Agreement No. CE 21/2012 (WS)

Desalination Plant at Tseung Kwan O – Feasibility Study

Environmental Monitoring and Audit Manual

8901/B&V/0051

Report Authorized For Issue By: For and on Behalf of Black & Veatch Hong Kong Limited

Black & Veatch Hong Kong Limited
25/F, Millennium City 6
392 Kwun Tong Road
Kowloon
Hong Kong

Water Supplies Department
6/F, Sha Tin Government Offices
No.1 Sheung Wo Che Road
New Territories
Hong Kong

July 2015

DOCUMENT CONTROL			Desalination Plant at Tseung Kwan O – Feasibility Study	**No:** 8901-0051
				Prepared By: B&V/ERM
AMENDMENT RECORD			Water Supplies Department	**Initials: BV/ERM**
				Date: July 2015

Pages	**Date**	**Issue No.**	**Description**	**Initials**
All	May 2015	1	Formal Submission	BV/ERM
All	July 2015	2	Public Inspection	BV/ERM

*The Registered Recipient is responsible for destroying or marking as 'superseded' for all superseded documents.

Table of Contents

Page

	Name	Signature	Date
Prepared by	BV/ERM		
Checked by	Benjamin Yeung		
Reviewed by	Christina K Hartinger		

1 INTRODUCTION

1.1 Purpose of the Manual

This Environmental Monitoring and Audit (EM&A) Manual ("the Manual") has been prepared by ERM-Hong Kong, Limited (ERM) on behalf of Water Supplies Department (hereinafter referred to as WSD). The Manual is a supplementary document of the Environmental Impact Assessment (EIA) Study of the construction and operation of a desalination plant using Seawater Reverse Osmosis (SWRO) technology in Tseung Kwan O (TKO) Area 137 (hereafter referred to as the Project).

The Manual has been prepared in accordance with the *EIA Study Brief* (No. ESB-266/2013) and the *Technical Memorandum of the Environmental Impact Assessment Process* (*EIAO-TM*). The purpose of the Manual is to provide information, guidance and instruction to personnel charged with environmental duties and those responsible for undertaking EM&A work during construction and operation. It provides systematic procedures for monitoring and auditing of potential environmental impacts that may arise from the works.

This Manual contains the following information:

- Responsibilities of the Contractor(s), Environmental Team (ET), and the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the project;
- Project organisation;
- Requirements with respect to the construction and operational programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted including field, laboratory and analytical procedures, and details on quality assurance and quality control programme;
- Preliminary definition of Action and Limit levels;
- Establishment of Event and Action plans;
- Requirements for reviewing pollution sources and working procedures required in the event of exceedances of applicable criteria and/or receive of complaints;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirements for review of EIA predictions and the effectiveness of the mitigation measures/environmental management systems and the EM&A programme.

For the purpose of this manual, the ET Leader (ETL), who will be responsible for and in charge of the ET, will refer to the person delegated the role of executing the EM&A requirements.

This Manual is considered to be a working document and should be reviewed periodically and updated if necessary during the course of implementing the Project.

1.2 Project Description

1.2.1 Project Scope

The proposed Tseung Kwan O desalination plant will produce potable water with an initial capacity of 135 million liter per day (MLD), expandable to an ultimate capacity of 270 Mld in the future to provide a secure and alternative fresh water resources complying with the World Health Organization (WHO) standards. The plant will adopt the Seawater Reverse Osmosis (SWRO) technology, which dominates the market due to its reliability and progressive reduction in cost as the technology advances.

The following elements of the Project are classified as Designated Projects under the *Environmental Impact Assessment Ordinance* (*Cap. 499*) (EIAO) and are addressed in this EIA Report:

- Schedule 2, Part I, Item E.2 – Water treatment works with a capacity if more than 100,000 m^3 per day.
- Schedule 2, Part I, Item K.13 – A dangerous good godown with a storage capacity exceeding 500 tonnes.
- Schedule 2, Part I, Q.1 – Earthworks partly in an existing country park.

1.2.2 Site Location

The proposed site for the desalination plant is located in Tseung Kwan O (TKO) Area 137 with a reserved site area of about 10 hectares (ha). Natural slope mitigation works consist of construction of flexible barriers, soil nailing and rock stabilization at the lower portion of the natural slope within the Clear Water Bay Country Park. The present design will also involve the construction of submarine intake and outfall pipelines at Joss House Bay and the 9km freshwater rising main along Wan Po Road to the existing Tseung Kwan O Fresh Water Primary Service Reservoir (TKOFWPSR).

The location of the Project and the associated works are shown in ***Figure 1.1***.

1.3 Objective of the EM&A

The broad objective of this EM&A Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the Project during design, construction and operation. The construction and operational impacts arising from the implementation of the Project are specified in the EIA Report. The EIA Report also specifies mitigation measures and construction practices that may be needed to confirm compliance with the environmental criteria. These mitigation measures and their implementation requirements are presented in the Implementation Schedule of Mitigation Measures (*Annex A*).

The main objectives of the EM&A programme are to:

- provide a database of environmental parameters against which to determine any short term or long term environmental impacts;

- provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- confirm that the mitigation recommendations of the EIA are included in the design of the project;
- clarify and identify potential sources of pollution, impact and nuisance arising from the works for the responsible parties;
- confirm compliance with regulatory requirements, contract specifications and EIA study recommendations;
- confirm compliance of environmental designs during the design phase of the Project with the specifications stated in the EIA Report and the EP;
- monitor performance of the mitigation measures and to assess their effectiveness;
- take remedial action if unexpected issues or unacceptable impacts arise;
- verify the environmental impacts predicted in the EIA; and
- audit environmental performance.

EM&A procedures are required during the design, construction and operational phases of the project implementation and a summary of the requirements for each of the environmental parameters is detailed in ***Table 1.1***.

Table 1.1 Summary of EM&A Requirements

Parameters	EM&A Phase		
	Design Phase (1) (2)	Construction Phase	Operation Phase
Air Quality	–	✓(SI)	–
Noise	–	✓	–
Water Quality	–	✓	✓
Waste	–	✓ (SI)	–
Land Contamination	–	✓ (SI)	–
Ecology (Terrestrial & Aquatic)	✓	✓ (SI)	–
Fisheries	–	—	—
Landscape & Visual	✓	✓ (SI)	✓ (SI)
Landfill Gas Hazard	✓ (3)	✓	✓ (SI)
Hazard to Life	✓	✓	✓

Notes:
" (SI) "= Site Inspection forms the main checking method; " — " = no EM&A required
(1) Pre-construction monitoring may overlap the design phase.
(2) EM&A requirements in the design phase shall include confirmation on the compliance for environmental designs which were specified in the EIA Report and the EP for all parameters.
(3) The monitoring of landfill gas during construction would act as baseline monitoring.

1.4 The Scope of the EM&A Programme

The scope of this EM&A programme is to:

- establish baseline noise and water quality levels at specified locations and implement monitoring requirements for noise and water quality monitoring programme;
- implement inspection and audit requirements for air quality;
- implement inspection and audit requirements for waste management and land contamination;
- implement inspection and audit requirements for ecological mitigation measures;
- implement inspection and audit requirements for landscape and visual mitigation measures;
- implement inspection and audit requirements for landfill gas hazard;
- implement inspection and audit requirements for safeguard measures of hazard to life issues;
- liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the significance and implications of the environmental monitoring data;
- identify and resolve environmental issues and other functions as they may arise from the works;
- check and quantify the Contractor(s)'s overall environmental performance, implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental effects as they may arise from the works;
- conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to verify that necessary mitigation measures are identified and implemented, and to undertake additional *ad hoc* monitoring and auditing as required by special circumstances;
- evaluate and interpret environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the EIA;
- manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- conduct regular site inspections and audits of a formal or informal nature to assess:

    - the level of the Contractor(s)'s general environmental awareness;
    - the Contractor(s)'s implementation of the recommendations in the EIA and their contractual obligations;
    - the Contractor(s)'s performance as measured by the EM&A;
    - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed;
    - to advise the site staff of any identified potential environmental issues; and

- produce monthly EM&A reports which summarise project monitoring and auditing data, with full interpretation illustrating the acceptability or

otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.5 Works Programme & Works Locations

The preliminary construction programme is given in ***Figure 1.2***. The locations of works are shown in ***Figure 1.1***.

1.6 Organization & Structure of the EM&A

The proposed organisation of the personnel involved in the EM&A process is illustrated in ***Figure 1.3***.

The roles and responsibilities of the various parties are summarised below:

- **Project Proponent**: Water Supplies Department.
- **Environmental Protection Department (EPD)** is the statutory enforcement body for environmental protection matters in Hong Kong
- The **Engineer's Representative (ER)** shall appoint an appropriate member of the resident site staff, who shall:

    (i) Monitor the Contractor's compliance with the contract specifications, including the EM&A programme, and the effective implementation and operation of environmental mitigation measures in a timely manner;

    (ii) Ensure that impact monitoring is conducted at the correct locations at the correct frequency as identified in the EM&A programme;

    (iii) Instruct the Contractor to follow the agreed protocols or those In the Contract Specifications in the event of exceedances or complaints;

    (iv) Review the programme of works with a view to identifying any potential environmental impacts before they arise;

    (v) Check that mitigation measures that have been recommended in the EIA Report, this document and contract documents, or as required, are correctly implemented in a timely manner, when necessary;

    (vi) Report the findings of site audits and other environmental performance reviews to DSD;

    (vii) Verify the environmental acceptability of permanent and temporary works, relevant design plans and submissions; and

(viii) Comply with the agreed Event and Action Plan in the event of any exceedance.

- The **Independent Environmental Checker (IEC)** shall advise the ER on environmental issues related to the project. 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.

  The IEC shall be responsible for the duties defined in this Manual, and shall audit the overall EM&A programme, including the implementation of all environmental mitigation measures, submissions required in this 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.

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

  (i) Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;

  (ii) 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;

  (iii) Carry out random sample check and audit on monitoring data and sampling procedures, etc;

  (iv) Conduct random site inspection (at least once a month);

  (v) Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;

  (vi) Review the effectiveness of environmental mitigation measures and Project environmental performance;

(vii) On an as needed 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;

(viii) Verify investigation results of complaint cases and the effectiveness of corrective measures;

(ix) Verify EM&A reports submitted and certified by the ET Leader; and

(x) Feedback audit results to ER/ ET by signing according to the Event/ Action Plans specified in this Manual.

- An **Environmental Team (ET)** headed by an ET Leader shall preferably be appointed by the Contractor to carry out the recommended EM&A programme for the Project. Neither ET Leader nor ET shall be in any way an associated body of ER, IEC or the Contractor. The ET Leader 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 of their employer.

  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.

  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:

  (i) To monitor the various environmental parameters as required by the EM&A programme;

  (ii) To follow up and close out of the non-compliance actions;

  (iii) To investigate and audit the Contractor's equipment and work methodologies with respect to pollution control and

environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;

(iv) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;

(v) To review the EM&A programme after the collection and analysis of the baseline data;

(vi) To modify the EM&A programme in terms of parameters, sites, sample sizes, frequency etc. if appropriate in consultation with the ER and EPD; and

(vii) To report the environmental monitoring and audit results to the IEC, Contractor and the ER.

- The **Contractor** shall assign an on-site environmental coordinator to oversee Contractor's environmental performance and the implementation of the EM&A duties. The coordinator shall be a person who has relevant professional qualifications in environmental control and is subject to approval by the ER.

  The broad categories of works of the Contractor comprise the following:

  (i) Work within the scope of the construction contract and other tender conditions with respect to environmental requirements;

  (ii) Operate and strictly adhere to the guidelines and requirements in this EM&A programme and contract specifications;

  (iii) Provide assistance to ET in carrying our monitoring;

  (iv) Participate in the site inspections undertaken by the ET as required, and undertake correction actions;

  (v) Provide information / advice to the ET regarding works activities which may contribute, or be continuing to the generation of adverse environmental conditions;

  (vi) Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event / Action Plans;

  (vii) Implement measures to reduce impact where Action and Limit levels are exceeded; and

  (viii) Adhere to the procedures for carrying out complaint investigation.

  The Contractor should also participate in the environmental performance review undertaken by the ER and undertake any corrective actions as instructed by the ER.

1.7 Structure of the EM&A Manual

The remainder of this Manual is set out as follows:

- *Section 2* sets out the EM&A general requirements;
- *Section 3* details the requirements for air quality audit;
- *Section 4* details the requirements for noise monitoring;
- *Section 5* details the requirements for water quality monitoring;
- *Section 6* details the requirements for waste management and land contamination audit;
- *Section 7* details the requirements for sewerage and sewage implication;
- *Section 8* details the requirements for ecological mitigation measures;
- *Section 9* details the requirements for fisheries mitigation measures;
- *Section 10* details the requirements for landscape and visual mitigation measures;
- *Section 11* details the requirements for landfill gas monitoring;
- *Section 12* details the requirements for hazard to life safeguard measures;
- *Section 13* describes the scope and frequency of site auditing;
- *Section 14* details the EM&A reporting requirements;
- *Annex A* contains the implementation schedule summarising all mitigation measures proposed in the approved *EIA Report* with updates from the *ER Report*;
- *Annex B* contains the monitoring and complaint log sheets; and,
- *Annex C* presents the proposed methodology for the Silt Curtain Efficiency Test.

This Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. The primary focus for these updates will be to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

2 EM&A GENERAL REQUIREMENT

In this section, the general requirements of the EM&A programme for the Project are presented. The scope of the programme is developed with reference to the findings and recommendations of the EIA Report.

2.1 Construction Phase EM&A

The environmental issues, which were identified during the EIA process and are associated with the construction phase of the Project will be addressed through the monitoring and controls specified in this EM&A Manual and in the construction contracts.

During the construction phases of the Project, air quality, noise, water quality, waste management, land contamination, landscape and visual and landfill gas hazard will be subject to EM&A, with environmental monitoring being undertaken for noise and water quality as determined in the EIA. Monitoring of the effectiveness of the mitigation measures will be achieved through the environmental monitoring programme as well as through site inspections. The inspections will include within their scope, mechanisms to review and assess the Contractor(s)'s environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA Report.

a) Environmental Monitoring

The environmental monitoring work throughout the Project period will be carried out in accordance with this EM&A and reported by the ET. Monitoring works will comprise of quantitative assessment of physical parameters, such as water quality and noise, which also form an important part of the whole monitoring programme. The monitoring programme will be conducted at the chosen representative sensitive receivers in the vicinity of the construction site.

b) Action and Limit Levels

Action and Limit (A/L) Levels are defined levels of impact recorded by the environmental monitoring activities which represent levels at which a prescribed response is required. These Levels are quantitatively defined later in the relevant sections of this manual and described in principle below:

- *Action Levels:* beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to be necessary to prevent environmental quality from falling outside the Limit Levels, which would be unacceptable; and

- *Limit Levels:* statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances, HKPSG or Environmental Quality Objectives established by the EPD. If these are exceeded, works will not proceed without appropriate remedial action, including a critical review of plant and working methods.

c) Event and Action Plans

The purpose of the Event and Action Plans (EAPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant environmental incident occurs, the cause will be quickly identified and remediated. This also applies to the exceedances of A/L criteria identified in the EM&A programme.

d) Site Inspections

In addition to monitoring; as a means of assessing the ongoing performance of the Contractor(s), the ET will undertake site inspections and audits of the compliance with stipulated procedures and on-site practices. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractor(s) and the implementation of the environmental mitigation measures recommended in the EIA Report. The IEC will undertake site inspection and audit on as need basis to assess the performance of the Contractor(s).

Whilst the audit and inspection programme will complement the monitoring activity, the criteria against which the audits will be undertaken will be derived from the Clauses within the Contract Documents which seek to enforce the recommendations of the EIA Report and the EM&A Manual.

The findings of site inspections and audits will be made known to the Contractor(s) at the time of the inspection to enable the rapid resolution of identified non-conformities. Non-conformities, and the corrective actions undertaken, will also be reported in the monthly EM&A Reports.

Section 12 of this Manual presents details of the scope and frequency of on-site inspections and defines the range of issues that the audit protocols will be designed to address.

e) Enquiries, Complaint and Requests for Information

Enquiries, complaints and requests for information may occur from a wide range of individuals and organisations including members of the public, Government departments, the press and community groups.

All enquiries concerning the environmental impacts of the Project, irrespective of how they are received, should be reported to the Project Proponent and IEC and directed to the Contractor and ET who should set up procedures for handling, investigation and storage of such information. The following steps should be followed:

(a) The ET Leader should notify the IEC and ER of the nature of the enquiry.

(b) An investigation should be initiated to determine the validity of the complaint and to identify the source(s) of the problem.

(c) The ET Leader and the Contractor should undertake the following steps, as necessary:

- investigate and identify source(s) of the problem;
- if considered necessary by Project Proponent following consultation with the IEC, undertake additional monitoring to verify the existence and severity of the alleged complaint;
- identify necessary remedial measures and implement as soon as possible;
- if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- repeat the monitoring to verify effectiveness of mitigation measures; and,
- repeat review procedures to identify further possible areas of improvement if the repeat monitoring results continue to substantiate the complaint.

(d) The outcome of the investigation and the action taken will be documented on a complaint log (*Annex B*). A formal response to each complaint received will be prepared by the Contractor(s) within five working days and submitted to Project Proponent, in order to notify the concerned person(s) that action has been taken. All enquiries/complaints that trigger this process should be reported in the monthly EM&A reports, which should include results of investigations undertaken by the ET Leader and the Contractor, and details of the measures taken, and additional monitoring results (if deemed necessary). It should be noted that the receipt of complaint or enquiry should not be, in itself, a sufficient reason to introduce additional mitigation measures.

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

f) Reporting

Baseline, construction phase and post-construction phase monitoring, monthly, and annual/final reports will be prepared and certified by the ET Leader and verified by the IEC. The reports will be submitted to the WSD, Contractor(s), ER and EPD. The monthly reports will be prepared and submitted within two weeks of the end of each calendar month.

g) Cessation of EM&A

The cessation of EM&A programme is subject to the satisfactory completion of the *EM&A Final Report*, agreement with the IEC and approval from EPD.

2.2 Operation Phase EM&A

Based on the findings of the EIA, water quality monitoring during operation phase is considered necessary. Monitoring of any planting works should also continue over their establishment period, which may extend into the operation phase, and will be covered by regular site inspections. Other operational licenses will require specific monitoring or audit conditions or practices, and a non EIA EM&A practice will need to be put in place.

3 AIR QUALITY

The EIA study concluded that no air sensitive receivers (ASRs) will be affected by construction dust through the implementation of mitigation measures to reduce dust levels. During the operation phase, emissions will be controlled by integrated measures, regular inspections and relevant emissions licenses. Emissions from construction or operation phase are not predicted to yield concentrations that would lead to significant air quality impacts at the ASRs. Therefore, no air quality monitoring will be required for either the construction or operation phase, aside from that required by specific emissions licenses.

Regular site inspections and audits will be carried out during the construction phase in order to confirm that the mitigation measures are implemented and are working effectively. The Contractor(s) will be responsible for the design and implementation of the mitigation measures which are presented in *Annex A*.

4 NOISE

The mitigation measures and general requirements, methodology and equipment for monitoring and audit of noise impacts associated with the Project are described in this section.

4.1 Methodology & Criteria

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

Supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in *Annex B* for reference.

4.1.1 Baseline Monitoring

The ET should carry out the baseline noise monitoring prior to the commencement of the major construction works. The baseline noise levels should be measured for a continuous period of at least 14 consecutive days at a minimum logging interval of 30 minutes during daytime between 0700 and 1900 hours. The Leq, L_{10} and L_{90} should be recorded at the specified intervals. A schedule for the baseline monitoring should be submitted to the IEC for approval before the commencement of baseline monitoring.

There should not be any construction activities in the vicinity of the monitoring stations during the baseline monitoring. Any non-project related construction activities in the vicinity of the monitoring stations during the baseline monitoring should be noted and the source and location of such activities should be recorded.

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

4.1.2 Impact Monitoring

The impact noise monitoring should be carried out at all the designated monitoring stations when there are project-related construction activities undertaken within a radius of 300m from the monitoring stations. Monitoring of $Leq_{(30min)}$ should be carried out at each station at 0700-1900 hours on normal weekdays at a frequency of once a week when construction activities are underway. Any general construction work carried out during restricted hours is controlled by Construction Noise Permit (CNP) under the NCO.

In case of non-compliances with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan (*Section 4.4*) should be carried out. This additional monitoring should be continued until the recorded noise levels show

that the non-compliance is rectified or proved to be irrelevant to the project-related construction activities.

4.2 Monitoring Equipment

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

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

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

4.3 Monitoring Locations

According to the environmental findings detailed in the EIA report, the designated locations for the construction noise monitoring are listed in ***Table 4.1*** and shown in ***Figure 4.1***.

Table 4.1 Representative Noise Sensitive Receivers (NSRs) identified for Construction Noise Monitoring

ID	Noise Sensitive Receivers
NSR4	Creative Secondary School
NSR24	PLK Laws Foundation College
NSR31	School of Continuing and Professional Studies - CUHK

The status and location of the noise sensitive receivers (NSRs) may change after this EM&A Manual has been issued. In such case, and if changes to the monitoring locations are considered necessary, the ET should propose alternative monitoring locations and seek the agreement from the IEC and EPD on such proposal. When alternative monitoring locations are proposed, they should be chosen based on the following criteria:

(i) The monitoring locations close to the major construction works activities that are likely to have noise impacts;
(ii) The monitoring close to the NSRs as defined in the EIAO-TM; and,

(iii) The assurance of the minimal disturbance and working under a safe condition to the occupants during the monitoring in the vicinity of the NSRs.

The monitoring stations should normally be at a point 1m from the exterior of the facade of the NSR and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. For reference, a correction of +3dB(A) should be made to the free-field measurements. The ETL should agree with the IEC and EPD on the alternative monitoring position and corrections adopted. Once the positions for the monitoring stations are chosen, the baseline and impact monitoring should be carried out at the same positions.

4.4 Event and Action Plan

The action and limit levels for construction noise are defined in ***Table 4.2***. If non-compliance occurred, actions as stated in ***Table 4.3*** should be undertaken.

According to the EIA report, the construction activities would cause noise exceedances at various NSRs and, therefore, appropriate mitigation measures and good site practices are recommended. The Contractor should be responsible for the design and implementation of these measures. The Implementation Schedule of the mitigation measures is included in *Annex A* of this EM&A Manual.

Table 4.2 Action and Limit Levels for Construction Noise Impact Monitoring

Time Period	Action Level [(a)]	Limit Level
Construction Noise:		
07:00 – 19:00 hours on normal weekdays	When one documented complaint is received from any one of the noise sensitive receivers or 75 dB(A) recorded at the monitoring station	• 70 db(A) for school and • 65 db(A) during examination period

Notes:
(a) Limits specified in the GW-TM and IND-TM for construction and operational noise, respectively.

Table 4.3 Event and Action Plan for Construction Noise Monitoring

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Action Level	1. Carry out investigation to identify the source and cause of the complaint/ exceedance(s) 2. Notify IEC, ER, and Contractor and report the results of investigation to the Contractor, ER and the IEC 3. Discuss with the Contractor and IEC for remedial measures required 4. If the complaint is related to the Project, conduct additional monitoring for checking mitigation effectiveness and report the findings and results to the IEC, ER and the Contractor	1. Review the analyzed results submitted by the ET 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of Notification of Exceedance in writing 2. Require Contractor to propose remedial measures for the analysed noise problem 3. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals, if required, to the IEC and ER 2. Implement noise mitigation proposals.

Event	Action			
	ET	**IEC**	**ER**	**Contractor**
Limit Level	1. Carry out investigation to identify the source and cause of the exceedance 2. Notify IEC, ER, Project Proponent, EPD and Contractor 3. Repeat measurements to confirm findings 4. Provide investigation report to IEC, ER, EPD and Contractor he causes of the exceedances 5. If the exceedance is related to the Project, assess effectiveness by additional monitoring. 6. Report the remedial action implemented and the additional monitoring results to IEC, EPD, ER and Contractor 7. If exceedance stops, cease additional monitoring	1. Review the analyzed results submitted by the ET 2. Discuss the potential remedial measures with ER, ET Leader and Contractor 3. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 4. Supervise the implementation of remedial measures	1. Confirm receipt of Notification of Exceedance in writing 2. Require the Contractor to propose remedial measures for the analysed noise problem 3. Ensure remedial measures are properly implemented 4. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor, in agreement with the Project Proponent, to stop that activity of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC and ER within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant activity of works as determined by the Project Proponent until the exceedance is abated

Notes : ET = Environmental Team, IEC = Independent Environmental Checker; ER = Engineering Representatives

5 WATER QUALITY

In accordance with the recommendations of the EIA, water quality EM&A is required during dredging for the submarine pipelines and, during operation phase. In addition, baseline water quality monitoring will be required prior to the commencement of marine construction activities. The following Section provides details of the water quality monitoring to be undertaken by the Environmental Team (ET) to verify the distance of sediment and brine plume dispersion and to identify whether the potential exists for any indirect impacts to occur to ecological sensitive receivers. The water quality monitoring programme will be carried out to allow any deteriorating water quality to be readily detected and timely action taken to rectify the situation. The status and locations of water quality sensitive receivers and the marine works location may change after issuing this Document. If required, the ET in consultation with IEC will propose updated monitoring locations and seek approval from EPD.

Water quality monitoring for the Project can be divided into the following stages:

- Dredging activities during construction phase;
- Discharge of effluent from main disinfection during construction phase;
- Operation phase – first year upon commissioning; and,
- Continuous monitoring of effluent quality.

In addition, the marine works contractor is required to complete a silt curtain efficiency test for the combined use of floating silt curtain type and cage type silt curtain for dredging at seawater intake to confirm the silt curtain reduction efficiency assumptions of the assessment. The initial testing plan is provided in *Annex C*. The details of testing plan will be updated during construction phase based on the actual silt curtain arrangements on site. The updated testing plan shall be submitted by the ET to seek approval from the IEC and EPD.

5.1 Sampling & Testing Methodology

5.1.1 Water Quality Parameters

The parameters that have been selected for measurement *in situ* and in the laboratory are those that were either determined in the EIA to be those with the most potential to be affected by the construction works or are a standard check on water quality conditions. Parameters to be measured in the construction phase, operation phase and effluent quality monitoring are listed in ***Table 5.1***.

Table 5.1 Parameters measured in the marine water quality monitoring

Parameters	Unit	Abbreviation	Remarks			
			Baseline	Construction	First-year Operation	Effluent
In situ measurements						
Dissolved oxygen	mg/L	DO	✓	✓	✓	✓
Temperature	°C	-	✓	✓	✓	✓
pH	-	-	✓	✓	✓	✓
Turbidity	NTU	-	✓	✓	✓	✓
Salinity	$^0/_{00}$	-	✓	✓	✓	✓
Laboratory measurements						
Suspended Solids	mg/L	SS	✓	✓	✓	✓
Iron	mg/L	Fe	✓		✓	✓
Anti-scalant	mg/L	-			✓	✓
Total Residual Chlorine	mg/L	TRC		✓*	✓	✓

*Note: Monitoring of TRC will be conducted when cleaning and sterilization of the new freshwater main is carried out.

In addition to the water quality parameters, other relevant data will also be measured and recorded in Water Quality Monitoring Logs, including the location of the sampling stations, water depth, time, weather conditions, sea conditions, tidal stage, current direction and velocity, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results. A sample data record sheet is shown in *Annex B* for reference.

5.1.2 Monitoring Equipment

For water quality monitoring, the following equipment will be used:

Dissolved Oxygen and Temperature Measuring Equipment - The instrument will be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and will be operable from a DC power source. It will be capable of measuring: dissolved oxygen levels in the range of 0 - 20 mg L^{-1} and 0 - 200% saturation; and a temperature of 0 - 45 degrees Celsius. It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary (e.g. YSI model 59 DO meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

Turbidity Measurement Equipment - The instrument will be a portable, weatherproof turbidity-measuring unit complete with cable, sensor and comprehensive operation manuals. The equipment will be operated from a DC power source, it will have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU and will be complete with a cable with at least 35 m in length (for example Hach 2100P or an approved similar instrument).

Salinity Measurement Instrument - A portable salinometer capable of measuring salinity in the range of 0 - 40 ppt will be provided for measuring salinity of the water at each monitoring location.

Water Depth Gauge – A portable, battery-operated echo sounder (for example Seafarer 700 or a similar approved instrument) will be used for the determination of water depth at each designated monitoring station. This unit will preferably be affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme. The echo sounder should be suitably calibrated. The ET shall seek approval for their proposed equipment with the client prior to deployment.

Current Velocity and Direction – No specific equipment is recommended for measuring the current velocity and direction. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.

Positioning Device – A Global Positioning System (GPS) shall be used during monitoring to allow accurate recording of the position of the monitoring vessel before taking measurements. The Differential GPS, or equivalent instrument, should be suitably calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail) to verify that the monitoring station is at the correct position before the water quality monitoring commence.

Water Sampling Equipment - A water sampler, consisting of a PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, will be used (e.g. Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler will have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

Total Residual Chlorine for Discharge of Sterilization Water - Total residual chlorine (TRC) shall be measured *in-situ* using approved test kit.

5.1.3 Sampling / Testing Protocols

All *in situ* monitoring instruments will be checked, calibrated and certified by a laboratory accredited under HOKLAS [(1)] or any other international accreditation scheme before use, and subsequently re-calibrated at monthly intervals throughout the stages of the water quality monitoring. Responses of sensors and electrodes will be checked with certified standard solutions before each use.

On-site calibration of field equipment shall follow the "*Guide to On-Site Test Methods for the Analysis of Waters*", BS 1427: 2009. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

5.1.4 Laboratory Measurement and Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory [(2)]. Sufficient volume of each water sample shall be collected at the monitoring stations for carrying out the laboratory analyses. Using chain of custody forms, collected water samples will be transferred to an HOKLAS accredited laboratory for immediate processing. The determination work shall start within the next working day after collection of the water samples. The laboratory measurements shall be provided to the

([1]) The laboratory will be contracted before commencement of the monitoring programme.
([2]) The laboratory will be contracted before commencement of the monitoring programme.

client within 5 working days of the sampling event. Analytical methodology and sample preservation of other parameters will be based on the latest edition of *Standard Methods for the Examination of Waste and Wastewater* published by APHA, AWWA and WPCF and methods by USEPA, or suitable method in accordance with requirements of HOKLAS or another internationally accredited scheme. The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

Parameters for laboratory measurements, their standard methods and their detection limits are presented in ***Table 5.2***.

Table 5.2 Laboratory measurements, standard methods and corresponding detection limits of marine water quality monitoring

Parameters	Standard Methods	Detection Limit	Reporting Limit	Precision
Construction Phase				
Dissolved oxygen (mg/L)	Instrumental, CTD	0.1	–	±25%
Temperature (°C)	Instrumental, CTD	0.1	–	±25%
pH	Instrumental, CTD	0.1	–	±25%
Turbidity (NTU)	Instrumental, CTD	0.1	–	±25%
Salinity (‰)	Instrumental, CTD	0.1	–	±25%
Suspended Solids (mg/L)	APHA 2540E	1.0	–	±25%
Total Residual Chlorine (mg/L) (for main disinfection)	Test-kit *	*	*	*
Operation Phase Marine Water Quality Monitoring				
Dissolved oxygen (mg/L)	Instrumental, CTD	0.1	–	±25%
pH	Instrumental, CTD	0.1	–	±25%
Turbidity (NTU)	Instrumental, CTD	0.1	–	±25%
Salinity (‰)	Instrumental, CTD	0.1	–	±25%
Suspended Solids (mg/L)	APHA 2540E	1.0	–	±25%
Anti-scalant	To be determined upon the confirmation of anti-scalant	To be determined		
Iron	APHA 3111 B	0.2	-	±25%
Total Residual Chlorine (mg/L)	APHA 4500CL: G	0.2	–	±25%

*Note: The testing methods, Quality Assurance/Quality Control 9QA/QC) details, detection limits and accuracy shall be submitted to EPD for approval prior to the commencement of monitoring programme.

5.1.5 Monitoring Locations

The water quality monitoring locations for baseline, construction and first-year operation phases are shown in ***Figure 5.1*** and detailed in ***Table 5.3*** below. A schedule for water quality monitoring shall be prepared by the ET and approved by IEC and EPD prior to the commencement of the monitoring.

Table 5.3 Location of Water Quality Monitoring Stations

Station	Easting	Northing	Description	Remarks		
				Baseline	Construction	First-year Operation
CE	843550	815243	Upstream control station at ebb tide	✓	✓	✓
CF	846843	810193	Upstream control station at flood tide	✓	✓	✓
WSR1	846864	812014	Ecological sensitive receiver at Tung Lung Chau	✓	✓	✓
WSR2	847645	812993	Fisheries sensitive receiver at Tung Lung Chau	✓	✓	✓
WSR3	848023	813262	Ecological sensitive receiver at Tung Lung Chau	✓	✓	✓
WSR4	847886	814154	Ecological sensitive receiver at Tai Miu Wan	✓	✓	✓
WSR16	845039	815287	Ecological sensitive receiver at Fat Tong Chau	✓	✓	✓
WSR33	847159	814488	Ecological sensitive receiver at Tai Miu Wan	✓	✓	✓
WSR36	846878	814081	Ecological sensitive receiver at Kwun Tsai	✓	✓	✓
WSR37	846655	813810	Ecological sensitive receiver at Tit Cham Chau	✓	✓	✓
NF1	846542	813614	Edge of nixing zone, ~ 200m west of outfall diffuser	✓		✓
NF2	846942	813614	Edge of nixing zone, ~ 200m east of outfall diffuser	✓		✓
NF3	846742	813414	Edge of nixing zone, ~ 200m south of outfall diffuser	✓		✓

Effluent from desalination plant shall be collected at a suitable location after all treatment process before discharge. The sampling location should be agreed with WSD and EPD, and should fulfil the following requirements:

- Effluent collected at the sampling location is representative to the effluent discharged at the outfall diffuser
- Sampling works at the sampling location would not interfere with the desalination plant operation
- Sampling works at the sampling location would not induce safety hazard (e.g. staff sampling effluent drops into the culvert)

The status and locations of water quality sensitive receivers and the monitoring sites may change after issuing this Manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from the ER, the IEC, and the IEC.

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

- at locations close to and preferably at the boundary of the site activities as indicated in the EIA report, 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; and
- reference stations which are at locations representative of the project site in its undisturbed condition.

5.1.6 Sampling Frequency

a) Baseline Monitoring

Baseline conditions for water quality shall be established and agreed with the IEC and the 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 normally be established by measuring the water quality parameters specified above.

The measurements shall be taken at all designated monitoring stations including control stations, once per day for a minimum of 3 days per week for 4 weeks prior to the commencement of the construction works. Measurements shall be taken at each station at any time. The interval between two sets of monitoring shall not be less than 36 hours.

No construction activities shall be on-going in the vicinity of the stations during the baseline monitoring. The ET shall be responsible for undertaking the baseline monitoring and submitting the results within 10 working days from the completion of the baseline monitoring work.

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

The baseline monitoring schedule shall be issued to the IEC and EPD at least 1 week prior to the commencement of baseline monitoring.

b) Construction Phase

During periods when there are dredging works, impact monitoring should be undertaken at the monitoring stations as shown in ***Figure 5.1*** and ***Table 5.1*** three times a week. Monitoring at each station would be undertaken at both mid-ebb and mid-flood tides on the same day. The tidal range selected for the baseline monitoring will be at least 0.5 m for both flood and ebb tides as far as practicable. The interval between two sets of monitoring would not be less than 36 hours. The monitoring frequency would be increased in the case of exceedances of Action/Limit Levels if considered necessary by ET. Monitoring frequency would be maintained as far as practicable.

The monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal stage, special phenomena and work underway at the marine works site will be recorded.

For the discharge of dechlorinated effluent used after main sterilization, in-situ testing of total residual chlorine should be conducted every 1 hour (not less than) at the discharge point(s) should be conducted to ensure the level of total residual chlorine (TRC) does not exceed < 0.2 mg/L when dechlorinated effluent is being discharged. If the TRC level of the dechlorinated effluent exceeds the 0.2 mg/L, discharge should be suspended and the water should be circulated to a standby tank for further dechlorination and testing until the TRC level complies with the required discharge standard. The Contractor is required to submit the details of the chlorination and dechlorination treatment facilities, treatment processes, treatment capacity, discharge volume, methodology, chemicals use, implementation programme, sampling location(s), discharge location(s), monitoring frequency and event and action plan to the Engineer and verified with IEC before commencement of sterilization work. This plan should also be submitted to EPD for approval prior to the commencement of work.

c) First-year Operation Phase

Upon commencement of the desalination plant, an operation phase water quality monitoring exercise would be carried out for one-year, in the same manner as the baseline monitoring.

d) Continuous Effluent Quality Monitoring

The effluent should be collected in a full 24-hour period. Twenty four-hour flow-weighted composite effluent sample for subsequent chemical analysis and testing should be prepared by the following procedures:

- Collect effluent sub-sample at bi-hourly interval over a 24 hour period
- Obtain flow record of the Project for the 24-hour sampling period
- Calculate the volume of each sub-sample for preparation of flow-weighted composite sample
- Transfer the appropriate volume of sub-samples to a clean container and mix thoroughly

Continuous effluent quality monitoring shall be conducted in in accordance with the effluent parameters and standards stipulated by the WPCO Discharge License conditions and therefore would not be further detailed in this document. The monitoring requirement for the continuous effluent quality monitoring shall be approved by EPD. The effluent results reflect whether the effluent quality is in compliance with the Discharge License requirements. In case of non-compliance, suitable actions shall be undertaken to notify the plant operator for the non-compliance and identify the cause for the non-compliance. Corrective and remedial actions shall be implemented to improve the effluent quality. The monitoring

frequency should also be increased until the effluent quality is in compliance with the Discharge License requirements. The non-compliance events and preventive measures shall be documented.

5.1.7 Sampling Depths & Replication

For baseline, construction phase and operation phase monitoring, each station will be sampled and measurements/ water samples will be taken at three depths, 1 m below the sea surface, mid-depth and 1 m above the seabed. For stations that are less than 3 m in depth, only the mid depth sample shall be taken. For stations that are less than 6 m in depth, only the surface and seabed sample shall be taken. For *in situ* measurements, duplicate readings shall be made at each water depth at each station. Duplicate water samples shall be collected at each water depth at each station.

The effluent sampling should be planned carefully to ensure appropriate volume of effluent sub-samples is collected to prepare sufficient amount of flow-weighted composite effluent sample for carrying out subsequent chemical analysis and testing.

5.2 Water Quality Compliance

Water quality monitoring will be evaluated against Action and Limit Levels. The key assessment parameters are dissolved oxygen and suspended sediment and thus Action and Limit Levels based on the assessment criteria are identified for these. However turbidity can also provide valuable instantaneous information on water quality and thus Action and Limit Levels are also recommended for this parameter to facilitate quick responsive action in the event of any apparent unacceptable deterioration attributable to the works. The proposed Action and Limit Levels are shown in ***Table 5.4***.

Action and Limit levels are used to determine whether operational modifications are necessary to mitigate impacts to water quality. In the event that the levels are exceeded, appropriate actions in Event and Action Plan (***Table 5.5)*** should be undertaken and a review of works will be carried out by the Contractor(s).

Any noticeable change to water quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Particular attention will be paid to the Contractor(s)'s implementation of the recommended mitigation measures.

Table 5.4 Action and Limit Level for Water Quality

Parameter	Action Level	Limit Level
Construction Phase Marine Water Monitoring		
DO in mgL^{-1} [b]	Surface and Middle 5%-ile of baseline data for surface and middle layer Bottom 5%-ile of baseline data for bottom layers Tung Lung Chau Fish Culture Zone 5.1 mgL^{-1} or level at control station (whichever the lower)	Surface and Middle 4 mg L^{-1} Bottom 2 mg L^{-1} Tung Lung Chau Fish Culture Zone 5.0 mgL^{-1} or level at control station (whichever the lower)
Turbidity (Tby) in NTU (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
SS in mgL^{-1} (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
Construction Phase Main Disinfection Effluent Discharge		
Total Residual Chlorine (TRC) in mgL^{-1} (measured at the effluent discharge point outlet)	0.1 mg L^{-1}	0.1 mg L^{-1}
First-year Operation Phase Marine Water Monitoring		
Dissolved oxygen in mg/L [b]	Surface and Middle 5%-ile of baseline data for surface and middle layer Bottom 5%-ile of baseline data for bottom layers Tung Lung Chau Fish Culture Zone 5.1 mgL^{-1} or level at control station (whichever the lower)	Surface and Middle 4 mg L^{-1} Bottom 2 mg L^{-1} Tung Lung Chau Fish Culture Zone 5.0 mgL^{-1} or level at control station (whichever the lower)
Turbidity in NTU (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station
Salinity in PSU (Depth-averaged [a]) [c]	109% of baseline level or 9% exceedance of value at any impact station compared with corresponding data from control station	110% of baseline level or 10% exceedance of value at any impact station compared with corresponding data from control station
SS in mg/L (Depth-averaged [a]) [c]	95%-ile of baseline data, **or** 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, **or** 30% exceedance of value at any impact station compared with corresponding data from control station

Parameter	Action Level	Limit Level
Anti-scalant in mgL^{-1} (Depth-averaged [a]) [c]	0.362 mg L^{-1}	0.362 mg L^{-1}
Iron in mgL^{-1} (Depth-averaged [a]) [c]	0.3 mg L^{-1}	0.3 mg L^{-1}
Total Residual Chlorine in mgL^{-1} (Depth-averaged [a]) [c]	0.02 mg L^{-1}	0.02 mg L^{-1}

Notes:

a. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
b. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
c. For SS, turbidity, total residual chlorine, salinity, anti-scalant and iron, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table 5.5 Event and Action Plan for Water Quality Monitoring

Event	Action			
	ET	**IEC**	**Contractor(s)**	**ER**
Action Level being exceeded by one sampling day	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER.	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice	1. Confirm receipt of notification of exceedance in writing.
Action Level being exceeded by two or more consecutive sampling days	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Consider changes of working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; 5. Implement the agreed mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented. 3. Ensure additional mitigation measures are properly implemented.

Event	Action			
	ET	**IEC**	**Contractor(s)**	**ER**
Limit Level being exceeded by one sampling day	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; 5. Implement the agreed mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented. 3. Ensure additional mitigation measures are properly implemented. 4. Request Contractor(s) to critically review the working methods.

Event	Action			
	ET	**IEC**	**Contractor(s)**	**ER**
Limit Level being exceeded by two or more consecutive sampling days	1. Repeat *in situ* measurement on the next day of exceedance to confirm findings; 2. Check monitoring data, plant, equipment and Contractor(s)'s working methods; 3. Identify source(s) of impact and record in notification of exceedance; 4. Inform IEC, Contractor(s) and ER; 5. Discuss with IEC and Contractor(s) on additional mitigation measures and ensure that they are implemented	1. Check monitoring data submitted by ET and Contractor(s)'s working methods; 2. Inform EPD; 3. Discuss with ET and Contractor(s) on additional mitigation measures and advise ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of exceedance in writing; 2. Check plant and equipment and rectify unacceptable practice; 3. Critically review the need to change working methods; 4. Discuss with ET and IEC on additional mitigation measures and propose them to ER within 3 working days; 5. Implement the agreed mitigation measures. 6. As directed by ER, slow down or stop all or part of the marine construction works/ production volume of the desalination plant until no exceedance of Limit Level.	1. Confirm receipt of notification of exceedance in writing; 2. Discuss with the IEC on the proposed additional mitigation measures and agree on the mitigation measures to be implemented. 3. Ensure additional mitigation measures are properly implemented. 4. Request Contractor(s) to critically review the working methods; 5. Consider and instruct, if necessary, the Contractor(s) to slow down or to stop all or part of the marine construction works/ production volume of the desalination plant until no exceedance of Limit Level.

Notes : ET = Environmental Team, IEC = Independent Environmental Checker; ER = Engineering Representatives
The above actions should be taken within 1 working day after the exceedance is identified during operation phase.

6 WASTE MANAGEMENT AND LAND CONTAMINATION

The proposed desalination plant is expected to generate the following types of waste during the construction phase:

- Dredged marine sediment;
- Excavated materials;
- Construction & demolition (C&D) materials;
- Chemical waste; and
- General refuse.

In addition to the above, dewatered sludge will be generated during operation phase.

Mitigation measures, where appropriate, have been recommended as part of the EIA to avoid or reduce potential adverse environmental impacts associated with handling, collection and disposal of waste arising from the construction of the proposed Project.

Waste management will be the Contractor(s)'s responsibility and wastes produced during the construction phase will be managed in accordance with appropriate waste management practices and EPD's regulations and requirements.

Auditing of waste management practices during regular site inspections will confirm that these solid and liquid wastes generated during construction are not disposed of into the surrounding storm drains. The construction Contractor(s) will be responsible for the implementation of any mitigation measures to reduce waste or redress issues arising from the waste materials.

6.1 Waste Management Practices

The waste management practices and recommended mitigation measures will be incorporated into a Waste Management Plan (WMP) as stated in the "*ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites"* and C&D Material Management Plan (C&DMMP) for the Project for managing the different types of wastes by the Contractors on site. The Waste Management Plan (WMP) will become a part of the Environmental Management Plan (EMP), as required under the quoted *ETWB TCW No. 19/2005*. The contractor is required to prepare the EMP and submit it to the Architect/Engineer under the Contract for approval and then implement the EMP accordingly. The WMP will also be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the EIA Report.

The WMP shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment, the estimated rate of construction and demolition materials generation and disposal, and the recommended mitigation measures on

waste management as set out in *Section 8.5* of the EIA Report. The WMP shall indicate the disposal arrangements and locations of C&D materials and other wastes.

A Trip Ticket system will be included in the WMP. Surplus excavated spoil and other wastes will not be disposed at any other designated disposal locations unless otherwise approved in writing by EPD, Secretary of Public Fill Committee and/or other authorities as appropriate.

The Implementation Schedule (*Annex A)* provides details on the appropriate mitigation measures for avoiding and preventing adverse environmental impacts associated with dredged marine mud, C&D materials, chemical wastes, general refuse and sewage from the workforce. The WMP will be refined and updated as more detailed information is generated on the volume of dredged marine mud and the agreed disposal arrangements. Similarly, it will be regularly reviewed, and updated as appropriate, throughout the course of the construction works to confirm that it remains current with the latest detailed information and works practices.

The WMP will also outline the requirements for a waste audit program to verify that the measures outlined in the plan are effectively implemented and adhered too.

6.2 Methodology and Criteria

The construction Contractor(s) must confirm that the necessary disposal permits or licences are obtained from appropriate authorities in accordance with the various Ordinances. In addition to the monthly joint inspections/ audits, each construction Contractor(s) will designate a member of staff as being responsible for routine inspections and audits of on-site waste management practices, with reference to the relevant legislation and guidelines as well as the recommendations given in the Implementation Schedule contained in *Annex A* of this Manual, and defined below:

a) General Legislation

- *Waste Disposal Ordinance (WDO) (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C);*
- *Waste Disposal (Charges for Disposal of Construction Waste) Regulation;*
- *Land (Miscellaneous Provisions) Ordinance (Cap 28);*
- *Public Health and Municipal Services Ordinance (Cap 132) – Public Cleansing and Prevention of Nuisances Regulations; and*
- *Dumping at Sea Ordinance (DASO) (Cap. 466).;*

b) Other Relevant Guidelines

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat, Hong Kong SAR Government;*
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), EPD, Hong Kong SAR Government;*
- *Hong Kong Planning Standards and Guidelines Planning (2014), Planning Department, Hong Kong SAR Government;*
- *WBTC No. 2/93 - Public Dumps, Works Branch, Hong Kong SAR Government;*

- *WBTC No. 2/93B - Public Filling Facilities, Works Branch, Hong Kong SAR Government;*
- *WBTC No. 16/96 - Wet Soil in Public Dumps, Works Branch, Hong Kong SAR Government;*
- *Waste Reduction Framework Plan, 1998 to 2007, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;*
- *WBTC No. 4/98 and 4/98A - Use of Public Fill in Reclamation and Earth Filling Projects, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 25/99, 25/99A and 25/99C - Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2000 - Fill Management, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 19/2001 - Metallic Site Hoardings and Signboards; Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 11/2002 - Control of Site Crushers, Works Bureau, Hong Kong SAR Government;*
- *WBTC No. 12/2002 - Specifications Facilitating the Use of Recycled Aggregates, Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 33/2002 - Management of Construction and Demolition Material Including Rock, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 34/2002 - Management of Dredged/ Excavated Sediment, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *ETWB TC(W) No. 19/2005 - Environmental Management on Construction Sites, Environment, Transport and Works Bureau, Hong Kong SAR Government;*
- *DevB TC(W) No. 6/2010 - Trip Ticket System for Disposal of Construction & Demolition Materials, Development Bureau, Hong Kong SAR Government; and*
- *Practice Note for Authorized Persons and Registered Structural Engineers No. 252 - Management Framework for Disposal of Dredged/Excavated Sediment, Buildings Department, Hong Kong SAR Government.*

The Contractor(s)'s waste management practices will be audited with reference to the checklist detailed in ***Table 6.1*** below.

Details of the required mitigation measures are included in the Implementation Schedule of *Annex A* of this EM&A Manual.

Table 6.1 Waste Management Checklist

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Necessary waste disposal permits or licences have been obtained	Before the commencement of works	Once	The ET will inform the Contractor(s), IEC and ER. The Contractor(s) will apply for the necessary permits/ licences prior to disposal of the waste. The ET will verify that corrective action has been taken.
Dredged sediments are managed and disposed in accordance with *ETWB TC(W) No. 34/2002: Management Framework for Disposal of Dredged/ Excavated Sediment* .	Throughout the dredging works.	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to manage and dispose the dredged materials properly. The Contractor(s) will immediately suspend dredging until the dredging materials are properly managed and disposed.
Only licensed waste hauliers are used for waste collection.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to use a licensed waste haulier. The Contractor(s) will temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action will be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed are properly kept. For demolition material/waste, the number of loads for each day will be recorded (quantity of waste can then be estimated based on average truck load. For landfill charges, the receipts of the charge could be used for estimating the quantity).	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. The Contractor(s) will estimate the missing data based on previous records and the activities carried out. The ET will review the results and forward to ER for approval.
Sufficient waste disposal points are provided. Wastes are collected and removed from site in a timely manner. General refuse is collected on a regular basis.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to remove waste accordingly.

Activities	Timing	Checking Frequency	If non-compliance noted, Action Required
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance. Appropriate measures to reduce windblown litter and dust nuisance of waste will be adopted, e.g. by either covering trucks or by transporting wastes in enclosed containers.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to clean the storage area and/or cover the waste.
Different types of waste are segregated in different containers or skip to enhance reuse and recycling of material and proper disposal of waste.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to provide separate skips/ containers. The Contractor(s) will verify that the workers place the waste in the appropriate containers.
Chemical wastes are stored, handled and disposed of in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes*, published by the EPD. Chemical wastes are separated for special handling and appropriate treatment at the Chemical Waste Treatment Centre at Tsing Yi.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to rectify the issues immediately. Warning will be given to the Contractor(s) if corrective actions are not taken within 24 hrs.
Demolition materials are properly covered before leaving the site.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to comply. The Contractor(s) will confirm that the demolition materials are properly covered when transport out of the site.
Wastes are disposed at licensed sites.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will warn the Contractor(s) and instruct the Contractor(s) to confirm that the wastes are disposed of at the licensed sites. Should it involve chemical waste, the Waste Control Group of EPD will be notified.
Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors are provided. A recording system for the amount of wastes generated/ recycled and disposal sites is developed and implemented.	Throughout the works	Each Week	The ET will inform the Contractor(s), IEC and ER. ER will instruct the Contractor(s) to comply.

Notes : ET = Environmental Team, IEC = Independent Environmental Checker; ER = Engineering Representatives

6.3 Marine Dredged Material Management

Prior to the commencement of dredging activities, the disposal strategy for the dredged sediment will be determined in accordance with the *ETWB TC(W) No. 34/2002: Management Framework for Disposal of Dredged/ Excavated Sediment*. A Sediment Quality Report (SQR) and Waste Disposal Plan (WDP) for contaminated marine sediment generated by the Project will be prepared and agreement of the SQR and WDP will be sought with the Marine Fill Committee (MFC) of the Civil Engineering and Development Department and other relevant authorities, e.g. EPD. The SQR and WDP will contain the location of the disposal site(s) / disposal option(s) as agreed by the MFC and EPD, and it will be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA Report. The SQR and WDP will then be submitted to the EPD.

6.4 Waste Management EM&A

To facilitate monitoring and control over the contractors' performance on waste management, a waste inspection and audit programme will be implemented throughout the construction phase. The programme will look at the aspects of waste management including waste generation, storage, recycling, transport and disposal. An appropriate audit programme will be undertaken with the first audit conducted at the commencement of the construction works.

The aims of the waste inspection and audit programme are:

- To review the WMP including the quantities and types of C&D materials generated, reused and disposed of off-site; the amount of fill materials exported from/imported to the site and the quantity of timber used in temporary works construction for each process/activity;

- To confirm that the wastes arising from works are handled, stored, collected, transferred and disposed of an environmentally acceptable manner and comply with the relevant requirements under the *Waste Disposal Ordinance (WDO)* and its regulations;

- To confirm that the construction Contractor(s) properly implements the appropriate environmental protection and waste pollution control mitigation measures, as outlined in the WMP and the Implementation Schedule and presented in *Annex A,* to reduce and control the potential for waste impacts;

- To monitor the implementation and achievement of the WMP on site to assess its effectiveness; and

- To monitor the follow-up action on deficiencies identified.

Weekly audits of the waste management practices will be carried out during the construction phase to determine if wastes are being managed in accordance with the recommended good site practices, WMP and C&DMMP. Joint site inspections and audits by the ET, the IEC and the contractor will be undertaken once per month. The inspection/ audit will look at all aspects of on-site waste management practices

including waste generation, storage, recycling, transport and disposal. Particular attention will be given to the contractor's provision of sufficient spaces, adequacy of resources and facilities for on-site sorting and temporary storage of C&D materials. The C&D materials to be disposed of from the site will be visually inspected. The public fill for delivery to the off-site stockpiling area will contain no observable non-inert materials (e.g. general refuse, timber, etc). Furthermore, the waste to be disposed of at refuse transfer stations or landfills will as practicable contains no observable inert or reusable/recyclable C&D materials (e.g. soil, broken rock, metal, and paper/cardboard packaging, etc). Apart from site inspection, documents including licences, permits, disposal and recycling records will be reviewed and audited for compliance with the legislation and Contract requirements. Any irregularities observed during the site audits will be raised promptly to the contractor for rectification.

The findings of the waste audits will be reported in the *Monthly EM&A Reports, Quarterly EM&A Reports and Annual/Final EM&A Reports*.

6.5 Land Contamination

The land contamination assessment has examined the potential contaminating land uses within the Project area and investigated the potential impacts of the contamination on future use. A site reconnaissance was conducted on 7 August 2014 and potential land contaminating risks were identified at the generator room and the waste chemical drum storage at the side of the vehicle access road. Based on assessment result, only the area covered by the TMS Site was identified with low risk of potential land contamination.

Before the hand-over of the TMS Site to WSD for further development, the owner of TMS Site and its contractor shall ensure the TMS site is properly cleaned up before handover to CEDD. After the TMS Site is handed over to WSD and before the commencement of any construction work, the contractor of WSD shall prepare a Contamination Assessment Plan (CAP) for EPD endorsement prior to the commencement of site investigation. A Contamination Assessment Report (CAR) shall be prepared to summarise the results of the site investigation. If land contamination is identified, a Remediation Action Plan (RAP) shall be prepared to identify feasible remediation methods and a Remediation Report (RR) shall be prepared to demonstrate completion of remedial actions for EPD endorsement. In addition, mitigation measures to minimize the potential adverse effect to the environment due to the handling of contaminated materials shall be properly implemented (*Annex A*).

Visual inspection at all facilities during construction stage of the Project is recommended as best practice during construction activities associated with disturbed soil (*Annex A*).

7 SEWERAGE AND SEWAGE IMPLICATION

An adequate number of portable toilets should be provided at the Site during construction phase. The sludge collected from the portable toilets should be disposed of at the appropriate STW. Sewage generated during the operation and aftercare phases should be diverted to the public sewer, if available.

No specific EM&A requirement is therefore required. Nevertheless, visual inspection during construction stage of the Project is recommended as best practice during construction activities related to the sewerage works (*Annex A*).

8 ECOLOGY

The Project only affects a small area of subtidal soft bottom habitat of low to moderate ecological value and loss of mixed woodland and grassland/shrubland habitats of low ecological value. With the implementation of good site practices, no unacceptable ecological impacts from the construction of the Project are found. The implementation of the ecological mitigation measures (*Annex A*) will be inspected regularly as part of the EM&A procedures during the construction period.

At the detailed design stage prior to the commencement of the slope mitigation works, a vegetation survey shall be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other flora species of conservation interest that may be directly affected by the construction works. A specification for fencing and demarcating individuals of *Marsdenai lachnostoma* (or other flora species of conservation interest, if found) adjacent to the proposed alignment of the flexible barriers will be prepared to protect the species, and a detailed specification describing the exact locations of the flexible barrier foundation plates, soil nails and rock dowels will be prepared to illustrate how the setback distance from existing trees would be implemented for tree avoidance.

8.1 Impact Monitoring

The recommended good site practices should be audited at least once every week as part of the site audit programme. The weekly site audit to be carried out by the ET should include checking whether good site practices are being properly implemented by the Contractor.

The extent of the works area within the Clear Water Bay Country Park should be checked by the ET during the weekly site audit. Any trespass by the Contractor outside the works area especially any damage to the vegetation and rocky shore outside the Project area shall be reported to ER and IEC. ET shall also check and ensure the retained trees and individuals of *Marsdenia lachnostoma* are not affected by any unacceptable construction works. In event such non-compliance are found, the relevant Event/ Action Plan should be implemented (***Table 8.1***).

Table 8.1 Event and Action Plan for Ecology during Construction Phase

Event	Action			
	ET	**IEC**	**Contractor(s)**	**ER**
Non-conformity on one occassion	1. Identify source 2. Inform IEC and ER 3. Discuss remedial actions with IEC, the ER and the Contractor 4. Monitor/ audit/ review remedial actions until rectification has been completed	1. Check monitoring/ auditing results 2. Check the Contractor's working method 3. Discuss with the ET and Contractor on possible remedial measures 4. Advise the ER on effectiveness of proposed remedial measures 5. Check the implementation of remedial measures	1. Take immediate action to avoid further problem 2. Amend working methods if needed 3. Submit proposals for remedial actions to ET, ER and IEC 4. Rectify damage and implement the agreed remedial actions	1. Notify Contractor 2. Ensure remedial measures are properly implemented 3. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the works in case of serious non-conformity until situation is rectified
Repeated Non-comformity	1. Identify source 2. Inform IEC, ER, EPD and AFCD 3. Increase monitoring and audit frequency 4. Discuss remedial actions with the IEC, the ER and the Contractor 5. Monitor/ audit/ review remedial actions until rectification has been completed 6. If non-conformity stops, cease additional monitoring/ auditing	1. Check monitoring/ auditing results 2. Check the Contractor's working method 3. Discuss with the ET and Contractor on possible remedial measures 4. Supervise the implementation of remedial measures 5. Advise the ER on effectiveness of proposed remedial measures and keep EPD and AFCD informed	1. Take immediate action to avoid further problem 2. Amend working methods if needed 3. Submit proposals for remedial actions to ET, ER and IEC 4. Rectify damage and implement the agreed remedial actions	1. Notify Contractor 2. Ensure remedial measures are properly implemented 3. Consider and instruct, if necessary, the Contactor to slow down or to stop all or part of the works in the case of serious non-conformity until situation is rectified

Notes : ET = Environmental Team, IEC = Independent Environmental Checker; ER = Engineering Representatives

9 FISHERIES

The EIA concluded that the Project would not affect fisheries resources and fishing activities significantly. With the use of trenchless method (e.g. HDD) in laying the submarine intake and outfall pipelines, there will be no marine works and no impact to the seabed. Potential indirect water quality impact from from site runoff and wastewater discharge on capture fisheries, fish spawning and nursery grounds and mariculture in the Eastern Water Control Zone are considered insignificant with the implementation of water quality mitigation measures. Apart from water quality mitigation measures, no specific fisheries mitigation is required and the residual impact is acceptable.

Water quality monitoring programme at various locations including the Tung Lung Chau Fish Culture Zone is recommended during construction and operation phases to ensure no unacceptable water quality impact is arising from the works. Details of the water quality monitoring and audit requirements and the associated event and action plans are described in *Section 5* of this Manual.

10 LANDSCAPE & VISUAL

The EIA has recommended that checking of implementation of the mitigation measures for landscape and visual resources can be undertaken as part of the site inspection programme during construction, extending into operation phase depending on the establishment period of any planting works carried out (See ***Table 1.1*** and *Sections 2.1*, *2.2*).

The implementation and maintenance of mitigation measures (*Annex A*) will be checked to confirm that they are fully realized and that potential conflicts between the proposed landscape and visual measures and any other project works and operational requirements are resolved at the earliest practical date and without compromise to the intention of the mitigation measures.

11 LANDFILL GAS HAZARD

Under Section 6.5, Chapter 9 of the *Hong Kong Planning Standards and Guidelines*, an evaluation of the risk posed by landfill gas (LFG) is required for any development proposed within a 250 m Landfill Consultation Zone. Part of the desalination plant and the indicative area of natural slope mitigation works fall within the SENT Landfill Extension Consultation Zone; and part of the 1,200 mm diameter fresh water mains along Wan Po Road falls within the SENT Landfill and SENT Landfill Extension Consultation Zones, TKO Stage II/III Restored Landfill and TKO Stage I Restored Landfill Consultation Zones (see ***Figure 11.1***).

The qualitative LFG risk assessment in Section 12 of the EIA Report has indicated the risks associated with LFG at desalination plant and the associated facilities during both construction and operation are "Low" to "Medium". As such, some precautionary measures ("passive control") and engineering measures ("semi active control") will be required, respectively, to ensure Project is safe. Definitions of "passive control" and "semi active control" are annotated in Chapter 4 of the *Landfill Gas Hazard Assessment Guidance Note* issued by EPD. The following precautionary and protection measures are considered appropriate:

- Design Phase
  - Cut-off barrier to seal any service trench entering the buildings within the Project Site and LFG consultation zones. *Figure B.6* in the *Guidance Note* provides details of a suitable design; and
  - Grilled metal covers are required to be used for the below grade cable trenches entering the buildings within the Project Site and LFG consultation zones.
- Construction Phase
  - All workers should be aware of potential presence of LFG;
  - Train and provide breathing apparatus and gas detection equipment for confined spaces or deep trenching;
  - Impact monitoring should be conducted before excavations of 1m depth or more and/ or drilling operations within the Project Site and LFG consultation zones;
  - Safety precautions should be made available during trenching, excavation and creation of confined spaces near to or below ground level; and
  - Provision of Safety officers, specifically trained with regard to landfill gas and leachate related hazards and the appropriate actions to take in adverse circumstances, on the site throughout the works.
- Operational Phase
  - Alert workers and visitors of possible LFG hazards;
  - Prohibit smoking and open fires on site; and

- Conduct regular LFG monitoring at buildings, manholes, utility pits within the Project Site and consultation zones, etc.

11.1.1 LFG Parameters

LFG monitoring shall be carried out to identify any migration between the landfill and the Project and to ensure the safety of the construction, operation and maintenance personnel working on-site, visitors and any other person within the Project area.

The following parameters shall be monitored:

- Methane.
- Oxygen.
- Carbon Dioxide.
- Barometric Pressure.

Monitoring should be carried out and reported in a similar manner to that for the SENT Landfill and SENT Landfill Extension, TKO Stage II/III Restored Landfill and TKO Stage I Restored Landfill contracts to provide comparable data. The presentation format for LFG monitoring shall be agreed with EPD in advance.

11.1.2 Monitoring Equipment

LFG monitoring shall be carried out using intrinsically-safe, portable multi-gas monitoring instruments. The gas monitoring equipment shall:

- Comply with the *Landfill Gas Hazard Assessment Guidance Note* as intrinsically safe;
- Be capable of continuous barometric pressure and gas pressure measurements;
- Normally operate in diffusion mode unless required for spot sampling, when it should be capable of operating by means of an aspirator or pump;
- Have low battery, fault and over range indication incorporated;
- Store monitoring data, and shall be capable of being down-loaded directly;
- Measure in the following ranges:
  - methane 0-100% Lower Explosion Limit (LEL) and 0-100% v/v;
  - oxygen 0-25% v/v;
  - carbon dioxide 0-100% v/v; and
  - barometric pressure mBar (absolute).
- alarm (both audibly and visually) in the event that the concentrations of the following are exceeded:

- methane >10% LEL;
- carbon dioxide >0.5% by volume; and
- oxygen <19% by volume.

11.1.3 Monitoring Locations and Frequency

a) Construction Phase

During construction of works within the consultation zones, excavations of 1m depth or more should be monitored:

- at the ground surface before excavation commences;
- immediately before any worker enters the excavation;
- at the beginning of each working day for the entire period the excavation remains open; and
- periodically through the working day whilst workers are in the excavation.

For excavations between 300mm and 1m deep, measurements should be carried out:

- directly after the excavation has been completed; and
- periodically whilst the excavation remains open.

In the case that drilling operations are required to be carried out within any of the landfill consultation zones, the following additional recommendations should also be adopted, including:

- Proceed drilling with adequate care and precautions against the potential hazards which may be encountered;
- Prior to the commencement of the site works, the drilling contractor should devise a 'method-of-working' statement covering all normal and emergency procedures (including but not limited to number of operatives, experience and special skills of operatives, normal method of operations, emergency procedures, supervisors responsibilities, storage and use of safety equipment, safety procedures and signs, barriers and guarding). The site supervisor and all operatives must be familiar with this statement.

Both the monitoring locations and frequency will be *ad hoc* and instructed by the Engineer.

b) Operation Phase

Following construction, routine monitoring is required at buildings within the Project Site and consultation zones. The monitoring frequency will be monthly for the first year of operation. If the monitoring results show no sign of LFG migration, reduce the

monitoring frequency to once every six months. However, should EPD alert the Operator that high LFG levels had been detected during monthly monitoring under the SENT Landfill, SENT Landfill Extension, TKO Stage II/III Restored Landfill and/ or TKO Stage I Restored Landfill contracts, then the Operator of the desalination plant may be required to increase LFG monitoring to monthly until such time as EPD inform the Operator that biyearly monitoring can be resumed.

For the manholes and utility pits within the Project Site and along the fresh water mains, each manhole/ utility pit should be monitored with two measurements (at mid depth and base). Each measurement should be monitored for a minimum of 10 minutes. A steady reading and peak reading should be recorded at each manhole/ utility pit and for each measurement. The need for venting the manhole/ utility pit and further monitoring will be reviewed after the initial monitoring. As the exact location of these will be dependent upon the detailed design of the desalination plant and fresh water mains, these locations cannot be specified prior to completion of the detailed design.

11.1.4 Limit Levels and Event and Action Plan For LFG

The Limit levels and EAP for LFG detected in excavations, utilities and any enclosed on-site areas are shown in ***Table 11.1*** below.

Table 11.1 Action / Limit Levels and Event and Action Plan for LFG Hazard

Parameters	Level	Action
Oxygen (O_2)	Action Level < 19% O_2	Ventilate trench/void to restore O_2 to > 19%
	Limit Level < 19% O_2	Stop works Evacuate personnel/prohibit entry Increase ventilation to restore O_2 to > 19%
Methane (CH_4)	Action Level >10% LEL	Post "No Smoking" signs Prohibit hot works Increase ventilation to restore CH_4 to <10% LEL
	Limit Level >20% LEL	Stop works Evacuate personnel/prohibit entry Increase ventilation to restore CH_4 to<10% LEL
Carbon Dioxide (CO_2)	Action Level >0.5% CO_2	Ventilate to restore CO_2 to < 0.5%
	Limit Level >1.5% CO_2	Stop works Evacuate personnel / prohibit entry Increase ventilation to restore CO_2 to <0.5%

12 HAZARD TO LIFE

The EIA study concluded that no unacceptable risks are foreseen as a result of the operation of the desalination plant. No mitigation measures are thus deemed necessary and no monitoring will be required for the construction and operation phases.

Safeguard measures are recommended to ensure the risk associated with the use, storage, and transport of chlorine and DGs at the proposed Desalination Plant complies with the Hong Kong Risk Guidelines and stays in "Acceptable" region. The implementation of safeguard measures will be checked in the design, construction and operation phases according to the implementation schedule (*Annex A*).

13 ENVIRONMENTAL SITE INSPECTION

13.1 Site Inspections

Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. Regular site inspections will be carried out by the ET and the Contractor once per week during construction phase. During operation phase, regular site audit shall be carried out to cover all planting works for a period of not less than 12-months. The IEC will also undertake monthly site audit to assess the performance of the Contractor(s). Additionally, the ET will be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that were implemented as a result of the inspection; the results of the inspections should be made available to the Contractor, IEC and ER.

The areas of inspection should include the general environmental conditions in the vicinity of the Site and pollution control and mitigation measures within the Site; it should also review the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The ET should make reference to the following information in conducting the inspections:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- individual works method statements which will include proposals on associated pollution control measures;
- contract specifications on environmental protection; and
- relevant environmental protection and pollution control laws.

The ET's inspection findings and their associated recommendations on improvements to the environmental protection and pollution control works should be submitted to the IEC and the Contractor within 24 hours, for comment and for taking immediate action. They should also be presented, along with the remedial actions taken, in the monthly EM&A reports. The Contractor should follow the procedures and time-frames stipulated in the environmental site inspection for the implementation of mitigation proposals. An action reporting system should be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

Ad hoc site inspections should also be carried out by the ET and IEC if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the associated investigation work.

13.2 Compliance with Legal & Contractual Requirements

There will be contractual environmental protection and pollution control requirements as well as Hong Kong's environmental protection and pollution control laws which the construction activities will comply with.

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

The Contractor should also regularly copy relevant documents to the ET Leader, IEC, ER and Project Proponent so that the checking work can be carried out. The relevant documents are expected to include the updated Work Progress Reports, the updated Works Programme, application letters for different licences/permits under the environmental protection laws, and all the valid licences/permit. The site diary should also be available, upon request, to the ET Leader during his site inspection.

After reviewing the documentation, the ET should advise IEC, ER, Project Proponent, EPD and 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 is incompatible with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he should also advise the Contractor accordingly.

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

13.3 Environmental Complaints

The ET Leader should undertake the following procedures upon receipt of a complaint:

- log complaint and date of receipt into the complaint database and inform the Contractor, ER, IEC and Project Proponent immediately;
- investigate the complaint jointly with the Contractor and the IEC and discuss with the Contractor and IEC to determine its validity and to assess whether the source of the issue is due to construction or operation of the Project;
- if a complaint is considered valid due to the construction or operation activities, the ET Leader should identify mitigation measures in consultation with the Contractor, and submitted to the IEC and ER for review. The ER should report the results to the Project Proponent;
- if mitigation measures are required, the ET Leader should advise the Contractor accordingly;

- review the Contractor's response on the identified mitigation measures and the updated situation;

- if the complaint is transferred from EPD, an interim report should be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;

- undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;

- report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and

- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and ER shall cooperate with the ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor should promptly carry out the mitigation measures. EPD will approve the proposed mitigation measures and the ET Leader and IEC should check that the measures have been carried out by the Contractor.

13.4 Log-Book

The ET Leader should keep a contemporaneous log-book of each and every instance or circumstance or change of circumstances which may affect the findings of the environmental impact assessment and non-compliance with the Environmental Permit. The ET Leader should notify the IEC within one working day of the occurrence of any such instance or circumstance or change of circumstance. The ET Leader's log-book should be kept readily available for inspection by persons (such as IEC and Contractor) assisting in supervision of the implementation of the recommendations of the EIA Report and the conditions set out in the Environmental Permit, or by EPD or his authorised officers.

14 REPORTING

14.1 General

Reports can be provided in an electronic medium upon agreeing the format with the Contractor, IEC, IC, Project Proponent and the EPD. All the monitoring data should also be submitted on diskettes or CD Rom.

14.2 Baseline Monitoring Report

The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 days of completion of the baseline monitoring. The Baseline Monitoring Report will be submitted to the Contractor, IEC, ER and EPD. The baseline monitoring report will include at least the following:

(a) up to half a page executive summary;

(b) brief project background information;

(c) drawings showing locations of the baseline monitoring stations;

(d) an updated construction programme;

(e) monitoring results (in both hard and diskette copies) together with the following information:

- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations;
- monitoring date, time, frequency and duration; and
- quality assurance (QA) / quality control (QC) results and detection limits;

(f) details on 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 results;

(g) determination of the Action and Limit Levels (A/L levels) for each monitoring parameter and statistical analysis of the baseline data;

(h) revisions for inclusion in the EM&A Manual; and

(i) comments and conclusions.

14.3 Monthly EM&A Reports

The results and findings of all EM&A works required in the Manual should be recorded in the monthly EM&A Reports and be prepared by the ET and verified by the ET Leader. The reports will be submitted to the Contractor, IEC and EPD within 10 working days of the end of each reporting month, with the first report due in the month after construction works commence. The ET should liaise with the relevant parties to confirm the exact number and format of monthly reports in both hard copy and electronic format. The report should include, but not be limited to, the following elements:

a) First Monthly EM&A Report

The first monthly EM&A report should include at least but not be limited to the following:

Executive Summary (1-2 pages);

- Exceedances of Action/Limit Levels;
- Complaint Log;
- Notifications of any summons and successful prosecutions;
- Reporting Changes;
- Future key issues.

Basic Project Information

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

Environmental Status

- Works undertaken during the month with illustrations (such as location of works); and
- Drawing showing the Project area, any environmental sensitive receivers.

Summary of EM&A requirements including:

- Environmental mitigation measures, as recommended in the *EIA Report*; and

- Environmental monitoring requirements and contractual requirements.

Implementation Status

- Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the *EIA Report*, summarised in the updated implementation schedule.

Site Audit Report

Monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth); and
- Monitoring date, time, frequency, and duration.

Report on Complaints, Notifications of Summons and Successful Prosecutions

- 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 notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

Others

- An account of the future key issues as reviewed from the works programme and work method statements; and
- 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.

b) Subsequent Monthly EM&A Reports

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

Executive Summary (1-2 pages)

- Exceedances of Action/Limit Levels;
- Complaint Log;
- Notifications of any summons and successful prosecutions;
- Reporting Changes; and
- Future key issues.

Environmental Status

- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/ mitigation measures for the month;
- Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
- Drawing showing the project area, any environmental sensitive receivers.

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.

Monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth); and
- Monitoring date, time, frequency, and duration.

Report on Complaints, Notifications of Summons and Successful Prosecutions

- 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 notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and

- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

Others

- An account of the future key issues as reviewed from the works programme and work method statements.

Appendix

- Supporting documents;

- Outstanding issues and deficiencies.

14.4 Quarterly EM&A Summary Reports

The quarterly EM&A summary report should contain the following listed information:

(a) Executive summary (up to half page);

(b) Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(c) A brief summary of EM&A requirements including:

- Monitoring parameters;

- Environmental quality performance limits (Action and Limit levels); and

- Environmental mitigation measures, as recommended in the Final EIA.

(d) Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the Final EIA, summarised in the updated implementation schedule;

(e) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

- The major activities being carried out on site during the period;
- Weather conditions during the period; and
- Any other factors which might affect the monitoring results.

(g) Advice on the solid and liquid waste management status;

(h) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(i) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(j) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(k) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(l) A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;

(m) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(n) Project Proponents' contacts and any hotline telephone number for the public to make enquiries.

14.5 Annual EM&A Review Report

The Annual EM&A Review Report should contain the following listed information:

(a) Executive summary (up to half page);

(b) Drawings showing the Project area, environmental sensitive receivers and monitoring and control stations;

(c) Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(d) A brief summary of EM&A requirements including:

- Monitoring parameters;
- Environmental quality performance limits (Action and Limit levels); and
- Environmental mitigation measures, as recommended in the Final EIA;

(e) Summary of the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the Final EIA, summarised in the updated implementation schedule;

(f) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:

- The major activities being carried out on site during the period;
- Weather conditions during the period; and
- Any other factors which might affect the monitoring results.

(g) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(h) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(i) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(j) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(k) A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;

(l) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(m) Project Proponents' contacts and any hotline telephone number for the public to make enquiries.

14.6 Final EM&A Summary Report

The EM&A programme will be terminated upon the completion of the construction works and specified operation phase monitoring period so that the potential to cause significant environmental impacts is ceased and the post-project monitoring is concluded.

The final EM&A summary report will include, *inter alia*, the following:

(a) An executive summary;

(b) Drawings showing the project area, any environmental sensitive receivers;

(c) Basic project information including a synopsis of the project organisation, programme, contracts of key management, and a synopsis of work undertaken during the entire construction period;

(d) A brief summary of EM&A requirements including: environmental mitigation measures, as recommended in the *EIA Report*;

(e) Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the *EIA Report*, summarised in the updated implementation schedule;

(f) Provide clear-cut decisions on the environmental acceptability of the Project with reference to the specific impact hypothesis;

(g) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(h) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(i) A summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/ pollution control legislation's, locations and nature of the breaches, investigation, follow-up actions taken and results;

(j) Review the practicality and effectiveness of the EIA process and EM&A programme (eg effectiveness and efficiency of the mitigation measures) recommend any improvement in the EM&A programme; and

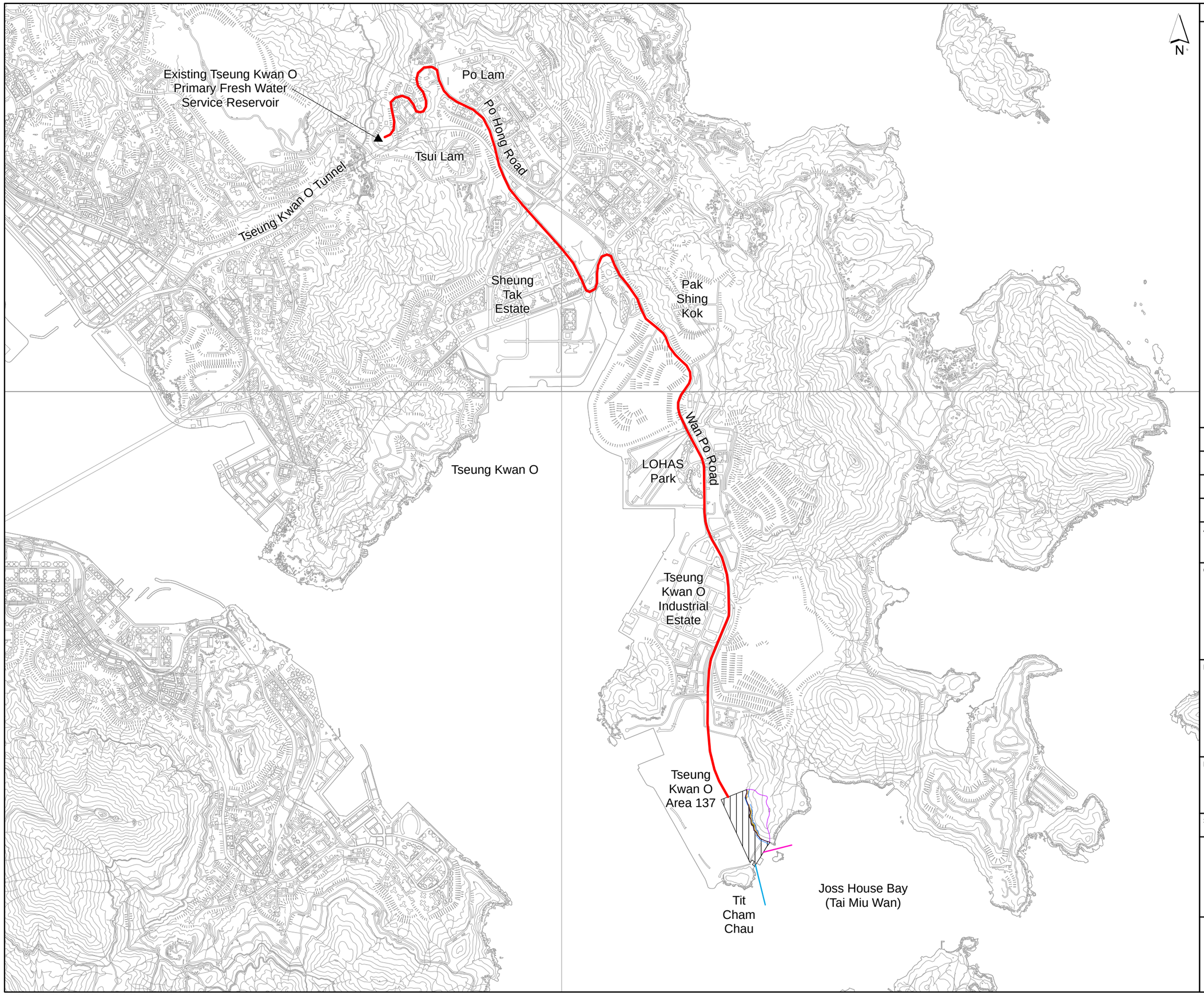
(k) A conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

14.7 Data Keeping

Documentation such as the monitoring field records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, such documents should be well kept by the ET Leader and should be available for the

inspection of the IEC, Project Proponent and EPD upon request. All relevant information should be clearly and systematically recorded in the documents. The monitoring data should also be recorded in electronic format. All the documents and data should be kept for at least five years after completion of the Extension contract.

Drawings



Legend

- Flexible Barrier
- Indicative location of seawater intake
- Indicative location of submarine outfall
- Proposed Fresh Water Main
- Earmarked Site for Desalination Plant
- Study area for slope mitigation works
- Soil Nailing Area
- Rock Slope Stabilization Area

Revision	Date	Description		Initial
	Designed	Checked	Drawn	Checked
Initial				
Date				

Agreement No.
CE 21/2012 (WS)

Contract title
DESALINATION PLANT AT
TSEUNG KWAN O -
FEASIBILITY STUDY

Drawing title
LOCATION OF THE PROPOSED
DESALINATION PLANT AT
TSEUNG KWAN O

Drawing no.
FIGURE 1.1

Revision

Scale
1:30,000

水務署
Water Supplies Department

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

File: T:\GIS\CONTRACT\0189570\Mxd\0189570_Proposed_Plant_Slope.mxd
Date: 26/5/2015

Figure 1.2 Preliminary Construction Programme of the Project

Year	2016												2017												2018												2019												2020											
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Package B - Mainlaying																																																										
Section A (Desalination Plant to Shek Kok Rd)																																																								
Section B (Shek kok Rd to Po Shun Rd)																																																								
Section C (Po Shun Rd to TKOFWPSR)																																																								
Package A - Desalination Plant																																																								
Site Clearance and Ground Investigation																																																								
Foundation and Pilling																																																								
Building Works																																																								
Architectural and Landscaping Work																																																								
Submarine Intake and Outfall																																																								
Slope Mitigation																																																								
E&M Installation, Testing and Commissioning																																																								

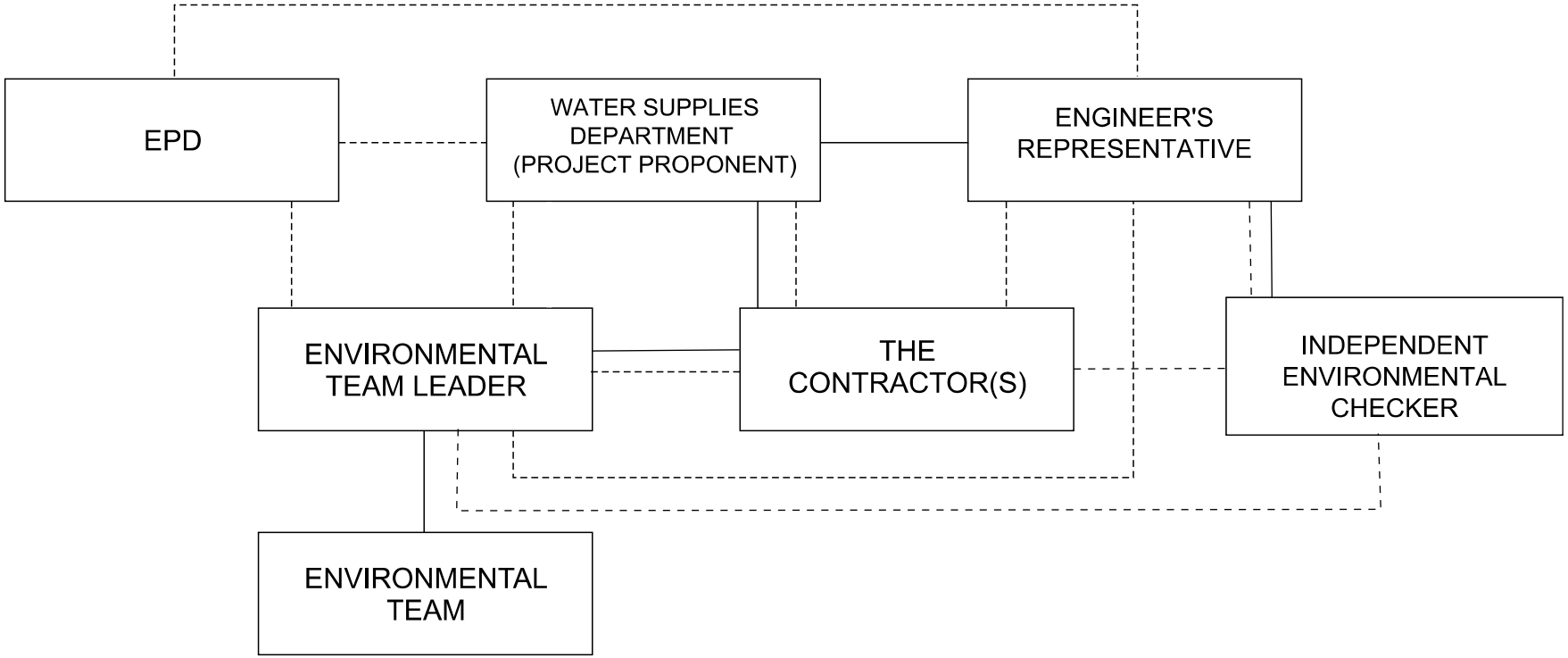


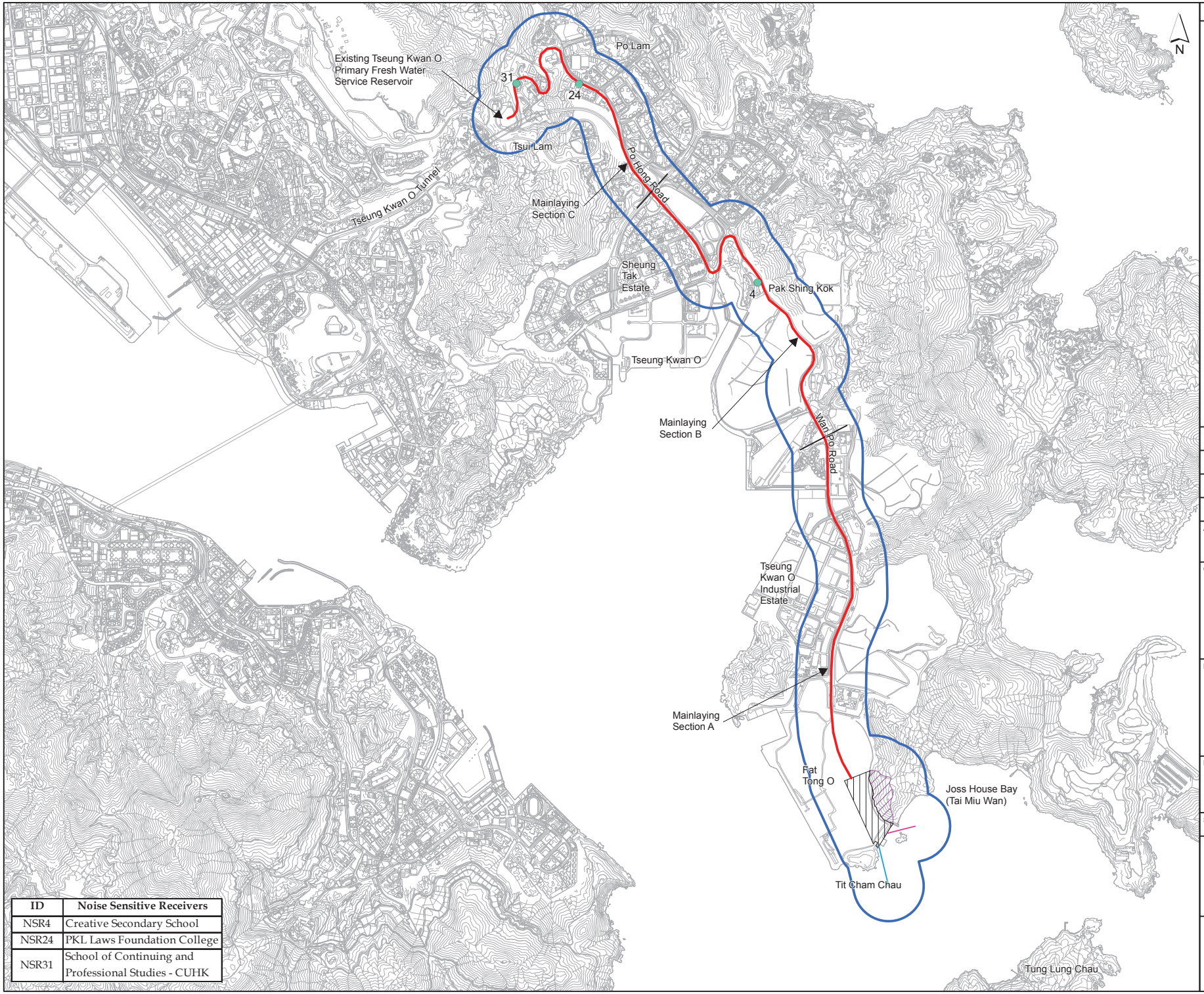
Figure 1.3

Indicative Project Organisation Chart

FILE: 0018180_z8a
DATE: 20/11/2009

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

水務署
Water Supplies Department



ID	Noise Sensitive Receivers
NSR4	Creative Secondary School
NSR24	PKL Laws Foundation College
NSR31	School of Continuing and Professional Studies - CUHK

Legend

- Noise Sensitive Receivers
- Proposed Fresh Water Main
- Indicative location of seawater intake
- Indicative location of submarine outfall
- Earmarked site for desalination plant
- Study area for slope mitigation works
- 300m Study Area

Revision	Date	Description		Initial
	Designed	Checked	Drawn	Checked
Initial				
Date				

Agreement No.
CE 21/2012 (WS)

Contract title
DESALINATION PLANT AT TSEUNG KWAN O - FEASIBILITY STUDY

Drawing title
NOISE MONITORING STATIONS

Drawing no.
Figure 4.1

Revision

Scale
1:30,000

水務署
Water Supplies Department

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

File: T:\GIS\CONTRACT\0189570\Mxd\NSR\0189570_Noise_Monitoring_Station.mxd
Date: 6/3/2015

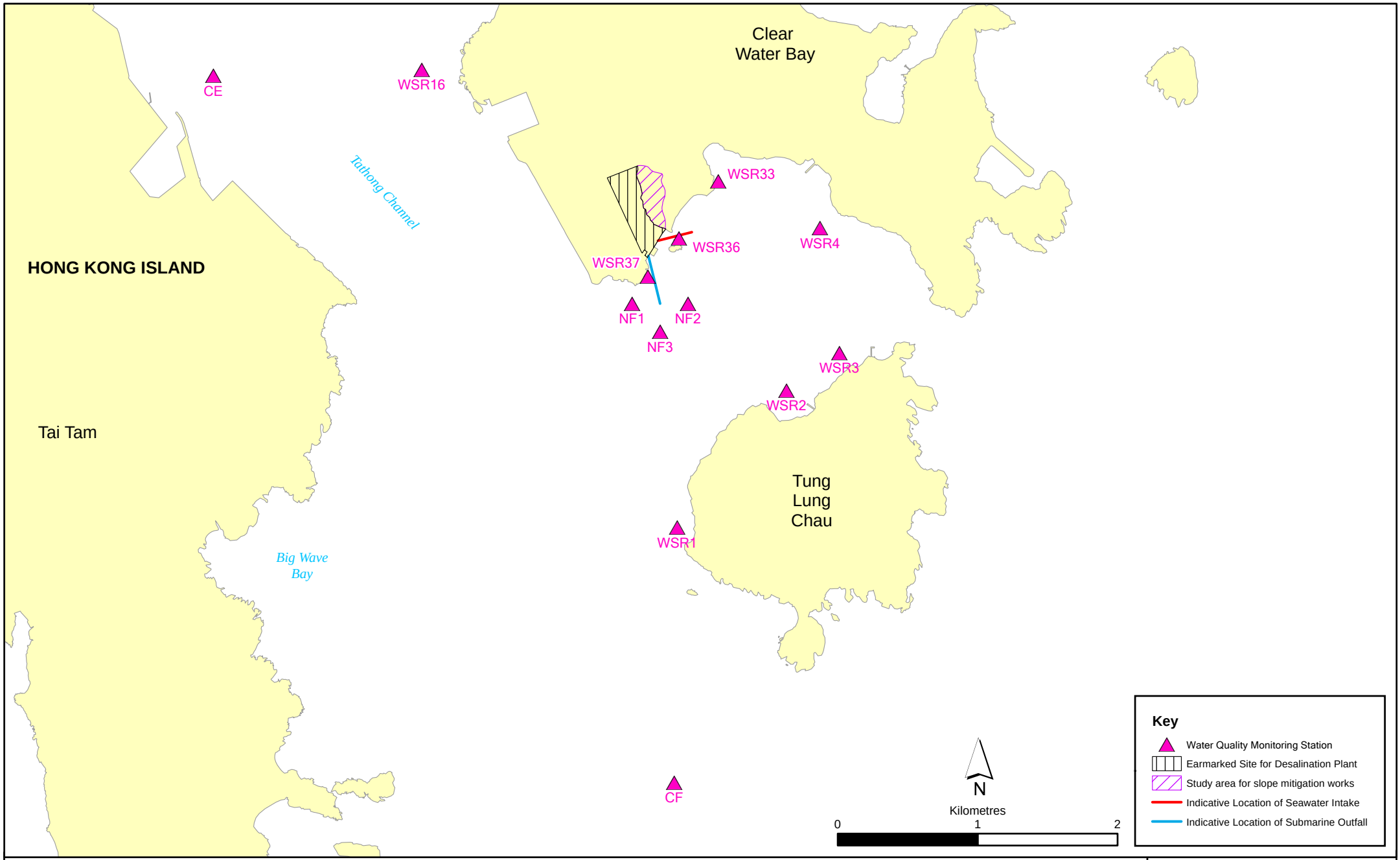


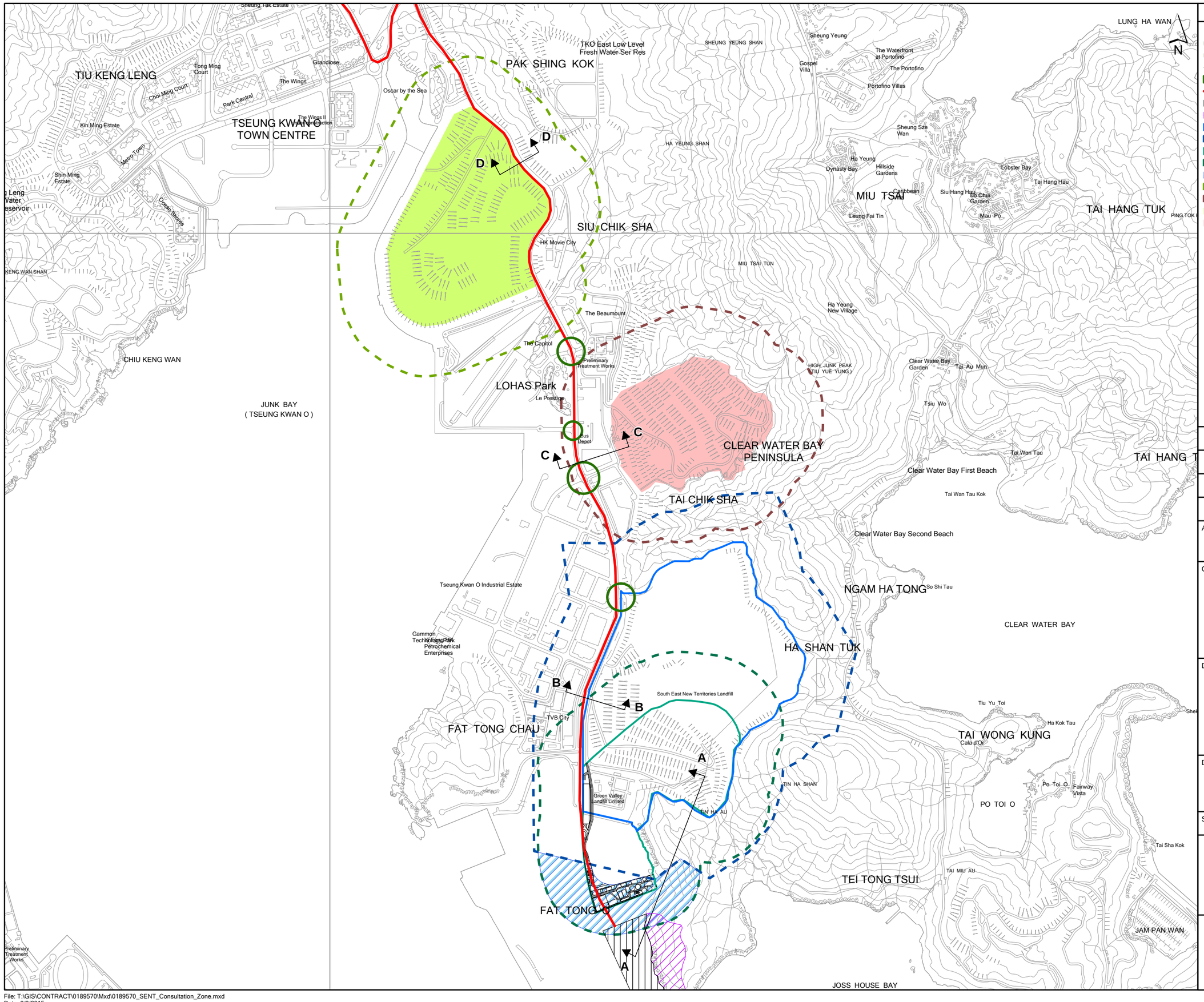
Figure 5.1

Water Quality Monitoring Station

File: T:\GIS\CONTRACT\0189570\Mxd\0189570_Water_Quality_Monitoring_Station.mxd
Date: 27-May-2015

Environmental Resources Management

ERM



Legend

- Indicative Location of Seawater Intake
- Indicative Location of Submarine Outfall
- Cross Section
- Proposed Pipe Jacking Locations
- Proposed Fresh Water Main*
- Earmarked Site for Desalination Plant
- Study area for slope mitigation works
- Existing SENT Landfill
- Existing Consultation Zone
- SENT Extension (Waste Boundary)
- Extension Consultation Zone
- Additional Area Covered by Consultation Zone
- TKO Stage I Restored Landfill Consultation Zone
- TKO Stage II/III Restored Landfill Consultation Zone
- TKO Stage I Restored Landfill
- TKO Stage II/III Restored Landfill

Revision	Date	Description			Initial
	Designed	Checked	Drawn		Checked
Initial					
Date					

Agreement No.
CE 21/2012 (WS)

Contract title
DESALINATION PLANT AT TSEUNG KWAN O - FEASIBILITY STUDY

Drawing title
250m Consultation Zones of the SENT Landfill, SEND Landfill Extension, TKO Stage II / III Restored Landfill and TKO Stage I Restored Landfill

Drawing no.
Figure 11.1

Revision

Scale
1:17,500

水務署
Water Supplies Department

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

File: T:\GIS\CONTRACT\0189570\Mxd\0189570_SENT_Consultation_Zone.mxd
Date: 3/3/2015

Annexes

Annex A - Implementation Schedule of Recommended Mitigation Measures

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
Air Quality							
S4.8.1	Impervious dust screen or sheeting will be provided to enclose scaffolding from the ground floor level of building for construction of superstructure of the new buildings.	Land site/ During Construction	Contractor(s)		✓		Air Pollution Control (Construction Dust)
S4.8.1	Impervious sheet will be provided for skip hoist for material transport.	Land site/ During Construction, particularly dry season	Contractor(s)		✓		-
S4.8.1	The area where dusty work takes place should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after dusty activities as far as practicable.	Land site/ During Construction	Contractor(s)		✓		-
S4.8.1	All dusty materials should be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation.	Land site/ During Construction	Contractor(s)		✓		-
S4.8.1	Dropping heights for excavated materials should be controlled to a practical height to minimise the fugitive dust arising from unloading.	Land site/ During Construction	Contractor(s)		✓		-
S4.8.1	During transportation by truck, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport.	Land site/ During Construction	Contractor(s)		✓		-
S4.8.1	Wheel washing device should be provided at the exits of the work sites. Immediately before leaving a construction site, every vehicle shall be washed to remove any dusty material from its body and wheels as far as practicable.	Land site/ During Construction	Contractor(s)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S4.8.1	Road sections between vehicle-wash areas and vehicular entrance will be paved.	Land site/ During Construction	Contractor(s)		✓		-
S4.8.1	Hoarding of not less than 2.4m high from ground level will be provided along the length of the Project Site boundary.	Land site/ During construction	Contractor(s)	✓	✓		-
S4.8.1	Haul roads will be kept clear of dusty materials and will be sprayed with water so as to maintain the entire road surface wet at all times.	Land site/ During construction	Contractor(s)		✓		
S4.8.1	Temporary stockpiles of dusty materials will be either covered entirely by impervious sheets or sprayed with water to maintain the entire surface wet all the time.	Land site/ During construction	Contractor(s)		✓		
S4.8.1	Stockpiles of more than 20 bags of cement, dry pulverised fuel ash and dusty construction materials will be covered entirely by impervious sheeting sheltered on top and 3-sides.	Land site/ During construction	Contractor(s)		✓		
S4.8.1	All exposed areas will be kept wet always to minimise dust emission.	Land site/ During construction	Contractor(s)		✓		
S4.8.1	Ultra-low-sulphur diesel (ULSD) will be used for all construction plant on-site, as defined as diesel fuel containing not more than 0.005% sulphur by weight) as stipulated in Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No 19/2005 on Environmental Management on Construction Sites.	Land site/ During construction/ During Operation	Contractor(s)		✓	✓	Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No 19/2005 on Environmental Management on Construction Sites
S4.8.1	The engine of the construction equipment during idling will be switched off.	Land site/ During construction	Contractor(s)		✓		
S4.8.1	Concrete batching plant will be required on site. The	Land site/ During construction	Contractor(s)		✓		Guidance Note on a Best

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	control measures recommended in the Guidance Note on a Best Practicable Means for Cement Works (Concrete Batching Plant) (BPM 3/2 (93)) will be implemented.						Practicable Means for Cement Works (Concrete Batching Plant) (BPM 3/2 (93))
S4.8.1	Regular maintenance of construction equipment deployed on-site will be conducted to prevent black smoke emission.	Land site/ During construction	Contractor(s)		✓		
S4.8.2	Odour mitigation measures may be implemented during the operation of the desalination plant. The treatment and storage of the chemical sludge should be enclosed inside building structure. Forced ventilation system with sufficient air change rate would be equipped at the sludge treatment and storage building and the exhaust discharge should be directed away from ASRs as far as practicable.	During operation	WSD			✓	
S4.10	To ensure proper implementation of the recommended dust mitigation measures and good construction site practices during the construction phase, environmental site audits on weekly basis is recommended throughout the construction period.	Land site/ During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		
Noise							
S5.7	Only well-maintained plant will be operated on-site and plant will be serviced regularly during the construction phase.	All area/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Silencers or mufflers on construction equipment will be utilised and will be properly maintained during the construction phase.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Mobile plant, if any, will be sited as far away from NSRs as possible.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
							Construction Works,
S5.7	Machines and plant (such as trucks) that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Plants known to emit noise strongly in one direction will, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Material stockpiles and other structures will be effectively utilised, wherever practicable, in screening noise from on-site construction activities.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Use of Quite Powered Mechanical Equipment (QPME).	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Movable noise barriers of 3m in height with skid footing should be used and located within a few metres of stationary plant and mobile plant such that the line of sight to the NSR is blocked by the barriers. The length of the barrier should be at least five times greater than its height. The noise barrier material should have a superficial surface density of at least 7 kg m^{-2} and have no openings or gaps.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	The noise insulating sheet should be deployed such that there would be no opening or gaps on the joints.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works,
S5.7	Construction activities (e.g. excavation/shoring, reinstatement (asphalt), and pipe jacking) will be planned and carried out in sequence, such that items of PME proposed for these activities will not be operated simultaneously.	Noise control/ During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from Construction Works
S5.7	PMEs will not be used at the works areas near educational institutions with residual impact (ie the	Noise control / During construction	Contractor(s)		✓		A Practical Guide for the Reduction of Noise from

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	"influence area" within a radius of 40m) during school hours in order to reduce impact to the educational institutions.						Construction Works
S5.7	Noise enclosures or acoustic sheds would be used to cover stationary PME such as generators. Portable/Movable noise enclosure made of material with superficial surface density of at least 7 kg m^{-2} may be used for screening the noise from operation of the saw/groover, concrete.	Noise control/ Pre-construction/ During construction	Contractor(s)	✓	✓		
S5.9	Sawcutting pavement, breaking up of pavement, excavation /shoring, pipe laying, backfilling, reinstatement (concrete) and pipe jacking shall be scheduled outside the examination period.	Noise control/ Pre-construction/ During construction	Contractor(s)	✓	✓		
S5.9	In view the duration of noise exceedance at Creative Secondary School, PLK Laws Foundation College, TKO Kei Tak Primary School and School of Continuing and Professional Studies-CUHK is limited to 8 weeks, the construction work in the influence areas near the four schools shall be scheduled during long school holidays (eg summer holiday, Easter holiday or Christmas holiday, etc) as far as practicable. Scheduling the construction work for the four schools and	Noise control/ Pre-construction/ During construction	Contractor(s)	✓	✓		
S5.10	A noise monitoring programme shall be implemented for the construction phase.	Designated monitoring stations as defined in EM&A Manual/During construction phase	Environmental Team (ET)		✓		
S5.10	The effectiveness of on-site control measures could also be evaluated through the regular site audits.	All facilities/ During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
			Checker (IEC)				
Water Quality							
S 6.9	Silt curtains shall be deployed during dredging to reduce the elevation of suspended solids to nearby sensitive receivers. Single layer of floating type silt curtain around grab dredger shall be used for dredging at submarine outfall and combined used of floating type silt curtain and cage type silt curtain should be adopted for dredging at seawater intake.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Closed grab dredger should be used to reduce the potential for leakage of sediments.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Closed grab of 3 to 6 m^3 will be used for dredging at seawater intake.	Marine Dredging at intake/ During construction	Contractor(s)		✓		-
S6.9	Specific work staff will be assigned the responsibility for monitoring the number of grab dredged per hour. Number of cycle shall be limited to 20 – 21 grab per hour for 3m^3 closed grab; 10 – 11 grab per hour for 6 m^3 closed grab.	Marine Dredging / During construction	Contractor(s)		✓		-
S6.9	The grab shall be operated in slow and controlled manner such that the impact to seabed by the grab when being lowered could be minimized. Also, the operator should ensure the grab be properly closed before lifting the grab.	Marine Dredging / During construction	Contractor(s)		✓		-
S6.9	The maximum allowed dredging rate at the seawater intake should be limited to 750 m^3/day while the maximum allowed dredging rate at the submarine outfall is 3,500 m^3/day.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Dredged marine sediment will be disposed of in a gazetted marine disposal area in accordance with	Marine Dredging/ During construction	Contractor(s)		✓		Dumping at Sea Ordinance (DASO)

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	marine dumping permit conditions of the Dumping at Sea Ordinance (DASO).						
S6.9	Disposal vessels will be fitted with tight bottom seals in order to prevent leakage of material during transport.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Barges will be filled to a level, which ensures that material does not spill over during transport to the disposal site and that adequate freeboard is maintained to ensure that the decks are not washed by wave action.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	After dredging, any excess materials will be cleaned from decks and exposed fittings before the vessel is moved from the dredging area.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	The contractor(s) will confirm that the works cause no visible foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the dredging site.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	When the dredged material has been unloaded at the disposal areas, any material that has accumulated on the deck or other exposed parts of the vessel will be removed and placed in the hold or a hopper. Under no circumstances will decks be washed clean in a way that permits material to be released overboard.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Dredger will maintain adequate clearance between vessels and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.	Marine Dredging/ During construction	Contractor(s)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S6.9	The contractor shall regularly inspect the silt curtains and check that they are moored and marked to avoid danger to marine traffic. Regular inspection on the integrity of the silt curtain should be carried out by the contractor and any damage to the silt curtain shall be repaired by the contractor promptly. Relevant marine works shall be stopped until the repair is fixed to the satisfaction of the engineer.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	All vessels should be well maintained and inspected before use to limit any potential discharges to the marine environment.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	All vessels must have a clean ballast system.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	No discharge of sewage/grey wastewater should be allowed. Wastewater from potentially contaminated area on working vessels should be minimized and collected. These kinds of wastewater should be brought back to port and discharged at appropriate collection and treatment system.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	No soil waste is allowed to be disposed overboard.	Marine Dredging/ During construction	Contractor(s)		✓		-
S6.9	Silt removal facilities such as silt traps or sedimentation facilities will be provided to remove silt particles from runoff to meet the requirements of the TM standard under the WPCO. The design of silt removal facilities will be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures will be inspected on a regular basis and maintained to confirm proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit will be removed regularly.	Land site & drainage/ During construction	Contractor(s)		✓		ProPECC PN 1/94 TM Standard under the WPCO

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S6.9	Earthworks to form the final surfaces will be followed up with surface protection and drainage works to prevent erosion caused by rainstorms.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9	Appropriate surface drainage will be designed and provided where necessary.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9	The precautions to be taken at any time of year when rainstorms are likely together with the actions to be taken when a rainstorm is imminent or forecasted and actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94.	Land site & drainage/ During construction	Contractor(s)		✓		ProPECC PN 1/94
S6.9	Oil interceptors will be provided in the drainage system where necessary and regularly emptied to prevent the release of oil and grease into the storm water drainage system after accidental spillages.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9	Temporary and permanent drainage pipes and culverts provided to facilitate runoff discharge, if any, will be adequately designed for the controlled release of storm flows.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9	The temporary diverted drainage, if any, will be reinstated to the original condition when the construction work has finished or when the temporary diversion is no longer required.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9	Appropriate infiltration control, such as cofferdam wall, should be adopted to limit groundwater inflow to the excavation works areas in the Project site. Groundwater pumped out from excavation area should be discharged into the storm system via silt removal facilities.	Land site & drainage/ During construction	Contractor(s)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S6.9	Appropriate numbers of portable toilets shall be provided by a licensed contractor to serve the construction workers over the construction site to prevent direct disposal of sewage into the water environment.	Land site & drainage/ During construction	Contractor(s)		✓		-
S6.9 and S6.12	The sterilization water should be dechlorinated with total residual chlorine (TRC) level below 1 mg/L before discharge to public sewer. In situ testing of TRC should also be conducted for the discharge of chlorinated water for pipeline disinfection to ensure sufficient dechlorination before discharge to public sewer.	Sterilization of water mains prior to commissioning	Contractor(s)		✓	✓	Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters
S6.9	The cleaning and flushing water should also be treated and desilted to the relevant discharge requirement stipulated in TM-DSS before discharging.	Sterilization of water mains prior to commissioning	Contractor(s)		✓	✓	Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters
S6.8.2	The dosing of polymer will be controlled to avoid any concurrent dosing during chlorination for bio-growth control. Such precautionary measure will be incorporated in the operation manual of the plant.	During operation	WSD			✓	-
S6.9	Site drainage should be well maintained and good construction practices should be observed to ensure that oil, fuels, solvents and other chemicals are managed, stored and handled properly and do not enter the nearby water streams.	Land site & drainage/ During construction/ During operation	Contractor(s)		✓	✓	-
S6.12	Regular site inspections will be carried out in order to confirm that regulatory requirements are being met and that contractors are implementing the standard site practice and mitigation measures as proposed to reduce potential impacts to water quality.	During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S6.12	A silt curtain efficiency test for the combined use of floating silt curtain type and cage type silt curtain for dredging at seawater intake to confirm the silt curtain reduction efficiency assumptions of the assessment will be completed prior to intake dredging works commencement.	Marine Dredging/ During construction	Contractor(s)/ Environmental Team (ET)		✓		-
S6.9 and S6.12	A water quality monitoring programme shall be implemented for the construction phase.	Designated monitoring stations as defined in EM&A Manual/During marine construction period	Environmental Team (ET)		✓		-
S6.9 and S6.12	To ensure compliance to the effluent standard, regular monitoring of effluent quality is recommended during normal operation. Furthermore, marine water monitoring at selected nearby WSRs during the first year of project commission are recommended to ensure compliance to WQO or other water quality criteria.	During operation	Environmental Team (ET)/ WSD		✓	✓	-
S6.8.2	As a precautionary measure, the dosing of polymer will be controlled to avoid any concurrent dosing during chlorination for bio-growth control. This precautionary measure will be incorporated in the operation manual of the plant.	During operation	Environmental Team (ET)/ WSD	✓		✓	
Sewerage and Sewage Treatment Implications							
S7.6	The proposed sewerage system will be constructed by WSD during the construction period and the system will handover to DSD for further maintenance. The detailed design of the proposed sewerage system should be circulated to DSD, EPD and other relevant parties for comment during planning and detailed design stage to ensure acceptance by relevant parties. Access for sewers, equipment and personnel for maintenance of the works should be adequately provided. The maintenance responsibility of those proposed sewerage facilities will be confirmed with	During design, construction and operation	WSD/ Contractor(s)/ DSD	✓	✓	✓	Stormwater Drainage Manual; DSD Sewerage Manual Part 1 & Part 2; Drainage Services Department Standard Drawings

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	relevant authorities in the detailed design stage of this project.						
S7.5	Gravity sewer will be constructed to connect the plant to the existing sewer for sewage treatment.	During design, construction	WSD/ Contractor(s)/ DSD	✓	✓		-
S7.6	The gravity sewer should be designed to avoid under surcharge condition. 1m freeboard should be provided if surcharge condition cannot be avoided. The flow velocity of the sewer should be not less than 1m/s under full bore flow for self-cleansing purpose. The maximum velocity should be limited to 3m/s. The structural and bedding design of the sewer should in accordance with *Section 6* of the *Sewerage Manual Part 1*.	During design, construction and operation	WSD/ Contractor(s)/ DSD	✓	✓	✓	Section 6 of the Sewerage Manual Part 1
S7.6	The design of manhole should be in accordance with *Section 7* of *Sewerage Manual Part 1* and manhole should be provided at intersection of sewers, location where sewer changes location and junction between different size/gradient of sewers.	During design, construction and operation	WSD/ Contractor(s)/ DSD	✓	✓	✓	Section 7 of Sewerage Manual Part 1
Waste Management							
S8.5	Nomination of approved personnel to be responsible for standard site practices, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site.	Contract mobilisation/ During construction	Contractor(s)		✓		-
S8.5	Training of site personnel in proper waste management and chemical handling procedures. Training will be provided to workers on the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling at the beginning of the construction works.	Contract mobilisation/ During construction	Contractor(s)		✓		-
S8.5	Provision of sufficient waste disposal points and	All area/ During construction/	Contractor(s)		✓	✓	DEVB TC(W) No. 8/2010,

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	regular collection for disposal.	During operation					Enhanced Specification for Site Cleanliness and Tidiness.
S8.5	Appropriate measures to reduce windblown litter and dust transportation of waste by either covering trucks or by transporting wastes in enclosed containers.	All area/ During construction	Contractor(s)		✓		DEVB TC(W) No. 8/2010, Enhanced Specification for Site Cleanliness and Tidiness.
S8.5	A waste management plan (WMP) as stated in the "*ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites*" for the amount of waste generated, recycled and disposed of (including the disposal sites) will be established and implemented during the construction phase as part of the Environmental Management Plan (EMP). The Contractor will be required to prepare the EMP and submits it to the Architect/ Engineer under the Contract for approval prior to implementation.	All area/ During construction	Contractor(s)		✓		ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites
S8.5	Separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Centre at Tsing Yi.	All area/ During construction	Contractor(s)		✓		Chapters 2 & 3 Code of Practice on the Packaging, Labelling & Storage of Chemical Wastes published under the Waste Disposal Ordinance (Cap 354), Section 35
S8.5	Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.	Land site/ During construction	Contractor(s)		✓		Waste Disposal Ordinance (Cap 354)
S8.5	A recording system for the amount of wastes generated/ recycled and disposal sites. The trip-ticket system will be included as one of the contractual requirements and implemented by the contractor(s).	Land site/ During construction	Contractor(s)		✓		DEVB TC(W) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials
S8.5	Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance	Land site/ During construction/ During operation	Contractor(s)		✓		WBTC 32/92, The Use of Tropical Hard Wood on

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	reuse or recycling of material and their proper disposal.						Construction Site
S8.5	Encourage collection of aluminium cans and waste paper by individual collectors during construction with separate labelled bins provided to segregate these wastes from other general refuse by the workforce.	Land site/ During construction	Contractor(s)		✓		ETWB TCW No. 33/2002, Management of Construction and Demolition Material Including Rock
S8.5	Any unused chemicals and those with remaining functional capacity will be recycled as far as possible.	Land site/ During construction	Contractor(s)		✓		-
S8.5	Use of reusable non-timber formwork to reduce the amount of C&D materials.	All areas/ During construction	Contractor(s)		✓		WBTC 32/92, The Use of Tropical Hard Wood on Construction Site
S8.5	Prior to disposal of construction waste, wood, steel and other metals will be separated to the extent practical, for re-use and/or recycling to reduce the quantity of waste to be disposed of to landfill.	All areas/ During construction	Contractor(s)		✓		DEVB TC(W) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials
S8.5	Proper storage and site practices to reduce the potential for damage or contamination of construction materials.	All areas/ During construction	Contractor(s)		✓		-
S8.5	Plan and stock construction materials carefully to reduce amount of waste generated and avoid unnecessary generation of waste.	All areas/ During construction	Contractor(s)		✓		-
S8.5	A Sediment Quality Report (SQR) for sampling and chemical testing of the sediment will be prepared and submitted to the EPD for approval. The approved detailed sampling and chemical testing will be carried out prior to the commencement of the dredging activities to confirm the sediment disposal method.	Marine works/ During construction	Contractor(s)		✓		ETWB TC(W) No. 34/2002 and Dumping at Sea Ordinance (DASO)
S8.5	The management of dredged/ excavated sediment	Marine works/ During	WSD/ Contractor(s)		✓		ETWB TC(W) No. 34/2002

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	management requirement from *ETWB TC(W) No. 34/2002* will be incorporated in the Specification of the Contract Documents.	construction					and Dumping at Sea Ordinance (DASO)
S8.5	The contractor will open a billing account with EPD in accordance with the Waste Disposal (Charges for Disposal of Construction Waste) Regulation for the payment of disposal charges.	Contract mobilisation/ During construction	Contractor(s)		✓		Cap 354N Waste Disposal (Charges for Disposal of Construction Waste) Regulation
S8.5	A trip-ticket system will be established in accordance with DEVB TC(W) No. 6/2010 to monitor the reuse of surplus excavated materials off-site and disposal of construction waste and general refuse at transfer facilities/ landfills, and to control fly-tipping.	Contract mobilisation/ During construction	Contractor(s)		✓		DEVB TC(W) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials
S8.5	The project proponent will also conduct regular inspection of the waste management measures implemented on site as described in the Waste Management Plan.	All area/ During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites
S8.5	A recording system (similar to summary table as shown in Annex 5 and Annex 6 of Appendix G of ETWB TC(W) No. 19/2005) for the amount of waste generated, recycled and disposed of (including the disposal sites) will be established during the construction phase.	All area/ During construction	Contractor(s)		✓		Annex 5 and Annex 6 of Appendix G of ETWB TC(W) No. 19/2005
S8.5	Inert C&D materials (public fill) will be reused within the Project as far as practicable.	All area/ During construction	Contractor(s)		✓		-
S8.5	Public fill and construction waste shall be segregated and stored in different containers or skips to facilitate reuse or recycling of materials and their proper disposal.	All area/ During construction	Contractor(s)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S8.5	Specific areas of the work site will be designated for such segregation and storage if immediate use is not practicable.	All area/ During construction	Contractor(s)		✓		-
S8.5	To reduce the potential dust and water quality impacts of site formation works, C&D materials will be wetted as quickly as possible to the extent practice after filling.	All area/ During construction	Contractor(s)		✓		Air Pollution Control (Construction Dust) Regulation (Cap 311R); WPCO (Cap 358)
S8.5	Open stockpiles of excavated/ fill materials or construction wastes on-site should be covered with tarpaulin or similar fabric.	Land site/ During Construction, particularly dry season	Contractor(s)		✓		Air Pollution Control (Construction Dust) Regulation (Cap 311R)
S8.5	Chemical waste container shall be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Chemical waste container shall have a capacity of less than 450 L unless the specifications have been approved by the EPD.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	A label in English and Chinese shall be displayed on the chemical container in accordance with instructions prescribed in Schedule 2 of the Regulations.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Storage areas for chemical waste shall be clearly labelled and used solely for the storage of chemical waste.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S8.5	Storage areas for chemical waste shall be enclosed on at least 3 sides.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Storage areas for chemical waste shall have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Storage areas for chemical waste shall have adequate ventilation.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Storage areas for chemical waste shall be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary).	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Storage areas for chemical waste shall be arranged so that incompatible materials are appropriately separated.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Chemical waste will be disposed of via a licensed waste collector; and to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S8.5	General refuse will be stored in enclosed bins or compaction units separately from construction and chemical wastes.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	Waste Disposal (Chemical Waste) (General) Regulation; Code of Practice on the Packaging, Handling and Storage of Chemical Wastes
S8.5	Adequate number of waste containers will be provided to avoid over-spillage of waste.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	DEVB TC(W) No. 8/2010 Enhanced Specification for Site Cleanliness and Tidiness.
S8.5	A reputable waste collector will be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimise odour, pest and litter impacts.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	-
S8.5	Recycling bins will be provided at strategic locations within the Site to facilitate recovery of recyclable materials (including aluminium can, waste paper, glass bottles and plastic bottles) from the Site. Materials recovered will be sold for recycling.	All area/ During construction/ During operation	Contractor(s)/ WSD		✓	✓	-
S8.5	To avoid any odour and litter impact, accurate number of portable toilets will be provided for workers on-site.	All area/ During construction	Contractor(s)		✓		-
S8.5	The burning of refuse on construction sites is prohibited by law.	All area/ During construction	Contractor(s)		✓		Air Pollution Control Ordinance (Cap 311)
S8.5	Thickened and dewatered sludge from the plant will be transported to the landfill by trucks. The requirement on the minimum dry solid content (30%) in the dewatered sludge to be disposed of at landfills as stipulated in the WDO will be incorporated in the Specification of the Contract Documents.	During operation	WSD			✓	Waste Disposal Ordinance (WDO) (CAP 354)

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S8.5	Sludge containers should be flushed with water regularly.	During operation	WSD			✓	Waste Disposal Ordinance (WDO) (CAP 354)
S8.5	Frequent sludge removal from storage containers is necessary to prevent the production of gases.	During operation	WSD			✓	Air Pollution Control Ordinance (Cap 311)
S8.7	To facilitate monitoring and control over the contractors' performance on waste management, a waste inspection and audit programme will be implemented throughout the construction phase.	All facilities/ During construction	ET/ IEC		✓		-
Land Contamination							
S8A.6	Before the hand-over of the temporary magazine storage (TMS) Site to WSD for further development, the owner of TMS Site and its contractor shall ensure the TMS site is properly cleaned up before handover to WSD After the TMS Site is handed over to WSD and before the commencement of any construction work, the contractor of WSD shall prepare a Contamination Assessment Plan (CAP) for EPD endorsement prior to the commencement of site investigation.	All area/ Pre-construction / During construction	Contractors/ WSD	✓	✓		-
S8A.6	A Contamination Assessment Report (CAR) shall be prepared to summarise the results of the site investigation. If land contamination is identified, a Remediation Action Plan (RAP) shall be prepared to identify feasible remediation methods and a Remediation Report (RR) shall be prepared to demonstrate completion of remedial actions for EPD endorsement.	All area/ During construction	Contractors		✓		-
S8A.6	Excavation profiles shall be properly designed and executed	All area/ During construction	Contractors		✓		-
S8A.6	An impermeable surfacing shall be placed under the stockpile and a cover should be employed to prevent dust emission and possible cross contamination. If not applicable, regular watering shall be applied.	All area/ During construction	Contractors		✓		-
S8A.6	Trucks carrying contaminated materials shall be	All area/ During construction	Contractors		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	enforced with speed control.						
S8A.6	In order to confirm that the construction Contractor(s) has(have) implemented the recommendations of the EIA Report, regular site inspections and audits during construction phase will be conducted in accordance with the approved procedures in CAP. The visual inspections/audits will look at all aspects of construction activities that disturb soil. The first inspection/audit will be conducted at the commencement of the construction works.	All facilities/ During construction	Contractor(s)/ Environmental Team (ET) & Independent Environmental Checker (IEC)		✓		-
Ecology							
S9.7	For slope mitigation works within the Clear Water Bay Country Park, to avoid tree felling and damages to trees, the exact locations of the flexible barrier foundation plates, soil nails and rock dowels can be adjusted during detailed design, and a setback distance from existing trees is recommended to be maintained as far as practical. A detailed specification describing the exact locations of the flexible barrier foundation plates, soil nails and rock dowels will be prepared to illustrate how the setback distance from existing trees would be implemented for tree avoidance.	Slope mitigation works area/ During detailed design/ During construction	Contractor(s)	✓	✓		-
S9.7	Pruning of tree canopies along the alignment of the flexible barriers shall be limited to a minimum.	Slope mitigation works area/ During construction	Contractor(s)		✓		
S9.7	The alignment of flexible barriers shall be optimized to preserve all species of conservation interest and minimize the impact to the existing vegetation as far as practicable. All individuals of *Marsdenia lachnostoma* within the slope mitigation areas shall be retained *in-situ*, by positioning the alignment of flexible barrier at a minimum 1.5m in a radius away from these individuals.	Slope mitigation works area/ During detailed design/ During construction	Contractor(s)	✓	✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S9.7 and 9.10	At the detailed design stage prior to the commencement of the slope mitigation works, a vegetation survey shall be carried out at the slope mitigation areas within the Clear Water Bay Country Park to assess the condition and identify the location of each individual of *Marsdenia lachnostoma* and other flora species of conservation interest that may be directly affected by the construction works.	Slope mitigation works area/ During detailed design/ During construction	Contractor(s)	✓	✓		-
S9.7	Temporary fencing will be installed to fence off the concerned species either in groups of individually within the works area and in the close proximity to prevent from being damaged and disturbed during construction. A sign identifying the site shall be attached to the fence and flagging tape shall be attached to the individuals to visualize their locations.	Slope mitigation works area/ During construction	Contractor(s)		✓		-
S9.7 and S9.10	A specification for fencing and demarcating individuals of *Marsdenai lachnostoma* (or other flora species of conservation interest, if found) adjacent to the proposed alignment of the flexible barriers will be prepared to protect the species.	Slope mitigation works area/ During construction	Contractor(s)		✓		-
S9.7	Induction training shall also be provided to all site personnel in order to brief them on this flora of conservation interest including the locations and their importance.	Slope mitigation works area/ During construction	Contractor(s)		✓		-
S9.7	The resident site supervisory staff will closely monitor the conditions of concerned individuals during construction of flexible barriers in the close proximity.	Slope mitigation works area/ During construction	Contractor(s)		✓		-
S9.7	Erect fences along the boundary of the works area before the commencement of works to prevent vehicle movements and encroachment of personnel onto adjacent areas.	All area/ During construction	Contractor(s)		✓		-
S9.7	Regularly check the work site boundaries to ensure that they are not breached and that damage does not occur to surrounding areas.	All area/ During construction	Contractor(s)/ Environmental Team (ET)		✓		-
S9.7	Avoid any damage and disturbance, particularly those	All area/ During construction	Contractor(s)		✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	caused by filling and illegal dumping, to the surrounding habitats through proper management of waste disposal.						
S9.7	Reinstate temporarily affected areas, particularly the habitats of plantation and shrubland-grassland immediately after completion of construction works, through on-site tree/shrub planting. The tree/shrub species will be chosen with reference to those in the surrounding area.	All area/ During construction	Contractor(s)		✓		-
S9.7	Affected habitats within the Clear Water Bay Country Bay shall be reinstated by hydro-seeding and planting of climbers and native shrub seedlings where practical upon completion of the slope mitigation works.	All area/ During construction	Contractor(s)		✓		-
S9.7	A closed grab dredger will be used to dredge down about -11mPD which is approximately 6m below the current seabed and there will be no excessive dredging.	Marine works area/ During construction	Contractor(s)		✓		-
Landscape & Visual							
S11.10 & 11.11	The construction area and area allowed for temporary structures, such as the contractor's office, will be minimized to a practical minimum. (MM1)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	-
S11.10 & 11.11	At the detailed design stage, the design team will seek to minimize the landscape footprint of the Project and above ground facilities, while satisfying all other requirements. (MM2)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	-
S11.10 & 11.11	Design principles will be adopted to take into account the surrounding area, particularly Clear Water Bay Country Park behind and the nearby waterfront, with due consideration given to: - green roofs where practical (ie without equipment on the roof); - roadside planting; - aesthetic treatment of all structures; - vertical greening; - screen planting along application site; and	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	- landscape enhancement with amenity planting where practical including planting along the edge (site boundary) fence with native shrubs where feasible, to reduce their visual impact and blend them into the surrounding landscape. (MM3)						
S11.10 & 11.11	All trees within the Project Site or the potential slope mitigation works area will be carefully protected during construction according to DEVB TCW No. 10/2013 – Tree Preservation (MM4)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	ETWB TCW No. 3/2006 - Tree Preservation.
S11.10 & 11.11	No tree within the Country Park will be felled. Trees within the Site unavoidably affected by the works will be transplanted where necessary and practical. For trees that need to be felled, compensatory planting will be provided to the satisfaction of relevant Government departments. A compensatory tree planting proposal including locations of tree compensation will be submitted to seek relevant government department's approval, in accordance with DEVB TC(W) No. 10/2013. (MM5)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	DEVB TC(W) No. 10/2013
S11.10 & 11.11	Any slope mitigation works necessary to address natural terrain hazards, will be minimized to minimize any potential environmental impact to the Country Park e.g. soil nailing and rock stabilization will aim to avoid existing trees e.g. should any restoration of vegetation be necessary, the best planting matrix with native species will be established, with the aim of resembling the existing vegetation. (MM6)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	
S11.10 & 11.11	Dredging works for the installation of intake structures and outfall diffusers should be minimized to avoid or reduce any potential environmental impacts to as low as reasonably practicable (ALARP). The intake and outfall structures (e.g. intake openings and diffuser heads) will be prefabricated and transferred to site for installation. (MM7)	All area/ Detailed design/ During construction/ During operation	WSD/ Contractor(s)	✓	✓	✓	
S11.10 & 11.11	All night-time lighting will be reduced to a practical minimum both in terms of number of units and lux	All area/ Detailed design/ During construction/ During	WSD/ Contractor(s)	✓	✓	✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	level and will be hooded and directional. (MM8)	operation					
Landfill Gas Hazard							
S12.7	During all works, safety procedures should be implemented to minimise the risks of fires and explosions, asphyxiation of workers and toxicity effects resulting from contact with contaminated soil and groundwater.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	-
S12.7	During trenching and excavation as well as creation of confined spaces at near to or below ground level, precautions should be clearly laid down and rigidly Gas detection equipment and appropriate breathing apparatus should be available and used when entering confined spaces or trenches deeper than 1 metre.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	The Contractor should make the workers are aware of potential hazards of working in confined spaces (any chamber, manhole or culvert which is large enough to permit access to personnel). Such work in confined spaces is controlled by the Factories and Industrial Undertakings (Confined Spaces) Regulations of the Factories and Industrial Undertakings Ordinance. Following the Safety Guide to Working in Confined Spaces ensures compliance with the above regulations.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	Safety officers, specifically trained with regard to landfill gas and leachate related hazards and the appropriate actions to take in adverse circumstances, should be present on the site throughout the works, in particular, when works are undertaken below grade.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	All personnel who work on site and all visitors to the site should be made aware of the possibility of ignition of gas in the vicinity of the works, the possible presence of contaminated water and the need to avoid physical contact with it.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	Monitoring for landfill gas should be undertaken in all excavations, manholes, chambers (particularly during pipe jacking) and any confined spaces through the use	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	of an intrinsically safe portable instrument, appropriately calibrated and capable of measuring the concentrations of methane. carbon dioxide and oxygen.						
S12.7	Monitoring frequency and areas to be monitored should be specified prior to commencement of groundwork, either by the Safety Officer, or by an appropriately qualified person. All measurements should be recorded and documented.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	Proceed drilling with adequate care and precautions against the potential hazards which may be encountered.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	Prior to the commencement of the site works, the drilling contractor should devise a 'method-of-working' statement covering all normal and emergency procedures (including but not limited to number of operatives, experience and special skills of operatives, normal method of operations, emergency procedures, supervisors responsibilities, storage and use of safety equipment, safety procedures and signs, barriers and guarding). The site supervisor and all operatives must be familiar with this statement.	All area/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	Where below ground service entries are necessary to the Incoming Switchgear Room, 132 kV Substation and Chlorine Store (I) and (II), the entry point should be sealed to prevent gas entry. In addition, any below grade cable trenches entering the Incoming Switchgear Room and 132 kV Substation can become the pathway for landfill gas and hence grilled metal covers should be used.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	It is recommended regular landfill gas monitoring should be carried out at the Incoming Switchgear Room, 132 kV Substation and Chlorine Store (I) and (II). The monitoring frequency will be monthly for the first year of operation. If the monitoring results show no sign of landfill gas migration, reduce the	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	monitoring frequency to once every six months.						
S12.7	The manholes and utility pits within the Project Site and along the fresh water mains. Each manhole/ utility pit should be monitored with two measurements (at mid depth and base). Each measurement should be monitored for a minimum of 10 minutes. A steady reading and peak reading should be recorded at each manhole/ utility pit and for each measurement. The need for venting the manhole/ utility pit and further monitoring will be reviewed after the initial monitoring.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
S12.7	All construction, operation and maintenance personnel working on-site as well as visitors should be made aware of the hazards of landfill gas and its possible presence on-site. This should be achieved through a combination of posting warning signs in prominent places and also by access to detailed information on landfill gas hazards and the designs and procedural means by which these hazards are being minimised on-site.	All area/ Detailed design/ During construction/ During operation	Contractor(s)	✓	✓	✓	
Hazard to Life							
Annex L of S13	Maximum 37 tonnes chlorine storage quantity (in 1 tonne drum) in the chlorine store	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Annual consumption of chlorine 148 tonnes per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Number of 25 chlorine truck deliveries per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Onsite chlorine transport route - from TKO Area 137 Pier to chlorine store by truck	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Offsite chlorine transport by barge; unloading at TKO Area 137 Pier	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
Annex L of S13	12 barge deliveries of chlorine drums per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Volume of chlorine store should be more than 4200 m3	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Length of overhead crane ~10 m	Ensure the impact of earthquake on chlorine storage as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Chlorine store should be constructed of reinforced concrete frame structure with unreinforced infill masonry walls	Ensure the impact of earthquake on chlorine storage as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Classification of the chlorine store should be Group 1 building with C/D ratio > 1 (= 2.2) in the column shear check and allowable shear stress 0.14 N/mm2 or better performance.	Ensure the impact of earthquake on chlorine storage as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Layout of chlorine drum storage area and main beams should be 300 mm in width (by referring to Figure 1 of Annex E of main EIA report)	Ensure the impact of earthquake on chlorine storage as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	The setback distance between the chlorine building and explosive trucks / TKO Area 137 Pier shall provide sufficient clearance so that the overpressure resulting from explosion of explosive trucks or the explosives offloading operation that reaches the	Ensure negligible impact of an explosive truck explosion or explosion at explosives offloading pier on chlorine storage; To be incorporated	WSD / Contractor(s)	✓	✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	chlorine building is less than 2 psi.	into detailed design, built in construction stage					
Annex L of S13	Separation distance between chlorine store and the site boundary approximately 100m for chlorine gas dispersion.	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13	Concentration of NaOCl solution should be 10-12 % (wt) stored in 25m^3 tanks	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-
Annex L of S13	The number of NaOCl storage tanks is 6. They are separated tanks and are not connected.	Ensure the risk as assessed; To be incorporated into detailed design, built in the construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Number of NaOCl deliveries is 24 deliveries per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Unloading rate of NaOCl/ HCl/ FeCl3/ H2SO4/ citric acid solution to tank should be 10 L/s or less	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-
Annex L of S13	Concentration of HCl solution should be 10 % (wt) stored in 40m^3 tanks	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-
Annex L of S13	Number of HCl storage tanks in chemical building should be 2 separate tanks which are not connected to each other	Ensure the risk as assessed; To be incorporated into detailed design, built in the construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Number of HCl deliveries is 9 tankers per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Concentration of HCl in FeCl3 solution should be approximately 5 % (wt) stored in 190m^3 tanks	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
Annex L of S13	Number of FeCl3 storage tanks in chemical building should be 8 separated tanks which are not connected to each other	Ensure the risk as assessed; To be incorporated into detailed design, built in the construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Number of FeCl3 deliveries is 243 tankers per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Concentration of H2SO4 solution should be approximately 98 % (wt) stored in 62m^3 tanks	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-
Annex L of S13	Number of H2SO4 storage tanks in chemical building should be 4 separated tanks which are not connected to each other	Ensure the risk as assessed; To be incorporated into detailed design, built in the construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Number of H2SO4 deliveries is 42 tankers per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Concentration of citric acid solution should be approximately 50 % (wt) stored in a 8m^3	Ensure the risk as assessed; To be incorporated into detailed design, implemented in operation stage	WSD / Contractors(s)	✓		✓	-
Annex L of S13	Number of citric acid storage tank in chemical building should be 1	Ensure the risk as assessed; To be incorporated into detailed design, built in the construction stage	WSD / Contractor(s)	✓	✓		-
Annex L of S13	Number of citric acid deliveries is 4 tankers per year	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Safety measures in placed to avoid right product delivered into the wrong tank, e.g. - hoses and couplers for transferring of NaOCl, H2SO4, HCl, FeCl3, H2SO4 and C6H8O7 are different in size to avoid connecting road tankers of incompatible chemicals to corresponding storage tanks	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage, implemented in operation stage	WSD / Contractors(s)	✓	✓	✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	- Warning signs will be displayed at the inlet of each storage tank to show chemical name and to warn the potential hazards of mixing incompatible chemicals. - NaOCl will be delivered by barges. Dedicated chemical feedline with connection points will be used for transferring NaOCl from barges to storage bulk tanks. HCl, FeCl3, H2SO4 and C6H8O7 will be delivered by road tankers. No other chemicals will be delivered with NaOCl by the same barge at the same time. - HCl, FeCl3, H2SO4 and C6H8O7 will be stored in double containment tanks. - HCl, FeCl3, H2SO4 and C6H8O7 flowing outside of the chemical building will be collected by road side drains. Moreover, road humps will help to prevent acids moving towards the NaOCl storage area. - Perimeter drain will be installed surrounding the NaOCl bund to collect spill from overtopping. Temporary storage tank will be connected to the drainage system for the NaOCl storage area to prevent from mixing with HCl / FeCl3 / H2SO4 / C6H8O7 or discharging directly to the sea. - NaOCl facilities are located 290 m far away from the chemical building.						
Annex L of S13	Maximum number of CO2 storage tank should be 16 units	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13	Type of storage tank is vacuum insulated type	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13	Maximum storage tank capacity should be 100 tonnes	Ensure the risk as assessed; To	WSD / Contractors(s)	✓	✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
	per tank	be incorporated into detailed design, built in construction stage					
Annex L of S13	Ambient type vaporizer should be used	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13	CO2 to be delivered by road tankers	Ensure the risk as assessed; To be implemented in operation stage	WSD / Contractors(s)			✓	-
Annex L of S13	Set back the CO2 storage with sufficient clearance so that the overpressure resulting from explosion of explosive vehicle during offsite transport or the explosives offloading operation that reaches the storage is less than 2 psi.	Explosion of an explosive truck or at explosives offloading pier does not cause failure of CO2 storage tanks; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13	Minimum separation distance between CO2 storage area and the site boundary should be approximately 100m	Ensure onsite CO2 storage facilities do not cause offsite impacts; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
Annex L of S13, S13.5.4	Safety measures to be incorporated into the design of CO2 storage tanks - Vacuum insulated, double containment - 2 sets of pressure relief valves (PRVs) on inner containment. The 2 sets of PRVs are connected by a switchover valve. Each set consists of 2 PRVs. - Plate pressure relief device on outer containment (considered on storage tanks only) - Trycock for overfilling alarm and warning - High level alarm to operating staff at control room for liquid level monitoring and warning.	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
S13.5.5	The pressure relief valves system will be designed to avoid the common mode failure such that the risk of common mode failure is negligible.	Ensure the risk as assessed; To be incorporated into detailed design, built in construction stage	WSD / Contractors(s)	✓	✓		-
S13.5.8	Design of turning angle for access road within the desalination plant should cater for 40 feet container trailer to avoid reverse manoeuvring or impact to buildings / structures in cornering.	Safety onsite transport of CO2. To be incorporated into detailed design, built in construction stage and implemented in operation stage	WSD / Contractor(s)	✓	✓	✓	-
S13.5.8	Telemetry monitoring system should be installed to alert the content level in the control room for additional safety.	Safety onsite storage of CO2. To be incorporated into detailed design, built in construction stage and implemented in operation stage	WSD / Contractor(s)	✓	✓	✓	-
S13.5.8	The storage area should be divided into a number of compartments to protect storage tanks from fire or pipeline / valve failure.	Protection on onsite storage of CO2. To be incorporated into detailed design, built in construction stage and implemented in operation stage	WSD / Contractor(s)	✓	✓	✓	-
S13.5.8	When leakage of an inner / outer tank occurs, a transfer pump should be used to remove CO2 content to other storage tanks as soon as possible. In case of emergency, venting should be carried out to ensure integrity of the storage tank.	Safety storage of CO2. To be implemented in operation stage	WSD / Contractors(s)			✓	-
S13.5.8	CO2 / O2 sensor should be installed for indoor environment with CO2 facilities or pipelines.	Safety onsite storage and use of CO2. To be incorporated into detailed design, built in construction stage and implemented in operation stage	WSD / Contractor(s)	✓	✓	✓	-
S13.5.8	Mechanical ventilation should be provided for indoor environment with CO2 facilities.	Safety onsite storage and use of CO2. To be incorporated into detailed design, built in construction stage and implemented in operation stage	WSD / Contractor(s)	✓	✓	✓	-
S13.5.8	Venting should be undertaken outdoor.	Safety operation of CO2	WSD / Contractors(s)	✓	✓	✓	-

EIA Reference	Recommended Environmental Protection Measures/ Mitigation Measures	Objectives of the recommended measures & main concerns to address	Implementation Agent	Implementation Stage			Relevant Legislation & Guidelines
				D	C	O	
		facilities. To be incorporated into detailed design, built in construction stage and implemented in operation stage					
S13.5.8	To enhance the safety operation of the facility, the inspection frequency of CO2 storage tanks should be twice per year.	Safety operation of CO2 storage. To be implemented in operation stage	WSD / Contractors(s)			✓	-

Annex B

Proforma for EM&A Programme

Water Quality Monitoring Data Log Sheet **Date:** ____________________ **Tide:** Mid-ebb / Mid-flood

Monitoring Station	Weather Condition	Sea Condition**	Sampling Time	Depth (m)		Current Velocity (m/s)	Direction	Temperature (°C)		Salinity (ppt)		pH		DO Saturation (%)		Dissolved Oxygen (mg/L)			Turbidity(NTU)			Suspended Solids (mg/L)		
								Value	Average	Value	Average	Value	Average	Value	Average	Value	Average	DA*	Value	Average	DA*		Average	DA*

Remark: * DA: Depth-Averaged
**** Calm: Small or no wave; Moderate: Between calm and rough; Rough: White capped or rougher**
***** Results of Suspended Solids refer to separate datasheet**

Data Sheet for Thermal Oxidizer / Landfill Gas Flare Monitoring

Monitoring Location	
Details of Location	
Sampler Identification	
Date & Time of Sampling	

Parameter	Value
NO_2	
CO	
Benzene	
Vinyl chloride	
Ammonia	

	Name & Designation	Signature	Date
Field Operator:			
Laboratory Staff:			
Checked by:			

Noise Monitoring Field Data 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))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

Name & Designation Signature Date

Recorded by:

Checked by:

Landfill Gas Monitoring –Field Measurement Recording Sheet

Name of site:
Date of measurement:

Sampling equipment used:	Dates calibrated

Sample location	Date of measurement	Sampling time	Monitoring wells / Surface Gas Emission						
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark

Name & Designation Signature Date

Field Operator:

Laboratory Staff:

Checked by:

Landfill Gas Monitoring – Permanent Gas Detection System Field Data Sheet of Alarm System Activation

Date	
Time	
Building	
Detector Head No.	
Fault	
Methane Concentration	
Action Taken	

Name & Designation Signature Date

Field Operator:

Laboratory Staff:

Checked by:

Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incidental Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time and Tidal status if relevant	
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: _____

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:

Implementation Status Proforma

Ref:

Ref**	Environmental Protection Measures*	Implementation Status

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

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

Signed by Environmental Team Leader:

Audited by Independent Environmental Checker:

Date:

Date:

Regulatory Compliance Proforma

Ref:

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

* Name of Applicant, Business Corporation, relevant regulation and remark of license/permit conditions

** File reference of the license/permittee

Recorded by Environmental Team Leader:

Audited by Independent Environmental Checker:

Date:

Date:

Annex C

Silt Curtain Efficiency Test Plan

CONTENTS

1 SILT CURTAIN EFFICIENCY TEST PLAN

1.1 INTRODUCTION

It is recommended in the water quality impact assessment of the EIA that the combined use of single layer of floating type silt curtain and a cage type silt curtain should be adopted for the dredging at the proposed seawater intake to control the dispersion of sediment for the protection of the coral communities at Kwun Tsai and Tit Cham Chau. A pilot test for silt removal efficiency of silt curtain (the "Pilot Tests") is recommended on the first two days of dredging at the proposed seawater intake to ensure sufficient silt removal efficiency can be provided by the proposed silt curtain system. This *Test Plan* presents a proposed plan of the Pilot Tests.

The aim of this test plan is to stipulate how the Pilot Test should be arranged to ensure feasibility while fulfilling the need for determining the silt removal efficiency of the proposed silt curtain system. Since this test plan is prepared based on the latest available information when the EIA is prepared, the test plan may be subject to further update and revision when final construction details and schedule become available.

1.2 MONITORING REQUIREMENT

Based on the latest details for construction, the dredging at submarine outfall would be conducted at a rate of 750 m^3/day, with the combined use of single layer of floating type silt curtain and a cage type silt curtain. The amount of sediment to be removed at the seawater intake is only 1,740 m^3/day. This means the dredging at seawater intake would be completed in 3 days at the proposed maximum rate of dredging. In view of the relatively short period of dredging at seawater intake, a smaller scale of the Pilot Test is recommended for this Project. Details for the Pilot Test are summarized of below in Table 1.1.

Table 1.1 Details for Pilot Test

Item	Details
No. of Dredger	One, equipped with close grab
Dredging Rate	750 m^3/day (62. M^3/hr)
Silt Curtain Arrangement	A single layer of floating type silt curtain should be deployed to enclose the whole or part of the dredging extent at the seawater intake. A cage type silt curtain should be deployed to enclose the small area where the close grab is working.
No. of Monitoring Stations	Five (refer to Figure 1.1 and Figure 1.2 for location)
No. of Monitoring Event	Seven. One proposed baseline monitoring event right before the dredging at the seawater intake commence. Six proposed impact monitoring event throughout the first day of dredging at the seawater intake at 2-hour interval.
No. of Sample to be taken per Monitoring Station	Six. Two replicates at each of the three water depths at each monitoring station.

Figure 1.1 Pilot Test Monitoring Stations

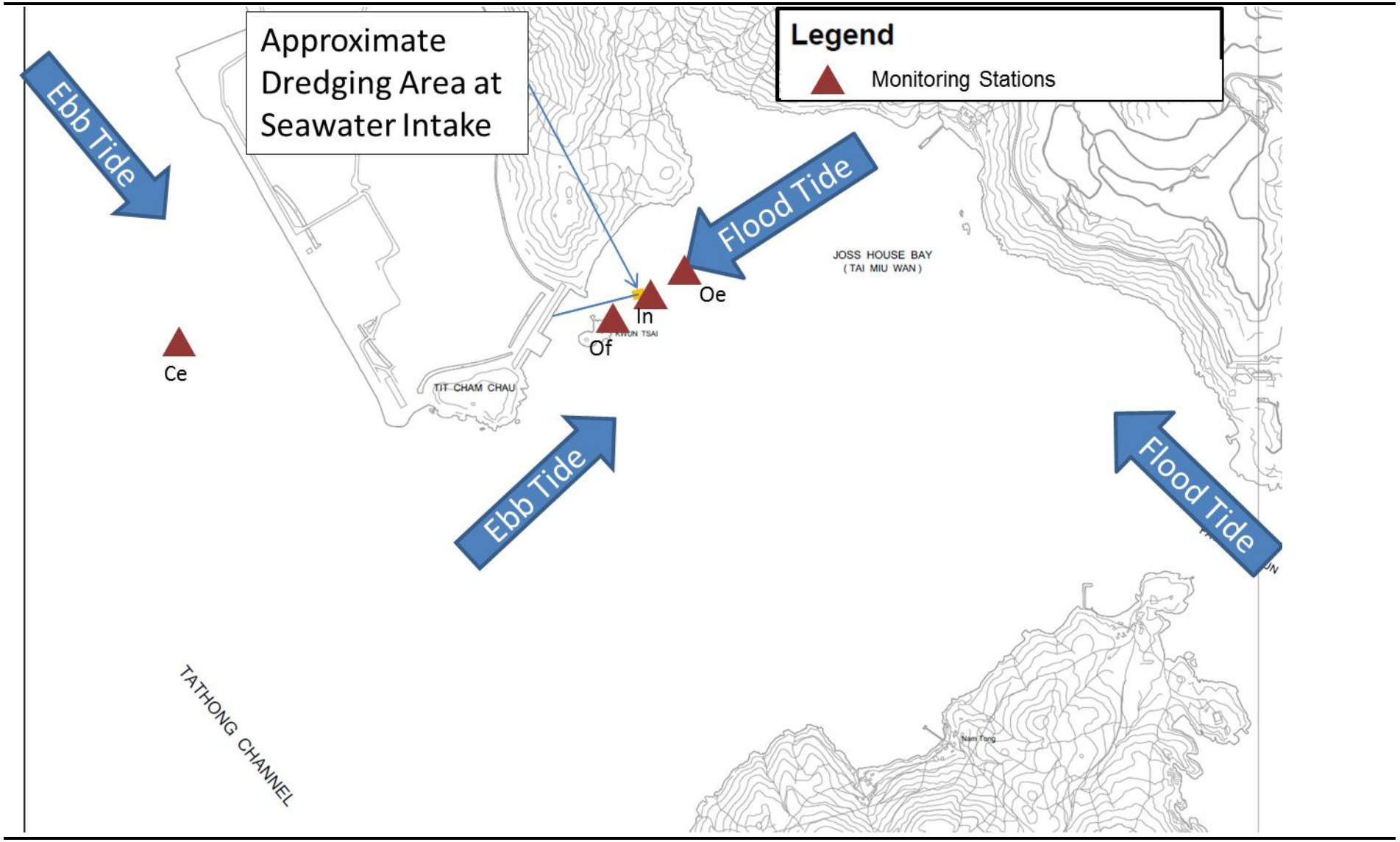
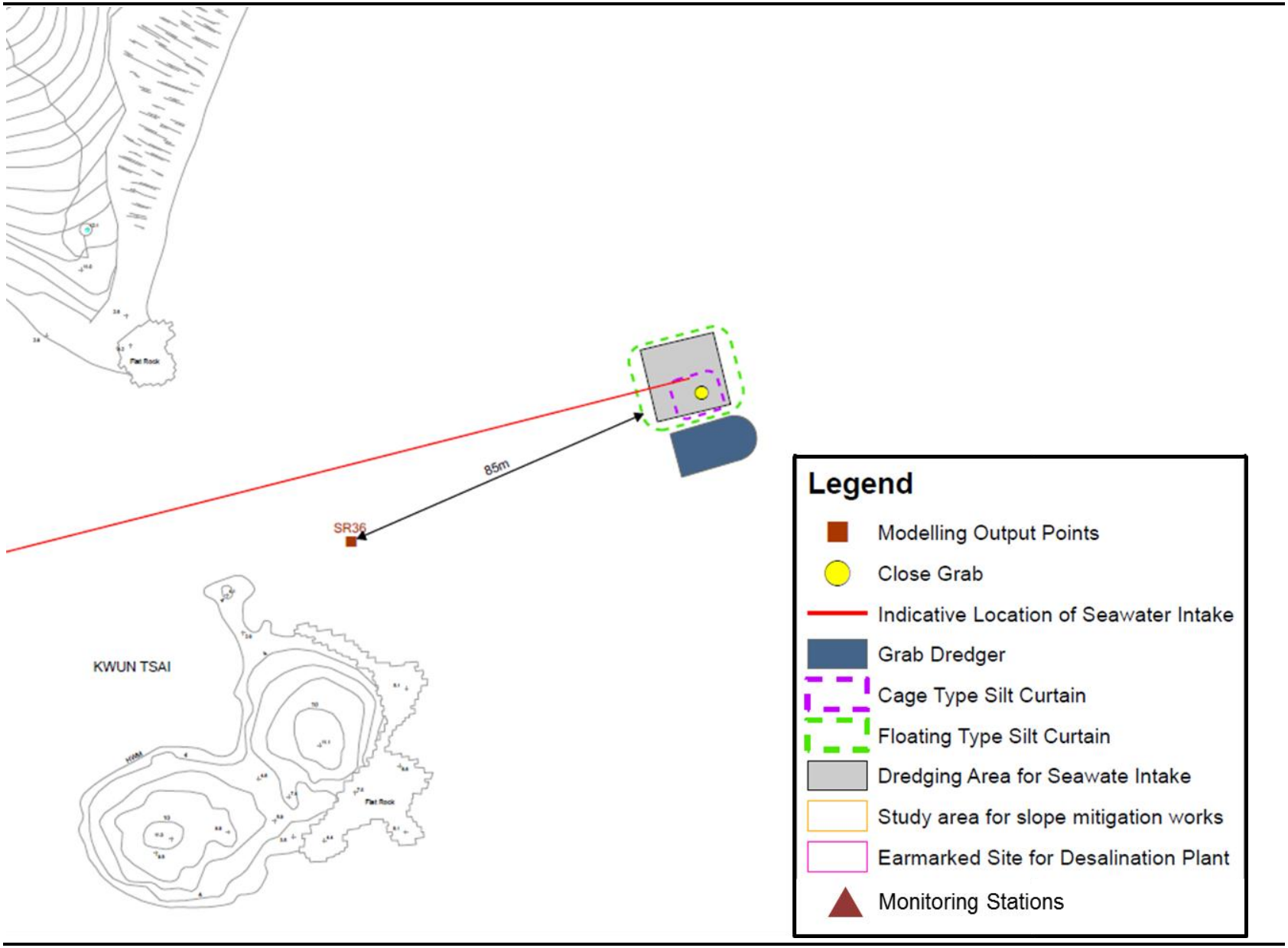


Figure 1.2 Pilot Test Monitoring Stations (Close up to the Seawater Intake)



1.2.1 Monitoring Locations

The monitoring locations were determined based upon the locations of the dredging activities under the Project. Three sets of monitoring stations will be arranged, comprising both Impact zone and Outer zone of the silt curtain as well as upstream Control Stations for impact water quality monitoring. The proposed locations of the monitoring stations for the Pilot Tests are illustrated in *Figure 1.1*, *Figure 1.2* and detailed in *Table 1.2*.

Table 1.2 Monitoring Stations for Pilot Tests of Silt Curtain Efficiency

Monitoring Stations	Description	Easting	Northing
In	Impact zone – area enclosed by both layers of silt curtains	846960	814130
Oe	Outer zone – downstream location of ebb tide at approximately 100 m from the dredging area, which is also close to the nearest coral site at Kwun Tsai	847030	814200
Of	Outer zone – downstream location at approximately 100 m from the dredging area	846890	814060
Ce	Upstream control station during ebb tide	845800	814110
Cf	Upstream control station during flood tide	848910	813340

The Impact zone station is defined as the active dredging area enclosed by the cage-type silt curtain, whilst the Outer zone stations are defined as at a distance approximately 100 m downstream to the dredging area. The actual locations of these stations will be determined on site based on the location of the dredging activities. Since station In is located at the immediate vicinity of the active dredging area within the cage-type silt curtain, its location may vary due to safety consideration and progress of dredging works. The actual location of monitoring stations will be updated in the monitoring report of the Pilot Tests for any discrepancy from the proposed.

The loss reduction factor between impact and outer zones of deployed silt curtain will be evaluated for the respective scenario (see *Section 1.2.8*).

1.2.2 Monitoring Parameters

The parameters that have been selected for measurement *in situ* and in the laboratory are those recommended in the EIA report that could be affected by the dredging at seawater intake (i.e. suspended solids and turbidity) and other general water quality parameters (i.e. dissolved oxygen, salinity and temperature). Suspended solid will be measured in the laboratory for silt curtain efficiency evaluation.

In addition to the water quality parameters, other relevant data will also be measured and recorded in Water Quality Monitoring Logs, including the location of the sampling stations, water depth, time, weather conditions, sea

conditions, tidal stage, current direction and velocity, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results.

1.2.3 Monitoring Equipment

For water quality monitoring, the following equipment will be used:

- ***Dissolved Oxygen and Temperature Measuring Equipment*** - The instrument will be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and will be operable from a DC power source. It will be capable of measuring: dissolved oxygen levels in the range of 0 - 20 mg L^{-1} and 0 - 200% saturation; and a temperature of 0 - 45 degrees Celsius. It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary (e.g. YSI model 59 DO meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

- ***Turbidity Measurement Equipment*** - The instrument will be a portable, weatherproof turbidity-measuring unit complete with at least 35m cable in length, sensor and comprehensive operation manuals. The equipment will be operated from a DC power source, it will have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example Hach 2100P or an approved similar instrument).

- ***Salinity Measurement Instrument*** - A portable salinometer capable of measuring salinity in the range of 0 - 40 ppt will be provided for measuring salinity of the water at each monitoring location.

- ***Water Depth Gauge*** – A portable, battery-operated echo sounder (e.g. Seafarer 700 or a similar approved instrument) will be used for the determination of water depth at each designated monitoring station. This unit will either be hand-held or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring period.

- ***Current Velocity and Direction*** – A current meter capable of measuring the velocity and direction of flow in the range of 0 – 6 m/s (± 0.01 m/s) and 0° to 360° (± 2°), respectively, will be used (e.g. Falmouth Scientific, Inc. 2-Dimensional Acoustic Current Meter or a similar approved instrument). The specification is provided in *Annex B*.

- ***Positioning Device*** – A Differential Global Positioning System (DGPS) shall be used during monitoring to allow accurate recording of the position of the monitoring vessel before taking measurements. The DGPS should be suitably calibrated at appropriate checkpoint to verify

that the monitoring station is at the correct position before the water quality monitoring commence.

- ***Water Sampling Equipment*** - A water sampler, consisting of a PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, will be used (e.g. Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler will have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

Prior to the Pilot Tests, the valid calibration certificates of the monitoring equipment to be used *in situ* will be provided to the RSS, the Contractor(s), and IEC for agreement. All valid calibration certificates will be attached to the monitoring report. Examples of calibration certificates are shown in *Annex A*.

1.2.4 Sampling / Testing Protocols

All *in situ* monitoring instruments will be checked, calibrated and certified by a laboratory accredited under HOKLAS (1) or any other international accreditation scheme before use. Responses of sensors and electrodes will be checked with certified standard solutions before each use.

On-site calibration of field equipment shall follow the "*Guide to On-Site Test Methods for the Analysis of Waters*", BS 1427: 2009. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

1.2.5 Laboratory Measurement and Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory (2). Water samples of about 1,000 mL shall be collected at the monitoring and control stations for carrying out the laboratory analyses. Water samples for SS measurements will be collected in high density polythene bottles, packed in ice (cooled to 4° C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

The determination work shall start within the next working day after collection of the water samples. The SS laboratory measurements shall be provided to the client within 7 working days upon the receipt of the samples. The analyses shall follow the standard methods as described in APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, unless otherwise specified (APHA 2540D for SS) with a detection limit of 0.5 mg L^{-1}.

(1) The laboratory will be contracted before commencement of the monitoring.
(2) The laboratory will be contracted before commencement of the monitoring.

The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc.), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme.

1.2.6 Monitoring Frequency & Arrangements

Monitoring will be conducted at all designated stations on the first day of dredging at seawater intake. The monitoring will be conducted at an interval of two hour throughout the first day. A total of 7 sampling event will be conducted. The first monitoring event should be conducted right before the dredging event to serve as a baseline condition.

The tentative monitoring schedule is presented in *Table 1.5*.

Table 1.3 Tentative Monitoring Schedule of Background Monitoring and Pilot Tests for Dredging

Time	Monitoring	Monitoring stations	Quantities	Duration
07:00	Baseline Monitoring	In, Ce, Oe, Cf, Of	Σ n = 2 replicates x 3 depths x 5 stations = 30	Prior to Pilot Tests when no dredging works is carried out under this Project
09:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event
11:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event
13:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event
15:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event
17:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event
19:00	Impact Monitoring	In, Ce, Oe, or In, Cf, Of *	Σ n = 2 replicates x 3 depths x 3 stations = 18	After 2 hours from the previous sampling event

* Only monitoring stations at the corresponding tide would be required. For instance, only the impact station (In), control stations for ebb tide (Ce) and outer station for ebb tide (Oe) would be required for an ebb tide condition.

Baseline Monitoring

Baseline monitoring will be conducted at all monitoring stations right before the commencement of the dredging on the first day of dredging at the seawater intake. The baseline monitoring is to investigate whether the change in the ambient environmental condition irrespective to any dredging works take place under this Project.

Pilot Tests

Upon dredging commenced, water samples for SS laboratory analysis will be collected with the *in situ* parameters measurements at Control, Outer zone and Impact zone Stations. Per each monitoring event, the *in situ* measurements and SS sampling will be conducted for every two hour (time = hr-2, hr-4 until hr-12) throughout the first day of dredging at the seawater intake.

1.2.7 Sampling Depths & Replication

Each station will be sampled and measurements will be taken at three depth, 1 m below sea surface, mid-depth and 1 m above the seabed. Duplicate (2) readings of the *in situ* measurements and duplicate (2) SS samples will be made at each water depth at each station. For stations that are less than 3 m in depth, only the mid depth sample will be taken. For stations that are less than 6 m in depth, the mid-depth station will be omitted.

As the QA/QC procedures for the *in-situ* measurement of DO and Turbidity, where the difference in value between the first and subsequent measurements at a certain depth is more than 25% of the value of the first measurement, the measurements should be discarded and further measurements should be taken to confirm the values.

Safety is the highest priority during sampling works and it will cease should conditions warrant ensuring the safety of the staff.

1.2.8 Loss Reduction Factor and Water Quality Compliance

The efficiency of the silt curtains will be evaluated against the relevant loss reduction factor for suspended solids (*Tables 1.7 & 1.8*) stipulated in *Section 5.8* of the *Updated EM&A Manual*, with reference to the approved EIA of TM-CLKL (*Table 20* in A*ppendix D5a*).

Table 1.4 Loss Reduction Factor of Silt-removal Efficiency for Dredging

Parameter	Loss Reduction Factor	Loss Reduction Criteria
Suspended Solids (SS) in mg/L (Depth-averaged [a])	100* [(SS (in) - SS (out)) / SS (in)] [b]	Loss reduction factor ≥ **95**%

Notes:

a. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

b. (out): represents mean measurement of the parameter at Outer zone of dredging works during the same tidal cycle
(in): represents mean measurement of the parameter at Impact zone of dredging works during the same tidal cycle

1.3 MONITORING RESULTS

In respect to the construction phase EM&A marine works, the ET will prepare and submit the monitoring results of the Pilot Tests for Silt Curtain Efficiency within 30 working days following the completion of the monitoring. Copies of the monitoring results of the Pilot Tests for Silt Curtain Efficiency will be submitted to the following: the Contractor(s), the RSS, the IEC and the EPD as appropriate. The ET will liaise with the relevant parties on the exact number of copies required.

1.4 EVENT & ACTION PLAN

This Pilot Test would be conducted in parallel to the construction phase water quality monitoring and audit by ET separately. The results of water quality monitoring and audit should be the only determinant for Action and Limit Levels stipulated in the EM&A Manual because the monitoring stations do not represent the proposed monitoring station in the EM&A Manual.