enclosed system;
- All dust-laden air or waste gas generated by the process operations shall be properly extracted and vented to fabric filtering system;
- Cement, pulverised fuel ash or other equally dusty materials shall be stored in storage silo fitted with audible high level alarms to warn of over-filling. The high-level alarm indicators shall be interlocked with the material filling line;
- Vents of all silos and weighing scale shall be fitted with fabric filtering system; and
- Seating of pressure relief valves of all silos shall be checked, and the valves re-seated if necessary, before each delivery.

2.9.4 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.

| Event | Action | | | |
|---|---|---|---|---|
| | **ET Leader** | **IEC** | **ER** | **Contractor** |
| **Action Level** | | | | |
| Exceedance for one sample | 1. Identify source;<br>2. Inform IEC and ER;<br>3. Repeat measurement to confirm finding;<br>4. Increase monitoring frequency to daily. | 1. Check monitoring data submitted by ET;<br>2. Check Contractor's working method. | 1. Notify Contractor. | 1. Rectify any unacceptable practice;<br>2. Amend working methods if appropriate. |
| Exceedance for two or more consecutive samples | 1. Identify source;<br>2. Inform IEC and ER;<br>3. Repeat measurements to confirm findings;<br>4. Increase monitoring frequency to daily;<br>5. Discuss with IEC and Contractor on remedial actions required;<br>6. If exceedance continues, arrange meeting with IEC and ER;<br>7. If exceedance stops, cease additional monitoring. | 1. Check monitoring data submitted by ET;<br>2. Check Contractor's working method;<br>3. Discuss with ET and Contractor on possible remedial measures;<br>4. Advise the ER on the effectiveness of the proposed remedial measures;<br>5. Supervise Implementation of remedial measures. | 1. Confirm receipt of notification of failure in writing;<br>2. Notify Contractor;<br>3. Ensure remedial measures properly implemented. | 1. Submit proposals for remedial actions to IEC within 3 working days of notification;<br>2. Implement the agreed proposals;<br>3. Amend proposal if appropriate. |

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

Table 2-3 Event / Action Plan for Air Quality

# 3 NOISE

## 3.1 Introduction

3.1.1 As the noise sensitive receivers (NSRs) will be subjected to the construction noise impact within non-restricted hours (07:00 to 19:00 on any day not being a Sunday or public holiday), a noise monitoring programme shall be developed by the ET to include noise measurement at the NSRs within non-restricted hours. The programme shall be carried out by the ET to ensure that the noise level of construction works will comply with the criteria of the adopted noise criteria in the ERR.

## 3.2 Noise Parameters

3.2.1 The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ($L_{eq}$). $L_{eq(30\ min)}$ shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays.

3.2.2 A 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 F*** for reference.

## 3.3 Monitoring Equipment

3.3.1 As referred to 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 noise measurement at each monitoring location 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(A).

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

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

## 3.4 Monitoring Locations

3.4.1 The ten noise monitoring locations as listed in Table 3.1 of the approved EM&A Manual have been reviewed in accordance with the latest information obtained from the site visit conducted on 19 June 2009. Three out of the ten noise monitoring locations are identified for the Stage 2 of the Project.

3.4.2 The noise monitoring locations are summarised in ***Table 3-1*** and shown in ***Appendix C***. The photos of the noise monitoring stations taken on 19 June 2009 are enclosed in ***Appendix G***. The status and locations of noise sensitive receivers may change after issuing this Manual. In this case, the ET Leader shall propose updated monitoring locations and seek approval from ER, and agreement from the IEC.

| Location | Monitoring Station | Description |
|---|---|---|
| Yuen Leng* | M1 (SR83A) | Residential |
| West Tai Wo | M2 (SR13) | Residential |
| Fanling Government School | M3 (SR2) | School |

Note: * SR11 near Tong Hang as stated in the approved EIA Report and EM&A Manual was abandoned due to land resumption of DS project and SR11 was replaced by SR11A and SR11B (***Table 1-2*** refers). Based on the site visit on 19 June 2009, SR83A is considered to be more representative because it is closer to the project boundary (***Appendix C-2*** refers). In addition, noise monitoring at SR11A or SR11B may be affected by the fence wall, plants or structures (***Appendix G*** refers). As such, noise monitoring at SR11 is proposed to change to SR83A.

Table 3-1 Noise Monitoring Stations

3.4.3 When alternative monitoring locations are proposed, the monitoring locations shall 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 purpose 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 shall be considered as a noise sensitive receiver); and
- For monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.

3.4.4 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 a 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 IEC on the monitoring positions and the correction adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

## 3.5 Baseline Monitoring

3.5.1 Baseline noise monitoring before commencement of construction works is not normally required in accordance with the *Environmental Monitoring and Audit Guidelines for Development Projects in Hong Kong* issued by EPD in 1998.

## 3.6 Impact Monitoring

3.6.1 Noise monitoring shall be carried out, by the ET, at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- One set of measurements between 0700 – 1900 hours on normal weekdays.

3.6.2 General construction works carrying out during restricted hours is controlled by Construction Noise Permit (CNP) system under the NCO.

3.6.3 School exists near the construction activity, such as the Fanling Government School (M3), noise monitoring shall be carried out 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.

3.6.4 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and 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 Construction Noise

3.7.1 The Action and Limit (AL) Levels for construction noise are defined in ***Table 3-2***. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in ***Table 3-3***, shall be carried out.

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

Note: * Noise level reduced from 70 dB(A) for schools and 65 dB(A) during school examination periods

Table 3-2 Action and Limit Levels for Construction Noise

## 3.8 Noise Mitigation Measures

3.8.1 The ERR Report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

3.8.2 Noise emissions from construction sites can be minimised through good site practice and selecting quiet plant. These methods are discussed in the following paragraphs.

**Good Site Practice**

3.8.3 Good site practice and noise management can considerably reduce the impact of construction site activities on nearby NSRs. The following package of measures shall be followed during each phase of construction:

- Only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction works;
- Machines and plant that may be in intermittent use shall be shut down between work periods or shall be throttled down to a minimum;
- Plant known to emit noise strongly in one direction, shall, where possible, be orientated to direct noise away from nearby NSRs;
- Mobile plant shall be sited as far away from NSRs as possible; and
- Material stockpiles and other structures shall be effectively utilised, where practicable, to screen noise from on-site construction activities.

**Selecting Quieter Plant and Working Methods**

3.8.4 The Contractor may be able to obtain particular models of plant that are quieter than standard types given in the GW-TM. The benefits achievable for each of the measures proposed will depend on the details of the Contractors' chosen methods of working, and it is considered too restrictive to specify items of plant that a Contractor has to use during construction activities. It is therefore both preferable and practical to specify an overall plant noise performance specification to apply to the total SWL of all plant on the site, so that the Contractor is allowed some flexibility to select plant to suit his needs.

**Use of Temporary and Movable Noise Barriers**

3.8.5 Movable barriers could be very effective in providing noise screening from a particular plant. It is anticipated that a 3m high movable noise barrier with a skid footing and a small cantilevered upper portion can be located within a few metres of plant. It is estimated that movable noise barrier of this type, if carefully located, can produce at least 10 dB(A) screening for stationary plant and 5 dB(A) for mobile plant.

**Reducing the Number of Plant Operating On-site Close to NSRs**

3.8.6 It shall be noted that various types of silenced equipment can be found in Hong Kong. However, the EPD, when processing a CNP application, will apply the noise levels contained in the relevant statutory TM, unless the noise emission of a particular piece of equipment can be validated by certificate or demonstration.

3.8.7 If the above measures are not sufficient to restore the construction noise 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 carry out the mitigation measures.

| Event | Action | | | |
|---|---|---|---|---|
| | **ET Leader** | **IEC** | **ER** | **Contractor** |
| Action Level | 1. Notify IEC and the Contractor.<br>2. Carry out investigation.<br>3. Report the results of investigation to IEC and the Contractor.<br>4. Discuss with the Contractor and formulate remedial measures.<br>5. Increase monitoring frequency to check mitigation effectiveness. | 1. Review with analysed results submitted by ET.<br>2. Review the proposed remedial measures by the Contractor and advise ER accordingly.<br>3. Supervise the implement of remedial measures. | 1. Confirm receipt of notification of failure in writing.<br>2. Notify the Contractor.<br>3. Require the Contractor to propose remedial measures for the analysed noise problem.<br>4. Ensure remedial measures are properly implemented. | 1. Submit noise mitigation proposals to IEC.<br>2. Implement noise mitigation proposals. |
| Limit Level | 1. Notify IEC, ER, EPD and the Contractor.<br>2. Identify the source.<br>3. Repeat measurement to confirm findings.<br>4. Increase monitoring frequency.<br>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented.<br>6. Inform IEC, ER, and EPD the causes & actions taken for the exceedances.<br>7. Assess effectiveness of the Contractor's remedial actions and keep IEC, EPD and ER informed of the results.<br>8. If exceedance stops, cease additional monitoring. | 1. Discuss amongst ER, ET Leader and the Contractor on the potential remedial actions.<br>2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise ER accordingly.<br>3. Supervise the implementation of remedial measures. | 1. Confirm receipt of notification of failure in writing.<br>2. Notify the Contractor.<br>3. Require the Contractor to propose remedial measures for the analysed noise problem.<br>4. Ensure remedial measures are properly implemented.<br>5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated. | 1. Take immediate action to avoid further exceedance.<br>2. Submit proposals for remedial actions to IEC within 3 working days of notification.<br>3. Implement the agreed proposals.<br>4. Resubmit proposals if problem still not under control.<br>5. Stop the relevant activity of works as determined by the ER until the exceedance is abated. |

Table 3-3 Event / Action Plan for Noise Impact

# 4 WATER QUALITY

## 4.1 Introduction

4.1.1 It has been recommended that monitoring water quality impacts shall be included in the impact monitoring and audit programme. The purpose of the impact monitoring of water quality is to determine any deterioration of the water quality when construction works are being carried out. Water quality sensitive receivers are illustrated in ***Appendix C-3*** prepared based on Figure 4.1 of the approved EM&A Manual.

## 4.2 Water Quality Parameters

4.2.1 Monitoring of turbidity in NTU, dissolved oxygen (DO) in mg/l and suspended solids (SS) in mg/l shall be carried out by the ET to ensure that any deteriorating water quality is readily detected and timely action may be taken to rectify the situation. The former two parameters are measured in-situ while the latter one is determined in an approved laboratory.

4.2.2 In association with the water quality parameters, some relevant data shall also be measured, such as monitoring location/position, time, water depth, water temperature, salinity, DO saturation, weather conditions, tidal stage, and any special phenomena and work underway at the construction site etc.

## 4.3 Monitoring Equipment

**Dissolved oxygen and temperature measuring equipment**

4.3.1 The instrument should be portable, weatherproof dissolved oxygen (DO) measuring instrument complete with cable, sensor, comprehensive operation manuals, and use a DC power source. It should be capable of measuring: -

- a dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation
- a temperature of 0-45 degree Celsius

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

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

**Turbidity Measurement Instrument**

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

**Suspended Solids**

4.3.5 Sufficient volume of each water sample should be obtained in accordance with the requirements of the laboratory. The water sampler should be rinsed before sampling.

4.3.6 Water samples for suspended solids measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

**Water Depth Detector**

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

**Salinity**

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

**Position Fixing**

4.3.9 A hand-held type digital Differential Global Positioning System (GPS) with way point bearing indication and Radio Technical Commission for Maritime (RTCM) Type 16 error message screen pop-up facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office) or other equivalent instrument of similar accuracy shall be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

**Calibration of In-Situ Instruments**

4.3.10 All *in-situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

4.3.11 For the on site calibration of field equipment, the BS 1427:2009, "Guide to on-site test methods for the analysis of waters" or the manual of each equipment should be observed.

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

4.3.13 Equipment list and testing methods for water quality baseline monitoring are summarized as follows:

a. Water depth

   Measured by portable echo sounder

b. Temperature (in-situ)

   Measured by using the temperature probe of the Dissolved Oxygen meter.

c. Dissolved oxygen (in-situ)

A portable DO meter

d. Turbidity (in-situ)

Water from the appropriate depth taken by a water sampler and the turbidity measured by a turbidmeter

e. Suspended Solids (laboratory)

Method used was in accordance with APHA 2540D.

f. pH (laboratory)

Measured by a pH meter

4.3.14 The locations of the water sampling will be determined by a hand-held GPS equipment.

## 4.4 Monitoring Locations

4.4.1 Monitoring shall be undertaken at two monitoring stations when working over water and one control station at the site. The ET Leader shall propose the locations indicated in ***Appendix I-1*** to the IEC for verification and then submit the proposal of monitoring location with IEC's verification to EPD for approval. No works over water shall be undertaken before EPD's approval for the monitoring location.

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

a. At locations close to and preferably at the boundary of the major site activities as indicated in the ERR, which are likely to have water quality impacts

b. Close to the sensitive receptors which are directly or likely to be affected

c. For monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring

d. Two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations should be located, as far as practicable, both upstream and downstream of the works area.

4.4.3 Control stations are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works.

4.4.4 Measurements shall be taken at mid-depth. The ET Leader shall seek approval from the IEC and EPD on all the monitoring stations.

## 4.5 Baseline Monitoring

4.5.1 Baseline conditions for river water quality shall be established and agreed with IEC and EPD prior to the commencement of works. The purposes of the baseline monitoring are to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact, control and reference monitoring stations. The baseline conditions shall normally be established

by measuring the water quality parameters specified in ***Section 4.2***. The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week for at least four weeks prior to the commencement of river training works.

4.5.2 There shall not be any construction activities over water in the vicinity of the stations during the baseline monitoring.

4.5.3 In exceptional case when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall seek approval from the IEC and DEP on an appropriate set of data to be used as baseline reference.

4.5.4 Baseline monitoring schedule shall be faxed to EPD 1 week prior to the commencement of baseline monitoring. The interval between 2 sets of monitoring shall not be less than 36 hours.

4.6 Impact Monitoring

4.6.1 During the course of the river training works, monitoring shall be undertaken on three occasions per week. The interval between two sets of monitoring shall not be less than 36hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency will be increased.

4.6.2 Upon completion of all river training work, a post project monitoring exercise on river water quality shall be carried out for four weeks in the same manner as the impact monitoring.

4.6.3 Proposed water quality monitoring schedule shall be faxed to EPD on or before the first day of the monitoring month, EPD shall be notified immediately of any change in schedule by fax.

4.7 Event and Action Plan for Water Quality

4.7.1 The water quality criteria, namely Action and Limit levels, are shown in ***Table 4-1***. Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria are exceeded, the actions in accordance with the Action Plan in ***Table 4-2*** shall be carried out.

4.7.2 This project has a duration of greater than 12 months and, therefore quarterly assessment of impacts of the construction activities on water quality at the project site shall be undertaken and reported in a quarterly report. The difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline and/or EPD data, of the related parameters shall be compared using appropriate statistical procedures. If the analytical results demonstrate quarterly mean is significantly higher than the 1.3 times of ambient mean ($P<0.05$), appropriate mitigation measures shall be proposed in the quarterly report. A sample data record sheet is shown in ***Appendix H*** for reference.

| **Parameters** | **Action** | **Limit** |
|---|---|---|
| DO in mg/l<br>(Surface, Middle & Bottom) | 5%-ile of baseline data | 4 mg/l or 40% saturation at 15 degree Celsius |

| Parameters | Action | Limit |
|---|---|---|
| SS in mg/l (depth-averaged) | 95%-ile of baseline data and 120% of upstream control station's SS at the same tide of the same day | 99%-ile of baseline, and 130% of upstream station's SS at the same tide of the same day and specific sensitive receiver water quality requirements |
| Turbidity (Tby) in NTU (depth averaged) | 95%-ile of baseline data and 120% of upstream control station's Tby at the same tide of the same day | 99%-ile of baseline and 130% of upstream control station's Tby |

Notes:

- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and Tby, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.

Table 4-1 Action and Limit Levels for Water Quality

| Event | Action | | | |
|---|---|---|---|---|
| | **ET Leader** | **IEC** | **ER** | **Contractor** |
| Action level being exceeded by one sampling day | 1. Repeat *in-situ* measurement on next day of exceedance to confirm findings;<br>2. Identify source(s) of impact;<br>3. Inform IEC, Contractor & ER;<br>4. Check monitoring data, all plant, equipment & contractor's working methods; | 1. Check monitoring data submitted by ET & Contractor's working methods; | 1. Confirm receipt of notification of failure in writing; Notify, Contractor | 1. Inform the ER & confirm notification of the non-compliance in writing;<br>2. Rectify unacceptable practice;<br>3. Amend working methods if appropriate. |
| Action level being exceeded by two or more consecutive sampling days | 1. Repeat measurement on next day of exceedance to confirm findings;<br>2. Identify source(s) of impact;<br>3. Inform IEC, Contractor, ER & EPD;<br>4. Check monitoring data, all plant, equipment & Contractor's working methods;<br>5. Discuss mitigation measures with IEC, ER & Contractor;<br>6. Ensure mitigation measures are implemented;<br>7. Increase monitoring to daily until no exceedance of Action level. | 1. Checking monitoring data submitted by ET & Contractor's working method;<br>2. Discuss with ET & Contractor on possible remedial actions;<br>3. Review the proposed mitigation measures submitted by Contractor & advise the ER accordingly;<br>4. Supervise the implementation of mitigation measures. | 1. Discuss with IEC on the proposed mitigation measures;<br>2. Ensure mitigation measures properly implemented;<br>3. Assess the effectiveness of the implemented mitigation measures. | 1. Inform the Engineer & confirm notification of the non-compliance in writing;<br>2. Rectify unacceptable practice;<br>3. Check all plant & equipment & consider changes of working methods;<br>4. Submit proposal of mitigation measures to ER within 3 working days of notification & discuss with ET, IEC & ER;<br>5. Implement the agreed mitigation measures. |

| Event | Action | | | |
|---|---|---|---|---|
| | **ET Leader** | **IEC** | **ER** | **Contractor** |
| Limit level being exceeded by one sampling day | 1. Repeat measurement on next day of exceedance to confirm findings;<br>2. Identify source(s) of impact;<br>3. Inform IEC, contractor, ER & EPD;<br>4. Check monitoring data, all plant, equipment & contractor's working methods;<br>5. Discuss mitigation measures with IEC, Contractor & ER. | 1. Checking monitoring data submitted by ET & Contractor's working method;<br>2. Discuss with ET & Contractor on the possible mitigation measures;<br>3. Review the proposed mitigation measures submitted by Contractor & advise the ER accordingly. | 1. Confirm receipt of notification of failure in writing;<br>2. Discuss with IEC, ET & Contractor on the proposed mitigation measures;<br>3. Request Contractor to review the working methods. | 1. Inform the ER & confirm notification of the non-compliance in writing;<br>2. Rectify unacceptable practice;<br>3. Check all plant & equipment & consider changes of working methods;<br>4. Submit proposal of mitigation measures to ER within 3 working days of notification & discuss with ET, IEC & ER. |
| Limit level being exceeded by two or more consecutive sampling days | 1. Repeat measurement on the next day of exceedance to confirm findings;<br>2. Identify source(s) of impact;<br>3. Inform IEC, Contractor, ER & EPD;<br>4. Check monitoring data, all plant, equipment & Contractor's working methods;<br>5. Discuss mitigation measures within IEC, Contractor & ER;<br>6. Ensure mitigation measures are implemented;<br>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days. | 1. Checking monitoring data submitted by ET & Contractor's working method;<br>2. Discuss with ET & Contractor on potential remedial actions;<br>3. Review Contractor's mitigation measures whenever necessary to assure their effectiveness & advise the ER accordingly;<br>4. Supervise the implementation of mitigation measures. | 1. Discuss with IEC, ET & Contractor on the proposed mitigation measures;<br>2. Request Contractor to critically review the working methods;<br>3. Make agreement on the mitigation measures to be implemented;<br>4. Ensure mitigation measures are properly implemented;<br>5. Consider & instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level. | 1. Take immediate action to avoid further exceedance;<br>2. Submit proposal of mitigation measures to ER within 3 working days of notification & discuss with ET, IEC & ER;<br>3. Implement the agreed mitigation measures;<br>4. Resubmit proposals of mitigation measures if problem still not under control;<br>5. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level. |

Table 4-2 Event / Action Plan for Water Quality

## 4.8 Mitigation Measures

4.8.1 The ERR has recommended water quality control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

- All wastewater generated on the Site shall be collected, removed from Site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance.
- The Contractor shall construct, maintain, remove and reinstate, as necessary, temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding and silt washed down from the Works. He shall also provide adequate precautions to ensure that no spoil or debris of any kind is allowed to be pushed, washed down, fall or be deposited on land or on the seabed adjacent to the site.
- Around any material storage, batching plants or other facilities where spillage may occur, a bund with a capacity of 110% will be provided.
- The Contractor shall not permit any sewage, waste water or other effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the Site onto any adjoining land or allow any solid waste to be deposited anywhere within the Site or onto any adjoining land and shall have all such materials removed from the Site.
- The Contractor shall be responsible for temporary drainage, diverting or conducting of open streams or drains intercepted by any works and for reinstating these to their original courses on completion of the Works.
- Any proposed temporary diversions to stream courses or nullahs shall be submitted to the Engineer for agreement one month prior to such diversion works being commenced. Diversions shall be constructed to allow the water flow to discharge without overflow, erosion or washout. The area through which the temporary diversion runs is to be reinstated to its original condition when the temporary diversion is no longer required.
- The Contractor shall not discharge directly or indirectly (by runoff) or cause or permit to be discharged into any public sewer, storm-water drain, channel, stream-course or sea, any effluent or foul or contaminated water or cooling water without the prior consent of the relevant Authority who may require the Contractor to provide, operate and maintain at the Contractor's own expense, within the premises or otherwise, suitable works for the treatment and disposal of such effluent or foul or contaminated or cooling or hot water.
- If any office, site canteen or toilet facilities is erected, foul water effluent shall, subject to clause as stated in the last paragraph above, be directed to a foul sewer or to a sewage treatment facilities either directly or indirectly by means of pumping.
- The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to the Site are kept safe and free from any debris and any excavated materials arising from the Works. The Contractor shall ensure that chemicals and concrete agitator washings are not deposited in watercourses.
- All Contractor's Equipment shall be designed and maintained to minimise the risk of silt and other contaminants being released into the water column or deposited in other than designated locations.

# 5 WASTE MANAGEMENT

## 5.1 Introduction

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

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

- The proposed re-use, recycling, storage, collection, transport and disposal methods for various wastes which are recommended to avoid or minimise potential adverse impacts are detailed below. Specifically, it is recommended that during the construction phase, the Contractor incorporate the recommendations into an on-site waste management plan.
- The Contractor shall also pay attention to the Waste Disposal Ordinance and its subsidiary regulations, 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 license/permit, such as the effluent discharge license, the chemical waste producer registration, etc. shall be obtained. The Contractor shall refer to the relevant booklets issued by EPD when applying for the license/permit.
- During the site inspections and the document review procedures as mentioned in ***Sections 7.1*** and ***7.2*** 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.

## 5.2 Waste Mitigation Measures

5.2.1 This section sets out recycling, storage, transportation and disposal measures which are recommended to avoid or minimise potential adverse impacts associated with waste arising from the construction of Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling. The contractor shall incorporate these recommendations into a comprehensive on-site waste management plan. Such a management plan shall incorporate site-specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials.

## 5.3 Waste Management Hierarchy

5.3.1 The various waste management options can be categorised in terms of preference from an environmental viewpoint. The options considered to be more preferable have the least impacts and are more sustainable in the longer term. Hence, the hierarchy is as follows:

- Avoidance and minimisation, i.e. not generating waste through changing or improving practices and design;
- Reuse of materials, thus avoiding disposal (generally without reprocessing);

- Recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
- Treatment and disposal, according to relevant laws, guidelines and good practice.

5.3.2 The Contractor shall consult the EPD on the final disposal of wastes.

5.3.3 This hierarchy shall be used to evaluate waste management options, thus allowing maximum waste reduction and often reducing costs. Waste reduction measures shall be introduced at the design stage and carried through the construction activities, wherever possible, by careful purchasing control, reuse of formworks and good site management. By reducing or eliminating over-ordering of construction materials, waste is avoided and costs are reduced both in terms of purchasing of raw materials and in disposing of wastes.

5.3.4 Training and instruction of construction staff shall be given at the site to increase awareness and draw attention to waste management issues and the need to minimise waste generation. The training requirement shall be included in the site waste management plan.

**Storage, Collection and Transport of Waste**

5.3.5 Permitted waste hauliers shall be used to collect and transport wastes to the appropriate disposal points. The following measures to minimise adverse impacts shall be instigated:

- Handle and store wastes in a manner which ensures that they are held securely without loss or leakage, thereby minimising the potential for pollution;
- Use waste hauliers authorised or licensed to collect specific category of waste;
- Remove wastes in a timely manner;
- Maintain and clean waste storage areas regularly;
- Minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers;
- Obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354), the Crown Land Ordinance (Cap 28);
- Dispose of waste at licensed waste disposal facilities;
- Develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of wastes does not occur; and
- Maintain records of the quantities of wastes generated, recycled and disposed.

**Surplus Excavated Material**

5.3.6 The excavated material may have to be temporarily stockpiled on-site for subsequent re-use. Control measures shall be taken at the stockpiling area to prevent the generation of dust and pollution of stormwater channels. Key control measures are highlighted below:

*Dust:*

- Wetting the surface of the stockpiled soil with water to keep the surface wet especially during the dry season;
- Covering the stockpiled materials with impervious sheets; and
- Enclosure of the stockpiling area.

*Water Quality:*

- Separating surface water drainage system for the stockpiling area;
- Installation of silt traps for the surface water drainage system; and
- Covering stockpiled material with tarpaulin during heavy rainstorm.

**Construction and Demolition (C&D) Material**

5.3.7 In order to minimise waste arising and to keep environmental impacts within acceptable levels, the environmental control measures described below shall be adopted.

5.3.8 Careful design, planning and good site management can minimise over-ordering and generation of waste materials such as concrete, mortars and cement grouts. The design of formwork shall maximise the use of standard wooden panels so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing shall be considered to increase the potential for reuse.

5.3.9 The Contractor shall recycle the C&D material on-site. Proper segregation of wastes on site will increase the feasibility of certain components of the waste stream by the recycling contractors. For example, concrete and masonry can be used as general fill and steel reinforcement bar can be used by scrap steel mills. Different areas of the worksite shall be designated for such segregation and storage wherever site conditions permit.

5.3.10 The handling and disposal of bentonite slurries shall be undertaken in accordance with ProPECC PN 1/94 on construction site drainage.

5.3.11 Construction and demolition wastes currently comprise approximately 35% of waste inputs to landfills. To maximise landfill life, Government policy discourages the disposal of C&D wastes with more than 30% inert material (by weight) at landfill. Inert C&D material are directed to reclamation areas, where they have the added benefit of offsetting the need for removal of materials from borrow areas for reclamation purposes.

5.3.12 Government has established a charging scheme for the disposal of waste to landfill. When it is implemented, this will provide additional incentive to reduce the volume of waste generated and to ensure proper segregation of wastes to allow free disposal of inert material to public filling areas.

**Chemical Waste**

5.3.13 It should be stressed that the Contractor should be registered as a Chemical Waste producer if chemical wastes are generated.

5.3.14 Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, shall be handled in accordance with the

Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows.

- Containers used for the storage of chemical wastes shall:
  - be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
  - have a capacity of less than 450 litres 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 Regulations.
- The storage area for chemical wastes shall:
  - be clearly labelled 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 entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and
  - be arranged so that incompatible materials are adequately separated.
- Disposal of chemical waste shall:
  - be via a licensed waste collector; and
  - be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or
  - be to a reuser of the waste, under approval from the EPD.
- EPD maintain the Hong Kong Waste Reduction website at https://www.wastereduction.gov.hk/, which provides resources relating to waste reduction and recycling, including the Hong Kong collector / recycler directory.

**General Refuse**

5.3.15 General refuse shall be stored in enclosed bins or compaction units separate from C&D and chemical wastes. A reputable waste collector shall 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 minimise odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.

5.3.16 General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware shall be used if feasible. Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate labelled bins for their deposit shall be provided if feasible.

5.3.17 Office wastes can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme shall be considered if one is available.

# 6 ECOLOGY

## 6.1 Introduction

6.1.1 The Contractor is responsible for the implementation of all mitigation measures as listed in ***Section 6.2*** to minimise ecological impacts from site activities. The implementation of these measures shall be checked by the ET as part of the environmental audit, details of which are presented in the following ***Section 7***.

## 6.2 Mitigation Measures

6.2.1 The ET shall be responsible for checking (auditing) the correct implementation of the following mitigation measures (and good site practices) by the Contractor prior to and during the works.

- Erection of fences along the boundary of construction sites before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel into adjacent wooded areas, particularly fung-shui woodlands and where the rare/protected plant species are located;
- Selection of haul routes, storage and works areas etc. so as to minimize habitat/vegetation disturbance;
- Regular checking to ensure that the work site boundaries are not exceeded and that no damage occurs to surrounding areas;
- Prohibition and prevention of open fires within the work site boundary during construction and provision of temporary fire fighting equipment in the work area during construction; and
- Check the effectiveness of on-site compensation planting to address loss of fung-shui woodlands and secondary woodlands due to road construction.

## 6.3 Non-compliance Action Plan

6.3.1 If during the audit the ET notes that significant vegetation damage has occurred as a consequence of non-compliance of any of the above measures, the ER shall be informed immediately verbally and in writing.

6.3.2 Should any supplementary works such as additional vegetation planting or tree surgery be undertaken as a consequence of non-compliance, the ET shall also be responsible for checking the effectiveness of these measures.

# 7 SITE ENVIRONMENTAL AUDIT

## 7.1 Introduction

7.1.1 Site Inspections provide a direct means to assess and ensure the project's environmental protection and pollution control measures are in compliance with the contract specifications. They shall be undertaken by the ET 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 report system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

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

7.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the pollution control and mitigation measures within the site; it shall 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.

7.1.4 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 report results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and timeframe 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.

7.1.5 *Ad hoc* site inspections 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 work, as specified in the Action Plan for environmental monitoring and audit.

## 7.2 Compliance with Legal and Contractual Requirements

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

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

7.2.3 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 any foreseeable potential for violating the laws can be prevented.

7.2.4 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 license/permits under the environmental protection laws, and all the valid license/permit. The site diary shall also be available for the ET Leader's inspection upon his request.

7.2.5 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 license/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 advise the Contractor and the ER accordingly.

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

## 7.3 Environmental Complaints

7.3.1 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 complaint:

- Log complaint and date of receipt onto the complaint database and inform the IEC immediately;
- Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- If a complaint is valid and due to works, identify mitigation measures;
- 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 EPD, the results shall 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.

7.3.2 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.

7.3.3 A flow chart of the complaint response procedures is shown in ***Figure 7-1***.

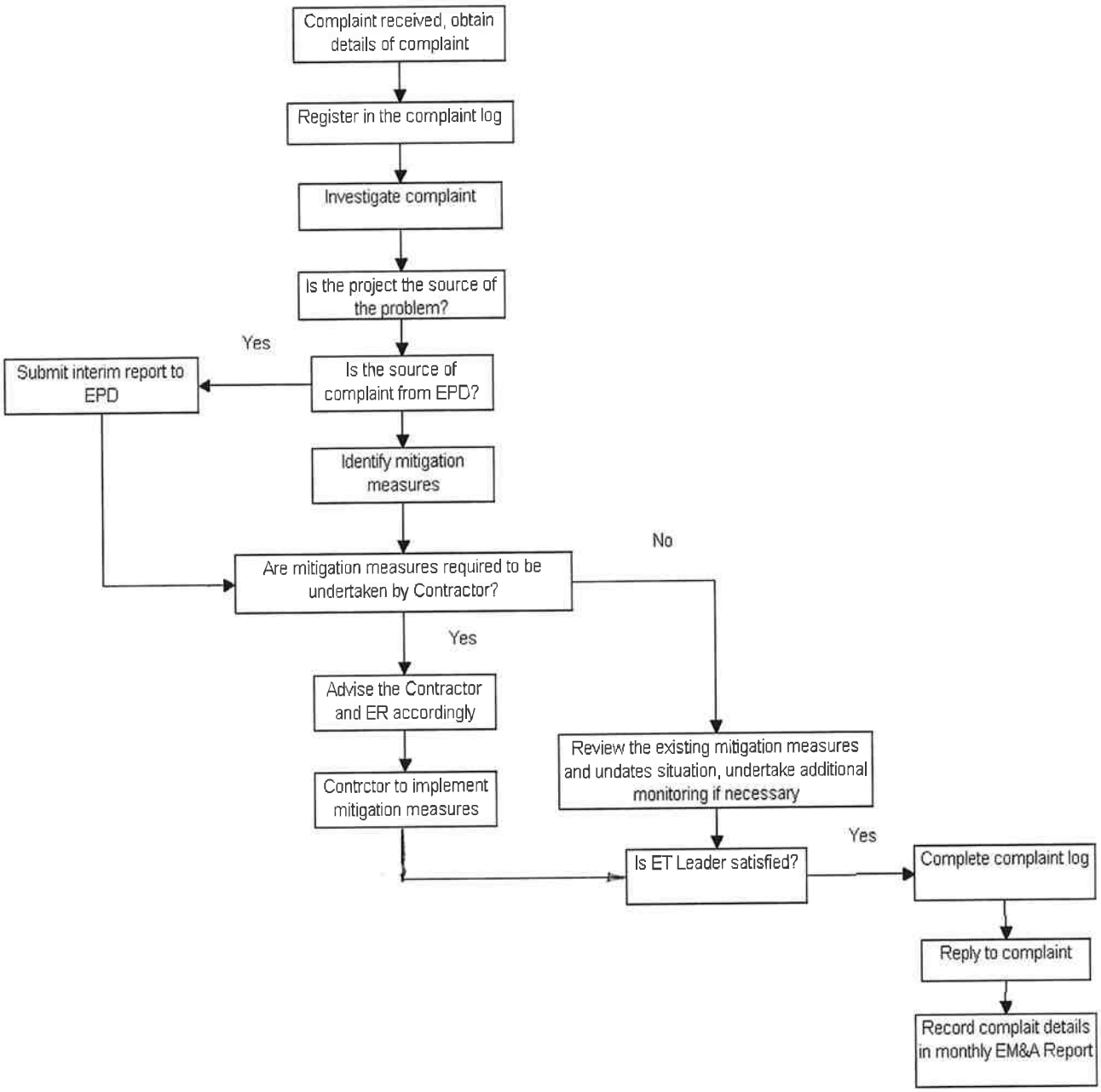



Figure 7-1 Complaint Response Procedure

# 8 REPORTING

## 8.1 General

8.1.1 The reporting guidelines referred to in this section are based upon a paper based system, however, the same information can be provided by an electronic medium as required under Clause 4 of the EP. All the monitoring data (baseline and impact) shall also be submitted electronically in the format shown in ***Appendices D and F***.

## 8.2 Baseline Monitoring Report

8.2.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to all parties: the Contractor, the IEC, the ER and the EPD. The format and content of the report, and the representation of the baseline monitoring data shall be in a format to satisfaction of EPD and include, but not be limited to 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 soft 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;
  - QA/QC results and detection limits;
- Details on influencing factors, including
  - major activities, if any, being carried out on the Site during the period;
  - weather conditions during the period;
  - other factors which might affect the results.
- Determination of the Action and Limit (AL) Levels for each monitoring parameter and statistical analysis of the baseline data; the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored, and the following information shall be recorded:
  - Graphical plots of monitored parameters in the month annotated against;
  - The major activities being carried out on site during the period;
- Revisions for inclusion in the EM&A Manual; and
- Comments and conclusions.

## 8.3 Impact Monitoring Reports

8.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the EM&A reports. Reports shall be prepared and certified by the ET Leader, verified by the IEC and submitted to EPD within 2 weeks of the end of each reporting month, as required under Clause 3.3 of the EP, with the first report due in the month after construction commences. 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 to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

**First Monthly EM&A Report**

8.3.2 The First Monthly EM&A Report shall include at least the following:

- Executive Summary (1-2 pages)
  - Breaches of AL levels;
  - Complaints Log;
  - Notifications of any summons and successful prosecutions;
  - Reporting Changes;
  - Future key issues.
- Basic Project Information
  - Project organisations including key personnel contact names and telephone numbers;
  - Programme;
  - Management structure; and
  - Works undertaken during the month.
- Environmental Status
  - Work undertaken during the month with illustrations (such as location of works daily dredging/filling rates percentage fines in the fill material used); and
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- Summary of EM&A requirements
  - All monitoring parameters;
  - AL Levels;
  - Event-Action Plans;
  - Environmental mitigation measures, as recommended in the project ERR;
  - Environmental requirements in contract documents.
- Implementation status
  - Advice on the implementation of environmental protection and pollution control/mitigation measures, as recommended in the ERR, summarised in the updated implementation schedule (in ***Appendix B***).

- Monitoring Results (in both hard and soft copies):
  - 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;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- Others
  - An account of the future key issues as reviewed from the Works programme and work method statements; and
  - Advice on the solid and liquid waste management status.

**Subsequent Monthly EM&A Reports**

8.3.3 The subsequent Monthly EM&A Reports shall include the following:

- Executive Summary (1-2 pages)
  - Breaches of AL levels;
  - Complaints Log;
  - Notifications of any summons and successful prosecutions;
  - Reporting Changes;
  - Future key issues.

- Environmental Status
  - Work undertaken during the month with illustrations including key personnel contact names and telephone number; and
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- Implementation status
  - Advice on the implementation of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts if applicable, as recommended in the ERR, summarised in the updated implementation schedule (in ***Appendix B***).
- Monitoring Results:
  - To provide monitoring results (in both hard and soft copies) together with the following information:
    - Monitoring methodology;
    - Name of laboratory and types of equipment used and calibration details;
    - Parameters monitored;
    - Monitoring locations;
    - Monitoring date, time, frequency, and duration;
    - Weather conditions during the period;
    - Any other factors which might affect the monitoring results; and
    - QA/QC results and detection limits.
- Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- Others
  - An account of the future key issues as reviewed from the Works programme and work method statements; and
  - Advice on the solid and liquid waste management status.

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

**Quarterly EM&A Summary Reports**

8.3.4 The Quarterly EM&A Summary Report which shall generally be around 5 pages (including about 3 of text and tables and 2 of figures) shall contain at least the following information:

- Up to half page of executive summary
- Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter;
- A brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (AL levels); and
  - environmental mitigation measures, as recommended in the ERR;
- 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;
- Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- Graphical plots of the trends of monitored parameters over the past 4 months (the last Month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results.
- Advice on the solid and liquid waste management status;
- A summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- A quarterly assessment of constructional impacts on water quality at the project site including but not limited to comparison of the difference between the

quarterly mean and 1.3 times of the ambientment which is defined as 30% increase of the baseline data or EPD data of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the liaison water quality times of the ambient mean ($p < 0.05$)

- A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures
- A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- A summary record of all complaints received (written or verbal) fro each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- Proponents' contacts and any hotline telephone number for the public to make enquiries.

**Annual/Final EM&A Review Reports**

8.3.5 The Annual/Final EM&A Report shall contain at least the following information:

- An executive summary;
- Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- Basic project information including a synopsis of the project organisation contacts of key management, and a synopsis of work undertaken during the entire construction period;
- A brief summary of EM&A requirements including:
  - Environmental mitigation measures, as recommended in the ERR;
  - Environmental impact hypotheses tested;
  - AL Levels;
  - All monitoring parameters;
  - Event-Action Plans
- A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the ERR summarized in the updated implementation schedule;
- Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, for all monitoring stations against:
  - the major activities being carried out on Site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results.

- A summary of non-compliances (exceedances) of the environmental quality performance limits (AL levels);
- A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- A description of the actions taken in the event of non-compliance;
- A summary record of all complaints received (written or verbal) for each media liaison and consultation undertaken, action and follow-up procedures taken;
- A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection pollution control legislations locations and nature of the breaches, investigation, follow-up actions taken and results;
- A review of the validity of ERR/EIA Report predictions and identification of shortcomings in ERR/EIA Report recommendations;
- A review of the effectiveness and efficiency of the mitigation measures; and
- A review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigatory action when necessary.

## 8.4 Data Keeping

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

## 8.5 Interim Notifications of Environmental Quality Limit Exceedances

8.5.1 With reference to Event/Action Plans in ***Table 2-3, Table 3-3 and Table 4-2***, when the environmental quality limits are exceeded, the ET Leader shall immediately notify the ER and EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in ***Appendix H***.

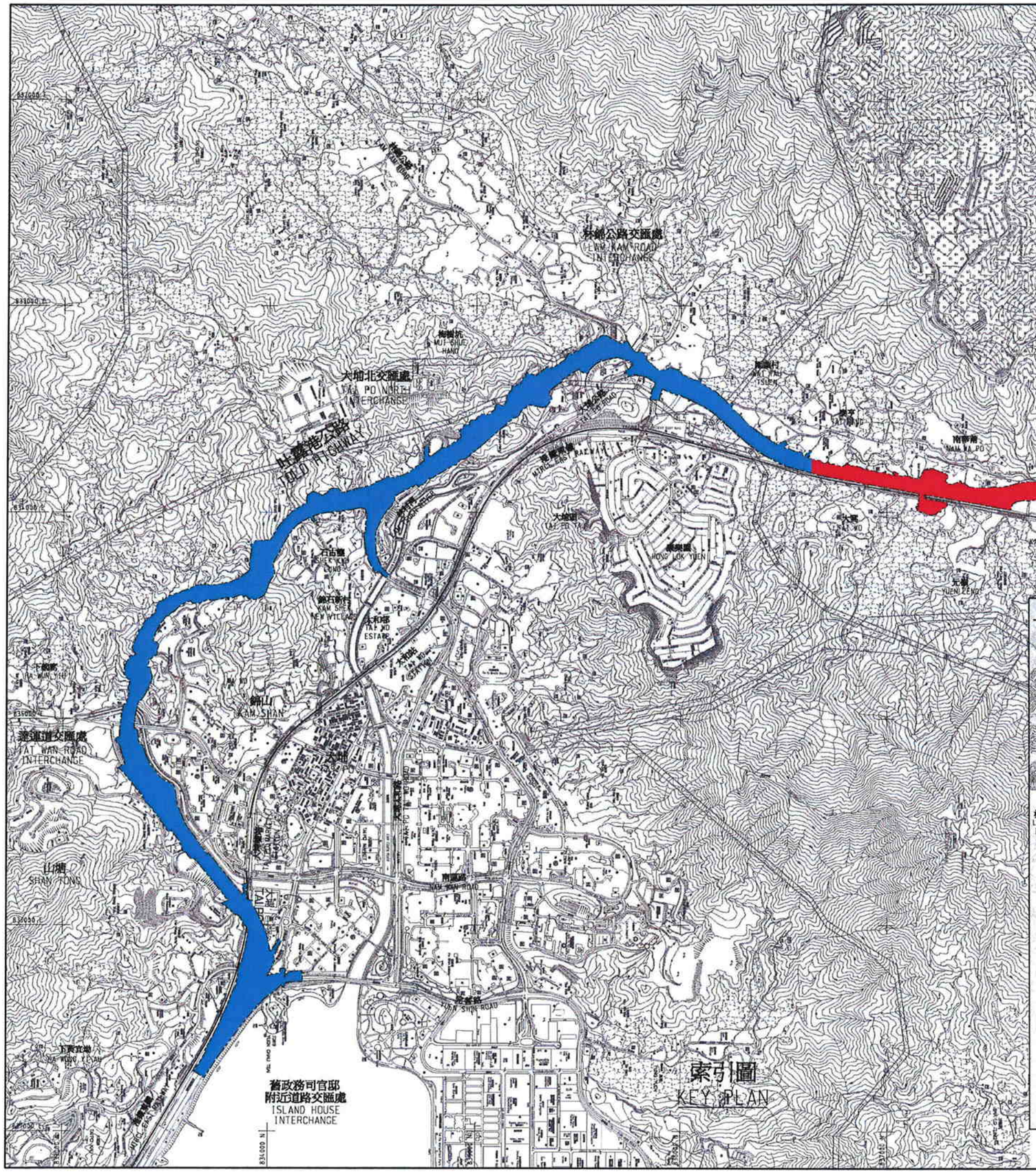
# 9 OPERATIONAL PHASE NOISE MONITORING

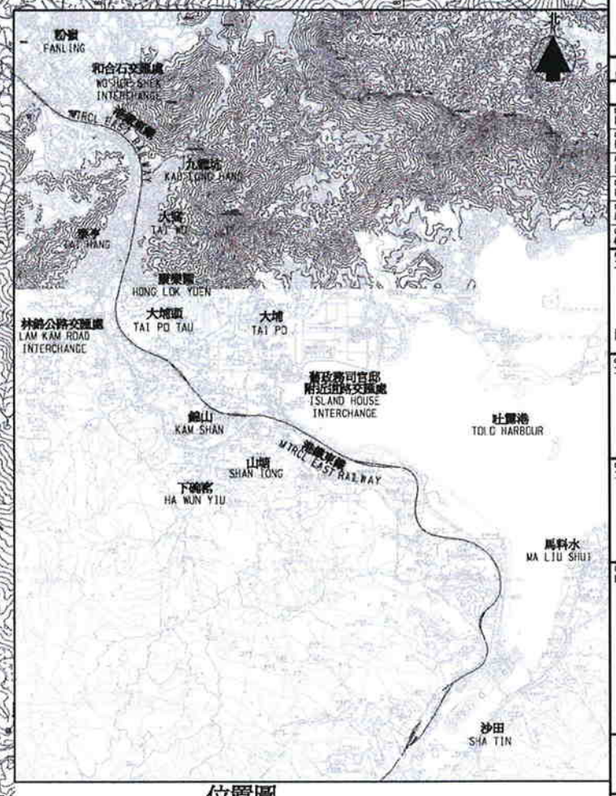
## 9.1 Introduction

9.1.1 Operational noise monitoring station as stated in the approved EM&A Manual will be covered in the operational phase of Stage 1 of the Project. As such, there is no need to conduct the operational noise monitoring for Stage 2 of the Project.

# Appendix A

## Location Plan




位置圖
LOCATION PLAN

## 註釋 NOTES :

1. 除在其他方面表明外，所有量度均以米為單位
ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. 所有水平均為約數，以米為單位，並基於香港主水平基準上
ALL LEVELS ARE APPROXIMATE VALUES AND IN METRES ABOVE HONG KONG PRINCIPAL DATUM.
3. 如有需要，施工區界限內的現有行車道、行人路、單車徑及通道的部分路段將會分階段暫時封閉
SECTIONS OF EXISTING CARRIAGEWAYS,FOOTPATHS, CYCLE TRACKS AND ACCESS TRACKS WITHIN LIMIT OF WORKS AREA MAY BE TEMPORARILY CLOSED IN PHASES AS AND WHEN REQUIRED.

## 圖例 LEGEND :

- 施工區界限 LIMIT OF WORKS AREA
- STAGE 1
- STAGE 2

| REV. 修訂 | DATE 日期 | DESCRIPTION 內容摘要 | CHECKED 審核 | APPD. 批准人 |
|---|---|---|---|---|
| REVISION | | | | |

| | | | |
|---|---|---|---|
| DESIGNED 設計 | V. CHIU | DRAWN 繪圖 | T. CHAN |
| DRAWN 繪圖 | B. FOOK | CHECKED 審核 | V. CHIU |
| APPROVED FOR ISSUE 批准人 | T. CHAN | © | Copyright Reserved 版權所有 |
| DATE 日期 | JAN 2008 | All dimensions are in mm unless shown otherwise. No measurement should be taken from drawing directly | |
| SCALE 比例 | AS SHOWN | | |
| CAD REF. 檔案名稱 | APPENDIX-A-1 | | |

PROJECT TITLE 工程項目

**Agreement No. CE 58/2000**
**Design and Construction Assignment for Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling**

CLIENT 工程項目

路政署
HIGHWAYS DEPARTMENT
主要工程管理處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

CONSULTANT 工程顧問

Hyder Consulting ARUP BLACK & VEATCH

DRAWING TITLE 圖名

LOCATION PLAN

STATUS 階段

DRAWING NO. 圖則編號 APPENDIX-A

REV. 修訂 -

# Appendix B

## Updated Implementation Schedule (Extracted from the ERR)

# Updated Environmental Mitigation Implementation Schedule

## Air Quality – Schedule of Recommended Mitigation Measures

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| Air Quality during construction | Restricting heights from which materials are dropped, as far as practicable to minimize the fugitive dust arising from unloading/loading. | During construction | Contractor |
| | All stockpiles of excavated materials or spoil of more than $50m^3$ shall be enclosed, covered or dampened during dry or windy conditions. | During construction | Contractor |
| | Effective water sprays shall be used to control potential dust emission sources such as unpaved haul roads and active construction areas. | During construction | Contractor |
| | All spraying of materials and surfaces shall avoid excessive water usage. | During construction | Contractor |
| | Vehicles that have the potential to create dust while transporting materials shall be covered, with the cover properly secured and extended over the edges of the side and tail boards. | During construction | Contractor |
| | Materials shall be dampened, if necessary, before transportation. | During construction | Contractor |
| | Travelling speeds shall be controlled to reduce traffic induced dust dispersion and re-suspension within the site from the operating haul trucks. | During construction | Contractor |
| | Vehicle washing facilities shall be provided to minimise the quantity of material deposited on public roads. | During construction | Contractor |
| Air Quality during Operation | Not required | N/A | N/A |

## Noise – Schedule of Recommended Mitigation Measures

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| Noise during construction | Use of silenced plant or plant equipped with mufflers or dampers in substitute of ordinary plant. | During construction | Contractor |
| | Reduce the number of equipment and their percentage on-time. | During construction | Contractor |
| | 3.5 m and 5.5 m high temporary noise barrier at culvert construction work area (Figure 2a of the Environmental Permit). | During construction | Contractor |
| | 3 m high temporary noise barrier along the northern edge of Bridge 12 at ground level (Figure 2b of the Environmental Permit). | During construction | Contractor |
| | 2 m high temporary noise barrier along the northern edge of Bridge 12 at bridge level (Figure 2b of the Environmental Permit). | During construction | Contractor |
| | 2.5 m high temporary noise barrier along Tai Wo Service Road West (Figure 2c of the Environmental Permit). | During construction | Contractor |
| | 3.5m and 7m high temporary noise barrier along Tai Wo Services Road West near Tai Hang (Figure 2c of the Environmental Permit). | During construction | Contractor |
| | 7 m high temporary noise barrier along Tai Wo Service Road West near Tai Wo Footbridge work area (Figure 2d of the Environmental Permit). | During construction | Contractor |
| | 7 m high temporary noise barrier near Kiu Tau Footbridge work area (Figure 2d of the Environmental Permit). | During construction | Contractor |
| | 2.5 m high temporary noise barrier near river diversion work area (Figure 2e of the Environmental Permit). | During construction | Contractor |
| Noise during operation | Various type of barriers of varying heights as shown in Figures 4a to 4e – Layout of Noise Barriers of the Environmental Permit. | Review of required noise barrier layout during the design stage | Designer to implement in the engineering design |
| | Low noise reducing surfacing along both the widened and reconstructed sections of the works | | |

## Water Quality – Schedule of Recommended Mitigation Measures

| Impact | Mitigation | Timing | Responsibility |
|---|---|---|---|
| Water quality during construction | Demolition and reconstruction of bridges<br>▪ Prevent off-site migration through use of sheet piles.<br>▪ Minimise duration of works as far as practical.<br>▪ All sewer and drainage connections should be sealed to prevent debris, soil, sand, etc, from entering public sewers/drains.<br>▪ Site surface runoff should be settled to remove sand/silt before it is discharged into the existing storm drains. | During construction | Contractor |
| | River training works<br>▪ Inspection and testing of water quality in the nullah on the Tai Po River and in the Ma Wat River immediately downstream of culvert N490, between the rubber dam and the water intake channel. | During construction | Contractor |
| | Road Widening Works and Earthworks<br>▪ Wastewater generated from any concrete batching washdown of equipment or similar activities should be discharged into foul sewers, after the removal of settable solids, and pH adjustment as necessary. All sewage discharges from the study area should meet the TM standards and approval from EPD through the licensing process is required.<br>▪ Sand traps, oil interceptors and other pollution prevention installations should be provided, properly cleaned and maintained.<br>▪ Runoff from exposed working areas, unfinished slopes and from unlined temporary channels should be directed to stilling basins and/or silt traps before discharging to the drainage outfalls.<br>▪ Regular inspections of stilling basins and/or silt traps is required to ensure that sediment is not conveyed into the existing drainage system.<br>▪ Open stockpiles should be covered with a tarpaulin cover.<br>▪ During the wet season, any exposed top soils should be covered with a tarpaulin, shotcreted or hydroseeded.<br>▪ Sand and silt from wash-water from vehicle washing should be settled out before discharging into storm drains.<br>▪ Fuels should be stored in bunded areas such that spillage can be easily collected. | During construction | Contractor |

| Impact | Mitigation | Timing | Responsibility |
|---|---|---|---|
| Water Quality during operation | Contaminants present in the run off during normal operation will by their chemical nature be strongly absorbed onto the particulate phase. The use of silt or sand traps, preferably built into the road drainage system will control both the suspended solids in the run off and the contaminants absorbed onto them. These traps should be maintained regularly and frequently cleaned to prevent the accumulation of solids with the resultant reduction in retention time and thus efficiency. | During design | Designer to implement in the engineering design |

## Waste – Schedule of Recommended Mitigation Measures

| Impact | Mitigation | Timing | Responsibility |
|---|---|---|---|
| Waste management during construction | General Waste<br>▪ Transport of wastes off site as soon as possible.<br>▪ Maintenance of accurate waste records.<br>▪ Minimisation of waste generation for disposal (via reduction/recycling/re-use).<br>▪ No on-site burning will be permitted.<br>▪ Use of re-useable metal hoardings/signboards. | During construction | Contractor |
| | Vegetation from site clearance<br>▪ Segregation of materials to facilitate disposal.<br>▪ Mulching to reduce bulk and where possible review opportunities for the possible beneficial use within landscaping areas. | During construction | Contractor |
| | Demolition Wastes<br>▪ Segregation of materials to facilitate disposal.<br>▪ Appropriate stockpile management. | During construction | Contractor |
| | Excavated Materials<br>▪ Segregation of materials to facilitate disposal / reuse.<br>▪ Appropriate stockpile management.<br>▪ Re-use of excavated material on or off site (where possible).<br>▪ Special handling and disposal procedures in the event that contaminated materials are excavated. | During construction | Contractor |
| | Construction Wastes<br>▪ Segregation of materials to facilitate recycling/reuse (within designated area in appropriate containers/stockpiles).<br>▪ Appropriate stockpile management.<br>▪ Planning to reduce over ordering and waste generation.<br>▪ Recycling and re-use of materials where possible (e.g. metal, wood from formwork)<br>▪ For material which cannot be re-used/recycled, collection should be carried out by an approved waste contractor for landfill disposal. | During construction | Contractor |

| Impact | Mitigation | Timing | Responsibility |
|---|---|---|---|
| | Bentonite Slurries<br>▪ Bentonite slurries should be reused as far as possible.<br>▪ Disposal in accordance with *Practice Note For Professional Persons ProPECC PN 1/94*.<br><br>Chemical Wastes<br>▪ Storage within locked, covered and bunded area.<br>▪ The storage area shall not be located adjacent to sensitive receivers e.g. drains.<br>▪ Minimise waste production and recycle oils/solvents where possible.<br>▪ A spill response procedure shall be in place and absorption material available for minor spillages.<br>▪ Use appropriate and labelled containers.<br>▪ Educate site workers on site cleanliness/waste management procedures.<br>▪ If chemical wastes are to be generated, the contractor must register with EPD as a chemical waste producer.<br>▪ The chemical wastes shall be collected by a licensed chemical waste collector.<br><br>Municipal Wastes<br>▪ Waste shall be stored within a temporary refuse collection facility, in appropriate containers prior to collection and disposal.<br>▪ Regular, daily collections are required by an approved waste collector. | During construction<br><br>During construction<br><br>During construction | Contractor<br><br>Contractor<br><br>Contractor |
| Waste management during operation | Not required. | N/A | N/A |

## Ecology – Schedule of Recommended Mitigation Measures

| Impact | Mitigation | Timing | Responsibility |
|---|---|---|---|
| Ecology during construction | Accurate Delineation of Works Area<br>▪ Boundaries of proposed works areas shall be clearly identified and separated from external areas by a physical barrier to prevent encroachment of adjacent habitats.<br>▪ Individual trees which fall within the works areas but which work plans show do not require removal are to be retained and fenced off to maximise protection. | During construction | Contractor |
| | Vegetation Clearance<br>▪ No fires shall be lit within the works area for the purpose of burning cleared vegetation.<br>▪ The Contractor shall give consideration to mulching the cleared vegetation for recycling within the works area / adjacent land. | During construction | Contractor |
| | Dust generation<br>There are a number of measures which shall be taken as specified in the Air Pollution Control (Construction Dust) Regulation on 'Dust Control Requirements, including the following key measures to be applied during construction:<br>▪ vehicle washing facilities to be provided at every discernible or designated vehicle exit point;<br>▪ all temporary site access roads shall be sprayed with water to suppress dust as necessary;<br>▪ all dusty materials should be sprayed with water immediately prior to any handling; and<br>▪ all debris should be covered entirely by impervious sheeting or stored in a sheltered debris collection area. | During construction | Contractor |
| | Surface Run-off<br>In general, mitigation measures shall be in accordance with ProPECC PN1/94 on 'Construction Site Drainage'. Key measures include:<br>▪ Bund and cover stock piles to avoid run-off;<br>▪ Channel any run-off through a system of oil, grease and sediment / silt traps and reuse water on site where ever practical;<br>▪ All vehicle maintenance to be undertaken within a bunded area; and<br>▪ Maximise vegetation retention on-site to maximise absorption (minimise transport). | During construction | Contractor |

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| Ecological impact during operation phase | Compensatory ecological planting<br>▪ To be conducted approx. 5.5 hectares of ecological compensatory planting, including native species.<br>▪ Specific planting details as in Section 8.5.9 of the ERR and the landscape plans approved by EPD (Clause 2.6 of the Environmental Permit refers). | During construction and operation | Contractor (during construction); LCSD* during operation) |

Note: * The division of vegetation planting and maintenance responsibilities shall follow the guidelines stipulated in ETWB TCW No. 2/2004.

## Landscape and Visual Impact – Schedule of Recommended Mitigation Measures

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| Landscape & Visual during construction | Preservation of Existing Vegetation<br>▪ Trees identified for retention within the project limit would be protected during the works<br>▪ The tree transplanting and planting works shall be implemented by approved Landscape Contractors | During construction | Contractor |
| | Temporary Works Areas<br>▪ Where feasible the works areas would be screened using hoarding and existing vegetation would be retained where possible to reduce the landscape and visual impacts arising from the construction activity. The landscape of these works areas would be restored following the completion of the construction phase. | During construction | Contractor |
| | Hoarding<br>▪ A hoarding would be erected where practicable in the most visually sensitive locations to screen the temporary construction works from the local VSRs. | During construction | Contractor |
| | Top Soils<br>▪ The works will result in disturbance to extensive areas of topsoil. Topsoil worthy of retention should be stockpiled for use following completion of the civil engineering works. It should either be temporarily vegetated with hydroseeded grass or turned over on a regular basis. | During construction | Contractor |
| | Protection of Important Landscape Features<br>▪ Important features such as temples, Island House and kilns within the study area, although remote from the proposed works retained and adequately protected. | During construction | Contractor |
| Landscape during operation | Footpath and Cycleway<br>▪ Two lengths of footpath / cycleway embankment would be reinstated between the reprovisioned footbridge at Nam Wah Po and the existing interchange Wo Hop Shek. Tree planting along the line of the reprovisioned footpath would provide shade for pedestrians. | During Operation | Designer to implement during engineering design |

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| Landscape during operation | Compensatory Planting<br>▪ The loss of existing vegetation would be a primary source of both the landscape and visual impacts. The road widening would be facilitated through the construction of extensions to the embankment and would have a soft finish.<br>▪ The embankments and cuttings would be planted with a mix of tree and shrub planting. Identifying a corridor separate from the utility corridors that impede landscape works.<br>▪ Tree and shrub screen planting including roadside and amenity planting. In certain locations, woodland planting would be appropriate with the species mix reflecting those affected with the eventual long-term objective of creating native woodland.<br>▪ Create a fast vegetative cover to ensure soil stability and quick visual effect for planting of disturbed areas. The long-term aim would be to allow native species to become dominant.<br>▪ Use of ornamental species in urban locations such as areas adjacent to residential development or on urban sections of the highway.<br>▪ Use of low growing shrub planting in the central reserve of the highway where the forward visibility splays allow. Robust plant species would be used which have a low maintenance requirement. | During Operation | Designer to implement during engineering design |
| Visual Impact during operation | Engineering Structures<br>▪ The structures should aim to "touch" the ground as lightly as possible in order to minimise disturbance to the existing landscape and vegetation below the structures. Landform and vegetation in areas disturbed by construction works will be reinstated to blend with the existing landscape patterns;<br>▪ Maintenance access roads shall be sensitively designed to minimise visual intrusion and physical disruption of the existing landscape.<br>▪ Lighting along the roadside should be designed to avoid excessive light spillage raising the levels of ambient light levels in the local areas and in views from the VSRs.<br>▪ New structures should aim to match those existing along Tolo Highway for visual compatibility.<br>▪ Drainage should where possible be concealed in the structure.<br>▪ Vegetation to be proposed below viaducts where light levels allow.<br>▪ The advice of ACABAS should be incorporated into the detailed design. | During Operation | Designer to implement during engineering design |

| Impact | Mitigation Measures | Timing | Responsibility |
|---|---|---|---|
| | Noise Barriers<br>▪ The design of the barriers shall be responsive to the landscape through which the highway would pass through the use of colour panels extract the main colour elements from the landscape.<br>▪ The use of a combination of opaque, tinted and clear panels would further reduce the visual impact caused by these structures and in some locations allow vehicle travellers views of the surrounding countryside and maintain existing views across the road corridor.<br>▪ The advice of ACABAS should be incorporated into the detailed design. | During operation | Designer to implement during design |
| Visual Impact during operation | Footbridges<br>▪ The proposed footbridges would be located along the northern section of the scheme where the highway would pass through what is essentially a rural landscape, the concept for the design of the external finishes for the footbridges is to respond to the rural landscape character of the area. The selection of colours and finishes have been designed to match the tones found in the existing views of the road corridor and so be as visually recessive as possible. Therefore the basic concept is to reflect the colours and tones of the landscape which the bridge structure would be viewed against.<br>▪ The advice of ACABAS should be incorporated into the detailed design.<br><br>Slopes<br>▪ The proposed alignment would require extensive earthworks and the formation of a new embankment along the roadside. The extent of the works, and therefore the slopes, would be minimised to avoid excessive disturbance to the existing vegetation. The opportunity would be taken where possible to give the proposed earthworks a less engineered appearance through for example designing slopes with a more naturalistic form. The design principles recommended in WBTC 25/93 on Control of Visual Impact of Slopes should be closely followed during the detailed design of the slopes to mitigate potential impacts. | During operation<br><br>During operation | Designer to implement during design<br><br>Designer to implement during design |

# Appendix C

## Locations of Sensitive Receivers (Extracted from the ERR)

LAM KAM ROAD INTERCHANGE

WAI TAI TSUEN

HONG LOK YUEN ROAD

HONG LOK YUEN

MTRCL EAST RAIL

STAGE 2

STAGE 2

TAI HANG

TAI WO

NAM WA PO

MATCH LINE A

SR23 SR22 SR88 SR89 SR22N SR90 SR80 SR96 SR107 SR19 SR20 SR21 SR108 SR81 SR81N SR17B SR17A SR1082 SR82N N1 SR13 SR1013 N8 SR97 SR98 N4 SR14 SR109 SR85 SR84 SR87 SR77

000+9

LEGEND :

LIMIT OF WORKS AREA

SR1 NOISE SENSITIVE RECEIVER

| REV. 修訂 | DATE 日期 | DESCRIPTION 內容摘要 | CHECKED 審核 | APP'D 批准人 |
|---|---|---|---|---|

REVISION

| | | | |
|---|---|---|---|
| DESIGNED 設計 | V. CHIU | CHECKED 審核 | T. CHAN |
| DRAWN 繪圖 | B. FOOK | CHECKED 審核 | V. CHIU |
| APPROVED FOR ISSUE 核准人 | T. CHAN | © Copyright Reserved 版權所有 | |
| DATE 日期 | DEC 2007 | All dimensions are in mm unless shown otherwise. No measurement should be taken from drawing directly. | |
| SCALE 比例 | A3 = 1 : 5000 | | |
| CAD REF 電腦化參照 | APPENDIX 1 | | |

PROJECT TITLE 工程項目

**Agreement No. CE 58/2000**
**Design and Construction Assignment for Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling**

CLIENT 工程委託

路政署
HIGHWAYS DEPARTMENT
土木工程拓展署
MAJOR WORKS PROJECT MANAGEMENT OFFICE

CONSULTANT 工程顧問

Hyder Consulting ARUP BLACK & VEATCH

DRAWING TITLE 圖名

SITE LAYOUT AND LOCATION OF SENSITIVE RECEIVERS

SHEET 1 OF 2

STATUS 階段

ENVIRONMENT REPORT

DRAWING NO. 圖則編號 Appendix C-1

REV. 修訂 -

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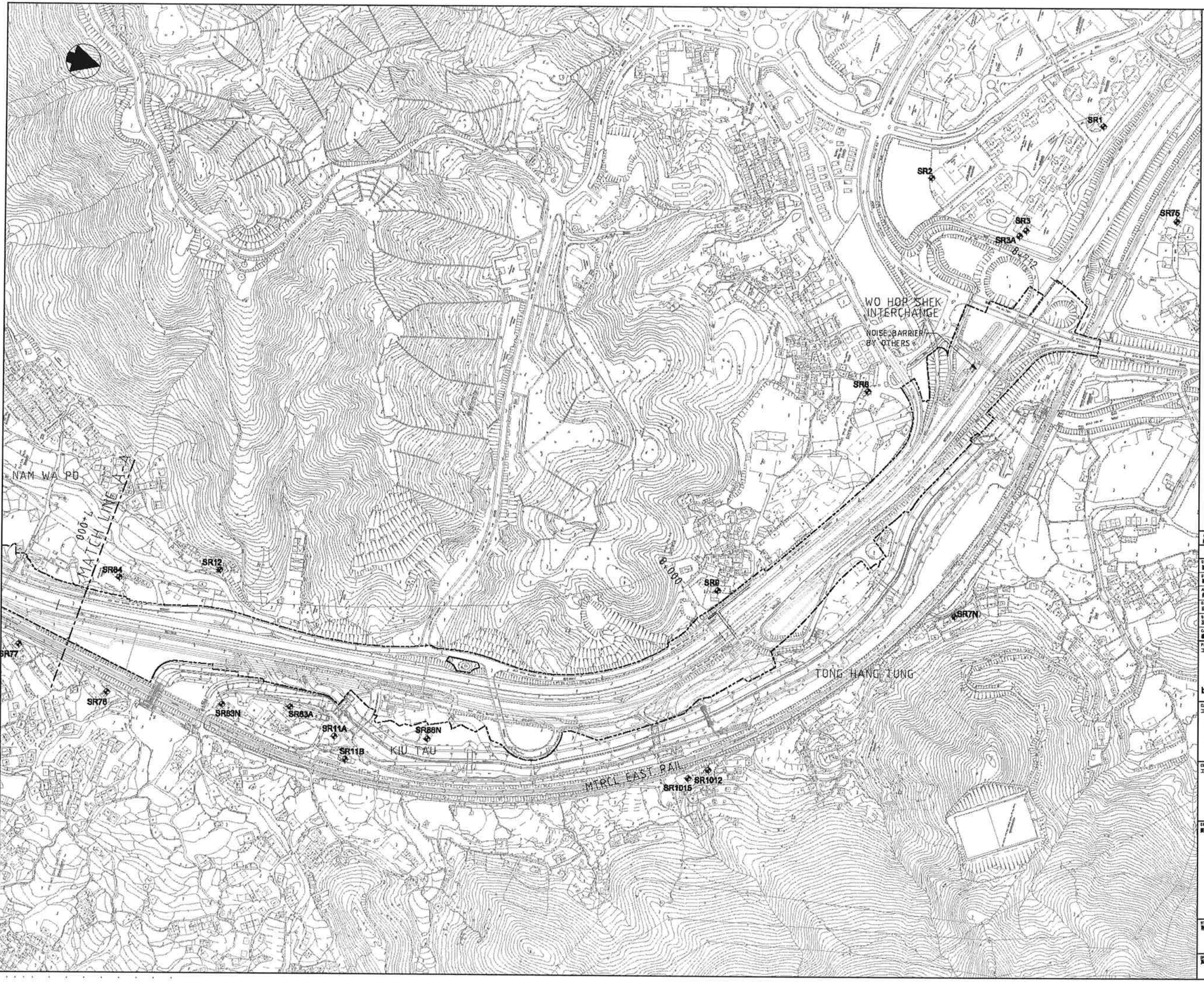


LEGEND :

——— LIMIT OF WORKS AREA

SR1 NOISE SENSITIVE RECEIVER

| REV. 修訂 | DATE 日期 | DESCRIPTION 內容摘要 | CHECKED 核對 | APPD. 批准人 |
|---|---|---|---|---|

REVISION

| | | | |
|---|---|---|---|
| DESIGNED 設計 | V. CHIU | CHECKED 核對 | T. CHAN |
| DRAWN 繪圖 | B. FOOK | CHECKED 核對 | V. CHIU |
| APPROVED FOR ISSUE 批准人 | T. CHAN | © Copyright Reserved 版權所有 | |
| DATE 日期 | DEC 2007 | All dimensions are in mm unless shown otherwise. No measurement should be taken from drawing directly. | |
| SCALE 比例 | A3 - 1 : 5000 | | |
| CAD REF 資訊光碟 | APPENDIX 2 | | |

PROJECT TITLE 工程項目

**Agreement No. CE 58/2000**
**Design and Construction Assignment for Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling**

CLIENT 工務部門

路政署
HIGHWAYS DEPARTMENT
主要工程管理處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

CONSULTANT 工程顧問

Hyder Consulting · ARUP · BLACK & VEATCH

DRAWING TITLE 圖名

SITE LAYOUT AND LOCATION OF SENSITIVE RECEIVERS

SHEET 2 OF 2

STATUS 狀態

ENVIRONMENT REPORT

DRAWING NO. 圖則編號

Appendix C-2

REV. 修訂 _

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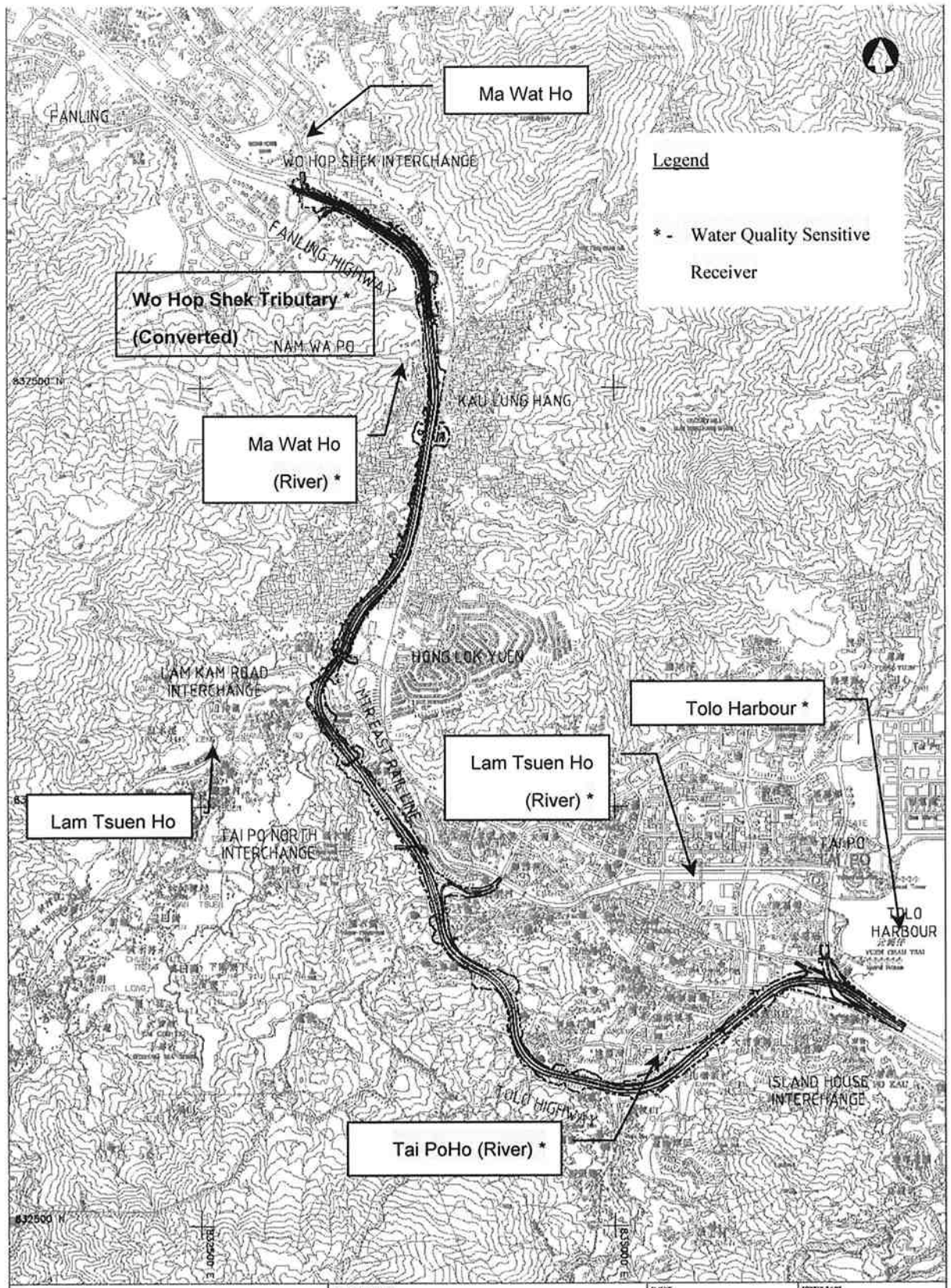
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FANLING
WO HOP SHEK INTERCHANGE
FANLING HIGHWAY
Wo Hop Shek Tributary *
(Converted)
NAM WA PO
832500 N
KAU LUNG HANG
Ma Wat Ho
(River) *
HONG LOK YUEN
LAM KAM ROAD
INTERCHANGE
MTR EAST RAIL LINE
Tolo Harbour *
Lam Tsuen Ho
(River) *
Lam Tsuen Ho
TAI PO NORTH
INTERCHANGE
TAI PO
TAI PO
TOLO
HARBOUR
ISLAND HOUSE
INTERCHANGE
TOLO HIGHWAY
Tai PoHo (River) *
832500 N
832500 E
835000 E
Legend
* - Water Quality Sensitive
Receiver
CONTRACT TITLE
Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling (Stage 2 – Between Tai Hang and Wo Hop Shek Interchange)
DRAWING TITLE
Water Quality Sensitive Receivers
CLIENT
HIGHWAYS DEPARTMENT
CONSULTANT
Hyder ARUP
STATUS
DRG. NO.
Appendix C-3
REV.
0

# Appendix D

## Data Sheet for TSP Monitoring

## **Dust Monitoring** – Data Record Sheet

| | | | | |
|---|---|---|---|---|
| Monitoring Location | | | | |
| Details of Location | | | | |
| Date of Monitoring | | | | |
| Weather Condition | Sunny/Fine/Cloudy/Rainy | | Temperature: | $^0$C |
| Mean Pressure | Initial | mmHg | Final | mmHg |

| | | | | |
|---|---|---|---|---|
| Equipment | Equipment No. | | | |
| High Volume Sampler | Model: | | S/N: | |

| | **1 hour** | **1 hour** | **1 hour** | **24 hours** |
|---|---|---|---|---|
| Sampling Start Time | : | : | : | : |
| Sampling End Time | : | : | : | : |
| Initial Elapsed Time Reading | | | | |
| Final Elapsed Time Reading | | | | |
| Initial Flow Rate (CFM) | | | | |
| Final Flow Rate (CFM) | | | | |
| Average Flow Rate (CFM) | | | | |
| Filter Identification no. | | | | |
| Initial Weight of Filter (g) | | | | |
| Final Weight of Filter (g) | | | | |
| Weight of Particulate (g) | | | | |
| Particulate Concentration ($\mu g/m^3$) | | | | |
| Action / Limit Level | | | | |
| Site Construction Activities | | | | |
| Remarks | | | | |

| | Name | Signature | Date |
|---|---|---|---|
| Recorded by | | | / / |
| Checked by | | | / / |

# Appendix E

## Photos of Dust Monitoring Locations (19 June 2009)

Yuen Leng– AM1 (SR83A)

Kiu Tau –SR11A

Kiu Tau – SR11B

Fanling Government School – M3 (SR2)

West Tai Wo – M3 (SR13)

# Appendix F

## Noise Monitoring Field Record Sheet

## **Noise Monitoring** – Data Record Sheet

| | |
|---|---|
| Monitoring Location | |
| Description of Location | |
| Date of Monitoring | |
| Weather Condition | Sunny/Fine/Cloudy/Rainy _____ $^0$C |
| Wind Strength (m/s) | |

| Equipment | Model No. | Serial No. |
|---|---|---|
| Sound Level Meter | | |
| Sound Pressure Calibrator | | |

| | |
|---|---|
| Calibration before measurement (dB (A)) | |
| Calibration after measurement (dB (A)) | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Measurement Start Time | | | | | | | | |
| Measurement Time Length (min) | | | | | | | | |
| Measurement Results (dB (A)) | 1st | 2nd | 3rd | 4th | 5th | 6th | Average | Façade Correction |
| $L_{eq}$ | | | | | | | | |
| $L_{10}$ | | | | | | | | |
| $L_{90}$ | | | | | | | | |
| Major Construction Noise Source(s) During Measurement | | | | | | | | |
| Other Noise Source(s) During Measurement | | | | | | | | |
| Remarks | Free Field / Façade Measurement | | | | | | | |

| | Name | Signature | Date |
|---|---|---|---|
| Recorded by | | | |
| Checked by | | | |

# Appendix G

## Photos of Noise Monitoring Locations (19 June 2009)

Yuen Leng – AM1 (SR83A)

Kiu Tau –SR11A

Kiu Tau – SR11B


Fanling Government School – AM2 (SR2)

# Appendix H

## Water Quality Monitoring Field Record Sheet

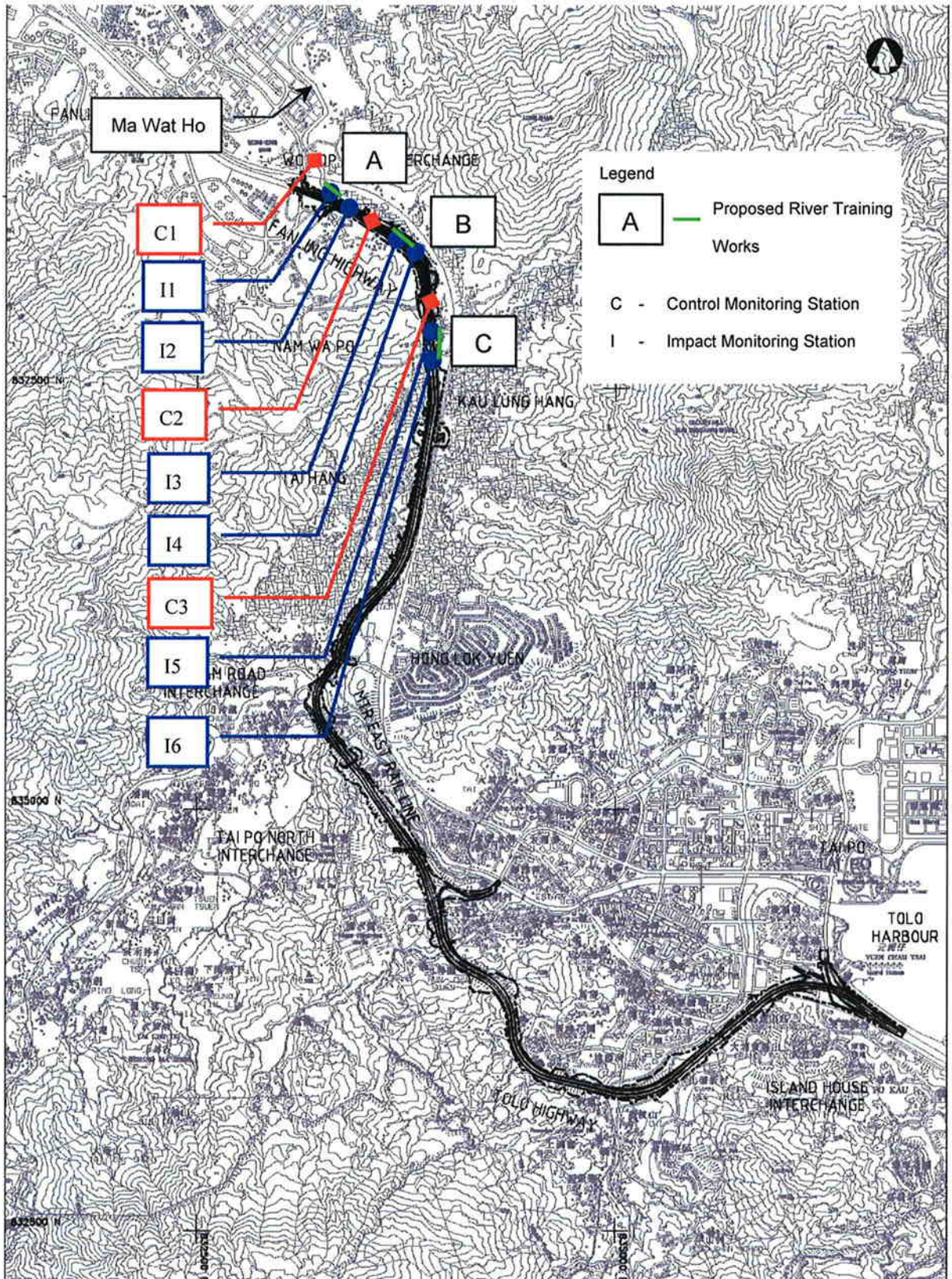
## **Water Quality Monitoring** – Data Record Sheet

| | |
|---|---|
| Location | |
| Date | |
| Start Time (hh:mm) | |
| Weather Condition | Sunny/Fine/Cloudy/Rainy _____ $^0$C |
| Water Depth (m) | |
| Monitoring Depth | |
| Salinity | |
| Temperature | |
| DO Saturation | |
| DO | |
| Turbidity | |
| SS | |
| Other Observations | |

| | Name | Signature | Date |
|---|---|---|---|
| Recorded by | | | |
| Checked by | | | |

# Appendix I

## Water Quality Monitoring Location Layout




| | | | |
|---|---|---|---|
| CONTRACT TITLE: Widening of Tolo Highway / Fanling Highway between Island House Interchange and Fanling (Stage 2 – Between Tai Hang and Wo Hop Shek Interchange) | DRAWING TITLE: Water Sampling Locations | CLIENT: Highways Department | CONSULTANT: Hyder ARUP |
| | | STATUS | |
| | | DRG. NO. Appendix I-1 | REV. 0 |

# Appendix J

## Interim Notification of Environmental Quality Limit Exceedance

**Interim Notifications of Environmental Quality Limits Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

| | |
|---|---|
| Project | |
| Date | |
| Time | |
| Monitoring Location | |
| Parameter | |
| Action & Limit Levels | |
| Measured Level | |
| Possible reason for Action or Limit Level Non-compliance | |
| Actions taken / to be taken | |
| Remarks | |

Prepared by:

Designation:

Signature:

Date: