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Agreement No. CE 55/2006 (EP) Inter-reservoirs Transfer Scheme (IRTS) - Water Tunnel between Kowloon Byewash Reservoir & Lower Shing Mun Reservoir - Environmental Impact Assessment - Investigation

EM&A Manual (Final)

Report No.: 240564/04/E

February 09

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1. INTRODUCTION

1.1 Project Background

1.1.1 This Project is named as "West Kowloon Drainage Improvement – Lai Chi Kok Transfer Scheme - Inter-Reservoirs Transfer Scheme ("IRTS") – Water Tunnel between Kowloon Byewash Reservoir and Lower Shing Mun Reservoir".

1.1.2 The main objective of the Project is to serve the dual purpose to substantially reduce stormwater discharge into the drainage system in the Lai Chi Kok area and, at the same time, to channel the overflow into the Lower Shing Mun Reservoir via the proposed IRTS tunnel to generate an average annual raw water yield at about 2.5 million m^3.

1.1.3 This Project partly falls within the Kam Shan Country Park and is a designated project under Item Q.1 of Part I, Schedule 2 of the EIAO which specifically encompasses "*All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, an existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest*".

1.1.4 An application (No. ESB-154/2006) for an Environmental Impact Assessment ("EIA") study brief under section 5(1) of the Environmental Impact Assessment Ordinance ("EIAO") was submitted by the Water Supplies Department ("WSD") on 29 September 2006 with a Project Profile (No. PP-298/2006). An EIA Study Brief (No.: ESB-154/2006) was issued by EPD on 9 Nov 2006 for carrying out the EIA.

1.1.5 Figure 1.1 shows this Project and the general EIA Study Area within 500m of the adopted tunnel alignment and both portals.

1.2 Extent of Works Required and Programme

1.2.1 The proposed Project, which this EIA concerns, comprises the following principal works elements:

- Construction of a new water tunnel, approximately 2.8 km in length and 3m in diameter, from Kowloon Byewash Reservoir to Lower Shing Mun Reservoir;
- Construction of an intake structure at Kowloon Byewash Reservoir and an isolation system;
- Construction of an outfall structure at Lower Shing Mun Reservoir with an energy dissipater; and
- All associated civil, structural, geotechnical, electrical and mechanical works, including landscaping, permanent and temporary accesses as may be necessary for the completion of the works elements listed above.

1.2.2 The project will only involve underground tunnelling works beneath the Kam Shan Country Park. No access shafts along the tunnel alignment would be necessary. According to the latest estimate, the Project is scheduled to commence construction in late 2009 for completion by mid 2011.

1.3 Objectives of this EM&A Programme

1.3.1 The main objectives of this EM&A Manual are:

1. To provide a database of baseline environmental quality for subsequent checking during the construction phase of the works;
2. To provide information at an early stage for identification of potential problem areas and formulation of additional environmental mitigation measures where necessary should any of the environmental control measures or practices fail to achieve the target standards;
3. To verify the environmental impacts predicted in the EIA for the project, if necessary;
4. To determine project compliance with relevant regulatory standards, requirements and guidelines;
5. To outline remedial measures to be undertaken if unexpected problems or unacceptable impacts arise; and
6. To provide data against which environmental audits may be undertaken effectively.

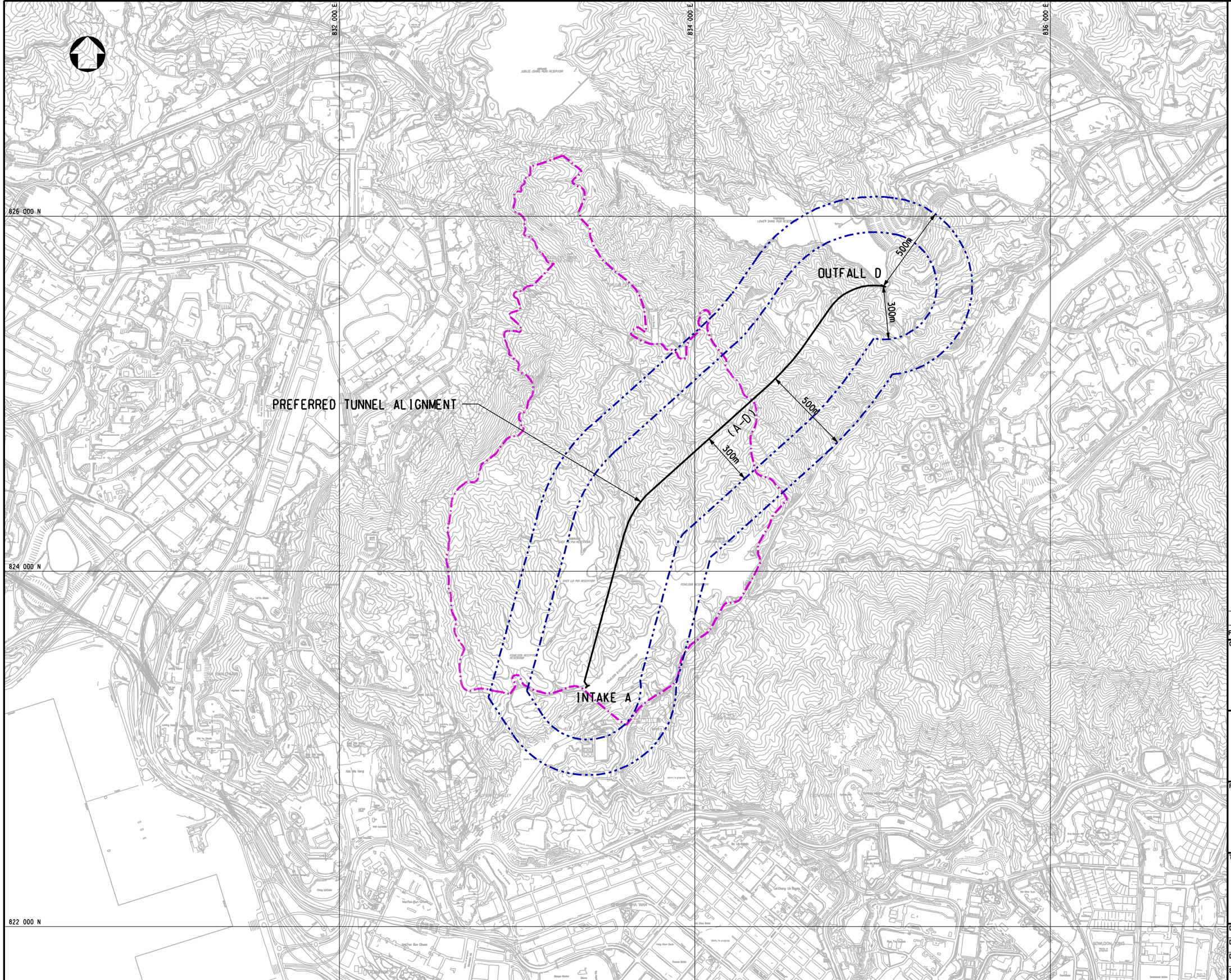
1.4 Contents

1.4.1 The recommended EM&A programme in this Manual contains the following information:

1. Duties of the various project staff and their respective responsibilities with regards to the EM&A requirements during construction;
2. Information on project organisation, work schedule and activities;
3. Requirements with respect to the work schedule and the necessary EM&A programme to detect the various possible environmental impacts;
4. Definition of Action/ Limit Levels and the establishment of Event/Action Plans;
5. Requirements for reviewing potential sources of pollution and assessing working procedures in the event of non-compliance with the environmental criteria;
6. Requirements for the presentation of EM&A data and appropriate reporting procedures; and
7. Proposed field data forms to be adopted during the various phases of the works.

1.4.2 An Implementation Schedule (IS) of the environmental mitigation measures has been developed and presented in Appendix A in accordance with the requirements of Clause 4.3 of the EIA Study Brief.

1.4.3 This EM&A Manual shall form the basis and be regarded as an evolving document that should be updated whenever necessary to reflect the EP requirements and activities on-site. Any updated EM&A Manual (if necessary) shall be certified by ET Leader, verified by the Independent Environmental Checker ("IEC") and finally submitted to the Engineer's Representative (ER) and EPD for agreement.



LEGEND:

KAM SHAN COUNTRY PARK BOUNDARY

STUDY AREA

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client

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Project

Agreement No. CE55/2006(EP)
Inter-reservoirs Transfer Scheme (IRTS)
Water Tunnel between Kowloon Byewash Reservoir and Lower Shing Mun Reservoir
Environmental Impact Assessment Investigation

Title

THE PREFERRED SCHEME

Designed	HN/PW		Eng.Chk.	PW	
Drawn	VN		Coordination	PW	
Dwg.Chk.	HN		Approved	AFK	

Scale 1:10000@A1

Project 240564

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Status INF

Drawing No. FIGURE 1-1

Rev

2. PROJECT ORGANISATION

2.1 Key Parties and Organisation Chart

2.1.1 Involvement of relevant parties in a collaborative and interactive manner is essential for the implementation of the recommended EM&A programme. The key parties in an EM&A programme include:

- Water Supplies Department (WSD) - Project Proponent
- Environmental Protection Department (EPD) - Environmental Authority
- The Engineer and Engineer's Representative (ER) – Black & Veatch Hong Kong Ltd. employed under Agreement No. CE 54/2006 (WS) by WSD
- The Independent Environmental Checker (IEC) – to be employed by WSD or the Engineer
- The Environmental Team (ET) – to be employed by WSD or the Engineer or the Contractor
- The Contractor.

2.1.2 A typical organisation chart that shows the relationship amongst the key parties is presented in Figure 2.1. Role of each key party is briefly described in the following sections.

2.2 Water Supplies Department

2.2.1 Water Supplies Department ("WSD") is the project proponent and works department and hence will assume overall responsibility for the project. WSD shall liaise with EPD on environmental issues associated with the project with IEC's advices.

2.3 Environmental Protection Department

2.3.1 Environmental Protection Department ("EPD") is the statutory enforcement body for environmental protection matters in Hong Kong.

2.4 Engineer's Representatives

2.4.1 The Engineer's Representative ("ER") shall be responsible for overseeing the operations of the Contractor and the ET, if under his employment. He shall advise, co-ordinate and give instruction when appropriate for efficient implementation of any specific environmental mitigation measures identified by the Contractor, and/or outstanding EM&A works required to be carried out by ET in consultation with the IEC. The ER shall supervise the Contractor's activities and ensure that the requirements in the Environmental Permit (EP), EIA Report, EM&A Manual and other government's standards are fully complied with.

2.4.2 The ER shall inform the Contractor when action is required to reduce impacts in accordance with the Event/Action Plans. The ER shall review the EM&A Reports submitted by the ET and follow up the recommendations. He shall ensure that the Contractor is implementing the environmental controls and mitigation measures as set out in the EIA report and EM&A Manual, as well as additional measures necessary for compliance with the relevant environmental standards.

2.4.3 In the event that the ET needs to undertake complaint investigation work, the ER and the Contractor shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are required following the investigation, the ER shall ensure that the Contractor has carried them out.

2.5 Independent Environmental Checker

2.5.1 The Independent Environmental Checker ("IEC") shall preferably be employed by WSD or the Engineer and shall advise the ER on environmental issues related to the project. The IEC shall preferably be established one month before commencement of major construction works. The IEC shall not be in any way an associated body of the ER, the Contractor or the ET for the project. The IEC shall be empowered to audit from an independent viewpoint the environmental performance during the construction of the project. The IEC shall be a person who has relevant professional qualifications in environmental control and at least 7 years experience in EM&A and environmental management.

2.5.2 The IEC shall be responsible for the duties defined in this EM&A Manual, and shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this EM&A Manual, as well as any other relevant submissions required under the Environmental Permit. The IEC shall be responsible for verifying the environmental acceptability of permanent and temporary works, relevant design plans and submissions under the EP. The IEC shall verify the logbook prepared and kept by the ET Leader. The IEC shall notify EPD by fax, within 24 hours of receipt of notification from the ET Leader of any such instance or circumstance or change of circumstances or non-compliance with the EIA Report or the EP, which might affect the monitoring or control of adverse environmental impact.

2.5.3 The main duty of the IEC is to carry out independent environmental audit of the project. This shall include, inter alias, the following:

1. Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;
2. Validate and confirm the accuracy of monitoring results, appropriateness of monitoring equipment, monitoring locations with reference to the locations of the nearby sensitive receivers, and monitoring procedures;
3. Carry out random sample check and audit on monitoring data and sampling procedures, etc;
4. Conduct random site inspection (at least once a month);
5. Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;
6. Review the effectiveness of environmental mitigation measures and project environmental performance;
7. On an as-need basis, verify and certify the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions under the environmental permit. Where necessary, the IEC shall agree in consultation with the ET Leader and the Contractor the least impact alternative;
8. Verify investigation results of complaint cases and the effectiveness of corrective measures;

9. Verify EM&A report submitted and certified by the ET Leader; and
10. Feedback audit results to ER/ ET by signing according to the Event/Action Plans specified in this EM&A Manual.

2.6 Environmental Team

2.6.1 An Environmental Team ("ET") headed by an ET Leader shall preferably be appointed by WSD or the Contractor to carry out the recommended EM&A programme for this project. The ET Leader shall preferably be established one month before commencement of major construction works. Neither the ET Leader nor the ET shall be in any way an associated body of the IEC or the Contractor. The ET Leader[1] shall plan, organise and manage the implementation of the EM&A programme, and ensure that the EM&A works are undertaken to the required standards. The ET Leader shall have relevant professional qualifications in environmental control and possess at least 7 years experience in EM&A and/or environmental management subject to the approval by his employer.

2.6.2 The ET Leader shall be responsible for the implementation of the EM&A programme in accordance with the EM&A requirements specified in this Manual and the EP. The ET Leader shall keep a contemporaneous logbook for recording each and every instance or circumstance or change of circumstances that may affect the compliance with the recommendations of the EIA report. This logbook shall be kept readily available for inspection by the IEC, and Director of Environmental Protection (DEP) or his authorised officers.

2.6.3 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project. The broad categories of works of the ET comprise the following:

1. Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements;
2. Environmental site surveillance;
3. Inspection and audit of compliance with environmental protection, and pollution prevention and control regulations;
4. Inspection and audit of compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliance;
5. Assess the effectiveness of the environmental mitigation measures implemented;
6. Monitor the implementation of environmental mitigation measures;
7. Monitor compliance with the environmental protection clauses/specifications in the Contract;
8. Review the construction schedule and provide comments as necessary;
9. Review work methodologies which may affect the extent of environmental impact during the construction phase and comment as necessary;
10. Complaint investigation, evaluation and identification of corrective measures;

[1] The Environmental Team (ET) leader refers to the person delegated the role of executing the environmental monitoring and audit requirements, and who shall be responsible for, and in charge of, the ET.

11. Liaison with the IEC on all environmental performance matters, and timely submission of all relevant EM&A proforma for IEC's approval;
12. Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc. and;
13. Timely submission of the EM&A report to the Project Proponent and the EPD.

2.6.4 In the event of any exceedance in Action/Limit levels, the ET shall inform the IEC, ER and the Contractor within one working day (Monday to Friday except public holidays) of the occurrence of each and every occurrence, change of circumstances or non-compliance with the EIA Report so that appropriate remedial action can be undertaken by the Contractor promptly.

2.6.5 The ET is also responsible for the preparation of the monthly EM&A reports for submission to the EPD and copy to the Project Proponent, IEC, the ER and Contractor.

2.6.6 The ET shall assist the Contractor through the ER in formulating any necessary corrective actions and/or additional mitigation measures, and liaise with relevant Government Departments where necessary.

2.7 The Contractor

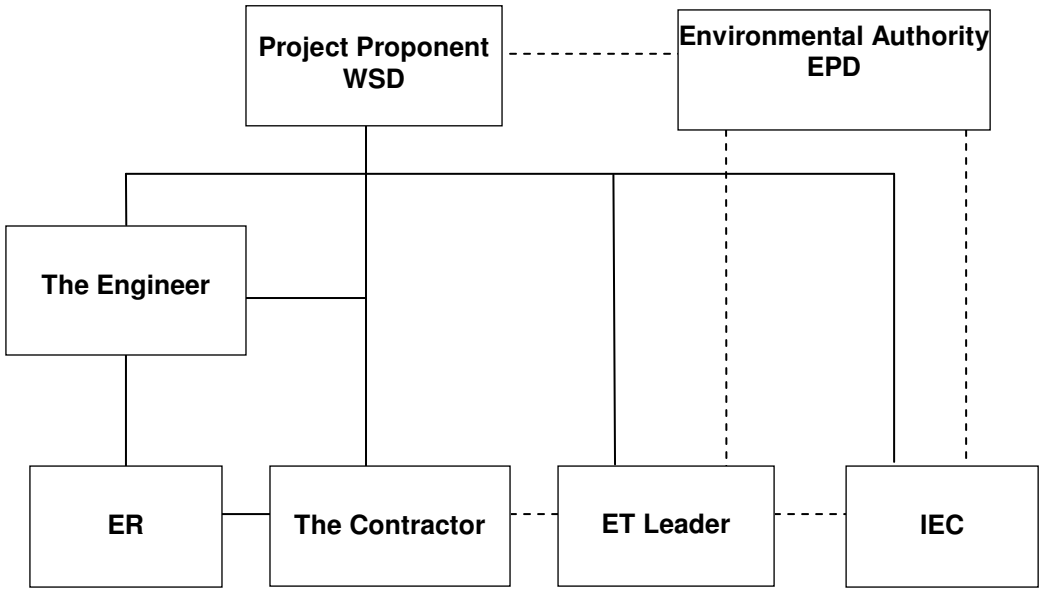
2.7.1 Upon the commencement of the project, the Contractor shall prepare and submit an Environmental Management Plan ("EMP") for the ER's approval, further to the IEC's verification. The EMP shall comprise of the appropriate extracts from (and references to) ETWB TCW No. 19/2005, the project EIA report, EM&A Manual and other relevant latest government's standards.

2.7.2 The Contractor is responsible for providing requested information to the ET in the event of any exceedance in the environmental criteria (Action/Limit levels) specified in this Manual or other current environmental standards and to rectify unacceptable practices. The Contractor shall discuss with the ET Leader, IEC and ER on any additional mitigation measures identified to be necessary by the ET and implement the agreed measures to alleviate any identified environmental impact to acceptable levels. The design and implementation of the control and mitigation measures shall be the responsibility of the Contractor.

2.7.3 In the event that the ET needs to undertake complaint investigation work, the Contractor and the ER shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are required following the investigation, the Contractor shall promptly carry out these measures.

2.7.4 The Contractor shall provide information to the ET Leader on the action(s) undertaken targeting at environmental protection for inclusion in the monthly EM&A report to be prepared by the ET.

Figure 2.1 Typical Organisation Chart



3. AIR QUALITY

3.1 Introduction

3.1.1 Based on the air quality impact assessment in the EIA, it has been identified that no significant impacts could arise from the construction and operation of the project through proper implementation of dust control measures required under the Air Pollution Control (Construction Dust) Regulation. While no other specific control measures have been recommended, general air quality control measures are recommended for implementation as good site practices in the EIA report. The ET shall check the Contractor's implementation of air quality control measures during the regular site environmental audit.

3.2 Environmental Audit

3.2.1 As mentioned in Section 9.1.2 of this Manual, the ET Leader is responsible for formulating an environmental site inspection, deficiency and action reporting system, and for carrying out site inspections under the EM&A programme.

3.2.2 In order to check that the air quality control measures have been implemented by the Contractor as good site practices, the ET shall include but not limited to the following items as part of their site inspections:

1. The works area for site clearance shall be sprayed with water before, during and after the operation so as to maintain the entire surface wet;
2. Restricting heights from which materials are to be dropped, as far as practicable to minimise the fugitive dust arising from unloading/ loading;
3. Immediately before leaving a construction site, all vehicles shall be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage;
4. Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle;
5. Erection of hoarding of not less than 2.4 m high from ground level along the site boundary, where appropriate;
6. Any stockpile of dusty materials shall be covered entirely by impervious sheeting; and/or placed in an area sheltered on the top and 4 sides;
7. 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.

4. NOISE

4.1 Introduction

4.1.1 During the construction of the project, power mechanical equipment (PME) used will be the primary noise source. The key noise generating activities include:

- Site clearance & formation
- Portal/ starter tunnelling works
- Scaffolding and superstructure works

4.1.2 Potential construction noise impacts have been assessed at representative Noise sensitive receivers (NSRs) in the EIA report. Noise monitoring during construction phase of the project is therefore recommended to ensure no unacceptable construction noise impact will be posed on the nearby NSRs.

4.2 Noise Parameters

4.2.1 Construction noise level at the proposed NSR shall be measured by the ET in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). Noise measurements shall be carried out with an integrating sound level meter using the 'fast' response mode. L_{eq}(30 min) shall be used as the monitoring parameter for the time period between 07:00-19:00 hours on any day except general holidays and Sundays. For all other time periods, L_{eq}(5 min) will be employed for comparison with the Noise Control Ordinance (NCO) criteria.

4.2.2 The supplementary information for data auditing statistical results such as L_{10} and L_{90} shall also be obtained for reference.

4.3 Monitoring Equipment

4.3.1 As referenced to the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring.

4.3.2 Immediately prior to and following each noise measurement the accuracy of the sound level meter will 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 agrees to within 1.0dB. The acoustic calibrator to be used shall meet IEC 942, 1988 Class 1 specifications. Annual calibration of all sound level meters and acoustic calibrators shall be conducted by a laboratory in Hong Kong or the manufacturer in compliance with national standards as recommended by the manufacturer of the sound level meter and acoustic calibrator.

4.3.3 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

4.3.4 ET Leader is responsible for the availability of monitoring equipments. He/she shall ensure sufficient noise measuring equipments and associated instrumentations are available for carrying out noise monitoring works. All equipment and associated instrumentations shall be clearly labelled, stored and maintained according to the manufacturer's instructions.

4.4 Noise Monitoring Stations

4.4.1 The EIA report has indicated that a number of NSRs could be impacted at higher level of noise. In which two of them have been earmarked as the construction noise monitoring stations as shown in Figure 4-1 to Figure 4-2 and tabulated below.

Table 4-1 Selected Construction Noise Monitoring Stations

Noise Sensitive Receivers	Description
LG	Tower 1, Lakeview Garden
VH	Village House

4.4.2 Should the status and locations of NSRs be changed after issuing this Manual or inaccessible due to other reasons, the ET Leader shall propose the updated monitoring location(s) and seek agreement from the IEC and EPD of the alternative locations.

4.4.3 When alternative monitoring location(s) is/are proposed, the monitoring location(s) shall be chosen based on the following criteria:

- At location(s) close to the major site activities which is/are likely to have noise impacts;
- Close to the NSRs (as defined by the EIAO TM); and
- For monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to occupants during monitoring.

4.4.4 The monitoring station shall normally be at a point 1 m from the exterior of the building facade and be at a position 1.2 m above the ground.

4.4.5 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 +3 dB(A) shall be made to the free field measurements. The ET Leader shall agree with the IEC on the monitoring position and the corrections adopted. Once the position for the monitoring station is chosen, the baseline monitoring (if necessary) and the impact monitoring shall be carried out at the same position.

4.4.6 Noise measurements shall be recorded on a field data sheet together with relevant information including project name, date and time of sampling, monitoring location and parameters, site observations and remarks. A sample field data sheet is attached in Appendix C.

4.5 Baseline Monitoring

4.5.1 Baseline noise monitoring is necessary given an existing tranquil environment in the vicinity of the work site and the local noise sensitive uses on either ends of the IRTS and the envisaged 24-hour tunnelling works.

4.5.2 The ET shall carry out baseline noise monitoring at least 2 weeks before commencement of the construction works. Baseline monitoring shall be carried out for 7 evenings/ nights at the intake and outfall ends of the IRTS tunnel for the following noise sensitive sessions during which there may be construction works carried out.

- All days during Evening (1900-2300 hrs) – for at least 6 consecutive L_{eq} (5min) results per evening per location;
- Night-time (2300 – 0700 hrs) - for at least 6 consecutive L_{eq} (5min) results per night per location

4.5.3 The ET Leader shall agree with the ER and the IEC on his proposed monitoring schedule and locations at least one week before the baseline monitoring.

4.5.4 The ET Leader shall make sure that there shall not be any abnormal activities in the vicinity of the monitoring stations during the baseline monitoring which would cause the monitoring results to be elevated above normal background conditions.

4.6 Impact Monitoring

4.6.1 General construction works carried out during the restricted hours are controlled by the Construction Noise Permit (CNP) System under the NCO. The Contractor shall apply for a CNP and abide by the requirements of the permit should works be necessary in the restricted hours.

4.6.2 Noise monitoring shall be carried out at the monitoring stations given in Table 4-1 per week. The following defines the regular monitoring frequency at each station on a per week basis when noise generating activities are underway:

a) 1 no. of L_{eq} (30 min) noise measurements between 0700-1900 hours on any normal weekdays

b) 3 nos. of consecutive L_{eq} (5 min) noise measurements between 0700-1900 hours on general holidays or Sundays (if work is undertaken)

c) 3 nos. of consecutive L_{eq} (5 min) noise measurements between 1900-2300 hours (if evening activities are undertaken)

d) 3 nos. of consecutive L_{eq} (5 min) noise measurements between 2300-0700 hours next day (if there are nighttime activities).

4.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event/ Action Plans in Appendix B 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.

4.7 Event and Action Plan

4.7.1 The Action/ Limit levels for construction noise are defined in Table 4-2 below. Should non-compliance of the noise criteria occur, actions in accordance with the Event/ Action Plan given in Appendix B should be carried out.

Table 4-2 Action and Limit Levels for Construction Noise Monitoring

Time Period	Action	Limit, dB(A)
Daytime (0700-1900) except general holidays and Sunday *Measurements in Leq (30min)*	When one documented compliant is received	75 for dwellings 70 for Schools 65 for schools during examination
Daytime (0700-1900) during general holidays and Sundays and all days during Evening (1900-2300 hrs) *Measurements in Leq (5min)*		60 for dwellings/ school 55 for schools during examination
Night-time (2300 – 0700 hrs) *Measurements in Leq (5min)*		45

4.8 Noise Mitigation Measures

4.8.1 It is recommended that the Contractor should also adopt good working practices in order to minimise construction noise as far as possible, e.g.:

1. The Contractor shall adopt the Code of Practice on Good Management Practice to Prevent Violation of the Noise Control Ordinance (Chapter 400) (for Construction Industry) published by EPD;
2. The Contractor shall observe and comply with the statutory and non-statutory requirements and guidelines;
3. Before commencing any work, the Contractor shall submit to the Engineer Representative for approval the method of working, equipment and noise mitigation measures intended to be used at the site;
4. The Contractor shall devise and execute working methods to minimise the noise impact on the surrounding sensitive uses, and provide experienced personnel with suitable training to ensure that those methods are implemented;
5. Noisy equipment and noisy activities should be located as far away from the NSRs as is practical;
6. Unused equipment should be turned off. PME should be kept to a minimum and the parallel use of noisy equipment / machinery should be avoided;
7. Regular maintenance of all plant and equipment; and
8. Material stockpiles and other structures should be effectively utilised as noise barriers, where practicable.

4.8.2 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 them to ER for approval, and carry out the mitigation measures.

E 834000

E 833500

E 835000

石鼓洞水塘
SHEK LEI PUI RESERVOIR

九龍水塘
KOWLOON RESERVOIR

九龍接收水塘
KOWLOON RECEPTION RESERVOIR

九龍泳水塘
KOWLOON BYEWASH RESERVOIR

(A-D)

300m

VH

N 823500

N 823000

R(C)4

R(C)5

R(C)6

R(C)3

R(C)2

R(C)1

CDA

OU

GB

G/IC

G/IC(1)

G/IC(2)

G/IC(3)

0 25 50 75 100 125 M
1:2 500 SCALE BAR

LEGEND:

- STUDY AREA BOUNDARY
- PREFERRED TUNNEL ALIGNMENT
- \+ NOISE SENSITIVE RECEIVER
- C — COMMERCIAL
- CDA — COMPREHENSIVE DEVELOPMENT AREA
- G/IC — GOVERNMENT/INSTITUTION/COMMUNITY
- GB — GREEN BELT
- I — INDUSTRIAL
- O — OPEN SPACE
- OU — OTHER SPECIFIED USES
- R(A) — RESIDENTIAL (GROUP A)
- R(B) — RESIDENTIAL (GROUP B)
- R(C) — RESIDENTIAL (GROUP C)
- R(E) — RESIDENTIAL (GROUP E)
- V — VILLAGE TYPE DEVELOPMENT

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client

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WATER SUPPLIES DEPARTMENT

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Project

Agreement No. CE55/2006(EP)
Inter-reservoirs Transfer Scheme (IRTS)
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Environmental Impact Assessment Investigation

Title

THE STUDY AREA AND REPRESENTATIVE NSRs (INTAKE END)

Designed	HN/PW		Eng.Chk.	PW	
Drawn	VN		Coordination	PW	
Dwg.Chk.	HN		Approved	AFK	

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Project: 240564

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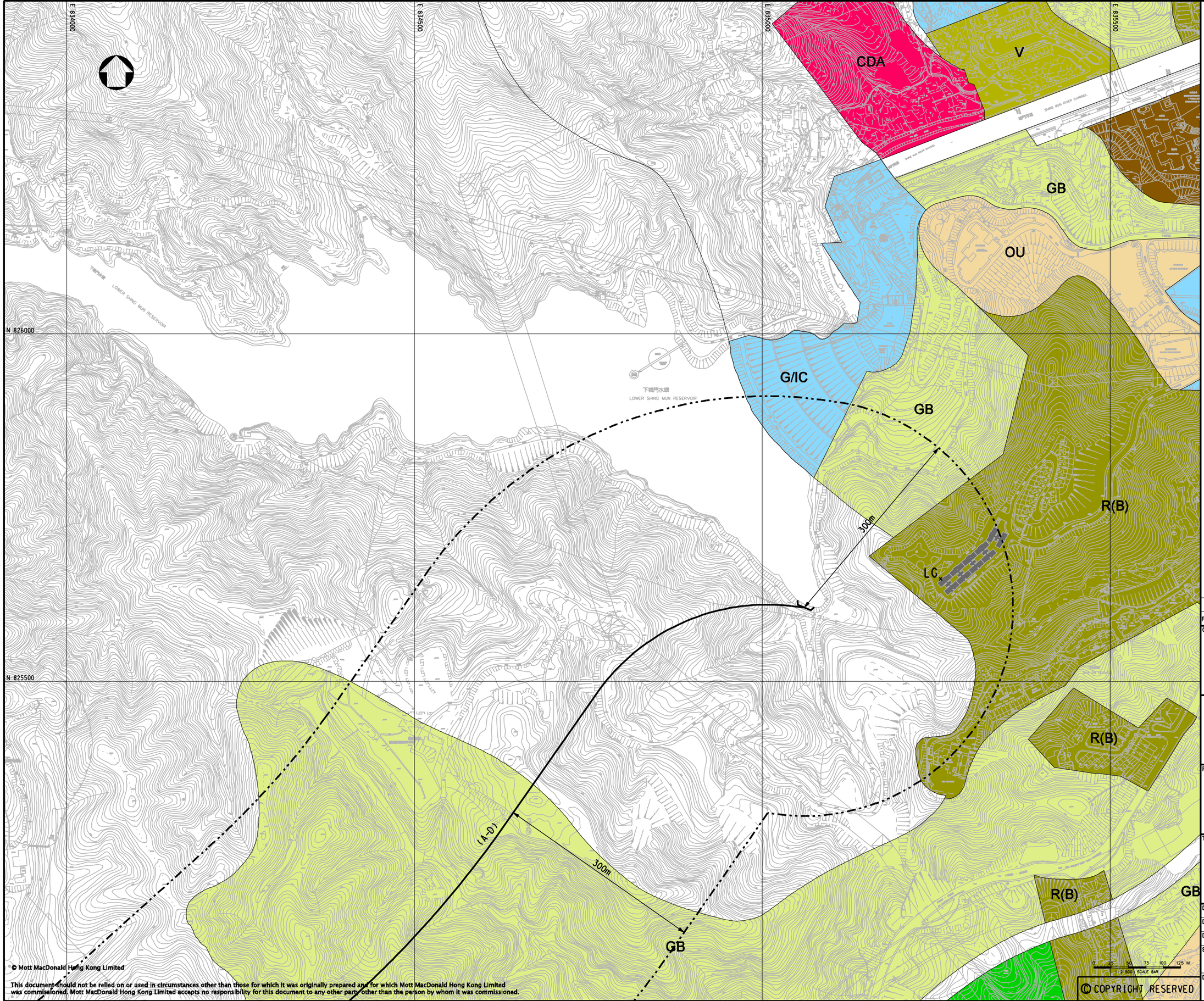
Rev



Rev	Date	Drawn	Description	Ch'k'd	App'd

Client

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Project

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Inter-reservoirs Transfer Scheme (IRTS)
Water Tunnel between Kowloon Byewash Reservoir and Lower Shing Mun Reservoir
Environmental Impact Assessment Investigation

Title

PROPOSED LOCATION OF NOISE MONITORING STATION AT OUTFALL END

Designed	HN/PW		Eng.Chk.	PW	
Drawn	VN		Coordination	PW	
Dwg.Chk.	HN		Approved	AFK	
Scale	1:2500@A1	Project	240564		Status INF
		CAD File	j:\240564\report\env\em&a-0812\FIGURE-4-2.dgn		
Drawing No.	FIGURE 4-2				Rev

5. WATER QUALITY

5.1 Introduction

5.1.1 The EIA has identified that the key impacts may arise from tunnel excavation and construction of the intake and outfall structures. To minimise the potential impacts arising from the construction of the proposed IRTS on water quality in the vicinity of water sensitive receivers (WSRs), proper construction methods with good site practices should be implemented.

5.1.2 Water quality monitoring and audit for the project are required to ensure compliance with the water quality criteria and the effectiveness of the proposed mitigation measures. Discharge water quality monitoring and audit shall be carried out during the construction period for the works at the Intake and Outfall Portal. Should proper measures be taken, impacts on the water quality in the Kowloon Byewash, Lower Shing Mun Reservoirs and the associated water gathering grounds are not anticipated.

5.1.3 Site inspections should also be required to ensure that the recommended water pollution mitigation measures would be properly implemented, functioned and maintained during construction phase of the Project.

5.2 Water Quality Parameters

5.2.1 Monitoring for dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, pH, turbidity and suspended solids (SS) should be undertaken at designated monitoring stations. All parameters should be measured in-situ except SS, which should be determined by the laboratory.

5.2.2 Other relevant data should also be recorded, including monitoring location/position, time, weather conditions and any special phenomena or work underway at the construction site.

5.3 Monitoring Equipment

5.3.1 Water samples for all monitoring parameters should be collected, stored, preserved and analysed according to the Standard Methods for the Examination of Water and Wastewater, APHA 21 ed. and/or methods agreed by the Director of Environmental Protection. The following equipment or equivalent should be provided by the ET and used for monitoring of water quality impact:

Dissolved Oxygen and Temperature Measuring Equipment

5.3.2 DO and water temperature should be measured in-situ by a DO/temperature meter. The instruction should be portable and weather proof using a DC power source. It should have a membrane electrode with automatic temperature compensation complete with a cable. The equipment should be capable of measuring:

- A DO level in the range of 0-20 mg/l and 0-200% saturation; and
- A temperature of between 0 and 45 degree Celsius.

pH Measuring Instrument

5.3.3 A portable pH meter capable of measuring a range between 0.0 and 14.0 should be provided to measure pH under the specified conditions (e.g. Orion Model 250A or an approved similar instrument) accordingly to the Standard Methods, APHA.

Turbidity Measuring Instrument

5.3.4 Turbidity should be measured in situ by the nephelometric method. The instrument should be portable and weatherproof using a DC power source complete with cable, sensor and comprehensive operation manuals. The equipment should be capable of measuring turbidity between 0-1000 NTU.

Water Sampling Equipment

5.3.5 A water sampler, consisting of a transparent PVC or glass cylinder of a capacity of not less than two litres which can be effectively sealed with cups at both ends should be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument).

5.3.6 Water samples for SS measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen) and delivered to HOKLAS accredited laboratory for analysis as soon as possible after collection.

Calibration of In Situ Instruments

5.3.7 All in situ monitoring instruments should be checked, calibrated and certified by a laboratory accredited under HOKLAS or other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Response of sensors and electrodes shall be checked with certified standard solutions before each use. On-site analyses are required to be carried out by trained and competent personnel.

5.3.8 For the on site calibration of field equipment, the BS 127:1993, "Guide to Field and on-site test methods for the analysis of waters" should be observed. Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

Laboratory Analytical Methods

5.3.9 Analysis of SS should be carried out in a HOKLAS or other international accredited laboratory. Table 5-1 shows the standard test methods of the proposed determinants for laboratory analysis.

Table 5-1 Methods for Laboratory Analysis for Water Samples

Parameters (Unit)	Suggested Method	Detection Limit
SS (mg/L)	APHA* 2540 D	$\leq$ 0.1 mg/L

*American Public Health Association: Standard Methods for the Examination of Water and Wastewater APHA 21 ed

5.3.10 The testing laboratory should be HOKLAS accredited (or if not, approved by the ER) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.

5.3.11 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control should be approved by ER. In any circumstances, the QA/QC should be in accordance with the requirement of HOKLAS or international accredited scheme such as ISO 17025:2005. The QA/QC results should be reported. EPD may also request the laboratory to carry out analysis of know standards provided by EPD for quality assurance.

5.3.12 Additional duplicate samples might be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required.

5.3.13 If in-house or non-standard methods are proposed, details of the method verification may also be required for submission to EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD.

5.4 Monitoring Locations

5.4.1 Water quality monitoring should be carried out at the proposed monitoring locations as detailed in Table 5-2 and Figures 5.1 and 5.2. The final locations and number of the monitoring points should be agreed with EPD at least 2 weeks before undertaking any monitoring works. The status and locations of water quality sensitive receivers may change after issuing this manual. If such cases exist, the ET leader should propose updated monitoring locations and seek approval from the IEC and EPD.

Table 5-2 Water Quality Monitoring Stations

ID	Description
C1	Control Point near Intake Site
C2	Control Point near Outfall Site
D1	Discharge Point near Intake Site
D2	Discharge Point near Outfall Site

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

- At locations close to and preferably at the boundary of the mixing zone of the major site activities, which are likely to have water quality impacts;
- Close to the sensitive receptors which are directly or likely to be affected;
- For monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring;

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

5.5 Baseline Monitoring

5.5.1 Baseline conditions for water quality shall be established and agreed with EPD prior to the commencement of works. The purpose of the baseline monitoring is to establish ambient

conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall be established by measuring the water quality parameters specified in Section 5.2. The measurement shall be taken at all designated monitoring stations including control stations for 3 days per week for 4 consecutive weeks prior to commencement of the works.

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

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

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

5.6 Impact Monitoring

5.6.1 During the course of the construction works, monitoring should be undertaken three times per week with sampling/measurement at all designated monitoring stations including control stations proposed in Section 5.4. The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and Limit levels, in which case the monitoring frequently would be increased.

5.6.2 Proposed water quality monitoring schedule should be sent to the Contractor, IEC, ER and EPD at least one week prior to commencement of the monitoring work. The Contractor, IEC, ER and EPD should be notified immediately of any change in monitoring schedule.

5.7 Event and Action Plan for Water Quality

5.7.1 The Action and Limit Levels for water quality are detailed in Table 5-3. The actions in accordance with the Event and Action Plan in Appendix B should be carried out if the water quality assessment criteria are exceeded at any designated monitoring points.

Table 5-3 Action and Limit Levels for Water Quality

Parameters	Action Level	Limit Level
Dissolved Oxygen in mg/l	5 percentile of baseline data	1 percentile of baseline data
pH	95 percentile of baseline data	99 percentile of baseline data
Turbidity , NTU Suspended Solids in mg/L	95 percentile of baseline data or 120% of upstream control station of the same day	99 percentile of baseline data or 130% of upstream control station of the same day

Note:
1. For DO measurement, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

2. For pH, non-compliance of the water quality limits occurs when monitoring result is higher than the limits. The water quality should not exceed the pH range of 6.5 to 8.5.

3. For SS and turbidity measurement, non-compliance occurs when monitoring result is higher than the limits.

4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever necessary.

5.8 Water Quality Mitigation Measures

5.8.1 Mitigation measures recommended for the construction phase have been summarised as below. The implementation schedule for these measures is presented in Appendix A.

Construction of Desilting Facilities

5.8.2 Construction for the desilting facilities at intake and outfall portals should be carried out behind a temporary cofferdam which is watertight enclosure built in the reservoirs and pumped dry to expose the bottom so that construction of intake and outfall portals could be undertaken.

5.8.3 The cofferdam composed of steel pilings driven into the slope surface of the reservoir to form a watertight structure around the intake and outfall work sites to prevent excavated materials from getting into the reservoirs. The cofferdams should remain on site until completion of intake and outfall portals and tunnel construction.

5.8.4 The cofferdams should be regularly inspected and maintained to ensure no spillage of waste or wastewater into the reservoirs. Indicative locations of the cofferdams are shown in Figure 5.1 and Figure 5.2 respectively.

5.8.5 During the dewatering process, appropriate desilting devices should be provided for treatment before discharge. The Contractor should ensure that the discharge water from the desilting facilities comply with the WPCO/TM-DSS requirements before discharge.

Stormwater Point and Non-point Source Pollution

5.8.6 Construction runoff will be managed as per the Practice Note for Professional Persons ProPECC PN1/94 - Construction Site Drainage and the conditions of working within Water Gathering Grounds stipulated by WSD.

5.8.7 A Drainage Management Plan should be prepared by the Contractor for approval by the Engineer for each of the works areas, detailing the facilities and measures to manage pollution arising from surface runoff from those works areas.

5.8.8 An Emergency Contingency Plan should also be prepared by the Contractor, detailing the response and procedures to contain and remove any accidental spillage along the temporary and permanent roads and at the site at short notice to prevent or minimize the quantities of contaminants from reaching the reservoirs and local streams leading to the reservoirs. The Emergency Contingency Plan should be submitted to the Engineer for approval.

5.8.9 It is envisaged that the following measures will effectively control runoff from works sites and avoid water pollution downstream as well as the water gathering grounds: -

Construction Site Runoff and Discharge

1. Surface run-off and effluent from the construction sites at the intake at Kowloon Byewash Reservoir and outfall at the Lower Shing Mun Reservoir will be directed towards adequately designed sand/silt removal facilities such as sand/silt traps and sediment basins to remove sand/silt particles from runoff to meet the requirements of the TM standards under the WPCO before discharging to discharge points downstream of the Kowloon Byewash Reservoir Dam and Lower Shing Mun Reservoir Dam respectively as shown in Figure 5-1 and Figure 5-2. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. Sizes may vary depending upon the flow rate, but for a flow rate of $0.1m^3/s$ a sedimentation basin of $30m^3$ would be required and for a flow rate of $0.5m^3/s$ the basin would be $150m^3$. The detailed design of the sand/silt traps should be undertaken by the contractor prior to the commencement of construction;
2. Channels, earth bunds or sand bag barriers will be provided on-site to properly direct stormwater to the above-mentioned facilities;
3. Existing on-site silt removal facilities, channels and manholes, if any, will be maintained and the deposited silt and grit will be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times;
4. Other manholes, if any, including any newly constructed ones will be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system;
5. Open stockpiles of materials on site will be avoided within water gathering grounds as far as practicable. All surplus spoil will be removed from water gathering grounds as soon as possible. Measures will be taken to prevent the washing away of construction materials, soil, silt or debris;
6. Where possible, works entailing soil excavation will be minimized during the rainy season (i.e. April to September). If excavation in soil could not be avoided in these months or at any time of year when rainstorms are likely, for the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest/edge of excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm;
7. Where applicable, final earthworks surfaces/ slopes will be well compacted and hydro-seeded following completion to prevent erosion;
8. Where surface runoff or construction effluent is likely to be contaminated with oil, properly designed and maintained petrol interceptor will be provided to meet the WPCO/TM-DSS requirements. Oil leakage or spillage shall be contained and cleaned up immediately. Detailed design of the petrol interceptor shall be provided by the Contractor before commencement of construction;
9. Sewage arising from the construction workers on site should be collected by temporary sanitary facilities e.g. portable chemical toilets. Portable toilets should be used coupled with tankering away services provided by a licensed collector;

10. All site discharges within Inland Waters Group A must comply with the terms and conditions of a valid discharge licence issued by EPD;

11. Vehicle wheel washing facilities should be provided, where applicable, at the site exit such that mud, debris, etc. deposited onto the vehicle wheels or body can be washed off before the vehicles are leaving the site area;

12. Section of the road between the wheel washing bay and the public road should be paved with backfill to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains;

13. Vehicle washing facilities should be drained into desilting facilities before discharge. The water should be recycled on site wherever possible. It is suggested that the wash water from the wheel wash basin is either reused for site watering or pumped to the on-site desilting facilities for treatment;

14. Desilting facilities should be checked and the deposited silt and grit should be removed regularly to ensure they are working properly at all times;

Construction of Tunnel, Intake and Outfall

15. To minimize water quality impact, recycled water should be used at the cutter face for cooling purposes. Used water should be collected and discharged to settling tank for settlement;

16. Excess water from the settling tank would be transferred to the desilting facilities for treatment before discharge. The Contractor should ensure that the discharge water from the desilting facilities and treated spent effluent arising from tunnel boring from the desilting facilities comply with the WPCO/TM-DSS requirements before discharge.

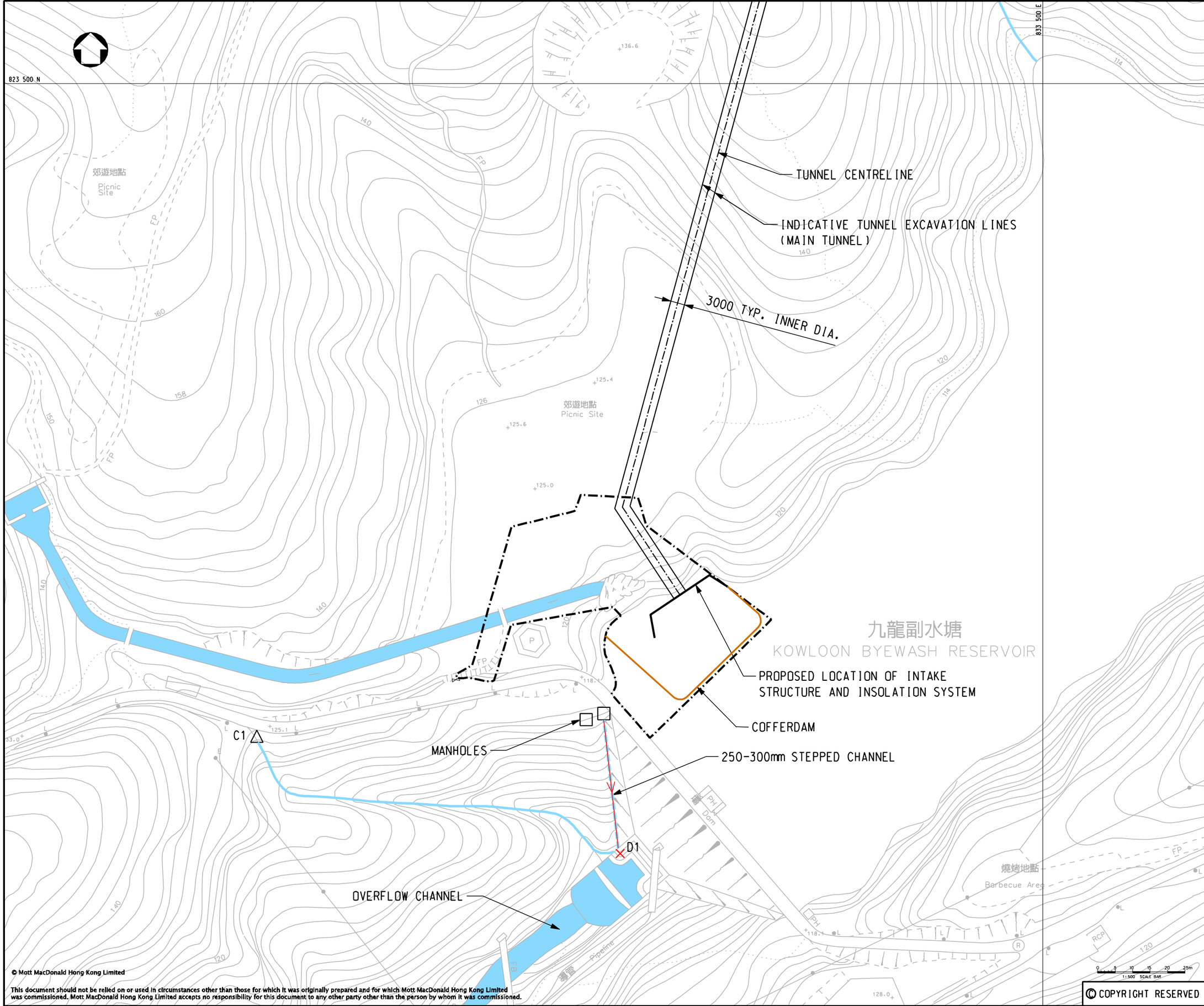
Protection against Accidental Spillage

17. The project may occasionally involve the handling of fuel and generates chemical wastes. It must be ensured that all fuel tanks and chemical storage are sited on sealed and bunded areas, provided with locks and located outside water gathering grounds as far as practicable;

18. The storage areas will be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank to prevent accidentally spilled oil, fuel or chemicals from reaching the receiving waters;

19. Oil and grease removal facilities will be provided where appropriate, for example, in area near plant workshop/ maintenance areas, if any;

20. Chemical waste arising from the site should be properly stored, handled, treated and disposed of in compliance with the requirements stipulated under the Waste Disposal (Chemical Waste) (General) Regulation.



NOTE:

DESIGN DETAILS OF THE COFFERDAM WILL BE DETERMINED BY THE CONTRACTOR.

LEGEND:

- WORKSITE AREA
- WATERCOURSE
- INDICATIVE LOCATION OF COFFERDAM
- FLOW PATH OF TREATED EFFLUENT
- POINT OF EFFLUENT DISCHARGE / MONITORING STATION D1
- CONTROL STATION AT INTAKE SITE

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	NOV 08	MING	MINOR AMENDMENT	FY	AFK
P2	NOV 08	MING	MINOR AMENDMENT	FY	AFK
P1	MAR 08	VN	FIRST ISSUE	RL	AFK

Client

THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION WATER SUPPLIES DEPARTMENT

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Project

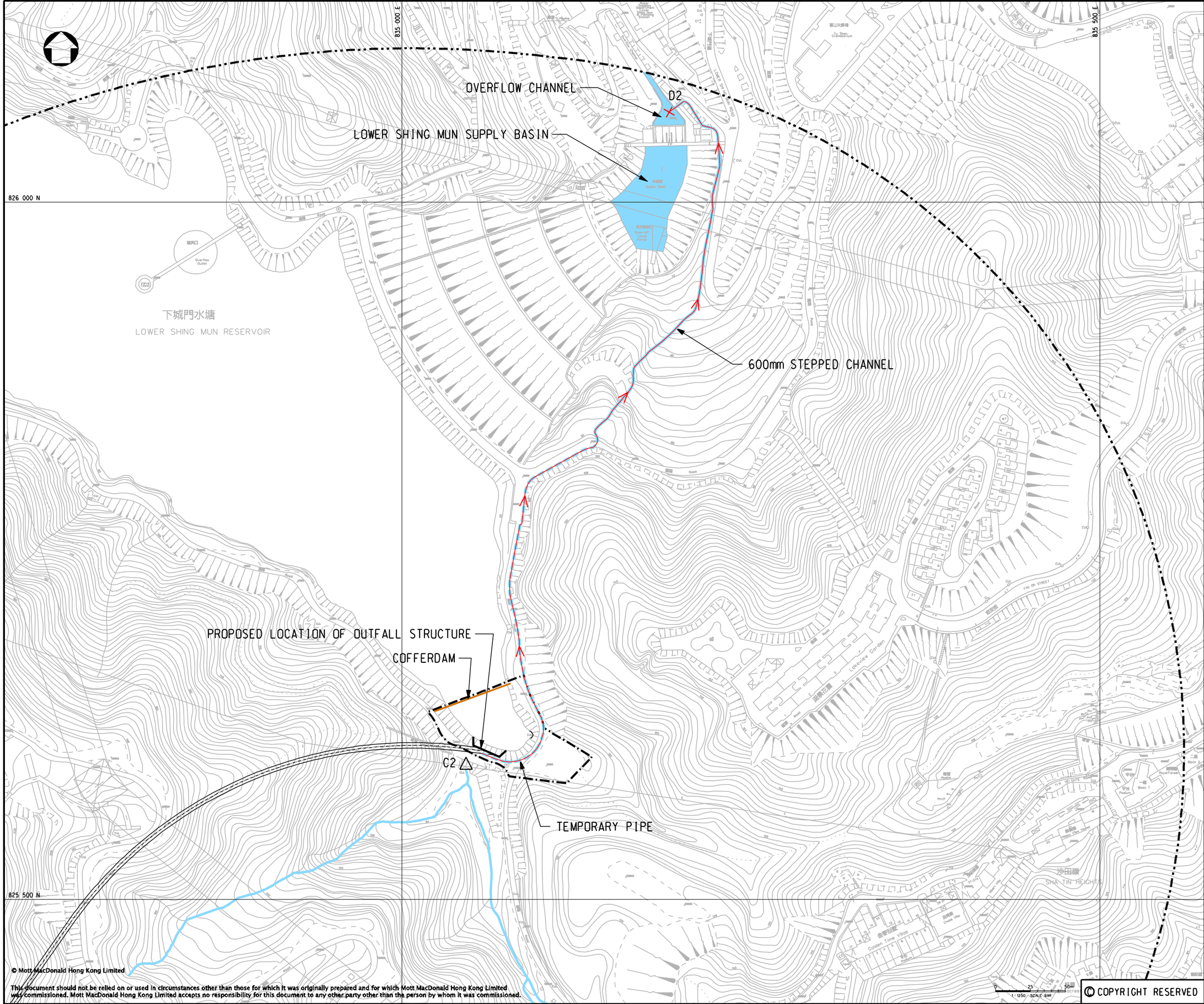
Agreement No. CE55/2006(EP)
Inter-reservoirs Transfer Scheme (IRTS)
Water Tunnel between Kowloon Byewash Reservoir and Lower Shing Mun Reservoir
Environmental Impact Assessment Investigation

Title

PROPOSED WATER QUALITY MONITORING STATION AT INTAKE END

Designed	FY		Eng.Chk.	FY	
Drawn	MING		Coordination	FY	
Dwg.Chk.	FY		Approved	AFK	

Scale 1:500@A1	Project 240564	Status INF
	CAD File J:\240564\REPORT\ENV\EM&A-08I21\FIGURE-5-1.dgn	
Drawing No. FIGURE 5-1		Rev P3



NOTE:

DESIGN DETAILS OF THE COFFERDAM WILL BE DETERMINED BY THE CONTRACTOR.

LEGEND:

- STUDY AREA BOUNDARY
- WORKSITE AREA
- WATERCOURSE
- TEMPORARY PIPE
- INDICATIVE LOCATION OF COFFERDAM
- FLOW PATH OF TREATED EFFLUENT
- POINT OF EFFLUENT DISCHARGE / MONITORING STATION D2
- CONTROL STATION AT OUTFALL SITE

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	NOV 08	MING	MINOR AMENDMENT	FY	AFK
P2	NOV 08	MING	MINOR AMENDMENT	FY	AFK
P1	MAR 08	VN	FIRST ISSUE	RL	AFK

Client

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Project

Agreement No. CE55/2006(EP)
Inter-reservoirs Transfer Scheme (IRTS)
Water Tunnel between Kowloon Byewash Reservoir and Lower Shing Mun Reservoir
Environmental Impact Assessment Investigation

Title

PROPOSED WATER QUALITY MONITORING STATION AT OUTFALL END

Designed	FY		Eng.Chk.	FY	
Drawn	MING		Coordination	FY	
Dwg.Chk.	FY		Approved	AFK	

Scale 1:1250@A1	Project 240564	Status INF
	CAD File J:\240564\report\env\em&a-0812\FIGURE-5-2.dgn	
Drawing No. FIGURE 5-2		Rev P3

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6. WASTE MANAGEMENT

6.1 Introduction

6.1.1 Based on the waste generation assessment in the EIA report, it has been identified that some construction wastes (including inert and non-inert wastes), chemical waste and general refuse will be generated from the construction activities.

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

6.2 Environmental Audit

6.2.1 As described in Section 9.1.2 of the Manual, the ET Leader is responsible for formulating an environmental site inspection, deficiency and action reporting system, and for carrying out site inspections under the EM&A programme.

6.2.2 The overall principles of construction waste management are to reduce waste generation and to reuse and recycle construction waste. The arrangement for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities and the recommended mitigation measures are to be described in a Waste Management Plan ("WMP").

6.2.3 The Contractor shall, no later than one month after the commencement of construction of the project, prepare a Waste Management Plan ("WMP") in accordance with the requirements set out in the ETWB TCW No. 19/2005, Waste Management on Construction Sites for approval by the ER. The WMP will describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities and will include the recommended mitigation measures on waste management in the EIA.

6.2.4 The WMP will indicate the disposal location(s) of all surplus excavated materials and wastes. A trip ticket system shall be included in the WMP. All measures recommended in the WMP shall be fully and properly implemented by the Contractor throughout the construction period.

6.2.5 In order to check that the waste control and mitigation measures have been implemented by the Contractor as good site practices, the following shall be included as part of the site inspections and audit by the ET.

1. An on-site environmental co-ordinator employed by the Contractor should be identified at the outset of the works. The co-ordinator shall prepare a Waste Management Plan ("WMP") in accordance with the requirements set out in the ETWB TCW No. 19/2005, Waste Management on Construction Sites. The WMP shall include monthly and yearly Waste Flow Tables ("WFT") that indicate the amounts of waste generated, recycled and disposed of (including final disposal site),

and which should be regularly updated;

2. The reuse/ recycling of all materials on site shall be investigated and exhausted prior to treatment/ disposal off-site;

3. Good site practices shall be adopted from the commencement of works to avoid the generation of waste, reduce cross contamination of waste and to promote waste minimisation;

4. All waste materials shall be sorted on-site into inert and non-inert C&D materials, and where the materials can be recycled or reused, they shall be further segregated. Inert material, or public fill will comprise stone, rock, concrete and soil which is suitable for land reclamation and site formation whilst non-inert materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance);

5. The Contractor shall be responsible for identifying what materials can be recycled/ reused, whether on-site or off-site. In the event of the latter, the Contractor shall make arrangements for the collection of the recyclable materials. Any remaining non-inert waste shall be collected and disposed of to the landfills whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if no use of the inert material can be found on-site, the materials can be delivered to a public fill reception facilities after obtaining the appropriate licence;

6. In order to monitor the disposal of C&D material and solid wastes at public fill reception facilities and landfills, and control fly-tipping, a trip-ticket system shall be implemented by the Contractor, in accordance with the contract and the requirements of WBTC 31/2004 “Trip Ticket System for Disposal of Construction and Demolition Material”;

7. Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall register as a Chemical Waste Producer if chemical wastes such as spent lubricants and paints are generated on site. Only licensed chemical waste collectors shall be employed to collect any chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme both published by EPD;

8. A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive surroundings. These bins shall be cleared daily and the collected waste disposed of to the refuse transfer station. Further to the issue of ETWB TCW No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness, the Contractor is required to maintain a clean and hygienic site throughout the project works;

9. All chemical toilets, if any, shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal;

10. Toolbox talks should be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;

11. The Contractor shall comply with all relevant statutory requirements and guidelines and their updated versions that may be issued during the course of project construction.

7. LANDSCAPE & VISUAL

7.1 Introduction

7.1.1 The EIA has recommended EM&A for landscape and visual resources to be undertaken during the design, construction and operational phases of the Project. The design, implementation and maintenance of landscape mitigation measures is a key aspect of this and should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

7.2 Mitigation Measures

7.2.1 The EIA has recommended a series of mitigation measures for both the construction and operational phases to ameliorate the landscape and visual impacts of the Project. These measures include the following as shown in Table 7-1, which are also summarised in the environmental mitigation implementation schedules provided in Appendix A:

Table 7-1 Proposed Landscape Mitigation Measures

Mitigation Code	Mitigation Measure
LMM1	**Preservation of Existing Topsoil -** Topsoil disturbed during the construction phase will be tested using a standard soil testing methodology and where it is found to be worthy of retention stored for re-use. The soil will be stockpiled to a maximum height of 2m and will be either temporarily vegetated with hydroseeded grass during construction or covered with a waterproof covering to prevent erosion. The stockpile should be turned over on a regular basis to avoid acidification and the degradation of the organic material, and reused after completion. Alternatively, if this is not practicable, it should be considered for use elsewhere, including other projects.
LMM2	**Preservation of Existing Trees** - The development proposals would avoid disturbance to the existing trees as far as practicable within the confines of both the areas surrounding the proposed water intake and outfall structures at southern portal and northern portal respectively. It is recommended that a full tree survey and felling application will be undertaken and submitted for approval by the relevant government departments in accordance with WBTC No. 03/2006, Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation during the detailed design phase of the project. Where possible all trees which are not in conflict with the proposals would be retained and shall be protected by means of fencing where appropriate to prevent potential damage to tree canopies and root zones from vehicles and storage of materials. Specifications for the protection of existing trees will be circulated for approval by the relevant government authorities during the preparation of the detailed tree survey.
LMM3	**Compensatory Tree Planting** – trees unavoidably affected by the proposed engineering works will be compensated with a minimum ratio of 1:1 (new tree planting: trees recommended to be felled). The compensatory tree planting proposals for southern portal and northern portal presented as Figure 9.6a and Figure 9.6b Landscape and Visual Mitigation Plan include some 17 (southern portal) and 55 (northern portal) new specimen trees in addition to replanting of shrubs within works site would be established. The proposed compensatory planting of trees will result in a compensatory planting ratio of 1.08:1 (new tree planting: trees recommended for felling at Southern Portal) and 1.06:1 (new tree

Mitigation Code	Mitigation Measure
	planting: trees recommended for felling at Northern Portal). This compares favourably with the report's assertion that some 11 trees would be felled at Southern Portal and some 27 trees would be felled at Northern Portal due to the proposals in this area. Following the retention of existing trees, the successful establishment of newly planted trees, the area near Southern Portal will contain approximately 268 trees, while the area near Northern Portal will contain approximately 231 trees. All compensatory trees will utilise species native to Hong Kong. These proposals will be subject to the detailed design stage of the project.
LMM4	**Erection of decorative screen hoarding –** Decorative hoarding surrounding the proposed works areas at both Southern and Northern Portals will be erected during the construction period in order to reduce visual impact to the nearby reservoir access roads.
LMM5	**Location of site office, storage or workshops –** Site office, storage or workshops should be carefully allocated out of the tree protection zone during the construction stage in order to protect existing trees.
LMM6	**Selection of preferred locations of the water intake and outfall structures –** The current location of proposed water intake and outfall structures have been taken into account at the tunnel alignment design stage. Visual impact is reduced by placing the proposed structure at the areas enclosed by existing topography and vegetation.
LMM7	**Appearance of the structure –** the design of the proposal has sought to reduce the apparent visual mass of the water intake and outfall structures through the use of contrasting textures for the finishes of the structure, and the use of colour blocking utilising range of visually recessive earth colours and tones.
LMM8	**Reinstatement of disturbed vegetation at both portal areas –** Reinstatement of tree and shrub planting on re-graded slopes and temporary works areas to blend the intake structures into their surrounding landscape and visual context.

7.3 Construction and Operational Phase Audit

7.3.1 A specialist Landscape Sub-Contractor should be employed by the Contractor for the implementation of landscape construction works and subsequent maintenance operations during the 12 month establishment period. It is proposed that as the majority of the planting works in the area not to be developed initially, the planting should be conducted within the first half of the construction contract. Thus, the establishment works will be undertaken through the latter half of the construction contract. The intention is to provide at least 12 months establishment period for the majority of the planting works.

7.3.2 All measures undertaken by both the Contractor and the specialist Landscape Sub-Contractor during the construction phase and first year of the operational phase shall be audited by a Registered Landscape Architect, as a member of the environmental auditing team, on a regular basis to ensure compliance with the intended aims of the measures. Site inspections should be undertaken at least once every two weeks throughout the construction period and once every two months during the operational phase. The broad scope of the audit is detailed below but should also be undertaken with reference to the more specific checklist provided in Table 7-2. Operational phase auditing will be restricted to the last 12 months of the establishment works of the landscaping proposals and thus only the items below concerning this period are relevant to the operational phase.

- The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the Contractor outside the limit of the works, including any damage to existing trees shall be noted;

- The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken;
- All existing trees and vegetation within the study area which are not directly affected by the works are retained and protected;
- The methods of protecting existing vegetation proposed by the Contractor are acceptable and enforced;
- Preparation, lifting transport and re-planting operations for any transplanted trees;
- All landscaping works are carried out in accordance with the specifications;
- The planting of new trees, shrubs, groundcover, climbers, ferns, grasses and other plans, together with the replanting of any transplanted trees are carried out properly and within the right season; and
- All necessary horticultural operations and replacement planting are undertaken throughout the Establishment Period to ensure the healthy establishment and growth of both transplanted trees and all newly established plants.

Table 7-2 Construction/ Operational Phase Audit Checklist

Area of Works	Items to be Monitored
Protection of all trees to be retained	• Identification and demarcation of trees / vegetation to be retained; • Creation of precautionary area around trees to be retained equal to half of the trees canopy diameter and fenced the precautionary area; • Prohibition of the storage of materials including fuel, the movement of construction vehicles, and the refuelling and washing of equipment including concrete mixers within the precautionary area; • Phased segmental root pruning for trees to be retained over a suitable period (determined by species and size) prior to lifting or site formation works which affect the existing root ball of trees identified for retention. The extent of the pruning will be based on the size and the species of the tree in each case; • Pruning of the branches of existing trees identified for retention to be based on the principle of crown thinning maintaining their form and amenity value; • The watering of existing vegetation particularly during periods of excavation when the water table beneath the existing vegetation is lowered; and • The rectification and repair of damaged vegetation following the construction phase to its original condition prior to the commencement of the works or replacement using specimens of the same species, size and form where appropriate to the design intention of the area affected.
Clearance of existing vegetation	• Identification and demarcation of trees / vegetation to be cleared; and • Checking of extent of works to minimise damage, monitoring of adjacent areas against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Plant supply	• Monitoring of operations relating to the supply of specialist plant material (including the collecting, germination and growth of plants from seed) to ensure that plants will be available in time to be used within the construction works.

Area of Works	Items to be Monitored
Soiling, planting, etc.	• Monitoring of implementation and maintenance of soiling and planting works and against possible incursion, physical damage, fire, pollution, surface erosion, etc.
Decorative treatment of site hoarding	• Implementation and maintenance, to ensure compliance with agreed designs.
Architectural design and treatment of water intake and outfall structures and associated engineering works.	• Implementation and maintenance of mitigation measures, to ensure compliance with agreed designs.
Establishment Works	• Monitoring of implementation of maintenance operations during Establishment Period
Management and maintenance scheme	• Implementation and maintenance of mitigation measures during operation phase, to ensure compliance with agreed designs.

7.3.3 In the event of non compliance the responsibilities of the relevant parties is detailed in the Event /Action plan provided on Appendix B.

8. CULTURAL HERITAGE IMPACT

8.1 Proposed Mitigation Measure

8.1.1 The Cultural Heritage Impact Assessment for the project has identified that there are sensitive historical structures in the vicinity of the proposed works and that mitigation in the form of vibration monitoring may be required during the construction phase at Intake A. Although no adverse impacts on the historical structures are anticipated, conducting a condition survey prior to the construction phase as a precautionary mitigation measure is recommended and the survey report shall be submitted to AMO for review prior to the commencement of the construction phase.

8.1.2 The following table presents the required mitigation for the identified sites of Cultural Heritage for which adverse impacts have been identified.

Table 8-1 Mitigation Recommendations for Sites of Cultural Heritage adversely impacted by the proposed construction works at Intake A

Resource	Mitigation Recommendation
Kowloon Byewash Reservoir Dam (Grade II) IRTS-01	Although no adverse impacts are expected, conducting a condition survey prior to the construction phase of the project as a precautionary mitigation measure is recommended. The survey shall check the state of the dam / valve house and provide the most up-to-date information of the condition of these structures; and advise any other additional protective measures are required during the construction period. The report should be submitted to AMO for review prior to the construction phase.
Kowloon Byewash Reservoir Valve House (Grade II) IRTS-02	
Shek Lei Pui Northeast Dam (Grade II) IRTS-04	Although no adverse impacts are expected, conducting a condition survey prior to the construction phase of the project as a precautionary mitigation measure is recommended. The survey shall check the state of the dam and provide the most up-to-date information of the condition of the structure; and advise any other additional protective measures are required during the construction period. The report should be submitted to AMO for review prior to the construction phase.
Shek Lei Pui Northeast Dam Valve House (Grade II) IRTS-05	Although no adverse impacts are expected, conducting a condition survey prior to the construction phase of the project as a precautionary mitigation measure is recommended. The survey shall check the state of the valve house and provide the most up-to-date information of the condition of the structure; and advise any other additional protective measures are required during the construction period. The report should be submitted to AMO for review prior to the construction phase.

Resource	Mitigation Recommendation
Shek Lei Pui Southwest Dam (Grade II) IRTS-06	Although no adverse impacts are expected, conducting a condition survey prior to the construction phase of the project as a precautionary mitigation measure is recommended. The survey shall check the state of the dam and provide the most up-to-date information of the condition of the structure; and advise any other additional protective measures are required during the construction period. The report should be submitted to AMO for review prior to the construction phase.

Requirements of the Condition Survey

8.1.3 The condition survey must be carried out by an approved qualified building surveyor who is a member of the Hong Kong Institution of Surveyors in the Building Surveying division or equivalent and an approved qualified engineer who is a member of the Hong Kong Institution of Engineers in the Civil or Structural Division or equivalent. The condition survey should also make reference (if appropriate) to the Practice Notes No. 289 issued by the Buildings Department of the Hong Kong SAR Government.

8.1.4 The condition survey report must be submitted to the Engineer and the Antiquities and Monuments Office (AMO) for review before the commencement of works and must contain the following:

- An appraisal of the state of the existing historic building and structures including location and condition of all signs of defect (including suitably referenced and catalogued photographs);
- An appraisal of their various types of construction, including foundations;
- Recommendations of monitoring measures to be taken and locations of proposed monitoring points (if required);
- Recommendations for reading frequency of the monitoring equipment (if required); and
- Recommendations of the necessity to conduct a separate assessment report.

8.1.5 A separate assessment report may be produced based on findings of this condition survey report to recommend the following:

- Setting of a safe limit for vibration levels for each historic structure (if required)
- The likely effect that the contractors method of working would have on the existing historic buildings and structures (including the structural stability of the structure);
- Recommendations of any other protective measures to be taken during the construction and/ or operational phases (if required).

8.1.6 If required, monitoring measures and protective measures must be implemented by the contractor and can include, but are not limited to; fixing approved tell tales and tilting markers to monitoring points to the structures and buildings and monitoring them on the schedule recommended in the condition survey report. It should be noted that that for the installation of monitoring measures disturbances to identified historic items should be kept to an absolute minimum and that after removal of such measures, the affected area should be restored to match the original condition. The results of the monitoring must be submitted to the engineer (in an agreed format) within two days of each monitoring undertaken. If the monitoring

measurements exceed the safe limits for any of the monitored structures, the Contractor shall take immediate corrective action as necessary, to bring vibration levels within compliance. The monitoring results should be submitted to AMO only if there is significant effect on the historic items.

9. SITE ENVIRONMENTAL AUDIT

9.1 Site Surveillance

9.1.1 Site surveillance provides a direct means to trigger and enforce the specified environmental protection and pollution control measures necessary to comply with contract specifications. They shall be undertaken regularly and routinely by the ET to inspect the activities at the works site in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented by the Contractor in accordance with the EM&A recommendations. With well-defined pollution control and mitigation specifications and a well-established site inspection, deficiency and action reporting system, site inspection is one of the most effective tools to enforce the environmental protection requirements on the site.

9.1.2 The ET Leader is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspections under the EM&A works. He/she shall prepare and submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the ER, Contractor and IEC for agreement. A preliminary site inspection, deficiency and action reporting system in the form of a flowchart has been prepared for reference, and is presented in Figure 9.1 for review and refinement by the ET at the commencement of the project.

9.1.3 The ET shall conduct a site inspection at least once a week during the construction period of the project. The areas of inspection shall include, but shall not be limited to, the environmental situation, and pollution control and mitigation measures within the site. It should also review the environmental situation outside the site area that 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:

1. The EIA recommendations on environmental protection and pollution control mitigation measures with regard to air quality, noise, waste management;
2. On-going results of the EM&A programme;
3. Works progress and programme;
4. Individual works methodology proposals (which shall include proposals on associated pollution control measures);
5. The contract specifications on environmental protection and pollution prevention;
6. The relevant environmental protection and pollution control laws, ProPECC Notes; and
7. Previous site inspection results.

9.1.4 The ER/ Contractor shall update the ET with all relevant information of the contract for him/ her to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the IEC and the ER in a site inspection proforma within 24 hours, for reference and for taking immediate action.

9.1.5 The Contractor shall follow the procedures and time frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET to report on any remedial measures subsequent to the site inspections.

9.1.6 The ET shall conduct ad-hoc site inspections if significant environmental problems are identified. The IEC shall also conduct independent site audits. Inspections may also be required subsequent to receipt of any environmental complaints, or as part of the investigation work, as specified in the Event/Action Plan for environmental monitoring and audit.

9.2 Compliance with Legal and Contractual Requirements

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

9.2.2 The Contractor shall regularly copy relevant documents to the ET so that the checking work can be carried out. The documents shall at least include the updated Work Progress Reports, the updated Works Programme, and application letters for different license/permits under the environmental protection laws, and all valid licence(s)/permit(s). The site diary shall also be available for the ET's inspection upon his request.

9.2.3 After reviewing the document, the ET Leader shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence/ permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly. The review shall be copied to IEC for any follow-up action.

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

9.3 Environmental Complaints

9.3.1 Complaints reviewed on environmental issues shall be referred to the ET Leader for carrying out complaint investigation procedures. Upon receipt of complaints the ET shall undertake the tasks outlined below. The complaint investigation procedures are also presented in form of a flow chart in Figure 9-2 for ease of reference.

1. Log complaint and date of receipt onto the complaint database and inform the IEC immediately;
2. Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
3. If a complaint is valid and due to works, identify mitigation measures in consultations with the IEC;
4. If mitigation measures are required, advise the Contractor accordingly;
5. Review the Contractor's implementation of the identified mitigation measures, and

the concurrent situation;

6. If the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation an follow-up action within the time frame assigned by EPD;
7. Undertake additional monitoring and audit to verify the complaint if necessary, and ensure that any valid reason for complaint does not recur through proposed amendments to work methods, procedures, machines and/or equipment, etc;
8. Report the investigation results and the subsequent actions to the source of complaint. (If the source of complaint is identified through EPD, the results should be reported within the time frame assigned by EPD); and
9. Log a record on the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

9.3.2 The ET Leader shall immediately notify the ER, IEC, Contractor and EPD of any complaints received and keep him well informed of the actions being taken to settle these complaints.

9.3.3 During the complaint investigation work, the Contractor and ER shall co-operate with the ET Leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified to be required in the investigation in consultation with the IEC, the Contractor shall promptly carry out the measures. The ER shall ensure that the Contractor has implemented the mitigation measures.

9.4 Documentation

9.4.1 All documentation is required to be filed in a traceable and systematically manner and ready for inspection upon request. All EM&A results and findings shall be documented in the EM&A report prepared by the ET and endorsed by IEC prior to circulation to the Contractor, ER and EPD

Figure 9.1 Flow Chart of Preliminary Site Inspection, Deficiency and Action Reporting System

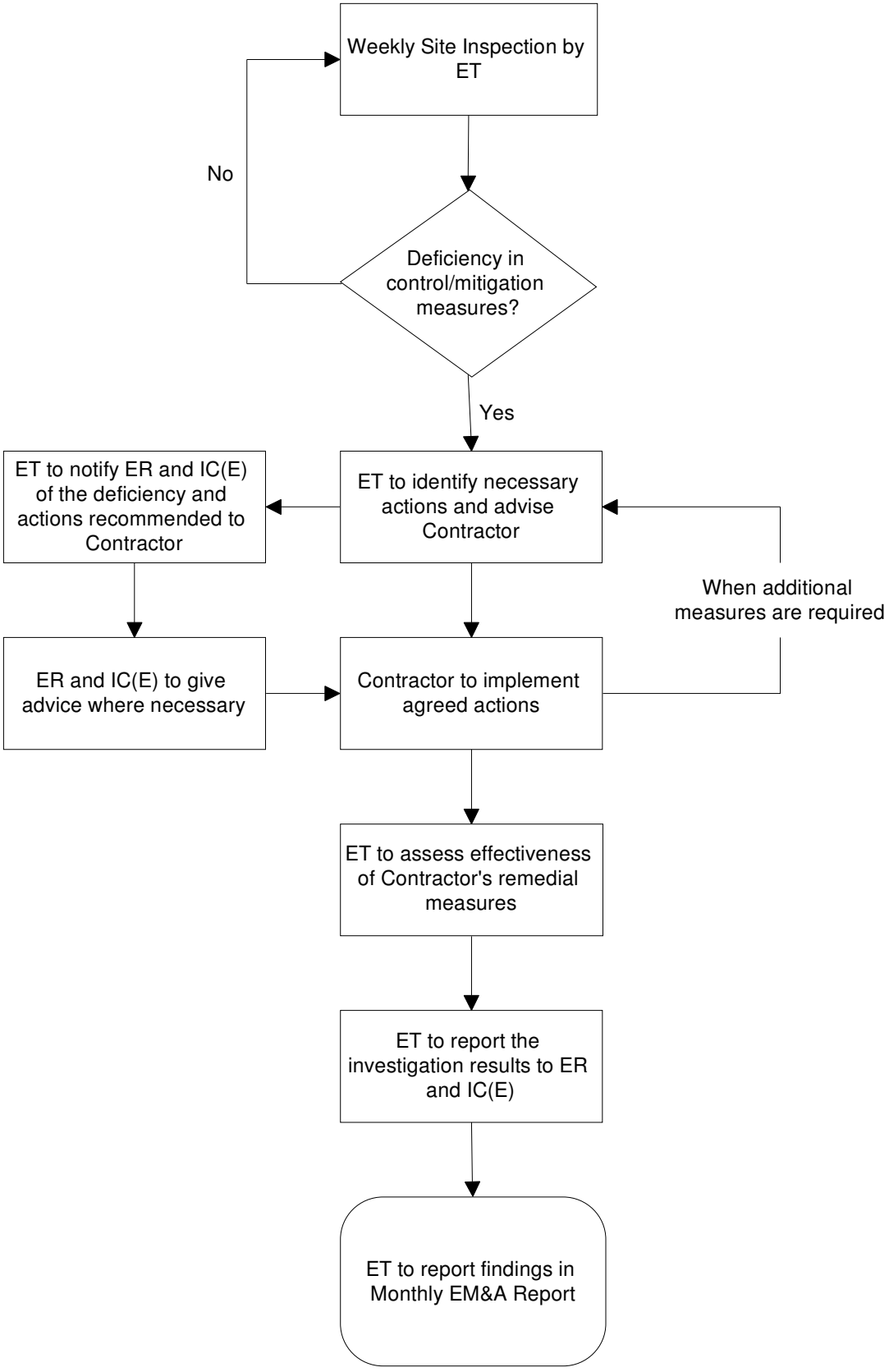
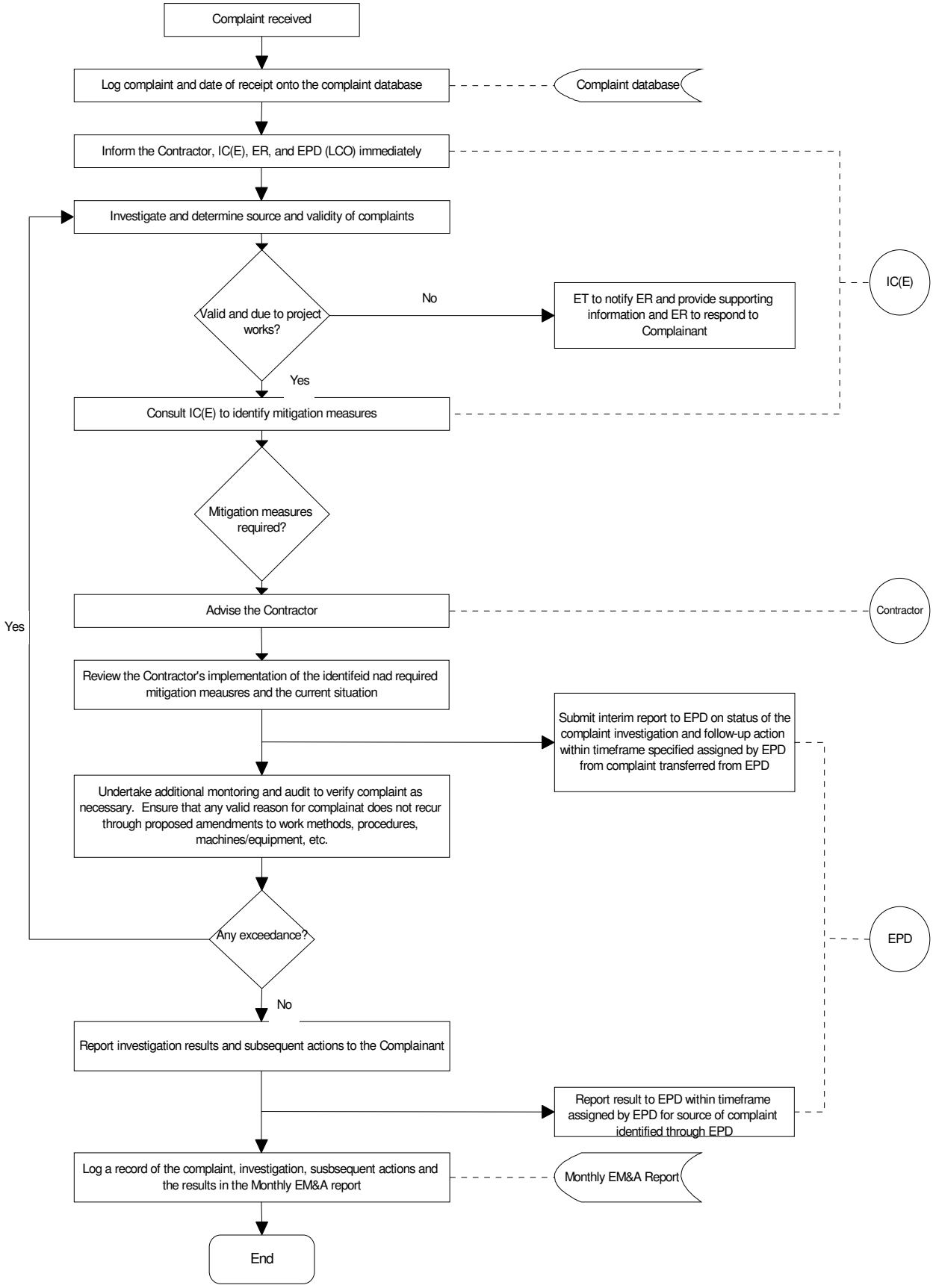


Figure 9.2 Flow Chart of Complaint Investigation Procedures



10. REPORTING

10.1 General

10.1.1 The following reporting requirements are based upon a paper-documented approach. However, the same information shall be provided in an electronic medium upon agreeing the format with the ER and EPD. All the monitoring data (baseline and impact) shall also be submitted in an agreed electronic format in accordance with the requirements under Annex 21 of the EIAO TM. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

10.2 Baseline Monitoring Report

10.2.1 As mentioned in Section 4.5, baseline monitoring for construction noise is necessary. The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days (Mondays to Fridays except public holidays) of completion of the baseline monitoring.

10.2.2 Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the 4 parties: ER, Contractor, IEC and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies needed. The format and content of the report, and the representation of the baseline monitoring data shall be in a format agreeable to EPD and include, but not necessarily limited to:

1. Up to a half-page executive summary;
2. Brief project background information;
3. Drawings showing locations of the baseline monitoring stations;
4. An updated programme on construction of the project with milestones of environmental protection/mitigation activities annotated;
5. Monitoring results (in both hard and soft copies) together with the following information:
    - Monitoring methodology;
    - Types of equipment used and calibration details;
    - Parameters monitored;
    - Monitoring locations;
    - Monitoring date, time, frequency and duration; and
    - QA/QC results and detection limits.
6. Details of influencing factors, including:
    - Major activities, if any, being carried out on the site during the period;
    - Weather conditions during the period; and
    - Other factors which might affect the results.

7. Determination of the Action/ Limit levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact actions for the parameters monitored;
8. Revisions for inclusion in the EM&A Manual; and
9. Comments and conclusions.

10.3 Monthly EM&A Report

10.3.1 The results and findings of all EM&A work required in this Manual shall be presented in a monthly EM&A report prepared and certified by the ET Leader and verified by the IEC before submitting to EPD.

10.3.2 Generally, each EM&A monthly report shall be submitted within 2 weeks of the end of each reporting month. The first report is due in the month after the establishment phase commences. Generally, in additional to the copies to EPD, 3 more copies of each monthly EM&A report shall be submitted to the ER, the IEC and the Contractor. 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 for both hard and soft copy.

10.3.3 The ET Leader shall review the number and location of monitoring stations and parameters to be monitored every 6 months or on a needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

10.4 First Monthly EM&A Report

10.4.1 The first monthly EM&A report shall include at least the following, where applicable:

1. Executive Summary (1-2 pages);
    - Breaches of Action/ Limit levels;
    - Complaint Log;
    - Notifications of any summons and successful prosecutions;
    - Reporting Changes; and
    - Future key issues.
2. Basic Project Information
    - Project organisation including key personnel contact names and telephone numbers;
    - Programme with fine tuning of activities showing the inter-relationship with environmental protection/mitigation measures for the month;
    - Management structure; and
    - Work undertaken during the month.
3. Environmental Status
    - Works undertaken during the month with illustrations (such as location of works, etc.); and
    - Drawings showing the project area, any environmental sensitive receivers and

the locations of the monitoring and control stations, if relevant.

4. Summary of EM&A requirements including:
    - All monitoring parameters;
    - Environmental quality performance limits (Action/ Limit levels);
    - Event/Action Plans;
    - Environmental mitigation measures, as recommended in the project EIA study final report;
    - Environmental requirements in contract documents;
5. Implementation Status
    - Advice on the implementation status of environmental protection and pollution control/ mitigation measures as recommended in the project EIA report, summarised in the updated implementation schedule.
6. Monitoring Results (in both hard and soft copies) together with the following information
    - Monitoring methodology;
    - Types of equipment used and calibration details;
    - Parameters monitored;
    - Monitoring locations;
    - Monitoring date, time, frequency, and duration;
    - Weather conditions during the period;
    - Graphical plots of the monitored parameters in the month annotated against;
        - Major activities being carried out on site during the period;
        - Weather conditions that may affect the results; and
        - Any other factors which might affect the monitoring results;
    - QA/QC results and detection limits;
    - Waste generation and disposal records;
    - All monitoring results should be tabulated with exceedances highlighted for ease of reference; and
    - Compare/contrast and assess the EM&A data with the EIA predictions and provide discussion for any discrepancies.
7. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
    - Compliance status with the EP under the EIAO and any EP submissions;
    - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action/ Limit 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 legislation,

including locations and nature of the breaches, investigation, follow-up actions taken, result 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.

8. Comments, Recommendations and Conclusions
    - An account of the future key issues reviewed from the works programme and work method statements;
    - Advice on the solid and liquid waste management status; and
    - Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarising the EM&A of the period.

10.5 Subsequent Monthly EM&A Report

10.5.1 The subsequent monthly EM&A reports shall including the following:

1. Executive Summary (1-2 pages)
    - Breaches of Action/ Limit levels;
    - Complaint log;
    - Notifications of any summons and successful prosecutions;
    - Reporting changes;
    - Future key issues.
2. Environmental Status
    - Programme with fine tuning of activities showing the inter-relationship with environmental protection/mitigation measures for the month;
    - Work undertaken during the month with illustrations included (such as location of works, daily, dredging/filling rates, etc); and
    - Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
3. Monitoring Results to provide monitoring results (in both hard and electronic copies) together with the following information.
    - Monitoring methodology;
    - Types of equipment used and calibration details;
    - Parameters monitored;
    - Monitoring locations;
    - Monitoring date, time, frequency, and duration;
    - Weather conditions during the period;
    - Graphical plots of the monitored parameters in the month annotated against;

- Major activities being carried out on site during the period;
- Weather conditions that may affect the results; and
- Any other factors which might affect the monitoring results;

- QA/QC results and detection limits;
- Waste generation and disposal records;
- All monitoring results should be tabulated with exceedances highlighted for ease of reference; and
- Compare/contrast and assess the EM&A data with the EIA predictions and provide discussion for any discrepancies.

4. Implementation Status
   - 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.
5. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
   - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action/ Limit 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 legislation, including locations and nature of the breaches, investigation, follow-up actions taken, result 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
   - A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
6. Comments, Recommendations and Conclusions
   - An account of the future key issues reviewed from the works programme and work method statements;
   - Advice on the solid and liquid waste management status; and
   - Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarising the EM&A of the period.
7. Appendix
   - Action/ Limit 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 periods;
- 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; and
- Outstanding issues and deficiencies.

10.6 Final EM&A Summary Report

10.6.1 Timing for completion of the EM&A Programme shall be confirmed by ER in liaison with the IEC. Impact monitoring shall continue until the completion of all construction works as approved by the ER.

10.6.2 The final EM&A summary report shall include the following:

1. An executive summary;
2. Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the entire construction phase, including baseline phase activities, of the works;
3. A brief summary of EM&A requirements including:
   - Monitoring parameters;
   - Environmental quality performance limits (Action/ Limit levels); and
   - Environmental mitigation measures, as recommended in the project EIA study final report.
4. Advice on the implementation status of environmental protection and pollution control/ mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation status proformas, including waste generation and disposal records;
5. Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
6. Compliance status with the EP under the EIAO and any EP submissions;
7. Graphical plots of the trends of monitored parameters over the period of construction (of the project) for representative monitoring stations annotated against;
   - The major activities being carried out on site during the period;
   - Weather conditions during the period;
   - Any other factors which might affect the monitoring results; and
   - The return of ambient environmental conditions in comparison with baseline data.
8. Compare/contrast and assess the EM&A data with the EIA predictions and provide discussion for any discrepancies;
9. Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
10. Advice on the solid and liquid waste management status;

11. Comments, Recommendations and Conclusions

- A summary of non-compliance (exceedances) of the environmental quality performance limits (Action/ Limit levels);
- 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) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- Review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- A summary record of all notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation, locations and nature of the breaches, investigation, follow-up actions taken and results;
- Review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures);
- Recommend any improvement in the EM&A programme.

10.7 Typical Forms to be Adopted

10.7.1 To facilitate the management of the EM&A programme for the construction of the project, the record forms presented in Appendix C (including those presented in the preceding sections) shall be adopted where applicable during the construction phase of the project. These forms are listed as follows:

1. Implementation Status Performa;
2. Data Recovery Schedule;
3. Site Inspection Corrective Action Proforma;
4. Proactive Environmental Protection Proforma;
5. Regulatory Compliance Proforma;
6. Complaint Log;
7. Sample Template for Interim Notifications of Environmental Quality Limits Exceedances; and
8. Noise Monitoring Field Record Sheet.

10.8 Data Keeping

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

10.9 Electronic Reporting of EM&A Information

10.9.1 To facilitate public inspection of the monthly EM&A Reports via the Environmental Impact Assessment (EIA) Ordinance Internet Website and at the EIA Ordinance Register Office, electronic copies of these Reports shall be prepared by the ET in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by the Director the EPD and shall be submitted by the ET at the same time as the hard copies as described in relevant condition of the EP.

10.9.2 For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EM&A Reports shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EM&A Reports shall be provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by the Director of EPD. The content of the electronic copies of these Reports shall be the same as the hard copies.

10.9.3 The ET shall pass all environmental monitoring data and results described in relevant conditions of the EP to the ER who will set up a dedicated web site and notify the Director of EPD in writing the internet address where the environmental monitoring and project data is to be placed, within 6 weeks after the commencement of the project.

10.9.4 All these environmental monitoring data and results described in relevant conditions of the EP shall be made available to the public via a dedicated web site to be set up by the ER.

10.9.5 The internet website described above will enable user-friendly public access to the monitoring data and project data including the EIA and the EP of the project. The internet website shall have features capable of: -

1. Providing access to all environmental monitoring data collected since the commencement of work
2. Searching by date
3. Searching by types of monitoring data (air quality and construction waste)
4. Hyperlinks to relevant monitoring data after searching; or otherwise as agreed by the Director

10.10 Interim Notifications of Environmental Quality Limit Exceedances

10.10.1 With reference to Event/Action Plans in previous sections, when the environmental quality limits are exceeded, the ET shall immediately notify the IEC, ER and EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Appendix C.

Appendix A
Implementation Schedule

Table A-1 Air Quality Impact – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S.3.5.9	S.3.2.2	All the dust control measures as recommended in the Air Pollution Control (Construction Dust) Regulation, where applicable, should be implemented. Typical dust control measures include:	Air Quality (fugitive dust) Control during Construction Phase	Contractors	At all construction areas of the site during the entire construction period	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ The works area for site clearance shall be sprayed with water before, during and after the operation so as to maintain the entire surface wet	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ Restricting heights from which materials are to be dropped, as far as practicable to minimise the fugitive dust arising from unloading/ loading	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ Immediately before leaving a construction site, all vehicles shall be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ Erection of hoarding of not less than 2.4 m high from ground level along the site boundary, where appropriate	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ Any stockpile of dusty materials shall be covered entirely by impervious sheeting; and/or placed in an area sheltered on the top and 4 sides	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S.3.5.9	S.3.2.2	▪ 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	Air Quality (fugitive dust) Control during Construction Phase	Contractors	Ditto	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
Operational Phase						
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table A-2 Noise Impact – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S.4.8.2	S.4.8.1	▪ The Contractor shall adopt the Code of Practice on Good Management Practice to Prevent Violation of the Noise Control Ordinance (Chapter 400) (for Construction Industry) published by EPD	Noise control during construction	Contractors	At all construction areas of the site during the entire construction period	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ The Contractor shall observe and comply with the statutory and non-statutory requirements and guidelines	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ Before commencing any work, the Contractor shall submit to the Engineer Representative for approval the method of working, equipment and noise mitigation measures intended to be used at the site	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ The Contractor shall devise and execute working methods to minimise the noise impact on the surrounding sensitive uses, and provide experienced personnel with suitable training to ensure that those methods are implemented	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ Noisy equipment and noisy activities should be located as far away from the NSRs as is practical	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ Unused equipment should be turned off. PME should be kept to a minimum and the parallel use of noisy equipment / machinery should be avoided	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ Regular maintenance of all plant and equipment	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
S.4.8.2	S.4.8.1	▪ Material stockpiles and other structures should be effectively utilised as noise barriers, where practicable	Noise control during construction	Contractors	Ditto	Annex 5 of EIAO-TM
Operational Phase						
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table A-3 Water Quality Impact – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S.5.10.1 -5.10.2	S.5.8.2 -5.8.3	Construction for the desilting facilities at intake and outfall portals should be carried out behind a temporary cofferdam which is watertight enclosure built in the reservoirs and pumped dry to expose the bottom.	Point Pollution Control	Contractors	Before construction of intake and outfall portals and remain on site until completion of intake and outfall portals and tunnel construction	Water Pollution Control Ordinance
S.5.10.3	S.5.8.4	The cofferdams should be regularly inspected and maintained to ensure no spillage of waste or wastewater into the reservoirs.	Point Pollution Control	Contractors	Before construction of intake and outfall portals and remain on site until completion of intake and outfall portals and tunnel construction	Water Pollution Control Ordinance
S. 5.10.4	S. 5.8.5	Construction of desilting facilities within works areas capable of controlling discharge of SS to comply with WPCO/TM-DSS	Point and Non-point Pollution Control	Contractors	At all construction areas of the site during the entire construction period	Water Pollution Control Ordinance
S.5.10.5	S.5.8.6	Construction runoff will be managed as per the Practice Note for Professional Persons ProPECC PN1/94 - Construction Site Drainage and the conditions of working within Water Gathering Grounds stipulated by WSD	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance Water Gathering Ground control by WSD
S.5.10.6	S. 5.8.7	A Drainage Management Plan should be prepared by the Contractor for approval by the Engineer for each of the works areas, detailing the facilities and measures to manage pollution arising from surface runoff from those works areas	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance Water Gathering Ground control by WSD
S. 5.10.7	S. 5.8.8	An Emergency Contingency Plan should also be prepared by the Contractor, detailing the response and procedures to contain and remove any accidental spillage along the temporary and permanent roads and at the site at short notice to prevent or minimize the quantities of contaminants from reaching the reservoirs and local streams leading to the reservoirs. The Emergency Contingency Plan should be submitted to the Engineer for approval	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance Water Gathering Ground control by WSD
S. 5.10.8	S. 5.8.9	▪ Surface run-off and effluent from the construction sites at	Stormwater and Non-point	Contractors	Ditto	Water Pollution Control

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		the intake at Kowloon Byewash Reservoir and outfall at the Lower Shing Mun Reservoir will be directed towards adequately designed sand/silt removal facilities such as sand/silt traps and sediment basins to remove sand/silt particles from runoff to meet the requirements of the TM standards under the WPCO before discharging to discharge points downstream of the Kowloon Byewash Reservoir Dam and Lower Shing Mun Reservoir Dam respectively. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. Sizes may vary depending upon the flow rate, but for a flow rate of 0.1m3/s a sedimentation basin of 30m^3 would be required and for a flow rate of 0.5m^3/s the basin would be 150m^3. The detailed design of the sand/silt traps should be undertaken by the contractor prior to the commencement of construction	Source Pollution Control			Ordinance
S. 5.10.8	S. 5.8.9	▪ Channels, earth bunds or sand bag barriers will be provided on-site to properly direct stormwater to the above-mentioned facilities	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Existing on-site silt removal facilities, channels and manholes, if any, will be maintained and the deposited silt and grit will be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Other manholes, if any, including any newly constructed ones will be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Open stockpiles of materials on site will be avoided within water gathering grounds as far as practicable. All surplus spoil will be removed from water gathering grounds as soon as possible Measures will be taken to prevent the washing away of construction materials, soil, silt or debris	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Where possible, works entailing soil excavation will be minimized during the rainy season (i.e. April to September). If excavation in soil could not be avoided in these months or	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		at any time of year when rainstorms are likely, for the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest/edge of excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm				
S. 5.10.8	S. 5.8.9	▪ Where applicable, final earthworks surfaces/ slopes will be well compacted and hydro-seeded following completion to prevent erosion	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Where surface runoff or construction effluent is likely to be contaminated with oil, properly designed and maintained petrol interceptor will be provided to meet the WPCO/TM-DSS requirements. Oil leakage or spillage shall be contained and cleaned up immediately. Detailed design of the petrol interceptor shall be provided by the Contractor before commencement of construction	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Sewage arising from the construction workers on site should be collected by temporary sanitary facilities e.g. portable chemical toilets. Portable toilets should be used coupled with tankering away services provided by a licensed collector	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ All site discharges within Inland Waters Group A must comply with the terms and conditions of a valid discharge licence issued by EPD	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Vehicle wheel washing facilities should be provided, where applicable, at the site exit such that mud, debris, etc. deposited onto the vehicle wheels or body can be washed off before the vehicles are leaving the site area	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Section of the road between the wheel washing bay and the public road should be paved with backfill to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
S. 5.10.8	S. 5.8.9	▪ Vehicle washing facilities should be drained into desilting facilities before discharge. The water should be recycled on site wherever possible. It is suggested that the wash water from the wheel wash basin is either reused for site watering or pumped to the on-site desilting facilities for treatment	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	• Desilting facilities should be checked and the deposited silt and grit should be removed regularly to ensure they are working properly at all times	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	• To minimize water quality impact, recycled water should be used at the cutter face for cooling purposes. Used water should be collected and discharged to settling tank for settlement	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	• Excess water from the settling tank would be transferred to the desilting facilities for treatment before discharge. The Contractor should ensure that the discharge water from the desilting facilities and treated spent effluent arising from tunnel boring from the desilting facilities comply with the WPCO/TM-DSS requirements before discharge	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Existing on-site silt removal facilities, channels and manholes, if any, would be maintained such that the deposited silt and grit will be removed regularly, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times;	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ Desilting facilities should be checked and the deposited silt and grit should be removed regularly to ensure they are working properly at all times;	Stormwater and Non-point Source Pollution Control	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ The project may occasionally involve the handling of fuel and generates chemical wastes. It must be ensured that all fuel tanks and chemical storage are sited on sealed and bunded areas, provided with locks and located outside water gathering grounds as far as practicable	Protection Against Accidental Spillage	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	▪ The storage areas will be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank to prevent accidentally spilled oil, fuel or chemicals from reaching the receiving waters	Protection Against Accidental Spillage	Contractors	Ditto	Water Pollution Control Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location / Timing of implementation of Measures	What requirements or standards for the measures to achieve?
S. 5.10.8	S. 5.8.9	• Oil and grease removal facilities will be provided where appropriate, for example, in area near plant workshop/ maintenance areas, if any	Protection Against Accidental Spillage	Contractors	Ditto	Water Pollution Control Ordinance
S. 5.10.8	S. 5.8.9	• Chemical waste arising from the site should be properly stored, handled, treated and disposed of in compliance with the requirements stipulated under the Waste Disposal (Chemical Waste) (General) Regulation	Protection Against Accidental Spillage	Contractors	Ditto	Waste Disposal (Chemical Waste) (General) Regulation
Operational Phase						
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table A-4 Waste Management Implication – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S.6.7.1		Given the potential for secondary environmental impacts (dust, noise, water quality and visual impacts), mitigation measures are required to ensure proper handling, storage, transportation and disposal of materials at the outset and throughout the construction phase of the project	Waste management during construction	Contractors	At all construction areas of the site during the entire construction period	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ An on-site environmental co-ordinator employed by the Contractor should be identified at the outset of the works. The co-ordinator shall prepare a Waste Management Plan ("WMP") in accordance with the requirements set out in the ETWB TCW No. 19/2005, Waste Management on Construction Sites. The WMP shall include monthly and yearly Waste Flow Tables ("WFT") that indicate the amounts of waste generated, recycled and disposed of (including final disposal site), and which should be regularly updated	Waste management during construction	Contractors	Ditto	ETWB TCW No. 19/2005, Waste Management on Construction Sites
S.6.7.2	S. 6.2.5	▪ The reuse/ recycling of all materials on site shall be investigated and exhausted prior to treatment/ disposal off-site	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ Good site practices shall be adopted from the commencement of works to avoid the generation of waste, reduce cross contamination of waste and to promote waste minimisation	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ All waste materials shall be sorted on-site into inert and non-inert C&D materials, and where the materials can be recycled or reused, they shall be further segregated. Inert material, or public fill will comprise stone, rock, concrete and soil which is suitable for land reclamation and site formation whilst non-inert materials include all other wastes generated from the construction process such as plastic packaging and vegetation (from site clearance)	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ The Contractor shall be responsible for identifying what materials can be recycled/ reused, whether on-site or off-site. In the event of the latter, the Contractor shall make	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		arrangements for the collection of the recyclable materials. Any remaining non-inert waste shall be collected and disposed of to the public fill reception facilities whilst any inert C&D materials shall be re-used on site as far as possible. Alternatively, if no use of the inert material can be found on-site, the materials can be delivered to a public fill reception facilities after obtaining the appropriate licence				
S.6.7.2	S. 6.2.5	▪ In order to monitor the disposal of C&D material and solid wastes at public fill reception facilities and landfills, and control fly-tipping, a trip-ticket system shall be implemented by the Contractor, in accordance with the contract and the requirements of WBTC 31/2004 "Trip Ticket System for Disposal of Construction and Demolition Material"	Waste management during construction	Contractors	Ditto	WBTC 31/2004 "Trip Ticket System for Disposal of Construction and Demolition Material"
S.6.7.2	S. 6.2.5	▪ Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor shall register as a Chemical Waste Producer if chemical wastes such as spent lubricants and paints are generated on site. Only licensed chemical waste collectors shall be employed to collect any chemical waste generated at site. The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes and A Guide to the Chemical Waste Control Scheme both published by EPD	Waste management during construction	Contractors	Ditto	Waste Disposal (Chemical Waste) (General) Regulation
S.6.7.2	S. 6.2.5	▪ A sufficient number of covered bins shall be provided on site for the containment of general refuse to prevent visual impacts and nuisance to the sensitive surroundings. These bins shall be cleared daily and the collected waste disposed of to the refuse transfer station. Further to the issue of ETWB TCW No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness, the Contractor is required to maintain a clean and hygienic site throughout the project works	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ All chemical toilets, if any, shall be regularly cleaned and the night-soil collected and transported by a licensed contractor to a Government Sewage Treatment Works facility for disposal	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
S.6.7.2	S. 6.2.5	▪ Toolbox talks should be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
S.6.7.2	S. 6.2.5	▪ The Contractor shall comply with all relevant statutory requirements and guidelines and their updated versions that may be issued during the course of project construction	Waste management during construction	Contractors	Ditto	Waste Disposal Ordinance
Operational Phase						
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table A-5 Ecological Impact – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S 8.8	N/A	Minimise the habitat loss of secondary woodland / plantation and grassland as far as possible	Reduce habitat and vegetation loss	Contractors	At all construction areas of the site during the entire construction period	Annex 16 of EIAO-TM
S 8.8	N/A	Disturbed secondary woodland / plantation and grassland should be reinstated after the completion of works	Reinstate disturbed habitats	Contractors	Worksite areas at the two portals / after completion of construction works	Annex 16 of EIAO-TM
S 8.8	N/A	Provide clear definition of site boundary	Prevent impact on offsite habitats	Contractors	At all construction areas of the site during the entire construction period	Annex 16 of EIAO-TM
S 8.8	N/A	Protect the protected plant *Pavetta hongkongensis* on its existing location; Transplant the *Pavetta hongkongensis* to other suitable location if onsite protection is not feasible.	Preserve the protected plant species	Contractors	On the vegetated slope along the existing vehicle access at worksite area at Lower Shing Mun Reservoir / Construction period	Annex 16 of EIAO-TM
S 8.8	N/A	Carry out compensatory planting if the individual of *Artocarpus hypargyreus* cannot be retained onsite	Mitigate the tree removal	Contractors	worksite area at Kwoloon Byewash Reservoir / Construction Period	ETWB TCW No. 3/2006
S 8.8	N/A	Workers should avoid eating and leave food in works area and avoid feeding the wildlife; Fishes observed remaining at the proposed works area during the draining down process should be translocated to the portion of the reservoir outside the cofferdam.	Avoidance of injury to wildlife	Contractors	At all construction areas of the site during the entire construction period	Annex 16 of EIAO-TM
S 8.8	N/A	Implement standard good site practices for dust suppression	Avoid dust deposition on vegetation	Contractors	At all construction areas of the site during the entire construction period	EIAO -TM, Air Pollution Control (Construction Dust) Regulation
S 8.8	N/A	Implement standard good site practices for water quality control	Avoid site runoff to nearby habitats	Contractors	At all construction areas of the site during the entire construction period	Water Pollution Control Ordinance
S 8.8	N/A	Workers shall not disturb birds and other wildlife; Litter shall not be burned on-site but shall be removed off-site;	Avoid disturbance to wildlife	Contractors	At all construction areas of the site during the entire construction period	Annex 16 of EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
		Machinery not in use should be switched off to minimize the noise nuisance; No fishing is allowed in the reservoir without permission.				
Operational Phase						
S 8.8	N/A	Compensate the habitat loss (grassland and woodland) by restoration of same type of habitats to be lost. The compensatory ratio should not be less than 1:1 in terms of area.	Mitigate the temporary habitat loss	Contractors	Woodland at worksite area at Kowloon Byewash Reservoir and Grassland at worksite area at Lower Shing Mun Reservoir / Operational period	Annex 16 of EIAO-TM

Table A-6 Landscape and Visual Impact – Implementation Schedule of Recommended Mitigation Measures

Id No.	Landscape and Visual Mitigation Measures	Location	Funding	Implementation/ Maintenance Agent	Relevant Standard or Requirement	Implementation Stage			Timing of Implementation	Objectives of the Recommended Measure and Main Concern to address
LMM1	Topsoil, where identified, should be stripped and stored for re-use in the construction of the soft landscape works, where practical	Site	WSD	Contractor	TM-EIA Annex 18		√		Throughout construction phase	To provide a viable growing medium suited to the existing conditions and reduce the need for the importation of top soil
LMM2	Existing Trees to be retained on site should be carefully protected during construction	Site	WSD	Contractor	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006		√		Throughout construction phase	To ensure the success of the tree preservation proposal
LMM3	Compensatory tree planting should be provided to compensate for felled trees	Site	WSD	Contractor	TM-EIA Annex 18, ETWB TCW No. 2/2004 & ETWB TCW No. 3/2006		√		Throughout design and construction phase	The planting proposal seeks to compensate for the predicted tree loss resulting form the construction, visually integrate the proposals within its existing landscape framework and provide an improved visual amenity
LMM4	Erection of decorative screen hoarding compatible with surrounding setting	Site	WSD	Contractor	TM-EIA Annex 18 and BD		√		Throughout construction phase	To integrate the construction site with the existing environment
LMM5	Locations of the site office, storage or workshops should be carefully adjusted to areas out of tree protection zones.	Site	WSD	Contractor	TM-EIA Annex 18 and BD	√			Throughout design phase	To avoid unnecessary felling of trees
LMM6	Selection of intake and outfall portals to areas enclosed by existing topography or vegetation	Site	WSD	Contractor	TM-EIA Annex 18 and BD	√			Throughout design phase	To preserve the existing topography and as many as trees as possible
LMM7	Appearance of the water intake and outfall structures	Site	WSD	Contractor	TM-EIA Annex 18 and BD	√			Throughout design phase	To reduce the apparent visual mass of water intake and outfall structures
LMM8	Reinstatement of disturbed vegetation at both portal	Site	WSD	Contractor	TM-EIA Annex 18			√	After the completion of construction	To mitigate disturbance to vegetation arising from the proposed construction

Id No.	Landscape and Visual Mitigation Measures	Location	Funding	Implementation/ Maintenance Agent	Relevant Standard or Requirement	Implementation Stage			Timing of Implementation	Objectives of the Recommended Measure and Main Concern to address
	areas								works	

Table A-7 Cultural Heritage – Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Who to implement the measures?	Location/ Timing of implementation of Measures	What requirements or standards for the measures to achieve?
Construction Phase						
S 10.7	S8.1.2	Condition Survey for the identified historic items and monitoring of vibration levels if required.	Prevention of structural damage to the identified historic items	Contractors	Condition survey to be undertaken prior to the construction phase and vibration monitoring to be undertaken during the construction phase if required.	None
Operational Phase						
N/A	N/A	None	None	None	None	None

Appendix B
Event/ Action Plan

Table B-1 Event/ Action Plan for Noise Impact

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

Table B-2 Event/ Action Plan for Water Quality Impact

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	1. Repeat in-situ measurement to confirm findings and repeat measurement on next day of exceedance being recorded; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor;	1. Check monitoring data submitted by ET and Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;	1. Confirm receipt of notification of failure in writing 2. Discuss with IEC, ET and Contractor on the proposed mitigation. 3. Request Contractor to view the working methods. 4. Ensure mitigation measures are properly implemented.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3 Check all plant and equipment and consider changes of working methods; 4. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC within 3 working days; 5. Implement the agreed mitigation measures.
Limit level being exceeded by more than one consecutive sampling days	1. Repeat in-situ measurement to confirm findings and repeat measurement on next day of exceedance being recorded; 2. Identify source(s) of impact; 3. Inform IEC, Contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency	1. Check monitoring data submitted by ET and Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented; 5. Consider and 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 2. Discuss with ET, IEC and ER and propose mitigation measures to ER and IEC; 3. Implement the agreed mitigation measures; 4. Resubmit proposals of mitigation measures if problem still not under control; 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.

	to daily until no exceedance of Limit level for two consecutive days.			

Table B-3 Event/ Action Plan for Landscape & Visual Impact

EVENT	ACTION			
	Environmental Specialist (ES)	IEC	Franchisee's Site Representative (FSR)	CONTRACTOR
Non-conformity on one occasion	1. Identify Source; 2. Inform the Contractor, IC(E) and the FSR; 3. Discuss remedial actions with the IC(E), the FSR and the Contractor; and 4. Monitor remedial actions until rectification has been completed	1. Check report; 2. Check the Contractor's working method; 3. Discuss with the ES and the Contractor on possible remedial measures; 4. Advise the FSR on effectiveness of proposed remedial measures; and 5. Check implementation of remedial measures.	1. Notify Contractor; and 2. Ensure remedial measures are properly implemented.	1. Amend working methods; 2. Rectify damage and undertake any necessary replacement.
Repeated Non-conformity	1. Identify Source; 2. Inform the Contractor, ICE and the FSR; 3. Increase monitoring frequency; 4. Discuss remedial actions with the IC(E), the FSR and the Contractor; 5. Monitor remedial actions until rectification has been completed; and 6. If exceedance stops, cease additional monitoring.	1. Check monitoring report; 2. Check the Contractor's working method; 3. Discuss with the ES and the Contractor on possible remedial measures; 4. Advise the FSR on effectiveness of proposed remedial measures; and 5. Supervise implementation of remedial measures.	1. Notify the Contractor; and 2. Ensure remedial measures are properly implemented.	1. Amend working methods; and 2. Rectify damage and undertake any necessary replacement.

Appendix C
Typical Proforma for EM&A

IMPLEMENTATION STATUS PROFORMA

Ref:_____

Ref**	Environmental Protection Measures*	Implementation Status

* *All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and /or accepted public comment to the proposed project*

** *EIA Ref/EM&A Log Ref/Design Document Ref*

Signed by Environmental Team Leader: _____ Date: _____

Audited by Independent Checker (Environment): _____ Date: _____

DATA RECOVERY SCHEDULE Ref:_____

Date	Air Quality Monitoring					Noise Monitoring					Water Quality Monitoring				
	Monitoring Station*					Monitoring Location*					Monitoring Location*				
	A1	A2	A3	A4	A5	N1	N2	N3	N4	N5	W1	W2	W3	W4	W5
1															
2															
3															
4															
5															
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26															
27															
28															
29															
30															
31															
% of R															

* *Remark type of parameters*
% of R *The percentage of Data Recovery is the actual monitoring over the scheduled monitoring*

Signed by Environmental Team Leader: _____ Date: _____

Copy to Independent Checker (Environment)

SITE INSPECTION PROFORMA Ref:_____

Date	Location	Req't Ref.*	Observation/Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* *EIA Ref/EM&A Log Ref/Design Document Ref/Environmental Protection Contract Clause*
** *Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies.*
*** *The required completion date to confirm the specified Environmental Protection Action*

This Proforma is an Environmental Protection Instruction for: _____ on _____

Signed by Environmental Team Leader: _____ Date: _____

Copy to Independent Checker (Environment)

PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA Ref:_____

Ref*	Proposed Construction Method**	Location/ Working Period	Anticipated Impacts	Recommended Mitigation Measures

* *EIA Ref/EM&A Log Ref/Design Document Ref*
** *Details of equipment, vehicles, plants, processes, technologies for the option of construction method*

Reviewed by Environmental Team Leader: _____ Date: _____

Approved by Independent Checker (Environment): _____ Date: _____

REGULATORY COMPLIANCE PROFORMA Ref:_____

Ref**	Environmental License/Permit*	Control Area/Facility/Location	Effective Date

* *Name of Applicant, Business Corporation, relevant regulation and remark of license/permit conditions*
** *File reference of the licensee/permittee*

Recorded by Environmental Team Leader: _____ Date: _____

Signed by Independent Checker (Environment): _____ Date: _____

COMPLAINT LOG Ref:_____

Log Ref	Date/Location	Complainant/ Date of Contact	Details of Complaint	Investigation/Mitigation Action	File Closed

Filed by Environmental Team Leader: _____ Date: _____

Sample Template for 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	

Location Plan

Prepared by : _____

Designation : _____

Signature : _____

Date : _____

Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L_{90} (dB(A))	
	L_{10} (dB(A))	
	L_{EQ} (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

	Name & Designation	Signature	Date
Recorded By :			
Checked By :			