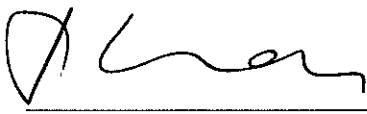


Drainage Services Department

Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O

Environmental Monitoring and Audit Manual (Version 2.2)

<p>Certified By </p> <p>(Project Director)</p>

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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1 INTRODUCTION

1.1 Background

- 1.1.1 The proposed sewerage works in Po Toi O is an environmental enhancement project that aims to improve environmental hygiene of the Po Toi O area.
- 1.1.2 Po Toi O is located in the southern part of Sai Kung District, next to Clear Water Bay. There is a small settlement called Po Toi O village around the bay. There is currently no public sewerage system for the village. Sewage and wastewater generated by local residents and local restaurants are treated by septic tanks/soakaway system (STS).
- 1.1.3 Provision of proper sewerage system to unsewered villages is a general government policy. Without centralized public sewage treatment facility, villagers have to regularly desludge the STS to maintain the cleaning performance and to avoid overflow of sewage. However, the desludging process may bring along potential hygiene and associated odour issues. Under the Port Shelter Sewerage Master Plan (SMP), Drainage Services Department (DSD) has proposed sewerage works at Po Toi. In addition to improving local hygiene conditions and removing associated odour problem, the provision of sewerage is a preventive measure to avoid potential environmental problems due to insufficient desludging or structural defect of the STS. This can also relieve villagers' burden to maintain their STS (e.g. desludging).
- 1.1.4 The proposed sewerage works at Po Toi O comprise sewage collection, treatment and disposal facilities at Po Toi O under Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O (hereinafter referred to as “the Project”). The location and details of the facilities are illustrated in **Figure 1-1**.
- 1.1.5 **Cinotech Consultants Ltd. (Cinotech)** has been commissioned by DSD in January 2014 to conduct an environmental impact assessment for the Project in order to investigate the environmental acceptability during construction and operation of the proposed sewerage works. **Black & Veatch Hong Kong Limited** (hereafter called “the Engineer”) is the consulting engineer employed by DSD to design the proposed sewerage facilities in this Project, among other tasks. **Urbis Limited** and **LWK & Partners (HK) Limited** provided expert input in landscape and visual impact and built heritage impact assessments respectively.

1.2 Project Descriptions

- 1.2.1 The Project mainly comprises the following works:
- Provision of village sewerage to the unsewered areas of Po Toi O. The works involve construction of about 800m of gravity sewers and 400m of rising mains;
 - Construction of a local sewage treatment plant (STP) with Average Dry Weather Flow (ADWF) of about 139m³/day; and
 - Construction of a submarine outfall of about 385m in length.

1.2.2 The Project consists of the following designated projects under Part I, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO):

- Item Q.1 – A sewage treatment plant and portion of sewer alignments in a conservation area;
- Item C.12 (a) (v) and (vii) – A dredging operation which is less than 500m from the nearest boundary of an existing fish culture zone and coastal protection area; and
- Item F.6 – A submarine sewage outfall.

1.3 Project Programme

1.3.1 The construction works for this Project are expected to commence in mid-2017 and complete in 2021 with one more year for defect correction.

1.4 Purpose of this Environmental Monitoring and Audit (EM&A) Manual

1.4.1 The purpose of this EM&A Manual (hereafter called the “Manual”) is to guide the establishment of an EM&A programme to assure compliance with the standards and predictions in the EIA study involving the construction and operation of Po Toi O Sewage Treatment Works (PTOSTW). The environmental performance will be regularly monitored and audited for evaluating the effectiveness of the recommended mitigation measures and to investigate any further need for additional mitigation measures or remedial action.

1.4.2 This EM&A Manual is prepared based on the findings and recommendations in the EIA and with reference to the requirements stipulated in Annex 21 Technical Memorandum under the Environmental Impact Assessment Ordinance (EIAO-TM):

- (i) To propose EM&A programme to monitor the environmental performance of the project
- (ii) To check the implementation status of mitigation measures to minimize construction and operational impacts on the environment
- (iii) To identify the need for additional mitigation measures
- (iv) To advise the responsibilities of different parties involved in the project and communication flow among them
- (v) To detail monitoring requirements (locations, environmental parameters, frequency, duration) before and during the construction period and in the operational period
- (vi) To propose monitoring equipment required and quality assurance
- (vii) To determine action and limit levels of each environmental parameter based on the legislative criteria and standards for compliance checking
- (viii) To set up event and action plans for remedial actions if exceedance of compliance is identified

- (ix) To devise procedures for handling complaint/consultation
- (x) To detail reporting requirement

1.5 Structure of EM&A Manual

1.5.1 This EM&A Manual comprises the following Chapters:

- Ch.1 Introduction
- Ch. 2 Project Organization
- Ch. 3 Air Quality
- Ch. 4 Noise
- Ch. 5 Water Quality
- Ch. 6 Terrestrial Ecology
- Ch. 7 Marine Ecology
- Ch. 8 Fisheries
- Ch. 9 Waste Management and Land Contamination
- Ch. 10 Landscape and Visual
- Ch. 11 Built Heritage
- Ch. 12 Site Environmental Audit
- Ch. 13 Reporting
- Ch. 14 Conclusion

2 PROJECT ORGANIZATION

2.1 Introduction

- 2.1.1 The implementation of the recommended EM&A programme requires participation of relevant parties in a correlative and collaborative manner. The project organization and lines of communication with respect to the recommended EM&A works are shown in **Figure 2-1**. The roles and responsibilities of the key EM&A programme participants involved are described in the following sections.

2.2 Project Proponent

- 2.2.1 The Project Proponent (Drainage Services Department) shall employ the Independent Environmental Checker (IEC) to audit and check the EM&A works carried out by the Environmental Team (ET).

2.3 The Contractor

- 2.3.1 The Contractor implies all construction contractors and sub-contractors working on the Project Site (within work boundary demarcated in **Figure 1-1**). He should:
- (i) Engage the ET to carry out EM&A works
 - (ii) Notify the ET the construction activities that may have environmental concern
 - (iii) Participate in the site inspection carried out by the ET and to rectify any environmental deficiency identified
 - (iv) Propose and implement necessary measures to mitigate any exceedance in Action/Limit Levels recorded in accordance to the Event/Action Plans
 - (v) Investigate complaints according to the agreed procedures

2.4 Engineer's Representatives (ER)

- 2.4.1 The ER shall be responsible to oversee the construction work of all contractors to ensure that the contract specifications are met. He should:
- (i) Supervise the Contractor's activities to ensure that they comply with the requirements in the EIA, EM&A Manual, Environmental Permit (EP) and the contract specifications
 - (ii) Follow the agreed procedures in the Event/Action Plan in case of any exceedance and instruct the Contractor to carry out remedial actions
 - (iii) Participate in joint site inspections and audits undertaken by the ET
 - (iv) Investigate complaints according to the agreed procedures and instruct the Contractor to follow up

- (v) Assist the ET in implementation of EM&A programme when required

2.5 Independent Environmental Checker (IEC)

2.5.1 The IEC shall be appointed by the Project Proponent to audit and verify the EM&A works carried out by the ET and to oversee the environmental performance of the Project site. He shall not have any association with the Contractor, ER or ET. The IEC should possess at least 7 years of experience in EM&A. The IEC should:

- (i) Review and verify EM&A Reports and submissions for EP prepared by the ET and advise for improvement
- (ii) Audit and confirm the validity and accuracy of monitoring activities and results. He may carry out random sample check and audit on monitoring data and sampling procedures, etc
- (iii) Audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site
- (iv) Review the implementation status and effectiveness of mitigation measures onsite and ensure that they are carried out properly
- (v) Conduct monthly and ad-hoc site inspections
- (vi) Investigate complaints according to the agreed procedures
- (vii) Review the proposal of mitigation measures by the Contractor in an event of exceedance according to the Event/Action Plan

2.6 Environmental Team (ET)

2.6.1 The ET shall be led and managed by the ET Leader. The ET Leader shall be an independent party from the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to the approval of the Engineer's Representative (ER). The ET Leader shall possess at least 7 years of experience in EM&A and/or environmental management. The ET should carry out the EM&A programme and to check the Contractor's compliance with the environmental protection requirements in the EIA, EM&A Manual and EP. The ET should:

- (i) Set up monitoring stations to carry out monitoring works, statistical analysis and compliance checking against legislative standard and guidelines
- (ii) Repeat field measurement in case of exceedance and propose mitigation measures for improvement
- (iii) Conduct weekly and ad-hoc site inspections to audit the Contractor's site practice on pollution prevention and the effectiveness and adequacy of mitigation measures
- (iv) Advise the Contractor rectification work required when environmental

deficiency is identified

- (v) Prepare monthly and quarterly EM&A reports to summarise environmental performance and to anticipate future key issues
- (vi) Review and comment on work schedule and methodology as necessary
- (vii) Support the Contractor for submissions required under the EP
- (viii) Investigate complaints and propose corrective measures according to the agreed procedures
- (ix) Liaise with the IEC on environmental performance matters and timely submission of all EM&A proforma for IEC's approval

2.6.2 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 the Director of Environmental Protection (DEP) or his authorised officers.

3 AIR QUALITY

3.1 Introduction

- 3.1.1 Major air quality impact in construction phase would arise from excavation of slope at the proposed sewage treatment plant. With implementation of dust suppression measures, it is anticipated that the dust impact would be acceptable. Regular air quality monitoring should be conducted at representative ASRs to ensure that relevant air quality standard can be met.
- 3.1.2 During the operational phase of the Project, odour will be generated from the operation of the proposed sewage treatment plant. With enclosure of odour sources underground, deodourization before exhaust into the atmosphere and adoption of enclosed container during transportation, odour impact is expected to be acceptable. According to the modelled results in the EIA Report, the odour levels at representative ASRs are far below the EIAO TM assessment criterion. Therefore, operational phase air quality monitoring is considered unnecessary.
- 3.1.3 This section outlines the requirements, methodology, equipment and locations for monitoring air quality impacts during the construction phase of the Po Toi O STW.

3.2 Monitoring Parameters

- 3.2.1 The ET shall evaluate the construction air quality impact by conducting 1-hour and 24-hour Total Suspended Particulates (TSP) measurements.

3.3 Monitoring Equipment

- 3.3.1 1-hour and 24-hour TSP levels will be measured in accordance to the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix A.
- 3.3.2 Other than using high volume sampler, 1-hour TSP levels can be measured alternatively by direct reading from portable dust meters upon approval from ER. The meters should be capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

3.4 Monitoring Requirements

High Volume Sampler

- 3.4.1 The ET shall provide sufficient number of high volume samplers (HVSs) for measurement at different ASRs during each monitoring. The HVSs shall comply with the following specifications for carrying out the 1-hour and 24-hour TSP monitoring:
- (a) 0.6 - 1.7 m³ per minute adjustable flow range;

- (b) equipped with a timing / control device with +/- 5 minutes accuracy for 24 hours operation;
 - (c) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
 - (d) capable of providing a minimum exposed area of 406 cm²;
 - (e) flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
 - (f) equipped with a shelter to protect the filter and sampler;
 - (g) incorporated with an electronic mass flow rate controller or other equivalent devices;
 - (h) equipped with a flow recorder for continuous monitoring;
 - (i) provided with a peaked roof inlet;
 - (j) incorporated with a manometer;
 - (k) able to hold and seal the filter paper to the sampler housing at horizontal position;
 - (l) equipped with easily changeable filter; and
 - (m) capable of operating continuously for a 24-hour period.
- 3.4.2 Clearly labelled calibration kit and filter papers shall also be provided. The HVSs should be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals.
- 3.4.3 Calibration should first be conducted after installing the HVSs and repeated on bi-monthly basis. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The concern parties such as IEC shall properly document the calibration data for future reference. All the data should be converted into standard temperature and pressure condition.
- 3.4.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet in **Appendix B**.

Direct Reading Meter

- 3.4.5 If the ET prefers to adopt direct reading method for 1-hour TSP, he should provide adequate support to the IEC for verifying the capacity of the meter as with the HVSs in obtaining comparable measurements. The meter shall be calibrated at regular intervals in accordance to the specification in the manufacturer's manual. The calibration certificates shall be available to the IEC for checking upon request. The validity and accuracy of the meter shall also be tested against the results by the HVS periodically. Sample data sheet is available in **Appendix B**.

Collection of Wind Data

- 3.4.6 For recording wind speed and wind direction, the ET shall install wind data monitoring equipment near the dust monitoring locations. The installation location shall be proposed by the ET and agreed with the IEC. The installation and operation of the equipment shall meet the following criteria:
- (a) The wind sensors should be installed 10 m above ground so that they are clear of obstructions or turbulence caused by buildings.
 - (b) The wind data should be captured by a data logger. The data shall be downloaded for analysis at least once a month.
 - (c) The wind data monitoring equipment should be re-calibrated at least once every six months.
 - (d) Wind direction should be divided into 16 sectors of 22.5 degrees each.
- 3.4.7 If agreed by the ER and the IEC, the ET may obtain wind data using alternative method.

Laboratory Testing

- 3.4.8 Filter paper to be placed in the HVSSs should have a size of 8" x 10" and be labelled before sampling. It should be clean without pinholes, and be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.
- 3.4.9 After air is passed through the HVSSs, the filter paper inside will be loaded with dust. It shall be collected inside a clean and tightly sealed plastic bag for transporting to a laboratory. It shall be reconditioned in the humidity-controlled chamber followed by accurate weighing by an electronic balance with accuracy up to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 3.4.10 All samples should be kept in good condition for 6 months before disposal.
- 3.4.11 The testing laboratory should be HOKLAS accredited. It should be clean and can maintain a stable temperature and humidity. Measuring and conditioning instruments should be available for handling the dust samples. It should be able to carry out result analysis, equipment calibration and maintenance.
- 3.4.12 If a site or non-HOKLAS laboratory will be responsible for conducting the testing, the laboratory equipment shall be approved by the ER and the measurement procedures shall be witnessed by the IEC. Any measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC. The IEC shall regularly audit the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix A for his reference.

3.5 Monitoring Location

3.5.1 Four representative Air Quality Monitoring stations (AMSs) are proposed as follows:

Table 3.1 Proposed Dust Monitoring Stations

Monitoring Stations	Location
AMS1	Po Toi O Tsuen Road, House No. 28
AMS2	In front of Hung Shing Temple
AMS3	Temporary Structure (House) near Rocky Shore
AMS4	Fairway Vista

3.5.2 The location of the stations can be found in **Figure 3-1**.

3.5.3 The status and locations of dust sensitive receivers may change after issuing this manual. In this case, the ET Leader shall propose alternative monitoring locations taken into account the following considerations and seek approval from the ER and the IEC:

- (a) locate at the work boundary or such locations close to the major dust emission source;
- (b) locate close to the sensitive receivers; and
- (c) take into account the prevailing meteorological conditions.

3.6 Placement of Equipment

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

- (a) a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- (b) no two samplers should be placed less than 2 meters apart;
- (c) the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- (d) a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- (e) a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- (f) no furnace or incinerator flue is nearby;

- (g) airflow around the sampler is unrestricted;
- (h) the sampler is more than 20 meters from the dripline;
- (i) any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- (j) permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- (k) a secured supply of electricity is needed to operate the samplers.

3.7 Baseline Monitoring

- 3.7.1 Baseline monitoring shall be conducted to determine the existing air quality in terms of 1-hour and 24-hour TSP levels before commencement of construction work. A consecutive measurement for 14 days shall be done for 24-hour TSP at all monitoring stations. At least 3 sets of 1-hour TSP data shall also be collected every day during this period, at the predicted time in which greatest impact is expected.
- 3.7.2 During the baseline monitoring, there should be no major construction or dust generating activities near the monitoring stations. The ET shall propose a monitoring schedule to the IEC so that he can conduct onsite audit to ensure the accuracy of the measurement where necessary.
- 3.7.3 Alternative baseline AMS that can give representative baseline result may be proposed for ER and IEC's approval with justifications.
- 3.7.4 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and ER to agree on an appropriate set of data to be used as a baseline reference and submit to EPD for approval.
- 3.7.5 The baseline monitoring data shall be reviewed once every three months. When there is seasonal change to ambient conditions, the baseline condition may need to be updated. Repeated measurement shall be conducted during which no dust generating activity is being carried out near the AMS. If a change in ambient condition is recorded, the baseline levels and therefore air quality criteria should be revised accordingly and agreed with the IEC and EPD.

3.8 Impact Monitoring

- 3.8.1 Impact monitoring shall be carried out throughout the construction period at all AMSs. 24-hour TSP sampling shall be conducted at a frequency of at least once in every 6 days, while that for 1-hour TSP shall be at least 3 times in every 6 days when the highest dust impact takes place. Similar to baseline monitoring, the ET shall submit a monitoring schedule to the IEC for onsite audit of the accuracy of the monitoring result where necessary.

- 3.8.2 The ET shall clearly define and strictly follow the starting and ending time for 24-hour TSP monitoring for each AMS.
- 3.8.3 If exceedance of air quality criteria is recorded, more frequent measurement shall be done within the specified timeframe in accordance to the Action Plan. The additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and upon agreement with the IEC.

3.9 Air Quality Performance Limit

- 3.9.1 The following table shows the action and limit levels for 1-hour and 24-hour TSP levels, while the baseline monitoring results shall be interpreted to derive the action levels.

Table 3.2 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24-hour TSP Level in $\mu\text{g m}^{-3}$	For baseline level $\leq 200 \mu\text{g m}^{-3}$, Action level = (baseline level * 1.3 + Limit level)/2; For baseline level $> 200 \mu\text{g m}^{-3}$ Action level = Limit level	260 $\mu\text{g/m}^3$
1-hour TSP Level in $\mu\text{g m}^{-3}$	For baseline level $\leq 384 \mu\text{g m}^{-3}$, Action level = (baseline level * 1.3 + Limit level)/2; For baseline level $> 384 \mu\text{g m}^{-3}$, Action level = Limit level	500 $\mu\text{g/m}^3$

3.10 Event and Action Plan

- 3.10.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in **Appendix C** shall be carried out.

3.11 Mitigation Measures

- 3.11.1 The EIA proposed a number of construction phase mitigation measures, examples as follows:

Construction Phase

- (a) Hoarding of not less than 2.4 m high shall be erected from ground level to surround the work area along Po Toi O Chuen Road except for a site entrance or exit.
- (b) Good housekeeping to minimize dust generation, e.g. by properly handling and storing dusty materials.

- (c) Adopt dust control measures, such as dust suppression using water spray on exposed soil, in areas with dusty construction activities and during material handling.
- (d) Minimize exposed earth after completion of work in a certain area by hydroseeding, vegetating, soil compacting or covering with bitumen.
- (e) Provide wheel washing at site exit to prevent carrying dust outside of the site.
- (f) Cover materials on trucks before leaving the site.
- (g) Limit traffic speed of construction trucks within the construction site and in Po Toi O, maximum at 10km/hr.
- (h) As there is limited space in Po Toi O, stockpiling should be avoided. However, if found necessary, the materials should be covered by impervious materials such as tarpaulin.

Operational Phase

- (a) Conduct regular inspection of the tanks to check for leakage of gas.
- (b) Direct odorous gas to odour removal system for treatment prior to exhausting into the atmosphere.
- (c) Maintain the removal efficiency of screenings and grits by flushing the screens and grit sump regularly to prevent build-up of solids.
- (d) Maintain the efficiency of MBR membrane by removing organic and inorganic debris with sodium hypochlorite and oxalic acid .
- (e) Replace worn filters to maintain the odour removal efficiency at 99.5%.
- (f) Remove sludge regularly to prevent build-up of odourous gas.
- (g) Sludge tanker should be parked inside the sewage treatment plant for sludge removal where the air is extracted for deodourization.
- (h) Sludge should be transferred to sludge tanker by coupling method to prevent odour leakage.
- (i) Screenings, grits and worn filters should be stored in sealed containers inside the STP and during removal for disposal.
- (j) Clean all the tanks with water regularly.

3.11.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

4 NOISE

4.1 Introduction

- 4.1.1 In the construction phase, the major noise impact will arise from the use of powered mechanical equipment. With implementation of noise mitigation measures, it is anticipated that the construction noise impact would be reduced to acceptable level. Regular monitoring of noise level should be carried out at noise monitoring stations near representative sensitive receivers before and throughout construction work to ensure that relevant noise standard can be met.
- 4.1.2 As most of the plant equipment for sewage treatment are stored underground and the STP is enclosed by a concrete structure, operational noise impact is expected to be acceptable. Therefore, no monitoring or audit is proposed.
- 4.1.3 In this section, the equipment, requirements, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction of the proposed sewerage works under the Project are presented.

4.2 Monitoring Parameters

- 4.2.1 Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq\ 30min}$ shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, $L_{eq\ 5min}$ shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.
- 4.2.2 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference.

4.3 Monitoring Equipment

- 4.3.1 Sound level meters shall be employed to measure the construction noise level. It should comply with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications in accordance to the Technical Memorandum (TM) issued under the NCO.
- 4.3.2 An acoustic calibrator shall be used to validate the accuracy of the sound level meter before and after each noise measurement. The calibrator can generate a known sound pressure level at a known frequency. The noise record will only be accepted if the calibration level from before and after the noise measurement agrees to within 1.0 dB.
- 4.3.3 Sufficient number of the above equipment shall be provided by the ET, who will also be responsible for installation, operation, maintenance and dismantlement. All equipment and instrumentation shall be clearly labelled.

4.4 Monitoring Requirement

- 4.4.1 Noise measurement shall normally be at a point 1 m from the exterior of the sensitive receiver building façade and be at a position 1.2 m above the ground. If the normal monitoring position cannot be accessed, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted. The agreed position shall be chosen in subsequent baseline and impact monitoring.
- 4.4.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

4.5 Monitoring Location

- 4.5.1 There are three kinds of construction work near the sensitive receivers: (1) construction of STP, (2) gravity sewers and rising mains installation and (3) horizontal directional drilling for submarine outfall. As such, four representative Noise Monitoring Stations (NMSs) are proposed near these work sites as follows:

Table 4.1 Proposed Construction Noise Monitoring Locations

Monitoring Stations	Location
NMS1	Po Toi O Tsuen Road, House No. 28
NMS2	In front of Hung Shing Temple
NMS3	Temporary Structure (House) near Rocky Shore
NMS4	Fairway Vista

- 4.5.2 The location of the stations can be found in **Figure 3-1**.
- 4.5.3 The status and locations of noise sensitive receivers may change after issuing this manual. In this case, the ET Leader shall propose alternative monitoring locations taken into account the following considerations and seek approval from the ER and the IEC:
- (a) locate close to the major site activities which are likely to have noise impacts;
 - (b) locate close to the most affected existing NSRs; and
 - (c) take into account the possibility of minimizing disturbance to occupants at the NSRs during monitoring.

4.6 Baseline Monitoring

- 4.6.1 Baseline noise measurement shall be conducted to determine the background noise before commencement of work. Daily measurement of A-weighted levels L_{eq} , L_{10} and L_{90} shall be conducted for at least two weeks. The sample period shall be 30 minutes between 0700 and 1900.
- 4.6.2 During the baseline monitoring, there should be no major construction or noise generating activities near the monitoring stations. The ET shall propose a monitoring schedule to the IEC so that he can conduct onsite audit to ensure the accuracy of the measurement where necessary.
- 4.6.3 Alternative baseline NMS that can give representative baseline result may be proposed for ER and IEC's approval with justifications.
- 4.6.4 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and ER to agree on an appropriate set of data to be used as a baseline reference and submit to EPD for approval.

4.7 Impact Monitoring

- 4.7.1 For daytime construction work on normal weekdays (0700-1900 Monday to Saturday), one set of 30-min measurement shall be carried out at each NMS every week based on the measurement procedures under the Noise Control Ordinance-TM. Similar to baseline monitoring, the ET shall submit a monitoring schedule to the IEC beforehand.
- 4.7.2 If noise exceedance is being recorded, additional noise monitoring shall be conducted in accordance to the Event Action Plan. The monitoring shall consider complete if the exceedance is being rectified or proved to be from source other than the project construction work.
- 4.7.3 Sample data sheet can be found in **Appendix B**.

4.8 Noise Performance Limit

- 4.8.1 The EIAO-TM sets the statutory limit for noise level produced during construction work.

Table 4.2 Action and Limit Levels for Noise

Time Period	Action Level	Limit Level
0700-1900 hrs on normal weekdays	When one documented complaint is received	75dB(A)

4.9 Event and Action Plan

- 4.9.1 Should non-compliance of the noise criteria occur, actions in accordance with the Action Plan in **Appendix C** shall be carried out.

4.10 Mitigation Measures

4.10.1 The EIA proposed a number of construction phase mitigation measures, examples as follows:

- (a) Adopt good site practice, such as regular maintenance of plant equipment, throttle down unused machines.
- (b) Use Quality Powered Mechanical Equipment (QPME).
- (c) Erect 3m high mobile barriers in the direction of noise sensitive receivers within a few meters of stationary plants and within about 5m of more mobile plant such as hydraulic breaker to prevent direct view. The barrier should have skid footing and a small cantilevered upper portion. The minimum surface density of the movable noise barrier is 7 kg/m² and provide with noise absorbing material.
- (d) Operate air compressor, generator and concrete pump within enclosure.
- (e) Cover the noisy part of piling machine with acoustic mat.
- (f) Orient noisy plant equipment so that noise emitted will not be directed towards the NSRs.
- (g) Strategic location and scheduling of the construction work front to minimize cumulative effect (e.g. the work front of village sewer installation near NSRs PTO_N1 and PTO_N3 shall not be conducted concurrently with installation of Po Toi O Chuen Road sewer and horizontal directional drilling respectively).
- (h) Vibratory poker shall only be operated 4m away from NSR and with noise barrier properly erected. Surfacing work within 4m from NSR shall be carried out by manual method.
- (i) Hand-held breaker shall be fitted with mufflers. A movable enclosure made up of plywood is proposed to surround both worker and breaker during breaking process.
- (j) Should there be concurrent project in the vicinity, continuous discussion between contractors shall be conducted to plan the location and programme of construction work to minimize cumulative impact.

4.10.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

5 WATER QUALITY

5.1 Introduction

- 5.1.1 Potential water quality impact arising from the construction activities (for examples, site runoff of exposed soil, earthworks and stockpiles during rainstorms and sewage generated from construction workforce) would be minimized by implementing appropriate mitigation measures and good site management practices.
- 5.1.2 Dredging and backfilling works associated with the diffuser of the submarine outfall at outer Poi Toi O Bay shall be confined within fully enclosed cofferdam. Dredger barge will be anchored outside the cofferdam and no opening of cofferdam is required during dredging and filling works. No release of suspended solids is expected. Minor displacement of bottom sediment may arise during installation of cofferdam.
- 5.1.3 Construction phase monitoring is proposed to keep track of the variation in water quality to identify any unacceptable impact at the sensitive receivers during installation and extraction of cofferdam and dredging works. Site audit shall be conducted regularly to ensure that the mitigation measures recommended in the EIA Report and this EM&A Manual are fully implemented.
- 5.1.4 Treated effluent will be discharged at outer Po Toi O Bay during the normal operation of the STP. The effluent quality shall be regularly monitored in accordance with the requirements under Discharge License. No substantial change in water quality in the Po Toi O Bay is expected. However, in view of the sensitivity of fish culture zone, corals and amphioxus to water quality change, marine water quality monitoring is proposed for the first commencement year to ensure that no unacceptable deterioration of water quality arises in the enclosed bay.
- 5.1.5 Practical and well sufficient mitigation measures have been proposed to protect water quality during marine construction works, such as no open dredging for submarine outfall by adopting HDD, dredging and filling within fully enclosed cofferdam and use of closed grab for dredging. During operation of the proposed STP, effluent that meets the water quality requirements under WPCO will be discharged. As no adverse water deterioration is expected during construction and operational phases, real-time reporting of monitoring data for the Project through a dedicated internet website is considered not necessary.

5.2 Construction Phase EM&A

Monitoring Requirement

- 5.2.1 Major water quality impact will be originated from minor displacement of suspended solids during installation and extraction of cofferdam around the proposed diffuser. Regular monitoring of water quality should be carried out at water quality monitoring stations (WMS) near the cofferdam (impact station), upstream of the impact (control stations), and near representative water sensitive receivers (WSRs) (e.g. Fish Culture Zone, coral and Amphioxus) before and throughout installation and extraction works.

Although no sediment is expected to be released during dredging, water quality monitoring during dredging works will also be proposed.

Monitoring Parameters

- 5.2.2 Suspended solids (SS) and in-situ water quality data (temperature, pH, turbidity, water depth, salinity, dissolved oxygen and percentage of saturation) shall be collected.
- 5.2.3 Other relevant data should also be recorded, including monitoring location/position, time, tidal stages, weather conditions and any special observation or works that may affect the monitoring results in the vicinity.
- 5.2.4 To ensure sufficient data for robust analysis, duplicate in-situ data shall be collected. In case the difference in the duplicate in-situ measurement results is larger than 25%, the third set of in-situ measurement shall be carried out for result confirmation purpose.
- 5.2.5 A sample data sheet can be found in **Appendix B**.

Monitoring Location

- 5.2.6 Six water monitoring stations are proposed at Po Toi O Fish Culture Zone (FCZ), major amphioxus habitat and rocky shores near the dredging point where coral thrives. Based on the prediction of Delft-3D model, water current flows from the open sea through Clear Water Bay towards Po Toi O bay during flood tide while the reverse happens during ebb tide. Therefore, three control stations will be allocated at where fresh marine water is not affected by the cofferdam installation/extraction works and two impact stations will be set near the cofferdam under different tidal periods. The location of the stations can be found in **Figure 5-1**.

Table 5.1 Marine Water Monitoring Locations in Construction Phase

Station	Monitoring Period	Description	Easting	Northing
WMS1	Mid-Ebb, Mid-Flood	Po Toi O Fish Culture Zone	848387	815201
WMS2		Po Toi O Fish Culture Zone	848479	815378
WMS3		Rocky Shore with Corals	848644	815391
WMS4		Rocky Shore with Corals	848774	815602
WMS5		Rocky Shore with Corals	848578	815591
WMS6		Major Amphioxus Habitat	848639	815523
I1	Mid-Flood	Impact Monitoring Station	848643	815692
I2	Mid-Ebb	Impact Monitoring Station	848722	815810
C1	Mid-Flood	Control Station	848904	816052
C2	Mid-Ebb	Control Station	848529	815373

Station	Monitoring Period	Description	Easting	Northing
C3	Mid-Ebb	Control Station	848243	815710

- 5.2.7 Water samples shall be extracted at 1m below surface, 1m above seabed and the mid-depth level at where the water depth is at least 6m. However, if the water depth is less than 3m, water samples shall only be collected at the mid-depth level. For stations with depth less than 6m, the mid-depth sample can be omitted.

Monitoring Frequency

- 5.2.8 Baseline monitoring shall be carried out 3 days per week, at mid-flood and mid-ebb tides (within ± 1.75 hour of the predicted time), for a period of 4 weeks prior to the commencement of the marine works. The interval between two sets of monitoring shall not be less than 36 hours. The monitoring period should avoid concurrent marine project in the vicinity.
- 5.2.9 Impact monitoring shall also be conducted at the same frequency throughout the whole cofferdam installation/extraction work and during dredging works. In case exceedance of Action/Limit Level is recorded, the frequency shall be increased as per the Event and Action Plan.

Construction Phase Site Inspection

- 5.2.10 Weekly site audit is recommended to monitor the implementation of the proposed water quality mitigation measures and check the Contractor's work practice on water pollution prevention during construction phase.
- 5.2.11 Should water pollution is observed (e.g. discharge of silty water into storm drains), the ET should record the environmental deficiency for investigation. The Contractor should be notified and responsible for carrying out rectification work immediately. The ET shall re-inspect the Project Site described in **Section 2.3.1** and review the effectiveness of the remedial measure performed until satisfaction. The Contractor shall implement preventive measure to avoid causing the same problem.

5.3 Operational Phase EM&A (Effluent Quality)

- 5.3.1 The water quality of the effluent should meet the requirements under *Technical Memorandum on Effluent Discharge Standard before discharge*. Therefore, effluent testing should be carried out at the discharge outlet at interval stipulated in the discharge license issued by the EPD. The water quality parameters shall be referred to the discharge license as well. Should exceedance be recorded, the plant operator should be notified, who shall identify the cause of non-compliance and formulate remedial measures. The monitoring frequency should increase until the effluent quality can meet the criteria. No effluent should be discharged until the effluent quality meets the required standard.

5.4 Operational Phase EM&A (Marine Water Quality)

Monitoring Requirement

- 5.4.1 Effluent will be discharged at the diffuser. Regular monitoring of marine water quality should be carried out at WMS to check whether the Water Quality Objectives (WQO) can be fulfilled. The monitoring should commence prior to operation of the STP to establish the baseline water quality condition.

Monitoring Parameters

- 5.4.2 Water quality parameters under the WQO that may be affected by effluent discharge shall be monitored at the nearby sensitive receivers: *E. coli*, DO, salinity, SS, ammonia (NH₃-N) and total inorganic nitrogen (TIN). As in the construction phase, other in-situ water quality data shall also be collected (temperature, pH, turbidity, water depth and percentage of saturation for DO).
- 5.4.3 Other relevant data should also be recorded, including monitoring location/position, time, tidal stages, weather conditions and any special observation or works that may affect the monitoring results in the vicinity.
- 5.4.4 To ensure sufficient data for robust analysis, duplicate in-situ data shall be collected. In case the difference in the duplicate in-situ measurement results is larger than 25%, the third set of in-situ measurement shall be carried out for result confirmation purpose.
- 5.4.5 A sample data sheet can be found in **Appendix B**.

Monitoring Location

- 5.4.6 The water monitoring stations shall follow those in the construction phase (WMS1-WMS6).
- 5.4.7 Water samples shall be extracted at 1m below surface, 1m above seabed and at the mid-depth level at where the water depth is at least 6m. However, if the water depth is less than 3m, water samples shall only be collected at the mid-depth level. For stations with depth less than 6m, the mid-depth sample can be omitted.

Monitoring Frequency

- 5.4.8 Baseline Monitoring shall be carried out for two times per month for a period of 6 months prior to the commencement of the operation of the PTOSTW. The 6-month period shall cover both wet and dry seasons. Water samples shall be collected during mid-ebb and mid-flood tides (within ± 1.75 hour of the predicted time) on each monitoring day. The monitoring period should avoid concurrent marine project in the vicinity.
- 5.4.9 Operational phase monitoring shall also be conducted at the same frequency as in baseline for the first three months of operation of PTOSTW (i.e. twice per month). If the results are satisfactory, the frequency will be reduced to once per month. However,

if exceedance is subsequently recorded, the frequency shall return to twice per month until satisfactory results are obtained again for three consecutive months. The whole monitoring shall last for one year. If no exceedance is recorded due to operation of the PTOSTW, no further monitoring is required.

Table 5.2 Overall Summary of Monitoring Requirements in Construction and Operational Phases

Monitoring Stations	Parameters	Duration	Frequency
Construction Phase			
WMS1- WMS6, I1, I2, C1-C3	<ul style="list-style-type: none"> • Temperature(°C) • pH(pH unit) • Turbidity (NTU) • Water depth (m) • Salinity (ppt) • DO (mg/L and % of saturation) • SS (mg/L) 	<u>Baseline:</u> 4 weeks <u>Construction:</u> Throughout installation and extraction of cofferdam and during dredging	<ul style="list-style-type: none"> • 3 days per week
Operational Phase			
WMS1- WMS6	<ul style="list-style-type: none"> • Temperature(°C) • pH(pH unit) • Turbidity (NTU) • Water depth (m) • Salinity (ppt) • DO (mg/L and % of saturation) • SS (mg/L) • NH-N (mg/L) • TIN (mg/L) • <i>E. coli</i> (no./100ml) 	<u>Baseline:</u> 6 months before operation, covering wet and dry seasons <u>Operation:</u> at least one year from operation	<ul style="list-style-type: none"> • 2 days per month • First 3 months: 2 days per month • Subsequent months: 1 day per month • If exceedance is recorded, frequency increases back to 2 days per month until no further deterioration is recorded for 3 months • Completed in one year
Notes: 1. Water Sampling Depth for all monitoring: <ul style="list-style-type: none"> • water depths: 1m below sea surface, mid-depth and 1m above sea bed • If the water depth is less than 3m, mid-depth sampling only • If water depth less than 6m, mid-depth may be omitted. 2. Sampling time for all monitoring: Mid-Ebb, Mid-Flood			

5.5 Monitoring Equipment

Position System

5.4.1 A hand held Global Positioning System (GPS) shall be used during water quality monitoring to ensure the monitoring vessel is at the correct location before taking measurements. GPS shall be calibrated at checkpoint (e.g. Quarry Bay Survey Nail at Easting 840683.49 and Northing 816709.55) to ensure the monitoring station is at the

correct position before taking measurement and water samples.

Water Depth Detector

- 5.4.2 A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station.

Salinity

- 5.4.3 A portable salinometer capable of recording salinity within the range of 0-40 ppt shall be used for salinity measurements.

Dissolved Oxygen (DO) and Temperature Measuring Equipment

- 5.4.4 The instrument for measuring dissolved oxygen and temperature shall be portable and weatherproof complete with cable, sensor, comprehensive operation manuals and use DC power source. It shall be capable of measuring:
- A dissolved oxygen level in the range of 0-20 mg/L and 0-200% saturation; and
 - A temperature of 0-45 degree Celsius.
- 5.4.5 It shall have a membrane electrode with automatic temperature compensation complete with a cable.
- 5.4.6 Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary.
- 5.4.7 The instrument for measuring DO shall obtain built-in salinity compensation.

Turbidity Measurement Equipment

- 5.4.8 Nephelometric method shall be used in measuring in-situ turbidity. The instrument shall be portable, weatherproof complete with a cable, sensor, comprehensive operation manuals and DC power source. It shall have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU and complete with a cable with at least 25 m in length. The meter shall be calibrated in order to establish the relationship between NTU units and suspended solids level. Turbidity shall be measured on split water sample collected from the same depths of suspended solid samples.

pH

- 5.4.9 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use.

Sampler

- 5.4.10 A water sampler, consisting of a transparent PVC or glass cylinder of a capacity of not less than two litres which can be effectively sealed with cups at both ends shall be used. The water sampler shall 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.

Sample Container and Storage

5.4.11 Following collection, water samples for laboratory analysis shall be stored in high density polythene bottles with appropriate preservatives added, packed in ice (cooled to 4°C without being frozen), delivered to the laboratory and analysed as soon as possible. Sufficient volume of samples shall be collected to achieve the detection limit.

5.4.12 Water samples for *E. coli* shall be collected in sterile bottles with leak-proof lids.

5.4.13 Water samples for suspended solids determinations shall be stored in high density polythene bottles with no preservative added.

Calibration of In-situ Instruments

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

5.4.15 For the on-site calibration of field equipment (Multi-parameter Water Quality System), the BS 1427:2009, "Guide to on-site test methods for the analysis of waters" shall be observed.

5.4.16 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 some equipment is under maintenance, calibration, etc.

Laboratory Measurement or Analysis

5.4.17 The testing of all parameters shall be conducted by a HOKLAS accredited laboratory or operator of the STP (for operational phase) with comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.

Table 5.3 Analytical Methods and Detection Limits for Marine Water Samples

Determinant	Detection Limit	Method Reference
<i>E. coli</i>	1 cfu/100mL	Membrane filtration with CHROMagar Liquid E coli-coliform culture ⁽¹⁾
Ammonia Nitrogen (NH ₃ -N)	0.005 mg NH ₃ -N/L	ASTM D3590-89 B (FIA)

Determinant	Detection Limit	Method Reference
Nitrite-nitrogen (NO ₂ -N)	0.002 mg NO ₂ ⁻ -N/L	APHA 20ed 4500-NO ₂ ⁻ B (FIA)
Nitrate-nitrogen (NO ₃ -N)	0.002 mg NO ₃ ⁻ -N/L	APHA 20ed 4500-NO ₃ ⁻ F & I (FIA)
Total Inorganic Nitrogen	0.01 mg N/L	By Calculation
Suspended Solids	0.5 mg/L	APHA 17e 2540 D

⁽¹⁾ (a) DoE, DHSS &PHLS (1983); The Bacteriological Examination of Drinking Water Supplies 1982, Sec. 7.8 & 7.9; and (b) B.S.W. Ho and T.Y. Tam (1997), Enumeration of E coli in environmental waters and wastewater using a chromogenic medium. Wat. Sci. Tech. Vol 35, No.11-12, pp.409-413, method adopted in 1997.

5.6 Water Quality Performance Limit

5.5.1 The following table listed out the criteria for relevant water quality parameters during construction and normal operational phase monitoring work.

Table 5.4 Action and Limit Levels for Water Quality

Parameters	Action Level	Limit Level
DO in mg/L (Surface, Middle & Bottom)	<u>Surface & Middle:</u> 5 percentile of baseline data for surface and middle layers <u>Bottom:</u> 5 percentile of baseline data for bottom layer.	<u>Surface & Middle:</u> (i) <u>General marine water:</u> 4 mg/L or 1 percentile of baseline data for surface and middle layers. (ii) <u>Fish culture zone:</u> 5 mg/L or 1 percentile of baseline data for surface and middle layers. <u>Bottom:</u> 2 mg/L or 1 percentile of baseline data for bottom layer.
SS in mg/L (depth-averaged)	95 percentile of baseline data or 120% of upstream control station's SS at the same tide of the same day.	99 percentile of baseline data or 130% of upstream control station's SS at the same tide of the same day.
Unionised Ammonia in mg/L (depth-averaged)	95 percentile of baseline data.	99 percentile of baseline data or 0.021 mg /L.

Parameters	Action Level	Limit Level
<i>E. coli</i> (depth-averaged)	95 percentile of baseline data.	(i) <u>Secondary contact, recreation subzones and fish culture zones:</u> 99 percentile of baseline or 610 cfu/100mL as geometric mean. (ii) <u>Bathing beach subzones:</u> 99 percentile of baseline or 180 cfu/100mL as geometric mean.
Turbidity in NTU (depth-averaged)	95 percentile of baseline data or 120% of upstream control station's turbidity at the same tide of the same day.	99 percentile of baseline or 130% of upstream control station's turbidity at the same tide of the same day.
TIN in mg/L (depth-averaged)	95 percentile of baseline data.	99 percentile of baseline data.

5.7 Event and Action Plan

- 5.6.1 Should non-compliance of the water quality criteria occur, actions in accordance with the Action Plan in **Appendix C** shall be carried out.

5.8 Mitigation Measures

- 5.7.1 Examples of construction phase mitigation measures are shown as follows:

- (a) Well manage construction materials, chemicals, sewage for proper storage and usage and to prevent accumulation onsite.
- (b) Immediately clean up contaminated soil upon chemical and oil leakage.
- (c) Label chemical waste containers as reminder. Store fuels, chemicals and waste at designated area with locks and bunds.
- (d) Register as chemical waste producer.
- (e) Settle surface runoff in sedimentation tank prior to discharge.
- (f) Provide sufficient number of chemical toilets if necessary and employ licensed contractor for regular clean-up and maintenance.
- (g) Provide wheel washing at site exit to prevent dust and silty water from leaving the construction site.
- (h) Cover slope and loose materials with tarpaulin before rainstorm and inspect the area afterwards.

- (i) Cover manhole to prevent silty runoff from entering the foul sewer.
- (j) Install fully enclosed cofferdam around the proposed diffuser and deploy a dredger barge outside the cofferdam for dredging and filling works.

5.7.2 In addition, the Contractor shall devise an emergency contingency plan during construction phase to detail the response and action in case of leakage or spillage of motor oil, bentonite, chemicals (e.g. paint) and etc. into stream or marine water. It should details the communication line between Contractor, relevant government and stakeholders, remediation plan for containing and cleaning of the leakage, evaluation and improvement of work and determine follow-up action (e.g. monitoring).

5.7.3 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

6 TERRESTRIAL ECOLOGY

6.1 Introduction

- 6.1.1 The proposed Project will cause minor habitat loss of shrubland, temporary habitat loss of woodland, developed area and rocky shore, and removal of one individual climber species of conservation importance that is common within the Study Area and Hong Kong. Indirect water quality impact may arise from surface runoff or accidental spillage of chemicals in construction phase. Use of powered plant equipment may bring noise disturbance on wildlife. In operational phase, noise impact from sewage treatment works will be limited. With proper implementation of mitigation measures, residual impact is expected to be acceptable.

6.2 Mitigation Measures

- 6.2.1 Construction noise and water quality mitigation measures proposed in the previous sections will be applicable to terrestrial ecology. In addition, the following mitigation measures shall be carried out:
- (a) Bright colour fencing shall be erected along the boundary of the undisturbed region of the shrubland and woodland, and around *Diospyros vaccinioides*, a plant species of conservation importance, near the work boundary to remind workers not to trespass or occupy the area, and to be careful during operation of equipment.
 - (b) Inspect the condition of *Diospyros vaccinioides* as part of weekly site audit.
 - (c) Reinstate the disturbed rocky shore with the rocks temporarily removed.
 - (d) Carry out compensatory tree planting in accordance with DEVB TCW No. 7/2015 to reinstate the affected woodland.
- 6.2.2 With proper implementation of mitigation measures, un-acceptable residual impact is not expected. Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

7 MARINE ECOLOGY

7.1 Introduction

- 7.1.1 The proposed Project will cause minor habitat loss of muddy seabed. Indirect water quality impact may arise from installation and extraction of sheet pile of cofferdam in construction phase. Dredging and backfilling for installation of diffuser will be conducted inside fully enclosed cofferdam. No marine sediment loss to water column is expected. During normal operation of the STP, no substantial change in water quality of the Po Toi O Bay is expected.

7.2 Mitigation Measures

- 7.2.1 The variation in water quality at coral and amphioxus habitats during cofferdam installation and extraction works will be overseen by water quality monitoring mentioned in **Section 5.2**. No specific monitoring and audit programme is required. With proper implementation of water quality mitigation measures, residual impact is expected to be acceptable.
- 7.2.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

8 FISHERIES

8.1 Introduction

- 8.1.1 No direct encroachment on Fish Culture Zone and Artificial Reefs in the Study Area is expected. About 1,920 m² of fishing ground and 500 m² of benthic spawning ground will be affected. Except the 5 m² benthic spawning ground will be lost permanently, other impacted area will only be affected in construction phase temporarily (reversible impact). Indirect impact on fisheries resources by the water quality deterioration will be insignificant with proper implementation of water quality mitigation measures. No substantial change in water quality of the Po Toi O Bay is expected during operational phase. No specific monitoring for fisheries is proposed.

8.2 Mitigation Measures

- 8.2.1 Water quality at FCZ will be monitored during cofferdam installation and extraction works and dredging works in the construction phase as proposed in **Section 5.2**. No specific monitoring and audit programme is required. With proper implementation of water quality mitigation measures, residual impact is anticipated to be acceptable.
- 8.2.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

9 WASTE MANAGEMENT AND LAND CONTAMINATION

9.1 Introduction

- 9.1.1 Construction of the sewage treatment plant, laying of gravity sewers and rising mains and submarine outfall are expected to generate mainly inert construction and demolition (C&D) materials (or public fill) from excavation, and unused building materials. Other wastes include non-inert C&D materials (or C&D waste), plant materials, scaffolding, formwork and packaging, chemical waste from plant maintenance, bentonite slurry from drilling works and general refuse from workers. Dredging at the proposed diffuser location will generate marine sediment. Operation of sewage treatment plant will generate sludge, debris from screening, worn filter in deodouring unit, and general refuse from staff. No adverse waste impact is expected if the mitigation measures are implemented properly.
- 9.1.2 Based on the aerial photos, Po Toi O was historically used for residential (village), agriculture, boat shelter, fish farming, religious and golfing use. Recent site visits did not identify any boat factory, repairing workshop or other industrial activity that may cause land contamination. As land contamination within the work boundary demarcated in **Figure 1-1** is highly unlikely, no EM&A is proposed.

9.2 EM&A Requirement

- 9.2.1 The Contractor should apply for relevant licences/permits for waste disposal under different regulations and ordinances as follows:
- (a) Chemical Waste Permits/licenses under the Waste Disposal Ordinance (Cap 354);
 - (b) Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
 - (c) Marine Dumping Permit under Dumping at Sea Ordinance (Cap 466); and
 - (d) Effluent Discharge Licence under the Water Pollution Control Ordinance (Cap 358).
- 9.2.2 Reference should be made to EPD's booklets on licences/permits. The Contractor shall also document recycling receipts/ disposal record to keep track of waste movement. The ET shall check with the Contractor that these licences/permits have been obtained. He should also review the above documentations regularly to ensure compliance with legislations and specifications.
- ### **9.3 Waste Management Plan**
- 9.3.1 The contractor should formulate waste management measures on waste minimization, storage, handling and disposal in a Waste Management Plan as part of Environmental Management Plan in accordance to ETWB TC (W) No.19/2005 for construction

phase. Mitigation measures proposed in the EIA Report and the EM&A Manual should be adopted.

9.4 Site Audit

- 9.4.1 Regular site audit shall be conducted by the ET to check the implementation status and evaluate the effectiveness of the proposed mitigation measures.

9.5 Mitigation Measures

- 9.5.1 The EIA proposed a number of mitigation measures, examples as follows:

Construction Phase

- (a) Reuse C&D materials onsite and dispose excess uncontaminated ones to public fill.
- (b) Provide sufficient waste collection points for general refuse and regularly maintained to avoid accumulation. Dispose the waste at waste transfer or disposal facilities.
- (c) Minimize wastage through careful planning and avoiding over-purchase of construction materials.
- (d) Provide training to workers on site cleanliness, waste management (waste reduction, reuse and recycle) and chemical handling procedures.
- (e) Hire licensed waste disposal contractors for waste collection and removal. Dispose waste at licensed waste disposal facilities.
- (f) Recondition and reuse bentonite as far as practical.
- (g) Conduct marine sediment test and dump dredged marine sediment according to *ETWB TCW No. 34/2002 Management of Dredged/Excavated Sediment and Dumping at Sea Ordinance*.

Operational Phase

- (a) Store and remove odorous materials (sludge, screenings and grits, worn filter) in sealed tankers and containers.
- 9.5.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

10 LANDSCAPE AND VISUAL

10.1 Introduction

- 10.1.1 Minor landscape and visual impact is expected due to dredging work in open sea, construction of the STP and pipelines on land and the loss of existing trees and vegetation at the sewage treatment plant site in the construction phase. Due to the relatively small scale of the proposed Project, none of the landscape and visual sensitive receivers will experience substantial residual impacts. Operational impact will become none to slight after 10 years following full establishment of compensatory planting within the Project Site described in **Section 2.3.1**.

10.2 Mitigation Measures

Construction Phase

- 10.2.1 The contractor shall employ a professionally qualified Registered Landscape Architect (RLA) on the Environmental Team to supervise and monitor the implementation of construction phase landscape and visual mitigation measures. This is necessary to ensure that all the recommended landscape and visual mitigation measures under Chapter 10 of the EIA are effectively implemented including minimisation of the works footprint, ensuring that those existing trees earmarked for retention on site or transplanting are protected and planting works are correctly implemented. Tree risk assessment shall be undertaken by the contractor during construction to all existing trees within the project site as per “Guidelines for Tree Risk Assessment and Management Arrangement”. Site inspections by appointed RLA shall be undertaken at monthly intervals to closely monitor all these aspects of work. Inspection findings shall be logged in a site monitoring report with any discrepancies or concerns regarding the implementation and effectiveness of mitigation measures highlighted.

Operational Phase

- 10.2.2 The compensatory tree planting required to offset the loss of existing trees, and the additional planting works for screening, and amenity purposes shall be checked by a Registered Landscape Architect engaged by the Contractor in the 12-month tree establishment period (a common practice in EIA). During this period, the Contractor shall take good care of the planted trees through regular horticultural operation (e.g. watering and pruning). This can help the trees to establish and have higher chance of growing to maturity. Planting must be established and become sustainable to provide long term landscape and visual mitigation. The RLA should check the planting on a bi-monthly basis to ensure that it has become established and self sustainable in order to provided long term landscape and visual mitigation as intended. Tree risk assessment shall be undertaken to all existing trees within the project site as per “Guidelines for Tree Risk Assessment and Management Arrangement”. After the establishment period, the trees shall be handed over to the project proponent for future management and maintenance.
- 10.2.3 Similarly, hardworks elements that have been provided as part of the new works or as

the reinstatement of impacted works should also be monitored and checked by the Registered Landscape Architect engaged by the Contractor on a bi-monthly basis in the first year after construction. This is to ensure that the hardworks are being maintained and are achieving their mitigation function. Subsequently, the STP site shall be handed over to the project proponent (building operator) for future management and maintenance.

10.3 Mitigation Measures

- 10.3.1 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

11 BUILT HERITAGE

11.1 Introduction

- 11.1.1 Po Toi O was a small fishing village and developed into a seafood and tourism destination. One Grade 3 historic building, Hung Shing Temple, two built heritages and six landscape features were identified in the Study Area. There is no direct damage to the built heritage resources. With the proposed mitigation measures including condition survey, vibration and settlement monitoring, provision of protective covering or protective screen, provision of buffer zone and maintenance of public access, the potential impacts to the identified built heritage resources should be minimised and considered acceptable.

11.2 EM&A Requirement

- 11.2.1 During construction phase, as the proposed work is close to some of the identified built heritage resources, condition survey, vibration and settlement monitoring to GB01, BH02 and LF04 are recommended to prevent indirect damage by mechanical vibration and settlement. A maximum vibration level of 7.5mm/s shall be adopted for the Grade 3 Hung Shing Temple and settlement check points in the Alert/Alarm/Action limit levels at 6mm/8mm/10mm shall be adopted. The location of the built heritage can be found in **Figure 11-1**.

11.3 Mitigation Measures

- 11.3.1 During construction phase, mitigation measures such as the provision of protective covering or protective screen is recommended to GB01, BH02, LF01 and LF04 in order to prevent damages by construction tools or waste. Maintenance of public access is suggested for LF01, LF04 and LF05. Besides, buffer zone of at least 1m from the works boundary should be provided for BH02, LF01 and LF04 as far as possible. Condition survey, vibration and settlement monitoring to GB01, BH02 and LF04 mentioned in **Section 11.2.1** shall be implemented.
- 11.3.2 Detailed mitigation measures are listed out in the Implementation Schedule of Recommended Mitigation Measures in **Appendix A**. Implementation status and the effectiveness of these measures shall be audited through regular site inspection.

12 SITE ENVIRONMENTAL AUDIT

12.1 Introduction

- 12.1.1 While a number of mitigation measures are proposed in the EIA report, regular site inspection is recommended for direct observation of the implementation progress to ensure they are properly implemented. Through a well-established action and reporting system, additional pollution control measures to identified environmental deficiency can be proposed and carried out at early stage. Site inspection is a useful way to enforce the environmental protection requirements onsite during construction.

12.2 Site Inspection

- 12.2.1 The ET Leader will be responsible for the site environmental audit. He will design the environmental site inspection, deficiency and action reporting system and conduct regular site inspection. He should prepare a proposal on the site inspection and reporting methodology to the Contractor for agreement and to the ER for approval.
- 12.2.2 Weekly site inspection shall be performed by the ET within the site where environmental protection measures will be implemented and also offsite where the construction activities may directly or indirectly be impacted upon. The following shall be noted during the inspection:
- (a) environmental protection and pollution control mitigation measures proposed in the EIA, contract specification, EP and this Manual
 - (b) works progress and programme
 - (c) ongoing results of the EM&A programme
 - (d) individual works methodology proposals (including associated pollution control measures)
 - (e) relevant environmental protection and pollution control laws
 - (f) previous site inspection results
- 12.2.3 The Contractor shall inform the ET on any update of all relevant information on the construction contract necessary for him to carry out the site inspection. After each site inspection, the ET shall submit an inspection report to the Contractor and the ER within 24 hours. It should include inspection result on any identification of environmental deficiency and corresponding mitigation recommendations for taking immediate rectification action. Follow up of identified problem from the previous inspection shall also be included. The Contractor shall report on any rectification actions after the site inspection in accordance to the procedures and timeframe proposed by the ET in the environmental site inspection, deficiency and action reporting system.

12.2.4 If significant environmental issue is identified, additional site inspection shall be performed. This may also be required upon receipt or during investigation of environmental complaint in accordance to the Action Plan for environmental monitoring and audit.

12.3 Compliance with Legal and Contractual Requirements

12.3.1 The environmental protection and pollution control laws in Hong Kong and project contract stipulate environmental protection and pollution control requirement for construction activities.

12.3.2 As such, the Contractor should submit all work method statements for ER's approval and ET Leader's review on environmental compliance with the contractual requirements. Sufficient environmental protection and pollution control measures shall be demonstrated in the method statement.

12.3.3 The ET Leader should also check that the work progress and programme can comply with legal requirement on environmental terms and to prevent violation in the future.

12.3.4 The Contractor shall regularly copy relevant documents to the ET for checking, including but not limited to updated Work Progress Reports, updated Works Programme, application letters for different licence/permits under the environmental protection laws, and all valid licences/permits. The site diary shall also be available for inspection upon ET Leader's request.

12.3.5 Should any non-compliance with the contractual and legislative requirements is identified after reviewing the documents, the ET should notify the ER and Contractor so that follow-up actions can be taken. He should also inform the ER and Contractor if the current status on licence/permit application and any environmental protection and pollution control preparation works may not meet the works programme or the construction work may lead to potential violation of environmental protection and pollution control requirements in due course.

12.3.6 The Contractor shall carry out remedial actions immediately upon receipt of ET's advice. The ER shall check with the Contractor to ensure that appropriate actions has been taken accordingly and can satisfy the environmental protection and pollution control requirement.

12.4 Environmental Complaints

12.4.1 Upon receipt of complaint, the ET shall be notified and investigation work shall be undertaken. He shall follow the procedures as listed below:

(a) log complaint and date of receipt on to the complaint database

(b) investigate the complaint to determine its validity, and to identify if the problem is caused by work activities

- (c) if the complaint is proved valid and due to works, formulate corresponding mitigation measures with the IEC
- (d) advise the Contractor on any rectification work required
- (e) evaluate the mitigation implementation progress and the updated situation
- (f) if the complaint is transferred from the EPD, submit an interim report on the complaint investigation and remediation progress to the EPD within the time frame assigned by the EPD
- (g) conduct additional monitoring and audit to verify the situation if necessary, and to determine any valid reason that the complaint will not recur
- (h) respond to the complainant by reporting the investigation result and follow-up actions taken (within the time frame set by the EPD if the complaint is made by the EPD)
- (i) record the complaint, investigation, the subsequent actions and results in the monthly EM&A reports

12.4.2 The Contractor and ER should provide necessary information and assistance to the ET for completing the investigation work. The Contractor shall implement any identified mitigation measures immediately and the ER shall ensure that the work has been carried out accordingly.

13 REPORTING

13.1 Introduction

- 13.1.1 The ET shall prepare baseline monitoring report, monthly EM&A reports, quarterly EM&A report and final EM&A report. They shall be submitted to the EPD in paper and electronic formats in timely order.

13.2 Baseline Monitoring Report

- 13.2.1 Baseline monitoring of air quality, noise, water quality and condition survey for built heritage are proposed. The baseline monitoring report shall be submitted within 10 workings days after completion of the monitoring work. The recipients include the IEC, Contractor and ER. It should first be verified by the IEC before formal submission to the EPD. The ET shall liaise with the relevant parties on the number of copies required. The report format and monitoring data format shall be agreed with the EPD prior to submission. The baseline monitoring report generally includes but not limited to 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) monitoring results (in both hard and soft copies) together with the following information:
 - a. monitoring methodology;
 - b. equipment used and calibration details;
 - c. parameters monitored;
 - d. monitoring locations (and depth);
 - e. monitoring date, time, frequency and duration;
 - f. quality assurance (QA) / quality control (QC) results and detection limits;
- (e) details of influencing factors, including:
 - a. major activities, if any, being carried out on the site during the period;
 - b. weather conditions during the period; and
 - c. other factors which might affect results;
- (f) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;

- (g) revisions for inclusion in the EM&A Manual; and
- (h) comments, recommendations and conclusions.

13.3 EM&A Report

- 13.3.1 The ET Leader shall prepare monthly EM&A reports which summarize the result and findings in all EM&A work conducted in accordance to the Manual, such as monitoring and site inspection. It shall be submitted within 10 workings days of the end of each reporting month, with the first report due in the month after construction commences. The recipients include the IEC, Contractor, ER and the EPD. It should first be verified by the IEC before formal submission. The ET shall liaise with the relevant parties on the exact number of copies required and the report format for both paper and electronic format prior to submission of the first EM&A report.
- 13.3.2 As there may be changes in surrounding environment and nature of work in progress, the ET Leader shall review and update the number and location of monitoring stations and parameters to be monitored every 6 months or on as needed basis.

13.4 First EM&A Report

- 13.4.1 The first EM&A report generally includes but not limited to the following:

- (a) Executive summary (1-2 pages):
 - a. breaches of Action and Limit levels;
 - b. complaint log;
 - c. notifications of any summons and successful prosecutions;
 - d. reporting changes; and
 - e. future key issues.
- (b) Basic project information:
 - a. project organisation including key personnel contact names and telephone numbers;
 - b. construction programme;
 - c. management structure, and
 - d. works undertaken during the month
- (c) Environmental status:
 - a. works undertaken during the month with illustrations (such as location of works); and

- b. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations)
- (d) A brief summary of EM&A requirements including:
- a. all monitoring parameters;
 - b. environmental quality performance limits (Action and Limit levels);
 - c. Event and Action Plans;
 - d. environmental mitigation measures, as recommended in the project EIA Report; and
 - e. environmental requirements in contract documents;
- (e) Implementation status:
- a. advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report;
- (f) Monitoring results (in both hard and diskette copies) together with the following information:
- a. monitoring methodology;
 - b. equipment used and calibration details;
 - c. parameters monitored;
 - d. monitoring locations;
 - e. monitoring date, time, frequency, and duration;
 - f. weather conditions during the period;
 - g. major activities being carried out on site during the period;
 - h. any other factors which might affect the monitoring results; and
 - i. QA/QC results and detection limits;
- (g) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- a. record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

- b. 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;
 - c. record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
 - d. review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
 - e. description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;
- (h) Others
- a. an account of the future key issues as reviewed from the works programme and work method statements;
 - b. advice on the solid and liquid waste management status; and
 - c. comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

13.5 Subsequent EM&A Reports

13.5.1 Subsequent EM&A report generally includes but not limited to the following:

- (a) Executive summary (1 - 2 pages):
 - a. breaches of Action and Limit levels;
 - b. complaints log;
 - c. notifications of any summons and successful prosecutions;
 - d. reporting changes; and
 - e. future key issues.
- (b) Basic project Information:
 - a. project organization including key personnel contact names and telephone numbers;

- b. programme;
 - c. management structure; and
 - d. works undertaken during the month.
- (c) Environmental status:
- a. works undertaken during the month with illustrations (such as location of works etc.); and
 - b. drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (d) Implementation status:
- a. advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA;
- (e) Monitoring results (in both hard and diskette copies) together with the following information:
- a. monitoring methodology;
 - b. equipment used and calibration details;
 - c. parameters monitored;
 - d. monitoring locations;
 - e. monitoring date, time, frequency, and duration;
 - f. weather conditions during the period;
 - g. major activities being carried out on site during the period;
 - h. any other factors which might affect the monitoring results; and
 - i. QA / QC results and detection limits.
- (f) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- a. record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - b. 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;

- c. record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- d. review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- e. description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(g) Others

- a. an account of the future key issues as reviewed from the works programme and work method statements;
- b. advice on the solid and liquid waste management status; and
- c. comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

(h) Appendix

- a. Action and Limit levels;
- b. graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - i. major activities being carried out on site during the period;
 - ii. weather conditions during the period; and
 - iii. any other factors that might affect the monitoring results.
- c. monitoring schedule for the present and next reporting period;
- d. cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- e. outstanding issues and deficiencies.

13.6 Quarterly EM&A Summary Reports

13.6.1 The quarterly EM&A summary report shall consist of around 5 pages (3 pages of text and tables and 2 pages of figures). It generally includes but not limited to the following:

- (a) up to half a page executive summary;
- (b) basic project information:
 - a. a synopsis of the project organisation, programme;
 - b. contacts of key management;
 - c. proponents' contacts and any hotline telephone number for the public to make enquiries; and
 - d. a synopsis of works undertaken during the quarter.
- (c) a brief summary of EM&A requirements:
 - a. monitoring parameters;
 - b. environmental quality performance limits (Action and Limit Levels); and
 - c. environmental mitigation measures, as recommended in the EIA Report;
- (d) environmental status:
 - a. a synopsis of work undertaken during the quarter;
 - b. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (e) implementation status:
 - a. 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) 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;
 - a. the major activities being carried out on site during the period;
 - b. weather conditions during the period; and
 - c. any other factors which might affect the monitoring results;
- (g) advice on the solid and liquid waste management status;
- (h) summary of non-compliance
 - a. a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);

- b. a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- c. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- d. a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (i) 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
- (j) Project Proponent's contacts and any hotline telephone number for the public to make enquiries.

13.7 Final EM&A Report

13.7.1 A Final EM&A report shall be prepared summarizing the results and findings of the EM&A works throughout the construction period. It should be submitted within 14 working days after project completion. It generally includes but not limited to the following:

- (a) An executive summary;
- (b) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (c) Basic project information:
 - a. a synopsis of the project organisation;
 - b. contacts of key management; and
 - c. a synopsis of work undertaken during the entire construction period.
- (d) A brief summary of EM&A requirements:
 - a. monitoring parameters;
 - b. environmental quality performance limits (Action and Limit levels); and
 - c. environmental mitigation measures, as recommended in the project EIA Report;
 - d. Event and Action Plans.

- (e) A summary of the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule;
- (f) Graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations, including the post-project monitoring annotated against:
 - a. the major activities being carried out on site during the period;
 - b. weather conditions during the period; and
 - c. any other factors which might affect the monitoring results.
- (g) Summary of non-compliance:
 - a. a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
 - b. a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
 - c. a summary description of the actions taken in the event of non-compliance;
 - d. 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;
- (h) A review of the validity of EIA predictions through comparison with the monitoring data and identification of shortcomings in EIA recommendations;
- (i) A review of the effectiveness and cost-effectiveness of the monitoring methodology
- (j) A review of the effectiveness and efficiency of the mitigation measures and of the performance of the overall EM&A programme;
- (k) Recommendations for improvement;
- (l) Evaluation on the return of environmental condition the baseline or predicted conditions in the EIA Report; and
- (m) Conclusion on the environmental acceptability of the project.

13.8 Data Keeping

- 13.8.1 The ET shall keep the site documents (such as monitoring field records, site inspection forms etc.) in order and make available for inspection upon request. These documents do not form part of the EM&A report. The monitoring data should also be input into electronic format for checking upon request. All documents and data shall be kept for at least one year after completion of the construction contract.

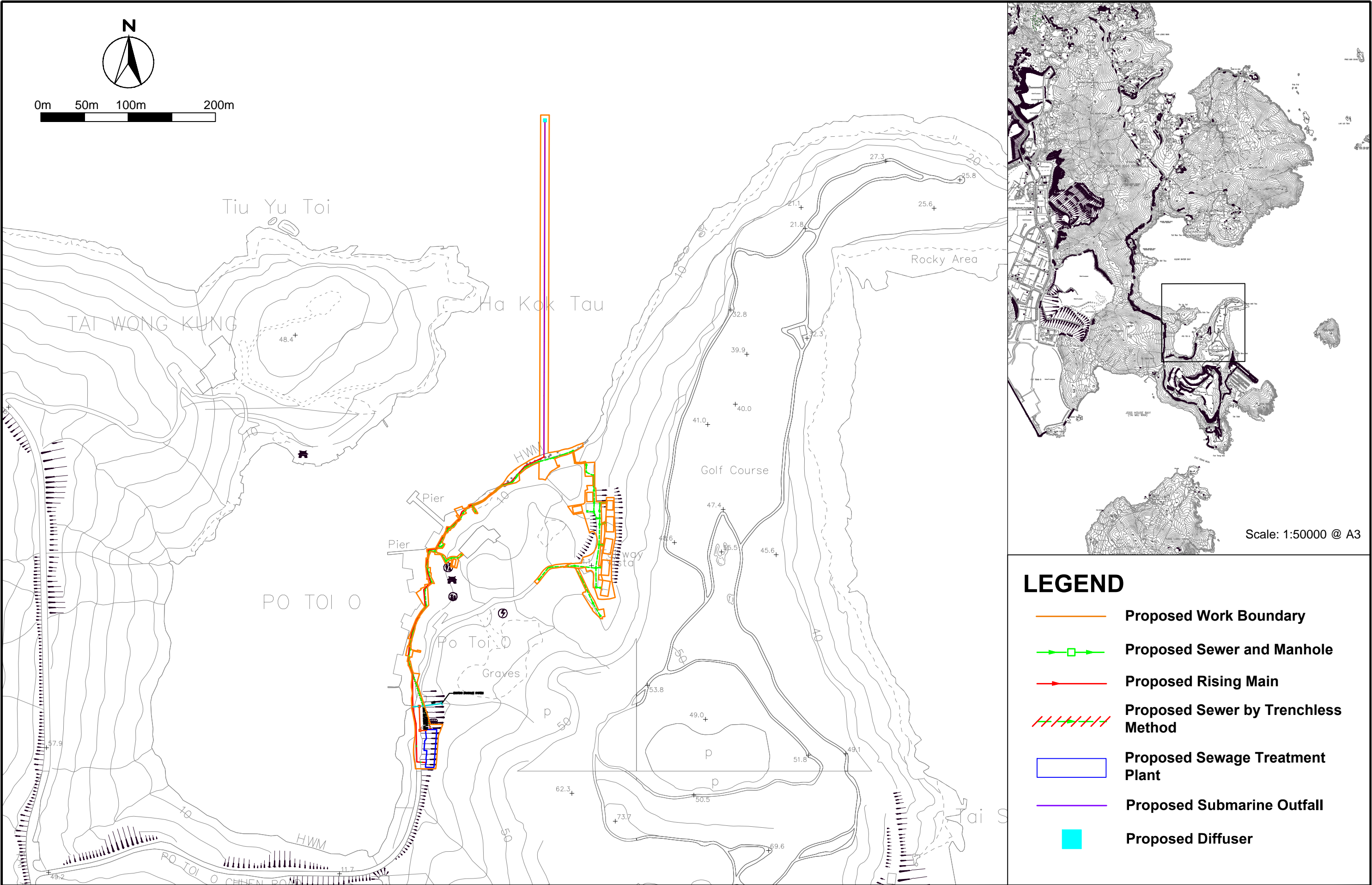
13.9 Interim Notification of Environmental Quality Limit Exceedances

- 13.9.1 Should any exceedance in environmental quality performance limit be recorded, the ET Leader should immediately inform the IEC, ER, Contractor and EPD as appropriate in accordance to the Event and Action Plan. He should advise to the IEC, ER, Contractor and EPD the investigation result, remediation actions performed, effectiveness of the measures and proposal of further actions required. A sample interim notification template can be found in **Appendix D**.

14 CONCLUSION

- 14.1.1 This Manual lists out the EM&A requirements for different environmental aspects, including air quality, noise, water quality, terrestrial ecology, marine ecology, fisheries, waste management, landscape and visual, and built heritage.
- 14.1.2 Environmental monitoring on air quality, noise, water quality, landscape and visual and built heritage are proposed, while regular site inspection is required for all environmental aspects. Any non-compliance identified should be notified to all parties according to the Event and Action Plan, and remediation measures should be carried out. Complaints received should be investigated and problems related to construction works should be solved till satisfaction. Baseline, monthly, quarterly and final EM&A reports shall be prepared to report on the continual monitoring results and evaluate the EM&A works.

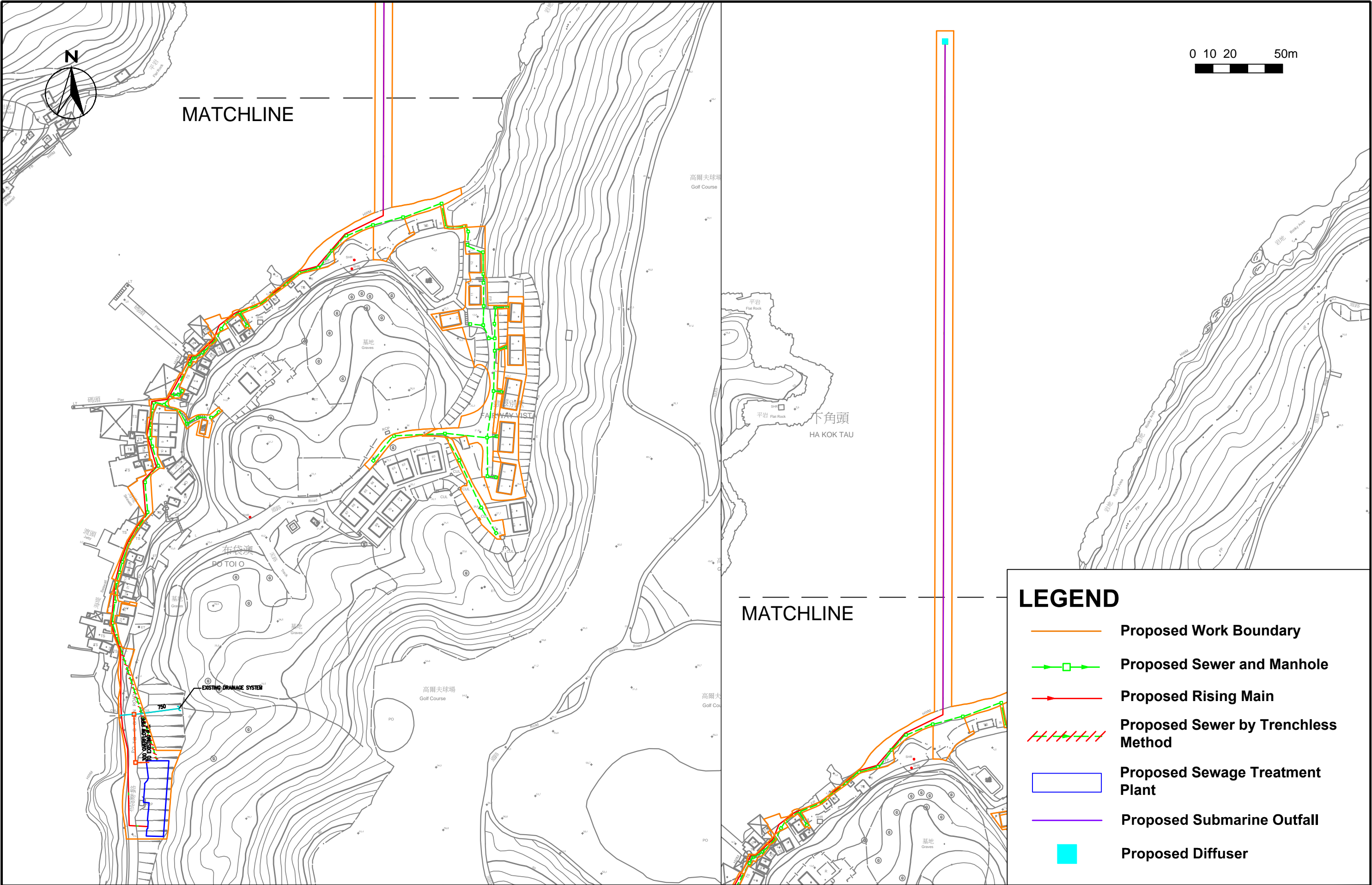
FIGURES



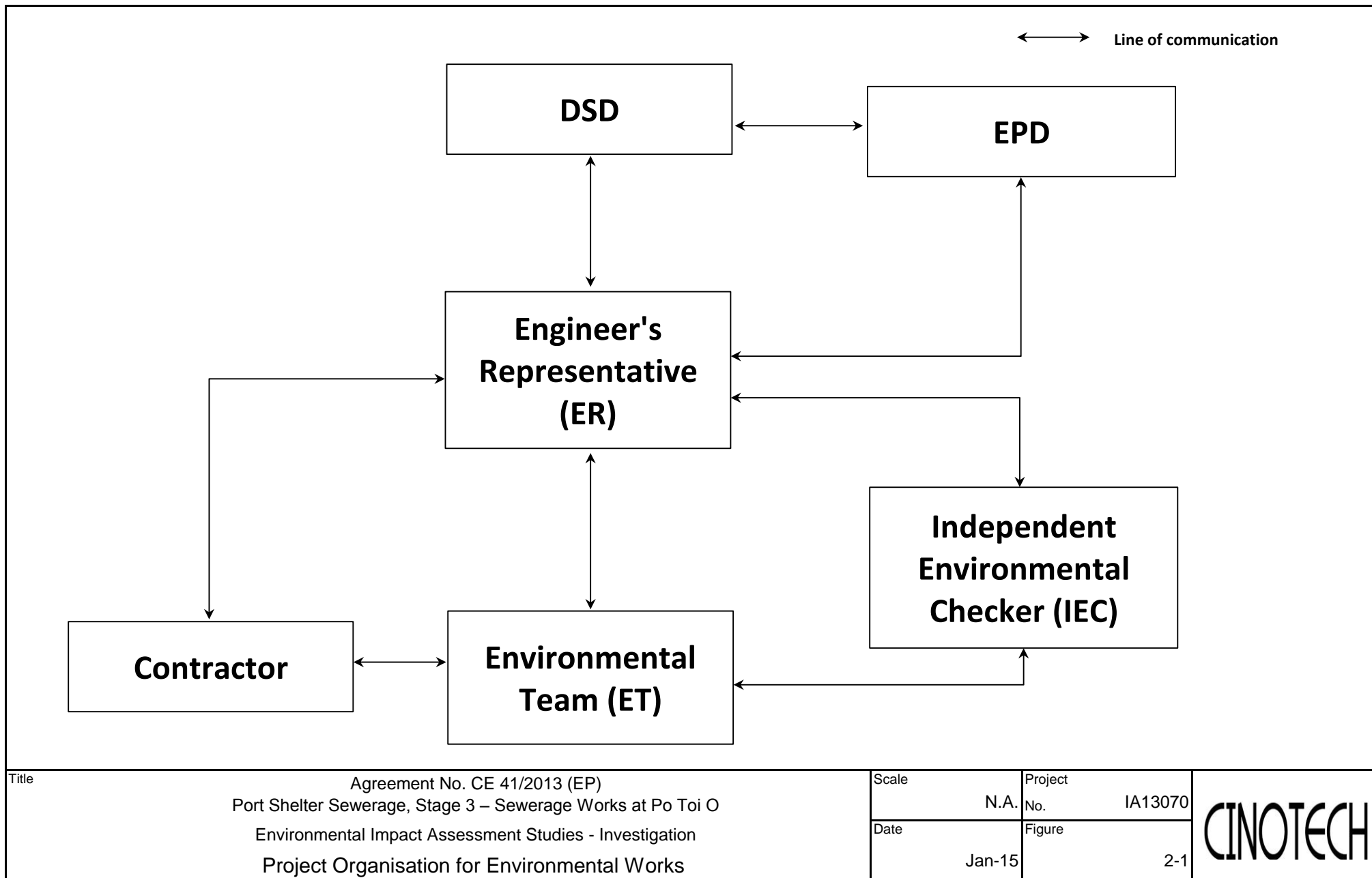
LEGEND

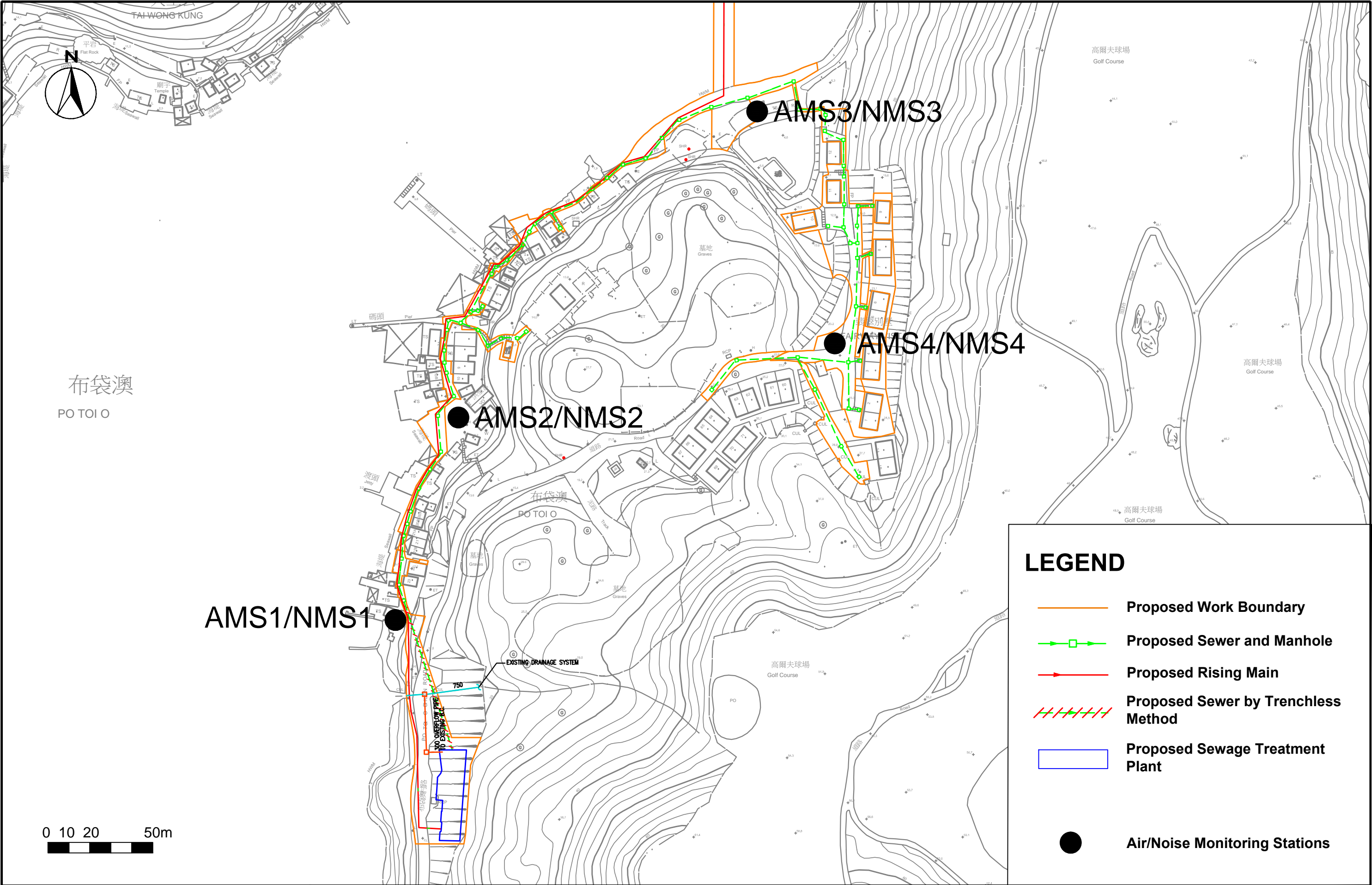
- Proposed Work Boundary
- Proposed Sewer and Manhole
- Proposed Rising Main
- Proposed Sewer by Trenchless Method
- Proposed Sewage Treatment Plant
- Proposed Submarine Outfall
- Proposed Diffuser



	Agreement No. CE 41/2013 (EP) Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O		SCALE	1:4000 @ A3	DATE	Oct 15
	Environmental Impact Assessment Studies - Investigation		CHECK	B.C.	DRAWN	H.T.
	Layout Plan of Proposed Sewerage Works in Po Toi O		JOB No.	IA13070	FIGURE No.	1-1A
博威工程顧問有限公司					REV	2



 <div>THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION DRAINAGE SERVICES DEPARTMENT</div>	 <div>CINOTECH Cinotech Consultants Limited</div>	 <div>BLACK & VEATCH HONG KONG LIMITED 博威工程顧問有限公司</div>	Agreement No. CE 41/2013 (EP) Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O Environmental Impact Assessment Studies - Investigation		SCALE	1:2000 @ A3	DATE	Oct 15	
			Layout Plan of Proposed Sewerage Works in Po Toi O		CHECK	B.C.	DRAWN	H.T.	
					JOB No.	IA13070	FIGURE No.	1-1B	REV 2





 	Agreement No. CE 41/2013 (EP) Port Shelter Sewerage, Stage 3 – Sewerage Works at Po Toi O Environmental Impact Assessment Studies - Investigation			
	Location of Air and Noise Monitoring Stations			
	SCALE	AS SHOWN	DATE	MAR 15
	CHECK	MC	DRAWN	BC
	JOB No.	IA13070	FIGURE No.	3-1
			REV	1

**APPENDIX A
IMPLEMENTATION SCHEDULE OF
RECOMMENDED MITIGATION
MEASURES**

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
Air Quality Impact								
Project Specific Measures								
3.8	A1	Deodourizer should have at least 99.5% hydrogen sulfide removal efficiency.	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A2	Odourous materials (sludge, screenings and grits, worn filter) should be stored and removed in sealed tankers and containers.	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A3	Sludge should be transferred to sludge tanker by coupling method.	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A4	During release of pressure from the tanker, the odourous gas should be discharged into the sludge storage room for extraction to deodourization unit.	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A5	Regular inspection should be conducted to check for leakage of odourous gas	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A6	Maintain the removal efficiency of screenings and grits by flushing the screens and grit sump regularly to prevent build up of solids	To maintain the removal efficiency of screenings and grits	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A7	Maintain the efficiency of MBR membrane by removing organic and inorganic debris regularly	To maintain the efficiency of MBR membrane	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A8	Replace worn filter to maintain the odour removal efficiency at 99.5%	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
3.8	A9	Clean all the tanks with water regularly	To minimize odour nuisance to sensitive receivers	DSD	Sewage Treatment Plant	Throughout operational phase	Operational phase	EIAO-TM
Generic/Standard Measures								
3.8	A10	Good housekeeping to minimize dust generation, e.g. by properly handling and storing dusty materials	To minimize dust generation	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A11	Adopt dust control measures, such as dust suppression using water spray on exposed soil (at least 4 times per day), in areas with dusty construction activities and during material handling	To minimize dust generation due to erosion	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
3.8	A12	Store cement bags in shelter with 3 sides and the top covered by impervious materials if the stack exceeds 20 bags	To prevent leakage of cement	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A13	Maintain a reasonable height when dropping excavated materials to limit dust generation	To minimize dust generation during movement of excavated materials	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A14	Limit vehicle speed within construction site and in Po Toi O to 10km/hr and confine vehicle movement in haul road	To minimize dust generation due to traffic movement	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A15	Minimize exposed earth after completion of work in a certain area by hydroseeding, vegetating, soil compacting or covering with bitumen	To minimize dust generation due to erosion	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A16	Provide wheel washing at construction site exit to clean the vehicle body and wheel	To prevent dust from being brought offsite	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A17	Cover materials on trucks before leaving the construction site to prevent debris from dropping during traffic movement or being blown away by wind	To prevent falling of debris during traffic movement and by wind	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A18	Regular maintenance of plant equipment to prevent black smoke emission	To minimize black smoke emission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A19	Throttle down or switch off unused machines or machine in intermittent use	To minimize unnecessary emission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A20	Minimize excavation area as far as possible	To minimize dust emission and potential release of odour from exposed ground	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A21	Store odourous excavated materials in covered containers and remove off-site as soon as possible within 24 hours	To minimize odour nuisance to sensitive receivers	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A22	Cover open stockpiles of construction materials (e.g. aggregates, sand and fill materials) with impermeable materials such as tarpaulin during rainstorms.	To prevent soil erosion under rainstorm	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO
3.8	A23	Hoarding of not less than 2.4 m high shall be erected from ground level to surround the construction site for sewage treatment plant along Po Toi O Chuen Road except for a construction site entrance or exit	To minimize dust emission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO

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3.8	A24	Carry out air quality monitoring throughout the construction period	To monitor construction dust level	DSD's Contractor	At representative ASRs	Prior to and throughout construction phase	Construction phase	EIAO-TM
3.8	A25	Carry out regular site inspection to audit the implementation of mitigation measures	To check the implemenation status and effectiveness of mitigation measures	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM, APCO

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Noise Impact								
Project Specific Measures								
4.7	N1	Use hand-held plant equipment or manual equipment within village area	To minimize construction noise level	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N2	For HDD, enclose the stationary plant equipment on three sides with cover. Only the side facing the sea shall be opened for heat exhaustion.	To lower noise transmission	DSD's Contractor	HDD work site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N3	Generator should be placed at a fixed location at least 5-6m away from the NSRs and screened by noise barrier whenever excavation work has to be carried out at their front doors	To lower noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N4	Avoid carrying out noisy activities at the same time. The work front of village sewer installation near NSRs PTO_N1 and PTO_N3 shall not be conducted concurrently with installation of Po Toi O Chuen Road sewer and horizontal directional drilling respectively.	To minimize noise production	DSD's Contractor	Whole construction site	When the respective workfront next to the NSR is carried out	Construction phase	NCO, EIAO-TM
4.7	N5	Vibratory poker shall only be operated 4m away from NSR and with noise barrier properly erected. Surfacing work within 4m from NSR shall be carried out by manual method.	To minimize noise production	DSD's Contractor	Whole construction site	When the respective workfront next to the NSR is carried out	Construction phase	NCO, EIAO-TM
Generic/Standard Measures								
4.7	N6	Schedule noisy activities to minimise exposure of nearby NSRs to high levels of construction noise	To minimize construction noise level	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N7	Use Quality Powered Mechanical Equipment (QPME) which produces lower noise level	To minimize construction noise level	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N8	Erect 3m high mobile barriers with skid footing and a small cantilevered upper portion within a few metres of stationary plants and within about 5m of more mobile plant.	To lower noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM

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4.7	N9	Hand-held breaker shall be fitted with mufflers. A movable enclosure made up of plywood is proposed to surround both worker and breaker during breaking process. The internal wall of the enclosure should be laid with sound absorbent such as mineral wool.	To lower noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N10	Regular maintenance of plant equipment to prevent noise emission due to impair	To prevent noise emission due to impair	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N11	Position mobile noisy equipment in location and direction away from NSR	To minimize noise transmission to NSR	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N12	Use silencer or muffler on plant equipment and should be properly maintained	To minimize noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N13	Throttle down or switch off unused machines or machine in intermittent use between work	To minimize noise production	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N14	Make good use of stockpiles or other structures for noise screening	To minimize noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N15	Mobile plant should be sited as far away from NSRs as possible	To minimize noise transmission	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N16	Reduce the percentage on-time for some noisy PME's	To minimize noise production	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	NCO, EIAO-TM
4.7	N17	Carry out noise monitoring	To monitor construction noise level	DSD's Contractor	At representative NSRs	Prior to and throughout construction phase	Construction phase	EIAO-TM

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Water Quality Impact								
Project Specific Measures								
5.8	W1	Divert the water from outfall of W3 (stream near Fairway Vista) during open cut excavation for laying of gravity sewer nearby.	To prevent the excavated materials from falling into the water and being carried into the sea	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W2	Place sandbag along the upstream section of the stream near Fairway Vista and along rocky shore during open cut excavation for laying of gravity sewers/rising mains nearby.	To prevent the excavated materials from falling into the water and being carried into the sea	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W3	Intercept the water from u-channel at the foot of the slope where the STP will be built	To prevent water from entering the construction site	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
6.8	W4	Install cofferdam around the proposed excavation area for entry pit of HDD work to prevent falling of debris into the sea	To prevent debris from entering the waterbodies	DSD's Contractor	HDD work site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W5	Install sheet piles in marine waters by vibratory action.	To minimize dispersion of marine sediment	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W6	Marine works (dredging, construction and installation works at diffuser location, backfilling) shall be carried out inside the watertight cofferdam. The cofferdam can only be removed after completion of work.	To minimize dispersion of marine sediment	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W7	Dredging should be carried out by grab dredgers anchored outside the cofferdam. The marine sediment should be placed in sealed compartment of the marine barge.	To minimize dispersion of marine sediment	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W8	Water removed from the cofferdam should be desilted before discharge back into the sea.	To prevent discharge of silty water into the sea	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W9	Carry out water quality monitoring at water sensitive receivers before and during cofferdam installation works, throughout dredging works, and during cofferdam extraction works	To identify any water quality impact due to construction works	DSD's Contractor	Water Monitoirng Stations	Before and throughout installation and extraction works of cofferdam	Construction phase	EIAO-TM

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5.8	W10	The following summarizes the precautionary measures for minimizing chance of emergency discharge: <ul style="list-style-type: none"> • Provision of dual power by CLP; • Equipped with Supervisory control and data acquisition system (SCADA), which signals to the operation and maintenance personnel for emergency attendance in case of plant failure; • Provision of standby pump and screen at the PTOSTW. • Provision of emergency generator within 4 hours by DSD's future term contractor. • Provision of emergency storage with capacity of 4-hr sewage retention time. • Arrangement of tankers for removing incoming sewage to other sewage treatment plants for treatment. 	To prevent emergency discharge	DSD	Sewage Treatment Plant	Operational phase	Operational phase	EIAO-TM
5.8	W11	Carry out water quality monitoring at water sensitive receivers during normal operation	To identify any water quality impact due to the normal operation of the Sewage Treatment Plant (STP)	DSD	At representative WSRs	6 months before and in 1st year of operation	Operational phase	WPCO, EIAO-TM
Generic/Standard Measures								
5.8	W12	Set up sedimentation tank for settling suspended solids in wastewater before discharge into storm drains. Sand/silt removal facilities such as sand traps, silt traps and sedimentation basin should be provided with adequate capacity.	To reduce the amount of suspended solid in wastewater	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W13	Follow ProPECC PN 1/94 "Construction Site Drainage" as far as practicable	To minimize surface runoff and chance of erosion	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W14	Construct catchpits and perimeter channels prior to commencement of site formation works and earthworks.	To stop runoff from flowing across the construction site	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W15	Maintain silt removal facilities, channels, manholes before and after rainstorm.	To prevent failure that may lead to flooding	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM

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5.8	W16	Remove silt and grit from silt trap at regular interval.	To prevent blockage the may lead to flooding	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W17	Well design works program to minimize the work areas to minimize the soil exposure and site runoff.	To minimize surface runoff and chance of erosion	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W18	<p>Arrange soil excavation works outside rainy seasons (April to September) as far as possible. If this cannot be achieved, the following measures should be implemented:</p> <ul style="list-style-type: none"> - Cover temporary exposed slope surfaces with impermeable materials, e.g. tarpaulin - Protect temporary access roads by crushed stone or gravel - Provide intercepting channels along crest/edge of excavation - Carry out adequate surface protection measures well before the arrival of a rainstorm 	To minimize surface runoff and chance of erosion	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W19	Minimize exposed earth after completion of work in a certain area by hydroseeding, vegetating, soil compacting or covering with bitumen	To prevent soil erosion under rainstorm	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W20	Prevent rainwater from entering trenches. Excavation of trenches should be dug and backfilled in short sections during rainy seasons. Remove silt in rainwater collected from the trenches or foundation excavations prior to discharge to storm drains.	To prevent soil erosion under rainstorm	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W21	Cover open stockpiles of construction materials (e.g. aggregates, sand and fill materials) with impermeable materials such as tarpaulin during rainstorms.	To prevent soil erosion under rainstorm	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W22	Cover and temporary seal manholes to prevent silt, construction materials or debris and surface runoff from entering foul sewers.	To prevent overloading of foul sewers	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W23	Remove waste from the construction site regularly.	To prevent waste accumulation	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
5.8	W24	Apply discharge license for effluent discharge. Treat the discharge to comply with the requirement in TM-DSS.	To ensure compliance with effluent discharge requirement	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	WPCO, TM-DSS, EIAO-TM

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5.8	W25	Reuse treated effluent onsite, e.g. dust suppression, wheel washing and general cleaning.	To minimize wastewater generation	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
5.8	W26	Monitor effluent water quality.	To ensure compliance with effluent discharge requirement	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	WPCO, EIAO-TM
5.8	W27	Register as chemical waste producer if chemical waste will be generated.	To control chemical waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
5.8	W28	Perform maintenance of vehicles and equipment that have oil leakage and spillage potential on hard standings within a bunded area with sumps and oil interceptors.	To prevent oil leakage or spillage	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
5.8	W29	Dispose chemical waste in accordance to Waste Disposal Ordinance. Follow the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> , examples as follows:	To avoid accident in waste storage and handling	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
		- Store chemical wastes with suitable containers to avoid leakage or spillage during storage, handling and transport						
		- Label chemical waste containers according to the CoP to notify and warn the waste handlers						
		- Store chemical wastes at designated safe location with adequate space						
5.8	W30	Provide sufficient chemical toilets with regular maintenance by registered waste collector where necessary	To proper collection of task force waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
5.8	W31	Provide a drip tray/container underneath the bentonite recycling system	To prevent any leaked bentonite from entering the watercourse or sea	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
5.8	W32	Carry out regular site inspection to audit the implementation of mitigation measures	To check the implemenation status and effectiveness of mitigation measures	DSD's Contractor	Water Monitoirng Stations	Throughout construction phase	Construction phase	EIAO-TM, APCO
5.8	W33	Carry out effluent quality monitoring at location specified in the discharge licence	To ensure compliance with effluent discharge requirement	DSD	Effluent outlet	Operational phase	Operational phase	WPCO, EIAO-TM

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Terrestrial Ecology								
Project Specific Measures								
6.12	E1	Erect bright colour fencing along the boundary of the undisturbed region of the shrubland and woodland, and around <i>Diospyros vaccinioides</i> , a plant species of conservation importance, near the work boundary to remind workers not to trespass or occupy the area, and to be careful during operation of equipment.	To protect the shrub from being damaged	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
6.12	E2	Reinstate the disturbed rocky shore with the rocks temporarily removed	To restore the rocky shore habitat	DSD's Contractor	Whole construction site	After completion of works near the rocky shore	Construction phase	EIAO-TM
6.12	E3	Place sandbag around the section of W3 next to Fairway Vista and along the shore during open cut excavation for laying of gravity sewer nearby.	To prevent the excavated materials from falling into the water and being carried into the sea	DSD's Contractor	Watercourse W3	When construction work is carried out in the vicinity of W3	Construction phase	EIAO-TM
6.12	E4	Temporarily divert the water from outfall of W3 away from excavation area.	To prevent the excavated materials from falling into the water and being carried into the sea	DSD's Contractor	Watercourse W3	When construction work is carried out in the vicinity of W3	Construction phase	EIAO-TM
6.12	E5	Inspect the condition of the <i>Diospyros vaccinioides</i> near the work boundary as part of weekly site audit	To inspect the condition of the <i>Diospyros vaccinioides</i>	DSD's Contractor	The <i>Diospyros vaccinioides</i> near the work boundary	Throughout construction phase	Construction phase	EIAO-TM
Generic/Standard Measures								
6.12	E6	Erection of hoarding, fencing or provision of clear demarcation of work zones	To remind workers not to damage area outside the work boundary	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
6.12	E7	Designate areas for placement of equipment, building materials and wastes away from the natural environment	To prevent damage on the natural environment	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM

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6.12	E8	Carry out tree preservation and compensatory tree planting will be carried out in accordance with DEVB TCW No. 7/2015.	To reinstated woodland habitat	DSD's Contractor	Whole construction site	After completion of works near woodland	Construction phase	EIAO-TM

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Waste Management								
Project Specific Measures								
9.8	WM1	Sludge will be delivered by sealed sludge tanker for treatment at Sludge Treatment Facilities.	To prevent odour nuisance	DSD	STP	Throughout operational phase	Operational phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
9.8	WM2	Debris from screening process and general refuse should be stored within the STP in sealed container and be disposed of at landfill regularly.	To prevent odour nuisance	DSD	STP	Throughout operational phase	Operational phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
9.8	WM3	Worn filters and MBR membrane shall be stored and labelled as in construction phase. Chemical wastes shall be treated at chemical treatment facility by licensed contractor.	To prevent odour nuisance	DSD	STP	Throughout operational phase	Operational phase	Waste Disposal Ordinance, EIAO-TM
Generic/Standard Measures								
9.8	WM4	Allocate an area for waste sorting and storage of C&D materials into the following categories for reuse, recycle or disposal if possible. Remove waste from the construction site for sorting once generated if no suitable space can be identified. - excavated materials suitable for reuse - inert C&D materials (or public fill) for disposal offsite - non-inert C&D materials (or C&D waste) for disposal at landfills - chemical waste - bentonite slurry for reconditioning and reuse - general refuse	To minimize waste generation	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM

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9.8	WM5	Adopt good site practice as follows:	To proper handling of waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
		- Provide training to workers on site cleanliness, waste management (waste reduction, reuse and recycle) and chemical handling procedures						
		- Provide sufficient waste collection points and regular removal						
		- Cover waste materials with tarpaulin or in enclosure during transportation						
		- Maintain drainage systems, sumps and oil interceptors						
		- Sort out chemical waste for proper handling and treatment onsite or offsite						
9.8	WM6	Adopt waste reduction measures as follows:	To minimize waste generation	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
		- Allocate area/containers for sorting, recovering and storing waste for reuse, recycle or disposal (e.g. demolition debris and excavated materials, general refuse like aluminium cans.)						
		Remove waste from the construction site for sorting once generated if no suitable space can be identified.						
		- Allocate area for proper storage of construction materials to prevent contamination						
		- Minimize wastage through careful planning and avoiding over-purchase of construction materials						
9.8	WM7	Prepare and implement a site specific Waste Management Plan (WMP) as part of Environmental Management Plan (EMP) in accordance with ETWB TCW No. 19/2005. Detail waste management method in the form of avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal according to the recommendations on the EIA and EM&A Manual. It should be approved by the ER and regularly reviewed.	To provide guidance to waste management	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ETWB TCW No. 19/2005, EIAO-TM

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9.8	WM8	Store waste materials properly as follows:	To properly store waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
		- Avoid contamination by proper handling and storing waste						
		- Prevent erosion by covering waste						
		- Apply water spray on excavated materials						
		- Maintain and clean storage area regularly						
		- Sort and stockpile different materials at designated location to enhance reuse						
9.8	WM9	Apply for relevant waste disposal permits in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28), Dumping at Sea Ordinance (Cap. 466).	To properly dispose waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28), Dumping at Sea Ordinance (Cap. 466), EIAO-TM
9.8	WM10	Hire licensed waste disposal contractors for waste collection and removal. Dispose waste at licensed waste disposal facilities	To properly dispose waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
9.8	WM11	Implement trip-ticket system for recording the amount of waste generated, recycled and disposed, including chemical wastes	To monitor movement of waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, Waste Disposal Ordinance, EIAO-TM
9.8	WM12	Provide wheel washing at construction site exit to clean the vehicle body and wheel	To prevent dust from being brought offsite	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	ProPECC PN 1/94, EIAO-TM
9.8	WM13	Reduce water content in wet spoil generated from piling work by mixing with dry materials. Only dispose treated spoil with less than 25% dry density to Public Fill Reception Facilities	To minimize load to reception facilities	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM

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9.8	WM14	Dispose dry waste or waste with less than 70% water content by weight to landfill	To minimize load to reception facilities	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
9.8	WM15	Follow the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Waste</i> as follows:	To avoid accident in waste storage and handling	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
		- Store chemical wastes with suitable containers. Seal and maintain the container to avoid leakage or spillage during storage, handling and transport						
		- Label chemical waste containers in both English and Chinese with instructions in accordance to Schedule 2 of the Waste Disposal (Chemical Waste) (General) Regulation						
		- The container capacity should be smaller than 450 litres unless agreed by the EPD						
9.8	WM16	Comply with the requirement of the chemical storage area:	To ensure proper storage of chemical waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
		- Store only chemical waste and label clearly the chemical characters of the waste						
		- Have at least 3 sides enclosed and protected from rainfall with cover						
		- Provide sufficient ventilation						
		- Have impermeable floor and has bunds to contain 110% of the capacity of the largest container or 20% of the total volume of the stored waste in the area, whichever is larger						
		- Adequately spaced incompatible materials						
9.8	WM17	Transfer used lubricants, waste oils and other chemicals to oil recycling companies, if possible, and empty oil drums for reuse or refill. No direct or indirect discharge is permitted	To ensure proper disposal of chemical waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
9.8	WM18	Hire licensed chemical waste disposal contractors for waste collection and removal. Dispose chemical waste at the approved Chemical Waste Treatment Centre at Tsing Yi or other licensed facility	To ensure proper disposal of chemical waste	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
9.8	WM19	Hire reputable waste collector to separately collect and dispose general refuse from other wastes. Cover the waste to prevent being blown away	To ensure proper disposal of general refuse	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
9.8	WM20	Provide recycling bins for sorting out recyclables for collection by recycling companies. Non-recyclables should be removed to designated landfills every day by licensed collectors to prevent environmental and health nuisance.	To ensure proper recycling and disposal of general refuse	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	Waste Disposal Ordinance, EIAO-TM
9.8	WM21	Organize training and reminders to site staff on waste minimization through avoidance and reduction, reusing and recycling	To ensure proper management of general refuse	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
9.8	WM22	Used bentonite shall be reconditioned onsite and reused as far as practical to minimize wastage. If this is deemed not viable, the used bentonite shall be delivered offsite for reconditioning.	To minimize wastage of bentonite	DSD's Contractor	Whole construction site	Throughout construction phase	Construction phase	EIAO-TM
9.8	WM23	Characterize the sediment quality of the marine sediment to be dredged and submit a Sediment Quality Report for EPD's approval. Dispose the dredged marine sediment in accordance with ETWB TC(W) No. 34/2002	To verify the categories of sediment to be disposed in accordance with ETWB TC(W) No. 34/2002	DSD's Contractor	To be allocated by CEDD	Before dredging works	Construction phase	ETWB TC(W) No. 34/2002

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
Landscape & Visual								
Project Specific Measures								
Table 10-6	CM8	Protective materials to be provided to natural rocky coastline to prevent damage to existing landform from plant and machinery during temporary drilling operations. Reinstatement following removal of plant & equipment to original or improved condition shall be undertaken.	To protect landscape resources	DSD's contractor	Temporary drilling site for submarine outfall	Construction planning and during construction period	Construction phase	Particular Specification
Table 10-7	OM1	Sensitive design of sewage treatment plant in terms of scale, height and bulk (visual weight) to integrate the building into the existing topography.	To mitigate visual impact	DSD's Design Architect/ Engineer	STP	Design Phase	Design Phase	Detailed Design Drawings and Specifications
Table 10-7	OM2	Use of appropriate building materials and colours for Sewage Treatment Plant to complement surroundings	To mitigate visual impacts	DSD's Design Architect/ Engineer	STP	Design Phase	Design, Construction and Operational Phases	Detailed Design Drawings and Specifications
				DSD's contractor		Construction Phase & first year in Operational Phase		
				Building Operator/DSD		Operational phase		
Generic/Standard Measures								
Table 10-6	CM1	The construction area and contractor’s temporary works areas should be minimised to avoid impacts on adjacent landscape. All slope excavation shall take place from within the work boundary to minimise impacts on adjacent slopes.	To avoid impact on adjacent landscape areas	DSD's contractor	STP, along gravity sewers and rising mains construction route and at temporary drilling site for submarine outfall	Construction planning and during construction period	Construction phase	Detailed Design drawings and particular specifications
Table 10-6	CM2	Reduction of construction period to practical minimum	To minimise duration of impact	DSD's contractor	N/A	Construction planning and during construction period	Construction phase	N/A

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relevant Legislation & Guidelines
Table 10-6	CM3	Construction traffic (land and sea) including construction plant, construction vessels and barges to be kept to a practical minimum.	To minimize visual impacts to local residents and surrounding VSRs	DSD's contractor	STP, along gravity sewers and rising mains construction route at temporary drilling and dredging sites for submarine outfall	Construction planning and during construction period	Construction phase	As per the Particular Specification
Table 10-6	CM4	Erection of decorative mesh screens or construction hoardings and/or temporary noise barriers around works areas in visually unobtrusive colours.	To screen construction works from local residents and surrounding VSRs	DSD's contractor	STP, along gravity sewers and rising mains construction route and at temporary drilling site for submarine outfall	Construction planning and during construction period	Construction phase	As per the Particular Specification
Table 10-6	CM5	Avoidance of excessive height and bulk of site buildings and structures.	To reduce visual impact	DSD's contractor	STP, and at temporary drilling site for submarine outfall	Construction planning and during construction period	Construction phase	As per the Particular Specification
Table 10-6	CM6	Control of night-time lighting by hooding all lights and through minimisation of night working periods.	To maximize screening of the works	DSD's contractor	STP and at temporary drilling and dredging site for submarine outfall	Construction planning and during construction period	Construction phase	As per the Particular Specification

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relevant Legislation & Guidelines
Table 10-6	CM7	All existing trees shall be carefully protected during construction. A Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. Tree risk assessment shall be undertaken to all existing trees within the project site as per "Guidelines for Tree Risk Assessment and Management Arrangement"	To maximize protection of existing trees	DSD's contractor	STP and all other construction areas	Construction planning and during construction period	Construction phase	As per Tree Protection Particular Specification, DEVB TC (W) No.10/2013 and Guidelines for Tree Risk Assessment and Management Arrangement
Table 10-7	OM3	Lighting units to be directional and minimise unnecessary light spill and glare.	To mitigate visual impacts	DSD's Design Architect/ Engineer	STP	Design Phase	Design, Construction and Operational Phases	Detailed Design Drawings and Specifications
				DSD's contractor		Construction Phase & first year in Operational Phase		
				Building Operator/DSD		Operational phase		
Table 10-7	OM4	Greening measures to reinstate the landscape which are appropriate to the context, including tree and shrub planting and vertical greening, shall be implemented.	To mitigate visual impacts	DSD's Design Landscape Architect	STP	Design Phase	Design, Construction and Operational Phases	Detailed Design Drawings and Specifications
				DSD's contractor		Construction Phase & first year in Operational Phase		
				Building Operator/DSD		Operational phase		

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
Table 10-7	OM5	Compensatory tree planting for all felled trees shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under the relevant technical circulars. Tree risk assessment shall be undertaken to all existing trees within the project site as per “Guidelines for Tree Risk Assessment and Management Arrangement”	To mitigate landscape and visual impacts of tree loss	DSD's Landscape Architect	STP and at temporary drilling site for submarine outfall	Design Phase	Design, Construction and Operational Phases	As per approved Tree Removal Application, Detailed Design Drawings, Tree Protection Particular Specification and Guidelines for Tree Risk Assessment and Management Arrangement
				Contractor's Landscape Architect		Construction Phase & first year in Operational Phase		
				Building Operator/DSD		Operational phase		

Appendix A - Implementation Schedule of Recommended Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures *	Objectives of the Recommended Measure & Main Concerns to address	Implementation Agent	Location of the measure	Duration of the measure	Implementation stages	Relveant Legislation & Guidelines
Built Heritage								
Project Specific Measures								
11.6	BH1	Undertake condition survey by professional qualified building surveyor or engineer to record the existing condition of the built heritage resources.	To record the condition of the built heritage resources before the commencement of construction works	DSD's Contractor	GB01, BH02, LF04	Before commencement of construction works	Construction phase	EIAO-TM and Guidelines for CHIA
11.6	BH2	Carry out vibration and settlement monitoring to built heritage resources. A maximum vibration level 7.5mm/s shall be adopted for the Grade 3 Hung Shing Temple and settlement check points in the Alert/Alarm/Action limit levels at 6mm/8mm/10mm shall be adopted.	To minimise the potential impact by mechanical vibration and settlement of built heritage resources	DSD's Contractor	GB01, BH02, LF04	During construction works	Construction phase	EIAO-TM and Guidelines for CHIA
11.6	BH3	Provision of protective covering or protective screen to built heritage resources which are close to the works area	To prevent direct impact from the machine and damages by construction tools or waste	DSD's Contractor	GB01, BH02, LF01, LF04	During construction works	Construction phase	EIAO-TM and Guidelines for CHIA
11.6	BH4	Maintain public access to the cultural landscape features as far as possible	To avoid the proposed works affecting the worshippers	DSD's Contractor	LF01, LF04, LF05	During construction works	Construction phase	EIAO-TM and Guidelines for CHIA
11.6	BH5	Provision of buffer zone of at least 1m from the proposed works as far as possible	To prevent any direct and indirect impact	DSD's Contractor	BH02, LF01, LF04	During construction works	Construction phase	EIAO-TM and Guidelines for CHIA

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

APPENDIX B
SAMPLE DATA SHEET

1-hr TSP Air Quality Monitoring

Field Operation Data Log Sheet

Equipment	Model	Equipment No.	Last Calibration/Due Date
			/

Monitoring Location				
Description of Location				
Sampling Date and Time				
Weather Condition		Sunny / Fine / Cloudy / Windy / Rainy		
Measuring Parameters		TSP		
		1st hour	2nd hour	3rd hour
Count Value				
Count Value ÷ 60 mins x (K Factor:)				
Mass Concentration ($\mu\text{g}/\text{m}^3$)				
Site Condition	Main Construction Site			
	Other Construction Site			
Remarks				

	Name	Signature	Date
Recorded By			
Checked By			

1-hr / 24-hr TSP Air Quality Monitoring Field Operation Data Log Sheet

Station: _____

Sampling Date & Time: From: _____ (: am/pm) Collection Date: _____

Operators: _____ Weather: Sunny Cloudy Windy Rainy
Wind: Strong Mild Calm

High Volume Sampler	Model no.	
	Blower Motor Serial no.	

TSP - Total Suspended Particulates Sampler			
Equipment No.		Set Point	
Slope, m		Intercept. b	
	Initial, I	Final, f	
Ambient Pressure (mmHg), Pa			
Ambient Temperature (K), Ta			
Delta (in. of Water), W			
$Y = [W \times (Pa/760) \times (298/Ta)]^{1/2}$			
Standard flow, Qstd (m ³ /min) = (Y - b)*0.0283/m			
Elapsed Timer Indicator (Hours), T			
Filter Identification no.			
Weight of Filter (g)			
Weight of Particulate (g)			
Mean Standard Flow, $Qstd_{avg} = (Qstd_i + Qstd_f)/2$			
Total Time, Total Time = (Tf - Ti) x 60			
Standard Volume, $Vstd (m^3) = Qstd_{avg} \times \text{Total Time}$			
Particulate Concentration (µg/m³)			
Observed Construction Activities	Main Construction Site		
	Other Construction Site		

Remarks: _____

Conducted by: _____ Signature: _____ Date: _____

Checked by: _____ Signature: _____ Date: _____

Noise Monitoring

Field Record Sheet

Equipment	Model	Equipment No.	Last Calibration/Due Date
			/
			/

Noise Monitoring Period	Before Measurement			After Measurement		
	Noise Level (dB)	Freq. of Signal (KHz)	Display (dB)	Noise Level (dB)	Freq. of Signal (KHz)	Display (dB)
07:00 – 19:00						

Monitoring Location					
Description of Location					
Date of Monitoring					
Weather Condition		Sunny / Cloudy / Rainy			
Measurement Start Time (hh:mm)					
Measurement Time Length (min/hr)					
Measurement Results	Parameter	Measured	Baseline	Actual Construction Noise Level	
	L _{eq} dB(A)				
	L ₁₀ dB(A)				
	L ₉₀ dB(A)				
Major Construction Noise Source(s) During Measurement	Excavator / backhoe		Bulldozer		
	Dump truck / lorry		Roller		
	Other, pls specify:				
Other Noise Source(s) During Measurement	Road traffic noise		Air traffic noise		
	Construction noise from other sites (e.g. piling) pls specify:				
Remarks		Façade Measurement / Free Field Measurement			

Note:

During daytime (0700-1900): 1 no. of L_{eq}(30-min)

	Name	Signature	Date
Recorded By			
Checked By			

Remarks: Monitoring should be cancelled if steady wind speed exceeds 5m/s or with gusts exceeding 10m/s

Marine Water Quality Monitoring Data Record Sheet

Location			
Date			
Start Time (hh:mm)			
Weather			
Sea Conditions			
Tidal Mode			
Water Depth (m)			
Monitoring Depth	Surface	Middle	Bottom
pH			
Salinity (mg/L)			
Temperature (°C)			
DO Saturation (%)			
DO (mg/L)			
BOD ₅ (mg/L)			
Turbidity (NTU)			
SS (mg/L)			
NH ₃ -N (mg/L)			
TIN (mg/L)			
<i>E.coli</i> (cfu/100mL)			
Observed Construction Activities	<100m from location		
	>100m from location		
Other Observations			

Name & Designation

Signature

Date

Record by: _____

Checked by: _____

Note: The SS results are to be filled up once they are available from the laboratory.

APPENDIX C
EVENT AND ACTION PLAN

Appendix C Event and Action Plan

Event and Action Plan for Construction Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
Exceedance for one sample	<ol style="list-style-type: none"> 1. Inform IEC, ER and Contractor; 2. Identify source, investigate the causes of exceedance and propose remedial measures; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method. 	<ol style="list-style-type: none"> 1. Notify Contractor. 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Inform IEC, ER and Contractor; 2. Identify source; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC, ER and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET/ER on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> 1. Submit proposals for remedial to ER and IEC within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

Appendix C Event and Action Plan

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
LIMIT LEVEL				
Exceedance for one sample	<ol style="list-style-type: none"> 1. Inform IEC, ER, Contractor and EPD; 2. Identify source, investigate the causes of exceedance and propose remedial measures; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance; 2. Discuss with ET and IEC on remedial actions 3. Submit proposals for remedial actions to IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Amend proposal if appropriate.
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Notify IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER and Contractor to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 5. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to terminate that portion of work until the exceedance ceases. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance; 2. Discuss with ET and IEC on remedial actions 3. Submit proposals for remedial actions to ER and IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Resubmit proposals if problem still not under control; 6. Stop the relevant portion of works as determined by the ER until the exceedance ceases.

Appendix C Event and Action Plan

Event and Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	<ol style="list-style-type: none"> 1. Notify IEC, ER and Contractor of exceedance; 2. Identify source 3. Investigate the causes of exceedance and propose remedial measures; 4. Report the results of investigation to the IEC, ER and Contractor; 5. Discuss with the IEC, ER and Contractor and formulate remedial measures; 6. Increase monitoring frequency to check mitigation effectiveness. 	<ol style="list-style-type: none"> 1. Review the analysed 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. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to ER with copy to ET and IEC; 2. Implement noise mitigation proposals.
Limit Level	<ol style="list-style-type: none"> 1. Inform IEC, ER, EPD and Contractor; 2. Identify source; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented; 5. If exceedance continues, investigate what portion of the work is responsible and instruct the Contractor to terminate that portion of work until the exceedance ceases. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to ER with copy to ET and IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Terminate the relevant portion of works as determined by the ER until the exceedance ceases.

Appendix C Event and Action Plan

Event and Action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
ACTION LEVEL				
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in situ measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and ER; 4. Check monitoring data, all plant, equipment and Contractor's working methods. 5. Discuss mitigation measures with IEC and Contractor. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working methods. 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Discuss with IEC on possible remedial actions; 3. Make agreement on the mitigation measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER. 5. Implement the agreed mitigation measures.
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Action level. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Ensure mitigation measures are properly implemented by the Contractor; 4. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of additional mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; 5. Implement the agreed mitigation measures.

Appendix C Event and Action Plan

Event	ET Leader	IEC	ER	Contractor
LIMIT LEVEL				
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to review the working methods. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER.
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly; 4. Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Take immediate action to avoid further exceedance; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; 5. Implement the agreed mitigation measures; 6. Resubmit proposals of mitigation measures if problem still not under control; 7. As directed by the Supervising Officer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

APPENDIX D
INTERIM NOTIFICATIONS OF
EXCEEDANCES

Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Report No.: _____

Monitoring Date	
Monitoring Parameter	
Action Level	
Limit Level	
Monitoring Station	
Measured Level	
Level Exceeded	
Cause of Exceedances	
Action required under the Event and Action Plan	
Action taken under the Event and Action Plan	
ET's conclusions and recommendations for mitigation	
Contractor's actions to implement the mitigation	
Contractor's comment	

Prepared by: _____ Signature: _____ Date: _____

Reviewed by: _____ Signature: _____ Date: _____