MOTT MACDONALD

Improvement Dredging for Lamma Power Station Navigation Channel

Updated Environmental Monitoring and Audit Manual

May 2019

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香港電燈有限公司
The Hongkong Electric Co., Ltd.

港燈
HK Electric

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499

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IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

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Date	23 May 2019
Certified by	(Mr. Kenneth Fung, Environmental Team Leader)
Verified by	Mr. Y T Tang (AECOM Asia Company Limited, Independent Environmental Checker)

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1 Introduction

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as the Manual) is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme proposed for the "Improvement Dredging for Lamma Power Station Navigation Channel" (the Project).

It should be noted that this EM&A Manual is an updated version as stipulated in the Environmental Permit (EP) (No. EP-535/2017 Clause 2.13) to include the latest EM&A requirements in accordance with the information and recommendations described in the EIA Report, the proposal on enhancement of water quality monitoring by taking into account any change in specific site conditions including marine ecology, fisheries and sediment quality from these reported in the EIA Report (Register No. AEIAR-212/2017). The EM&A Manual would be further reviewed and updated during the lifetime of the Project where necessary.

1.2 Project Description

The purpose of the Project is to provide and maintain safe clearance for ocean-going marine vessels delivering coal to Lamma Power Station (LPS) via the Lamma Power Station Navigation Channel (the "Channel"), through the dredging of naturally accumulating sediment from the seabed. In order to meet the requirements for continued safe passage, this Project involves the following:

- Improvement dredging of the Channel to a target dredge depth[1] of -16.5 mPD (construction phase); and
- Recurring, periodic dredging of the Channel to a target dredge depth of -16.5 mPD approximately once every 4 to 10 years (operation phase).

The Project area is shown in **Figure 1.1**.

1.3 Tentative Construction Programme

The construction phase of the Project is scheduled to commence in 2019. While the Contractor is yet to be engaged, it is expected that construction will require between 12 to 18 months, subject to the future Contractor's arrangements.

1.4 Project Organisation

The proposed project organisation is shown in **Figure 1.2**. The responsibilities of respective parties are set out below.

1.4.1 Project Proponent

The Hongkong Electric Company Limited (hereafter referred to as "HK Electric") is the Project Proponent for the development of the Project, and will assume overall responsibility for the Project

[1] While the Project aims to dredge to a target depth of -16.5 mPD, some overdredge may occur due to the limited precision control of dredging depths in practice.

during the construction phase and then during its operation phase when it is anticipated that improvement dredging operations in the Channel will be periodically required in the future to ensure the minimum depth condition is maintained.

1.4.2 Environmental Protection Department (EPD)

EPD is the statutory enforcement body for environmental protection matters in Hong Kong.

1.4.3 Engineer or Engineer's Representative (ER)

The ER is responsible for overseeing the construction works and for ensuring that the works are undertaken by the Contractor in accordance with the specification and contract requirements. The duties and responsibilities of the ER with respect to EM&A include:

- to monitor the Contractor's compliance with Contract Specifications, including the effective implementation and operation of the environmental mitigation measures;
- to employ an Independent Environmental Checker (IEC) to audit the results of the EM&A works carried out by the Environmental Team (ET);
- to monitor Contractors', ET's and IEC's compliance with the requirements in the EP and EM&A Manual;
- to facilitate ET's implementation of the EM&A programme;
- participate in joint site inspection by the ET and IEC;
- to oversee the implementation of the agreed Event / Action Plan in the event of any exceedance; and
- to adhere to the procedures for carrying out complaint investigation.

1.4.4 The Contractor

The Contractor should report to the ER. The duties and responsibilities of the Contractor include:

- to comply with the relevant contract conditions and specifications on environmental protection;
- to facilitate ET's monitoring and site inspection activities;
- to participate in the site inspections undertake by the ET and IEC, and undertake any corrective actions;
- to provide information / advice to the ET regarding works programme and activities which may contribute to the generation of adverse environmental impacts;
- to submit proposals on mitigation measures in case of exceedance of Action and Limit levels in accordance with the Event / Action Plans;
- to implement measures to reduce impact where Action and Limit levels are exceeded; and
- to adhere to the procedures for carrying out complaint investigation.

1.4.5 Environmental Team (ET)

The ET should be employed by HK Electric to conduct the EM&A programme. The ET should be managed by the ET Leader. The ET Leader should have relevant professional qualifications in environmental control and possess at least 7 years' experience in EM&A. Suitably qualified staff should be included in the ET, and resources for the implementation of the EM&A programme should be allocated in the time under the Contract, to enable fulfilment of the Project's EM&A requirements as specified in the EM&A Manual during construction of the Project. The ET should report to HK Electric and the duties should include:

- to monitor and audit various environmental parameters as required in this EM&A Manual;
- to analyse the environmental monitoring and audit data, review the success of EM&A programme and the adequacy of mitigation measures implemented, confirm the validity of the EIA predictions and identify any adverse environmental impacts arising;
- to monitor compliance with conditions in the EP, environmental protection, pollution prevention and control regulations and contract specifications;
- to audit environmental conditions on site;
- to report on the environmental monitoring and audit results to EPD, the ER, the IEC and Contractor or their delegated representatives;
- to recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- to liaise with the IEC on all environmental performance matters, and ensure timely submission of all relevant EM&A pro forma for IEC's approval;
- to provide advice to the Contractor on environmental improvement, awareness and enhancement matters, etc. on site;
- to adhere to the procedures for carrying out environmental complaint investigation;
- to prepare reports on the environmental monitoring data and the site environmental conditions;
- to submit the EM&A report to Director of Environmental Protection (DEP) timely;
- to review proposals of mitigation measures from the Contractor in case of exceedance of Action and Limit levels, in accordance with the Event and Action Plan; and
- to carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and mitigation measures.

1.4.6 Independent Environmental Checker (IEC)

The IEC should not be in any way an associated body of the Contractor or the ET for the Project. The IEC should be employed by HK Electric prior to the commencement of the construction of the Project. The IEC should be a person who has relevant professional qualifications in environmental control and at least 7 years experience in EM&A and environmental management. The duties and responsibilities of the IEC are:

- to provide proactive advice to the ER and HK Electric on EM&A matters related to the Project;
- to review and verify the monitoring data and all submissions in connection with the EP and EM&A Manual submitted by the ET;
- to arrange and conduct regular, at least monthly site inspections of the works during the construction phase, and to carry out ad hoc inspections if significant environmental problems are identified;
- to check compliance with the agreed Event / Action Plan in the event of any exceedance;
- to check compliance with the procedures for carrying out complaint investigation;
- to check the effectiveness of corrective measures;
- to feedback audit results to the ET by signing off relevant EM&A pro forma;
- to check that mitigation measures are effectively implemented;
- to report the works conducted, and the findings, recommendations and improvements of the site inspections, after reviewing ET's and Contractor's works, to the ER and HK Electric on a monthly basis;

- to verify the investigation result of the environmental complaint cases and the effectiveness of corrective measures;
- to verify EM&A report that has been certified by ET leader; and
- to audit EIA recommendations and requirements against the status of implementation of environmental mitigation measures on site.

1.5 Structure of the EM&A Manual

Following this Introduction section, the structure of this EM&A Manual has been set out as follows:

Section 2 – Water Quality Impact

Section 3 – Marine Ecological Impact

Section 4 – Fisheries Impact

Section 5 – Hazard to Life

Section 6 – Noise Impact

Section 7 – Waste Management Implications

Section 8 – Site Environmental Audit

Section 9 – Reporting

2 Water Quality Impact

2.1 Introduction

The EIA has recommended the following controls to safeguard water quality during construction phase and each operation phase recurrent improvement dredging, which are to be implemented as part of the EM&A programme for the Project.

2.1.1 Review of Sediment Quality

Each time prior to commencement of dredging, sediment samples using grab samplers shall be taken within those areas requiring dredging works, to assess the elutriation potential of contaminants in the sediment. At least one sample shall be taken within each zone of the Project requiring dredging. Representative blank marine water samples should also be collected. The sediment samples shall be tested for the parameters listed in Table 3-16 of the EIA report. Details of the sampling method and laboratory procedures shall be agreed with EPD prior to undertaking the sediment sampling and elutriation testing.

A Sampling Method and Laboratory Procedures for Sediment Sampling for Elutriation Testing was prepared and was agreed with EPD on 22 January 2018.

The elutriation test results shall be compared to the results in Table 3-16 of the EIA report to determine whether the findings of the EIA report in terms of contaminant release from sediment during dredging activities remains valid. In the event that the sediment quality results from the elutriation tests show concentrations both exceeding the criteria limit and are significantly greater than those concentrations assessed in the EIA report, a supplementary evaluation of the potential impacts associated with the release of those contaminants from sediment shall be carried out by the ET. The findings of the sediment quality review including any additional mitigation measures and/or monitoring requirements recommended shall be certified by the ET, verified by the IEC and agreed with EPD prior to commencement of dredging. The recommended additional mitigation measures and/or monitoring requirements shall apply until the next review of sediment quality for subsequent recurring improvement dredging works.

A Review of Sediment Quality report has been prepared and submitted on 1 November 2018 in accordance with the above. The findings showed that contaminant concentrations at WSRs would not be greater than those assessed in the EIA report. Therefore, the findings of the EIA report in terms of contaminant release from sediment during dredging activities remain valid, and no additional mitigation measures and/or monitoring for sediment quality are required.

2.1.2 Dredging Quantity, Programme and Sequence

As recommended in the EIA report, the total maximum allowable dredging rates for individual zones of the Project for grab dredger and Trailing Suction Hopper Dredger (TSHD) is shown in **Table 2-7**. For instances when dredgers are working concurrently in different zones, the zone with the lowest maximum allowable dredging rate would apply in total to all dredgers in all active zones, as summarised in **Appendix C**.

Prior to commencement of dredging, the Contractor shall submit details of the proposed dredging quantity (based on the latest bathymetry survey data), and their construction programme and sequence to EPD. This submission shall include the proposed dredging method (closed grab dredger and/or TSHD) and the dredging rates at each zone of the Project, which shall not exceed the maximum allowable dredging rates shown in **Table 2-7** (for individual zones) and **Appendix**

C (for concurrent zones). The proposed dredging rates shall be certified by the ET and verified by the IEC prior to submission to EPD.

2.1.3 Marine Water Quality Monitoring

Marine water quality monitoring shall be carried out during the marine works for both construction phase and each operation phase recurrent improvement dredging to detect and check for any deterioration in water quality and ensure that timely action is taken to rectify deteriorations that are due to the Project. Details of the water quality monitoring programme and the associated event and action plan are specified in the following sub-sections.

2.2 Monitoring Locations

A total of 10 impact stations representing different types of sensitive receivers, five near stations (representing the 'near the Project site' boundary) as recommended by the latest Proposal on Enhancement of Water Quality Monitoring near the Project Site prepared under EP Clause 2.12, and three control stations are proposed for water quality monitoring.

The locations of all the water quality monitoring stations are shown in **Figure 2.1** and **Table 2-1**.

Table 2-1: Locations of Water Quality Monitoring Stations

ID	Station	Easting	Northing	Remarks
SR1	HK Electric Power Station Intake	829194	808600	Monitored for SS only
SR2	Hung Shing Yeh Beach	830200	808700	Monitored during bathing season only (March to October inclusive)
SR3	Lo So Shing Beach	830450	807300	Monitored during bathing season only (March to October inclusive)
SR4	Marine Ecological Habitat at Pak Kok	829600	811630	
SR5	Marine Ecological Habitat at Shek Kok Tsui	828560	811100	
SR6	Marine Ecological Habitat at Ha Mei Wan	829760	805520	
SR7	Marine Ecological Habitat at Southwest of Lamma	829590	804520	
SR8	Fish Culture Zone at Lo Tik Wan	831265	809115	
SR9	Fish Culture Zone at Sok Kwu Wan	831600	807765	
SR10	Fish Culture Zone at Cheung Sha Wan	819160	810780	
A1	Near station for Zone 1	828543	809573	For monitoring potential impacts to SR5 and SR4 during flood tide
A2	Near station for Zone 2	829053	807945	For monitoring potential impacts to SR1 and SR2 during flood tide
A3	Near station for Zone 3	829187	807100	For monitoring potential impacts to SR3 during both flood and ebb tide
A4	Near station for Zone 4 (east)	829427	805520	For monitoring potential impacts to SR6 during ebb tide
A5	Near station for Zone 4 (south)	829267	805134	For monitoring potential impacts to SR7 during ebb tide
C1	Control Station 1	828000	813500	
C2	Control Station 2	825000	808000	

ID	Station	Easting	Northing	Remarks
C3	Control Station 3	829000	802000	

2.2.1 Review of Sensitive Receiver Locations

For each improvement dredging works, the monitoring stations identified in **Table 2-1** and their representative locations shall be reviewed prior to commencement of dredging. For monitoring stations representing intakes, beaches and Fish Culture Zones, the representative location should be the nearest accessible location for water quality monitoring, with justifications provided. For monitoring stations representing marine ecological habitats, reference should be made to the findings from the latest Marine Ecological Baseline Review Report and current literature to identify the hot spots nearest to the project boundary and confirm the representative location for monitoring. Based on the findings of the review, the ET shall propose updates to the locations of control, reference and sensitive receiver stations, if any, for verification by IEC and agreement by EPD prior to commencement of dredging.

2.3 Water Quality Monitoring Parameters

For the 10 sensitive receiver stations (SR1 to SR10) and three control stations (C1 to C3), parameters to be measured in-situ are dissolved oxygen (DO), dissolved oxygen saturation (DO%), pH, temperature, turbidity, salinity, and water depth. Suspended solids (SS) should be measured in the laboratory.

For the five near stations (A1 to A5), only the in-situ parameters (DO, DO%, pH, temperature, turbidity, salinity and water depth) should be measured.

Other relevant data should also be recorded, including monitoring location, time, tidal stages, weather conditions, sea conditions and any special phenomena and work underway at the Project site.

2.4 Sampling Procedures and Monitoring Equipment

In general, water samples for all monitoring parameters should be collected, stored, preserved and analysis according to the Standard Methods, APHA 22nd ed. and/or other methods as agreed by EPD. Sample data record sheet is shown in **Appendix A**.

2.4.1 In-situ Sampling and Monitoring

In-situ monitoring should be carried out with the following equipment:

Dissolved Oxygen and Temperature Measuring Equipment

The instrument should be portable and weatherproof using a DC power source. It should have a membrane electrode with automatic temperature compensation complete with a cable. The equipment should be capable of measuring:

- A dissolved oxygen level in the range of 0-20 mg/L and 0-200 % saturation; and
- A temperature of 0-45 degree Celsius with a capability of measuring to ±0.1 degree Celsius.

pH Measuring Equipment

A portable pH meter capable of measuring a range between 0.0 and 14.0 should be provided to measure pH under the conditions specified according to the Standard Methods, APHA.

Turbidity Measurement Instrument

The instrument should be portable and weatherproof using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU.

Salinity

A portable salinometer capable of measuring salinity in the range of 0-40 mg/L should be provided for measuring salinity of the water at each monitoring location.

Water Depth Detector

A portable, battery-operated echo sounder should be used for the determination of water depth at each monitoring location. The unit would either be handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

Water Sampling Equipment

A water sampler comprises a transparent PVC cylinder, with a capacity of not less than two litres, and could be effectively sealed with latex cups at both ends should be used. The sampler should 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.

Water samples for SS measurements shall be transferred directly to high density polythene sample bottles, packed in ice (cooled to 4 ^{O}C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

Positioning Device

A hand-held or boat-fixed type digital Global Positioning System (dGPS) with way point bearing indication or other equivalent instrument of similarly accuracy should be provided and used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

2.4.2 Calibration of In-situ Instruments

All in-situ monitoring instrument should be checked, calibrated and certified by a laboratory accredited under HOKLAS (or other international accreditation scheme that is HOKLAS-equivalent) before use, and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring, or as required per the manufacturers specification. Responses of sensors and electrodes should be checked with certified standard solutions before each use.

Wet bulb calibration for a DO meter should be carried out before measurement on each monitoring day. A zero check in distilled water should be performed with the turbidity probe at least once per monitoring day. The probe should then be calibrated with a solution of known NTU.

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

2.5 Laboratory Measurement / Analysis

Analysis of SS should be carried out in a HOKLAS laboratory (or other international accredited laboratory that is HOKLAS-equivalent). Sufficient water samples should be collected at each monitoring location for carrying out the laboratory SS determination. All samples should be assigned a unique code and accompanied by Chain of Custody (COC) sheets.

The SS determination work should start within 24 hours after collection of the water samples. Analysis of SS should follow the APHA 2540D analytical method with a detection limit of at least 1 mg/L unless otherwise agreed with EPD.

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

If in-house or non-standard methods are proposed, details of the method verification should, if required, be submitted to EPD. In any circumstances, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should be prepared to demonstrate the quality control programmes to EPD or their representative if and when required.

2.6 Monitoring Requirements

Baseline, impact and post-dredging monitoring shall be conducted for each improvement dredging works. The following requirements should be followed for baseline, impact and post-dredging monitoring:

- Sampling should take place under non-exceptional conditions with respect to the tides, weather and season. No dredging work will be carried out when typhoon signal no.3 or above is hoisted. No sampling should be carried out when typhoon signal No.3 or above or black rainstorm signal is hoisted.
- At least one duplicate in-situ measurement is required for all sampling locations.
- At least one duplicate water sample for laboratory analysis is required for the sensitive receiver stations (SR1 to SR10) and control stations (C1 to C3).
- The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency should be increased.
- Samples should be taken at three depths (at 1m below surface, at mid-depth, and at 1m above bottom) for locations with water depth >6m. For locations with water depth between 3m and 6m, two depths (surface and bottom) should be taken and the mid-depth sample may be omitted. Locations with water depth <3m, only mid-depth should be taken. All parameters should be measured on each monitoring day.
- At each measurement depth, two consecutive measurements would be taken. The probes would be retrieved out of the water after the first measurement and then redeployed for the second measurement. When the difference in value between the first and second measurement of on-site parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken.

2.6.1 Baseline Monitoring

Baseline conditions of water quality parameters will be established prior to the commencement of each improvement dredging works. The baseline monitoring schedule should be faxed to EPD at least two weeks prior to the commencement of baseline monitoring.

Baseline monitoring will be performed at all monitoring stations, 3-days per week, at mid-flood and mid-ebb tides, for 4 weeks before commencement of marine works. There should be no marine construction activities in the vicinity of the monitoring stations during the baseline monitoring.

In order to take into account the seasonal variations of the baseline DO level, separate baseline DO levels for the dry and the wet seasons will be derived both from the baseline data obtained prior to the commencement of works and EPD's routine monitoring data at station WM1, SM5, SM6 and SM7 (which are the nearest EPD stations to the Project's impact stations) over the last 5 years. Data from EPD's monitoring stations and the baseline data will be combined to derive the appropriate Action Levels and Limit Levels respectively, using the method presented in **Table 2-2** below.

Table 2-2: Method for Combining Baseline Monitoring Data to Determine Separate Action and Limit Levels for DO during Wet and Dry Season

Baseline Method for DO	If the 4-week baseline monitoring is conducted in wet season (April to September)	If the 4-week baseline monitoring is conducted in dry season (October to March)

Baseline for Wet Season	The 4-week baseline data shall be pooled with the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 in wet season before deriving the Action and Limit Levels.	The average DO from the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 during wet season shall be compared with the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 during dry season to obtain the difference. This difference shall be applied to the Action and Limit Levels derived from dry season to obtain the equivalent (i.e. to extrapolate) Action and Limit Levels for wet season, via the formula below:
		If dry season DO > wet season DO
		Baseline for Wet Season = Baseline for dry season – (average dry season DO – average wet season DO)
		
		If dry season DO < wet season DO
		Baseline for Wet Season = Baseline for dry season + (average wet season DO – average dry season DO)

Baseline for Dry Season	The average DO from the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 during dry season shall be compared with the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 during wet season to obtain the difference. This difference shall be applied to the Action and Limit Levels derived from wet season to obtain the equivalent (i.e. to extrapolate) Action and Limit Levels for dry season, via the formula below:
	If dry season DO > wet season DO
	Baseline for Dry Season = Baseline for wet season + (average dry season DO – average wet season DO)
	
	If dry season DO < wet season DO
	Baseline for Dry Season = Baseline for wet season – (average wet season DO – average dry season DO)
		The 4-week baseline data shall be pooled with the latest 5-year monitoring data from EPD's monitoring station WM1, SM5, SM6 and SM7 in dry season before deriving the Action and Limit Levels.

In cases when insufficient baseline monitoring data or questionable results are obtained from the 4-week baseline monitoring, the ET should seek approval from the IEC and EPD on an appropriate set of data to be used as baseline reference.

2.6.2 Impact Monitoring

Impact monitoring at all monitoring stations should be performed 3-days per week, at mid-flood and mid-ebb tides. In case of exceedances of Action and/or Limit levels at SR stations or exceedances of Alert levels at near stations, the relevant Event and Action Plan or Alert Action Plan shall be instigated immediately and the monitoring frequency may need to be increased. The locations for impact monitoring should be the same as those for baseline monitoring.

In the event that the status and locations of water sensitive receivers change during the course of impact monitoring, the ET Leader should propose updated monitoring locations and seek approval from the IEC and EPD.

2.6.3 Post-Dredging Monitoring

Upon completion of all dredging activities, a post-dredging water quality monitoring shall be carried out for 4 weeks at all monitoring stations except for the near stations A1 to A5. Post-dredging monitoring should be performed 3-days per week, at mid-flood and mid-ebb tides. The monitoring locations, parameters and requirements should be the same as those for impact monitoring.

2.7 Event and Action Plan for Sensitive Receiver Stations

The Action and Limit levels for water quality at SR stations are defined in **Table 2-3**.

Table 2-3: Action and Limit Levels for Water Quality at SR Stations

Parameters	Action Level	Limit Level
DO in mg/L (Surface, Middle & Bottom)	Surface and Middle 5 percentile of baseline and EPD's monitoring stations data from the last 5 years for surface and middle layer	Surface and Middle 4 mg/L or 1 percentile of baseline and EPD's monitoring stations data from the last 5 years for surface and middle layer 5 mg/L at Fish Culture Zones
	Bottom 5 percentile of baseline and EPD's monitoring stations data from the last 5 years for bottom layer	Bottom 2 mg/L or 1 percentile of baseline and EPD's monitoring stations data from the last 5 years for bottom layer 2 mg/L at Fish Culture Zones
SS in mg/L	95 percentile of baseline data or 120% of upstream control station at the same tide of the same day, whichever is higher For SR1, the SS action level is 90 mg/L	99 percentile of baseline data or 130% of upstream control station at the same tide of the same day, whichever is higher. For SR1, the SS limit level is 100 mg/L
Turbidity in NTU	95 percentile of baseline data or 120% of upstream control station at the same tide of the same day, whichever is higher	99 percentile of baseline data or 130% of upstream control station at the same tide of the same day, whichever is higher

Notes:
1. For DO measurement, non-compliance occurs when the monitoring result is lower than the specified limits. Action and Limit Levels will be derived for wet and dry seasons separately in order to account for seasonal variation.
2. For parameters other than DO, non-compliance of water quality occurs when the monitoring result is higher than the specified levels.
3. Depth-averaged results are used unless specified otherwise.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.

In the event of water quality monitoring results at SR stations exceeding the Action and/or Limit levels for water quality as defined in **Table 2-3**, the actions in accordance with the Event and Action Plan presented in **Table 2-4** shall be carried out.

Table 2-4: Event and Action Plan for Water Quality at SR Stations

	Action			
Event	**ET**	**IEC**	**Engineer**	**Contractor**
Action level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Inform IEC, Contractor and Engineer; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss mitigation measures with IEC, Engineer and Contractor; 5. Repeat in-situ measurement on next day of exceedance.	1. Discuss with ET, Engineer and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise Engineer accordingly; 3. Verify the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Supervise the implemented of agreed mitigation measures.	1. Identify source(s) of impact; 2. Inform the Engineer and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment; 5. Consider changes of working methods; 6. Discuss with ET, IEC and Engineer and propose mitigation measures; 7. Implement the agreed mitigation measures
Action Level being exceeded on more than one consecutive sampling day	1. Repeat in-situ measurement to confirm findings; 2. Inform IEC, Contractor and Engineer; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss mitigation measures with IEC, Engineer and Contractor; 5. Ensure mitigation measures are implemented; 6. Prepare to increase the monitoring frequency to daily; 7. Confirm the need for reducing dredging rates as per **Table 2-8**.	1. Discuss with ET, Engineer and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise Engineer accordingly; 3. Verify the effectiveness of the implemented mitigation measures; 4. Verify the need for reducing dredging rates as per **Table 2-8**.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Discuss with ET, IEC and Contractor on the effectiveness of the implemented mitigation measures; 4. Instruct the Contractor to reduce dredging rates as per **Table 2-8** if confirmed by ET and verified by IEC.	1. Identify the source(s) of impact; 2. Inform the Engineer and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment; 5. Consider changes of working methods; 6. Discuss with ET, IEC and Engineer and propose mitigation measures to Engineer and IEC within 3 working days of notification; 7. Implement the agreed mitigation measures; 8. As directed by the Engineer, reduce dredging rates as per **Table 2-8**.
Limit Level being exceeded by one sampling day	1. Repeat in-situ measurement to confirm findings; 2. Inform IEC, Contractor and Engineer; 3. Check monitoring data, all plant, equipment and Contractor's working methods;	1. Discuss with ET, Engineer and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise Engineer accordingly; 3. Verify the effectiveness of the	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;	1. Identify the source(s) of impact; 2. Inform the Engineer and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice;

	Action			
Event	**ET**	**IEC**	**Engineer**	**Contractor**
	4. Discuss mitigation measures with IEC, Engineer and Contractor; 5. Ensure mitigation measures are implemented; 6. Increase the monitoring frequency to daily until no exceedance of limit level.	implemented mitigation measures.	4. Discuss with ET, IEC and Contractor on the effectiveness of the implemented mitigation measures.	4. Check all plant and equipment; 5. Consider changes of working methods; 6. Discuss with ET, IEC and Engineer and propose mitigation measures to Engineer and IEC within 3 working days of notification; 7. Implement the agreed mitigation measures.
Limit Level being exceeded by more than one consecutive sampling days	3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented; 7. Confirm the need for reducing dredging rates as per **Table 2-8**; 8. Increase the monitoring frequency to daily until no exceedance of limit level for two consecutive days.	1. Discuss with ET, Engineer and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise Engineer accordingly; 3. Verify the effectiveness of the implemented mitigation measures; 4. Verify the need for reducing dredging rates as per **Table 2-8**.	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. Discuss with ET, IEC and Contractor on the effectiveness of the implemented mitigation measures; 5. Instruct the Contractor to reduce dredging rates as per **Table 2-8** if confirmed by ET and verified by IEC.	1. Identify the source(s) of impact; 1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to Engineer and IEC within 3 working days of notification; 6. Implement the agreed mitigation measures; 7. As directed by the Engineer, reduce dredging rates as per **Table 2-8**.

2.8 Alert Action Plan for Near Stations

The Alert levels for water quality at near stations are defined in **Table 2-5**.

Table 2-5: Alert Levels for Water Quality at Near Stations

Parameters	Alert Levels			
Turbidity	Near Station	Nearest Sensitive Receiver Station	AS / SR Ratio	Calculation*
	A1	SR5	3.1	= "AS / SR Ratio" *multiplied by* "Action level of turbidity derived at the reference sensitive receiver station (determined from baseline monitoring)"
	A2	SR1	1.9	
	A3	SR3	4.0	
	A4	SR6	3.3	
	A5	SR7	2.5	

Parameters	Alert Levels
Dissolved Oxygen	Depth-averaged 4 mg/L or 0.1 mg/L less than the minimum baseline result[#] or 0.1 mg/L less than the same day control, whichever is lower. Bottom 2 mg/L or 0.1 mg/L less than the minimum baseline result or 0.1 mg/L less than the same day control, whichever is lower.

* Applied to each near station individually
[#] 'Minimum baseline result' refers to the minimum DO level from baseline and EPD's monitoring stations data (from WM1, SM5, SM6 and SM7) from the last 5 years, using the same method as specified in **Table 2-2** to determine wet and dry season

Details of how the Alert levels for water quality at near stations are derived are prescribed in the latest Proposal on Enhancement of Water Quality Monitoring near the Project Site. It should be noted that any changes to the locations of sensitive receivers may require redetermination of the Alert levels in accordance with the Proposal. Any changes proposed by the ET should be verified by IEC and notified to EPD prior to implementation.

The Alert Action Plan applies to exceedances of Alert levels at the near stations (A1 to A5) only and presented in **Table 2-6**. Exceedances at the SR stations listed in **Table 2-1** shall follow the Event and Action Plan in **Table 2-4**.

Upon identification of an exceedance of Alert level, the actions specified in **Table 2-6** shall be implemented. Where applicable, the alert related actions shall proceed in parallel with the Event and Action Plan in **Section 2.7**.

All instances of exceedance of Alert levels and the subsequent actions under the Alert Action Plan shall be recorded by the ET and verified by the IEC.

Table 2-6: Alert Action Plan for Water Quality at Near Stations

Action	Action By	Outcome	Follow Up Action	Follow Up Action By
1. Repeat in-situ measurement to confirm findings	ET	No exceedance in repeat measurement	No further action required	
		Exceedance identified in repeat measurement	*Proceed to Action 2*	
2. Check relevant SR station results	ET	a. No exceedance of Action or Limit Level	Notify IEC, Engineer and Contractor	ET
			Obtain and record Contractor's working methods and the status of existing mitigation measures implemented	ET
			Identify any unacceptable practice	ET, IEC, Engineer
			Rectify any unacceptable practice	Contractor
			Proceed to Action 3	
		b. Exceedance of Action or Limit Level	Initiate Event and Action Plan in Table 2-4 of the EM&A Manual	ET, IEC, Engineer, Contractor
			Proceed to Action 3	

Action	Action By	Outcome	Follow Up Action	Follow Up Action By
3. Check for repeated cases of Outcome 2a or 2b	ET	No consecutive repeats of Outcome 2a or 2b	No further action required	
		Consecutive repeats of Outcome 2a	Review Contractor's working methods / mitigation measures and discuss with IEC, Engineer and Contractor	ET
			Identify and agree on improvements such as changes in working methods and/or additional mitigation measures	ET, IEC, Engineer, Contractor
			Implement the recommended improvements	Contractor
		Consecutive repeats of Outcome 2b	Review Alert levels and propose revised Alert levels where necessary to prevent exceedances at SR stations (due to project activities)	ET
			Verify the revised Alert levels	IEC
			Notify and agree with EPD on revised Alert levels	ET, Project Proponent

2.9 Reduction of Maximum Allowable Dredging Rates

In the event of exceedances in Action and/or Limit levels at SR stations, reduction of the maximum allowable dredging rates shall be applied. The total maximum allowable dredging rates of the Project for grab dredger and TSHD is shown in **Table 2-7**.

Table 2-7: Total Maximum Allowable Dredging Rates

Dredging Location	Dry Season (October to March)				Wet Season (April to September)			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Grab Dredger								
Maximum allowable dredging rate[1] (m^3/hr)	2,070	3,760	3,730	2,400	3,000	3,070	2,640	1,600
Maximum allowable dredging rate* (m^3/day)	49,800	90,400	89,600	57,800	72,100	73,700	63,500	38,500
TSHD								
Maximum allowable dredging rate[1] (m^3/hr)	3,280	5,730	7,160	2,630	5,520	3,280	2,710	920
Maximum allowable dredging rate* (m^3/day)	78,900	137,600	171,900	63,300	132,500	78,800	65,100	22,200

Note
The allowable dredging rates are the total for all dredgers working simultaneously.
Grab dredgers shall not be operated concurrently with TSHDs.
[1]Values are rounded down to the nearest ten.

*Refers to dredging over a 24 hour period. Notwithstanding this, the maximum hourly dredging rate for the Project shall not be exceeded in any given hour of dredging works.

Where exceedances are identified and confirmed by the ET and verified by the IEC as project-related, the maximum allowable hourly dredging rates of the Project shall be reduced according to **Table 2-8**. The reduced rates for the respective zone(s) and season shall apply until completion of the dredging works for the affected zone(s) and season.

Table 2-8: Reduction of Maximum Allowable Hourly Dredging Rates due to Exceedances

Frequency of Exceedance	No. of Consecutive Sampling Days					
	Two	Three	Four	Five	Six	More than Six
Action Level	5%	10%	15%	20%	30%	40%
Limit Level	10%	20%	30%	40%	50%	Stop all dredging works for one week. Contractor to propose changes in dredging methods, dredging rates and mitigation measures for agreement with ET and IEC before re-initiating dredging works.

Note: Where action level followed by limit level is exceeded consecutively, the larger percentage reduction shall apply (e.g. if action level is exceeded for four consecutive days, followed immediately by two consecutive days of limit level exceedance, the percentage reduction to be applied between Day 2 and Day 6 shall be 5%, 10%, 15%, 20% and 30% respectively). Similarly, where limit level followed by action level is exceeded consecutively, the larger percentage reduction also applies as action level is inherently exceeded whenever limit level is exceeded.

The above reductions apply to each improvement dredging event only, and shall not be carried forward to the next recurrent improvement dredging event, provided that the interval between recurrent improvement dredging events is greater than 12 months.

2.10 Mitigation Measures

Mitigation measures shall be applied during improvement dredging works. The implementation schedule of the recommended water quality mitigation measures is presented in **Appendix B**.

3 Marine Ecological Impact

3.1 General

The potential impacts on marine ecology associated with the Project are evaluated in Chapter 4 of the EIA report. With the implementation of recommended mitigation measures for marine ecology as well as water quality mitigation measures (including the implementation of maximum allowable dredging rates that control the sedimentation rate at coral sensitive receivers within the criteria limit for coral protection; details of the maximum allowable dredging rates are presented in **S2.9**) and monitoring programme, all potential marine ecological impacts would be adequately minimised. Therefore, no residual impact on the marine environment is expected, and no specific ecological monitoring is required.

A Marine Ecological Baseline Review Report has been prepared as specified in the EP Clause 2.9 to review / update the marine ecological baseline in the Project area and its vicinity. No significant changes in the marine ecological baseline and the status and distribution of species of conservation interest were found in the Review Report when compared to the EIA report. Therefore, the mitigation measures proposed and the conclusion drawn in the EIA report remain valid, and no additional mitigation measures are required.

3.2 Ecological Mitigation Measures

Mitigation measures were designed in accordance with Annex 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) which states the general policy and guidance in planning of ecological measures. The implementation schedule of the recommended mitigation measures is presented in **Appendix B**. Marine ecological mitigation measures recommended for both construction and operation phases include avoidance of dredging Zone 4 of the navigation channel during the calving season for Finless Porpoise (except for necessary hotspot / localised dredging), vessel movements to bypass the Finless Porpoise habitat area, speed limit in south and east Lamma waters where the porpoises inhabit, and briefing all vessel operators on the possible occurrence of Finless Porpoise within and in the vicinity of the Project Area as well as rules for safe vessel operation around cetaceans.

4 Fisheries Impact

4.1 General

The potential environmental impacts to fisheries associated with the Project are evaluated in Chapter 5 of the EIA report. With the implementation of the recommended mitigation and environmental protection measures, as well as mitigation measures and water quality monitoring for water quality, all potential impacts would be adequately minimised. Therefore, no adverse residual impact on fisheries is anticipated, and no fisheries specific monitoring is required. Three water quality monitoring stations representing Lo Tik Wan, Cheung Sha Wan and Sok Kwu Wan Fish Culture Zones are recommended during the marine works for both construction phase and each operation phase recurrent improvement dredging, to detect and check for any deterioration in water quality (refer to **Section 2.2**).

A Fisheries Baseline Review Report has been prepared as specified in the EP Clause 2.10 to update the fisheries baseline in and around the proposed dredging area using fisheries survey data and literature review of updated information available after the approval of the EIA report. The Review Report found that the fisheries impact assessment of the EIA report, which adopted a conservative approach, remains valid. Therefore, no additional mitigation measures for fisheries are required.

4.2 Stakeholders' Engagement Activities

Stakeholders' engagement activities will be arranged prior to construction phase and each operation phase recurrent improvement dredging with relevant fishermen and mariculturists to seek their views and foster their understanding on the proposed project works.

5 Hazard to Life

5.1 Introduction

A hazard identification workshop has been organised with various stakeholders including HK Electric and the EIA consultant to identify the hazards associated with the dredging works using the Grab Dredging method and TSHD method near the existing natural gas submarine pipeline. For each of the identified hazards, both existing and potential mitigation measures have been explored. The findings have been properly recorded in the worksheets.

5.2 Construction Phase

Implementation of the mitigation measures should be checked as part of the environmental monitoring and audit procedures during the construction phase dredging works.

5.3 Operation Phase

Implementation of the mitigation measures should be checked as part of the environmental monitoring and audit procedures during the operation phase recurrent dredging works.

6 Noise Impact

6.1 General

The potential noise impacts associated with the Project are evaluated in Chapter 7 of the EIA report. With the optimum quantity of construction plants, the construction noise levels at all Noise Sensitive Receivers (NSRs) are predicted to comply with the relevant noise criteria. Adverse residual construction noise impacts are therefore not anticipated in this project. As such, noise will not be an issue and monitoring at the NSRs is not considered necessary during non-restricted hours. However, a daily log book should be maintained to record the number and type of plants deployed for auditing purpose.

Noise monitoring during restricted hours should be subject to the Construction Noise Permit (CNP) requirements by EPD. Applicable permits under Noise Control Ordinance (NCO) should also be obtained by the Contractor.

7 Waste Management Implications

7.1 Introduction

The potential waste arising from the construction and operation activities of the Project has been evaluated in the EIA report. Provided that all wastes are handled, transported and disposed of in strict accordance with the relevant legislative requirements and the recommended mitigation measures are properly implemented, no adverse environmental impact is expected during the construction and operation phases.

A Sediment Quality Baseline Review has been conducted as stipulated in the EP Clause 2.11 to review the sediment quality conditions in the Project area before each dredging. The findings showed all sediment samples to be Category L (for Type 1 - Open Sea Disposal). Therefore, the mitigation measures recommended and the conclusion drawn in the EIA report remain valid.

7.2 Construction Phase Waste Management

It will be the contractor's responsibilities to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and the relevant regulations and requirements. The recommended mitigation measures shall form the basis of the Waste Management Plan (WMP) to be developed by the Contractor in the construction phase. The WMP shall be prepared and implemented in accordance with ETWB TC (W) No. 19/2005 Environmental Management on Construction Site and Practice Notes for Authorised Persons, Registered Structural Engineers and Registered Geotechnical Engineers ADV-21 (PNAP ADV-21) Management Framework for Disposal of Dredged/Excavated Sediment.

No dredging of sediment would be permitted to proceed until all matters on marine sediment disposal have been resolved and all relevant arrangements have been endorsed by the appropriate authorities, including Marine Fill Committee (MFC) and EPD/DASO Section.

During construction phase, regular site inspection as part of the EM&A procedures should be carried out to determine if various types of waste are being managed in accordance with approved procedures and the WMP. It should cover different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

7.3 Operation Phase Waste Management

During the operation phase, it is anticipated that the wastes generated from the periodical improvement dredging is of the same nature as that for construction phase. With the implementation of the recommended mitigation measures for handling, transportation and disposal of the identified waste arisings, no adverse residual impacts are anticipated during operation phase of the Project. Therefore, no other specific waste monitoring during operation phase is required.

No dredging of sediment would be permitted to proceed until all matters on marine sediment disposal have been resolved and all relevant arrangements have been endorsed by the appropriate authorities, including MFC and EPD/DASO Section.

8 Site Environmental Audit

8.1 Site Inspection

Site inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They should be undertaken routinely by the ET to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The ET Leader is responsible for formulating the environmental site inspection, the deficiency and action reporting system, and for carrying out the site inspection works. He should prepare a proposal for site inspection and deficiency and action reporting procedures to the IEC for agreement, and to the ER for approval. The Contractor's proposal for rectification would be made known to the ER and IEC.

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

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- works progress and programme;
- individual works methodology proposals (which should include proposal on associated pollution control measures);
- contract specifications on environmental protection;
- relevant environmental protection and pollution control laws; and
- previous site inspection results.

The Contractor should keep the ER and ET Leader updated with all relevant information on the construction contract necessary for him to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works should be recorded and followed up by the Contractor in an agreed time-frame. The Contractor should follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.

The ER, ET and Contractor should also carry out ad hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the investigation work.

8.2 Compliance with Legal and Contractual Requirements

There are statutory environmental protection and pollution control requirements with which construction activities must comply.

In order that the works are in compliance with the corresponding requirements, relevant sections (e.g. sections related to environmental measures) of works method statements submitted by the Contractor to the ER for approval should be sent to the ET Leader for vetting to check whether sufficient environmental protection and pollution control measures have been included. Any proposed changes to the mitigation measures specified in the Implementation Schedule (presented in **Appendix B**) shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations of the EIA Report.

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

The Contractor should regularly copy relevant documents to the ET Leader so that works checking can be carried out. The document should at least include the updated Works Progress Reports, updated Works Programme, relevant method statements, any application letters for different licences / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary and environmental records should also be made available for the ET Leader's inspection upon his request.

After reviewing the documentation, the ET Leader should advise the IEC and Contractor of any non-compliance with legislative requirements on environmental protection and pollution control for them to take follow-up actions.

Upon receipt of the advice, the Contractor should undertake immediate action to correct the situation. The ER and ET should follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

8.3 Environmental Complaints

The following procedures should be undertaken upon receipt of any valid environmental complaint:

- The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
- The Contractor / ET to investigate the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency, stations and parameters, if necessary;
- The Contractor to identify mitigation measures in consultation with IEC, ET and ER if a complaint is valid and due to the construction works of the Project;
- The Contractor to implement the remedial measures as required by the ER and to agree with the ET and IEC any additional monitoring frequency, stations and parameters, where necessary, for checking the effectiveness of the mitigation measures;
- The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- The ET to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- If the complaint is referred by the EPD, the Contractor is to prepare an interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and additional monitoring identified or already taken. The interim report shall be reviewed by the ET prior to submission to EPD within the time frame assigned by EPD; and

- The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and additional monitoring results, in the monthly EM&A reports.

Handling of environmental complaints should follow the environmental complaint flow diagram and reporting channel as presented in **Figure 8.1**.

During the complaint investigation work, the Contractor and ER should co-operate with and adhere to the advice of the ET and IEC for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor should promptly carry out the mitigation works. The ER should ensure that the measures have been carried out by the Contractor.

9 Reporting

9.1 General

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

For EM&A during construction phase and recurring operation phase dredging works, the types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the DEP. The exact details of the frequency, distribution and time frame for submission shall be agreed with the IEC, the ER and EPD prior to commencement of works.

9.2 Baseline Monitoring Report

The baseline monitoring report should include at least the following:

1. up to half a page of executive summary

2. brief project background information

3. drawings showing locations of the baseline monitoring stations

4. monitoring results (in both hard and diskette copies) together with the following information:
   - monitoring methodology
   - name of laboratory and types of equipment used and calibration details
   - parameters monitored
   - monitoring locations
   - monitoring date, time, frequency and duration
   - quality assurance (QA) / quality control (QC) results and detection limits

5. details of influencing factors, including:
   - major activities, if any, being carried out on the site during the period/monitoring
   - weather conditions during the period/monitoring
   - other factors which might affect results

6. determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data

7. revisions for inclusion in the EM&A Manual

8. comments, recommendations and conclusions

9.3 Monthly EM&A Monitoring Report

The results and findings of all EM&A work carried out during the month should be recorded in the monthly EM&A reports prepared by the ET Leader and endorsed by the IEC. The EM&A report should be prepared and submitted to EPD within 10 working days after the end of each reporting month. Before submission of the first monthly EM&A report, the ET Leader should liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

The ET Leader should review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

9.3.1 First Monthly EM&A Report

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

1. executive summary (1-2 pages):
   - breaches of Action and Limit levels
   - complaint log
   - notifications of any summons and status of prosecutions
   - changes made that affect the EM&A
   - future key issues

2. basic project information:
   - project organisation including key personnel contact names and telephone numbers
   - programme
   - works undertaken during the month with illustrations (such as location of works etc)
   - 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).

3. a brief summary of EM&A requirements including:
   - all monitoring parameters
   - environmental quality performance limits (Action and Limit levels)
   - Event and Action Plans
   - environmental mitigation measures, as recommended in the Project EIA study final report
   - environmental requirements in contract documents

4. environmental status
   - advice on status of compliance with EP including the status of submissions under the EP

5. implementation status
   - implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA report

6. monitoring results (in both hard and diskette copies) together with the following information:
   - monitoring methodology
   - name of laboratory and types of equipment used and calibration details

- parameters monitored
- monitoring locations
- monitoring date, time frequency, and duration
- weather conditions during the period / monitoring
- any other factors which might affect the monitoring results
- QA / QC results and detection limits

7. analysis of monitoring results, non-compliance, complaints, and notifications of summons and status of prosecutions:
   - analysis and interpretation of monitoring results in the month
   - any non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
   - changes made that affect the EM&A during the month
   - 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
   - notification of summons and status of 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
   - reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
   - actions taken in the event of non-compliance and deficiency, and follow-up actions related to earlier non-compliance

8. others
   - an account of the future key issues as reviewed from the works programme and work method statements
   - comment on the solid and liquid waste management status
   - outstanding issues and deficiencies
   - comments on effectiveness of the environmental management systems, practices, procedures and mitigation measures, recommendations (for example, any improvement in the EM&A programme) and conclusions

9.3.2 Subsequent Monthly EM&A Report

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

1. executive summary (1-2 pages):
   - breaches of Action and Limit levels
   - complaint log
   - notifications of any summons and status of prosecutions
   - changes made that affect the EM&A
   - future key issues

2. environmental status:
   - advice on status of compliance with EP including the status of submissions under the EP

3. implementation status:

- implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA report

4. monitoring results (in both hard and diskette copies) together with the following information:
   - monitoring methodology
   - name of laboratory and types of equipment used and calibration details
   - parameters monitored
   - monitoring locations
   - monitoring date, time frequency, and duration
   - weather conditions during the period / monitoring
   - any other factors which might affect the monitoring results
   - QA / QC results and detection limits

5. analysis of monitoring results, non-compliance, complaints, and notifications of summons and status of prosecutions:
   - analysis and interpretation of monitoring results in the month
   - any non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)
   - changes made that affect the EM&A during the month
   - 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
   - notification of summons and status of 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
   - reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures
   - actions taken in the event of non-compliance and deficiency, and follow-up actions related to earlier non-compliance

6. others
   - an account of the future key issues as reviewed from the works programme and work method statements
   - comment on the solid and liquid waste management status
   - outstanding issues and deficiencies
   - comments on effectiveness of the environmental management systems, practices, procedures and mitigation measures, recommendations (for example, any improvement in the EM&A programme) and conclusions

7. appendix
   - action and limit levels
   - graphical plots of the monitoring parameters in the month
   - monitoring schedule for the present and next reporting period
   - cumulative statistics on complaints, notifications of summons and successful prosecutions
   - outstanding issues and deficiencies

Some information concerning the EM&A works, such as the EM&A requirements would remain unchanged throughout the EM&A programme. In the subsequent Monthly EM&A Reports, the First Monthly EM&A Report can be referred instead of repeating the description of the unchanged information.

9.4 Quarterly EM&A Summary Report

A quarterly EM&A summary report should be produced and should contain at least the following information. In addition, the first quarterly summary report should also confirm if the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

1. up to half a page executive summary

2. basic project information including a synopsis of the Project organisation and programme, and a synopsis of works undertaken during the quarter

3. a brief summary of EM&A requirements including:
   - monitoring parameters
   - environmental quality performance limits (Action and Limit levels)
   - environmental mitigation measures, as recommended in the Project EIA Final Report

4. drawings showing the Project area, environmental sensitive receivers and the locations of the monitoring and control stations

5. implementation status of environmental protection and pollution control / mitigation measures, as recommended in the EIA report

6. graphical plots of the monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
   - the major activities being carried out on site during the period
   - weather conditions during the period
   - any other factors which might affect the monitoring results

7. advice on the solid and liquid waste management during the quarter

8. a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)

9. a brief review of the reasons for and the implications of any non-compliance, including a review of pollution sources and working procedures

10. a summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance

11. a summary of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

12. comments on the effectiveness and efficiency of the mitigation measures; recommendations on any improvements in the EM&A programme and conclusions for the quarter

13. proponents' contacts and any hotline telephone number for the public to make enquiries.

9.5 Final EM&A Review Report

The EM&A program could be terminated upon completion of those construction activities that have the potential to cause significant environmental impacts.

The proposed termination by the Contractor should only be implemented after the proposal has been endorsed by the IEC and the ER followed by final approval from the DEP.

The final EM&A report should include, inter alia, the following information:

1. an executive summary

2. basic project information including a synopsis of the Project organisation and programme, contacts of key management, and a synopsis of work undertaken during the entire construction period

3. a brief summary of EM&A requirements including:
   - monitoring parameters
   - environmental quality performance limits (Action and Limit levels)
   - environmental mitigation measures, as recommended in the Project EIA study final report

4. drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations

5. advice on the implementation status of environmental and pollution control / mitigation measures, as recommended in the Project EIA study final report, summarised in the updated implementation status pro forma

6. graphical plots of the monitoring parameters over the construction period for representative monitoring stations, including the post-project monitoring annotated against:
   - the major activities being carried out on site during the period
   - weather conditions during the period
   - any other factors which might affect the monitoring results

7. compare the EM&A data with the EIA predictions

8. a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels)

9. a brief account of the reasons the non-compliance including a review of pollution sources and working procedures

10. a summary of the actions taken against the non-compliance

11. a summary of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken

12. a review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness)

13. a summary 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

14. a review of the practicality and effectiveness of the EM&A programme (e.g. effectiveness and efficiency of the mitigation measures), and recommendation on any improvement in the EM&A programme

15. a conclusion to state the return of ambient and / or the predicted scenario as per EIA findings

9.6 Data Keeping

No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the EM&A reporting documents. However, any such document should be retained by the ET and be ready for inspection upon request. All relevant information should be clearly and systematically recorded in the document. Monitoring data should also be recorded in digital format, and the soft copy must be available upon request. Data format should be agreed with the IEC, the ER and EPD. All documents and data should be kept for at least one year following completion of the construction contract and one year after the completion of each operation phase recurring dredging contract for construction phase and operational phase EM&A respectively.

9.7 Interim Notifications of Environmental Quality Limit Exceedances

9.7.1 Exceedance of Action Level or Limit Level

During construction phase and recurring operation phase improvement dredging works, with reference to the Event and Action Plans, when the environmental quality performance limits are exceeded, the ET Leader should immediately notify the IEC, the ER and EPD, as appropriate. The notification should be followed up with advice to IEC and EPD on the results of the investigation, proposed remedial measures, actions taken, need for further follow-up proposals, etc. A sample template for the interim notifications is shown in **Appendix D**. The ET Leader may modify the interim notification form for this EM&A programme, the format of which should be approved by the ER and agreed by the IEC.

9.7.2 Exceedance of Alert Level

During construction phase and recurring operation phase improvement dredging works, with reference to the Alert Action Plan, when the Alert levels are exceeded, the ET Leader should immediately notify the IEC and the ER, as appropriate. The notification should be followed up with advice to IEC on the results of the investigation, proposed remedial measures, actions taken, need for further follow-up proposals, etc., where applicable. A sample template for the interim notifications is shown in **Appendix D**. The ET Leader may modify the interim notification form for this EM&A programme, the format of which should be approved by the ER and agreed by the IEC.

826000 E
828000 E
830000 E
832000 E
834000 E
810000 N
808000 N
806000 N
804000 N

WEST LAMMA CHANNEL 西博寮海峽

EAST LAMMA CHANNEL

LUK CHAU WAN

Pak Kok
Nam Tsui
PAK KOK SHAN
PAK KAP HANG
Shek Kok
石角咀
FERRY PIER
YUNG SHUE WAN
LONG LAES
Luk Chau
COAL DEPOT
POWER STATION
HUNG SHING YEH BEACH
KAT TSAI WAN
Luk Chau Village
LUK CHAU SHAN
Magazine Island
Lung Shan Pai
South Horizons
Ap Lei Chau Estate
SHEK PAI WAN
SHAM WAN
LEI YUE MUN
TAP PI CHAU
LUK KWAI SHAN
ABERDEEN CHANNEL
Ap Lei Pai
Assistance Rock

EXISTING PIPELINE

下尾灣
HA MEI WAN
TIT SHA LONG
LO SO SHING BEACH
PICNIC BAY
(SOK KWU WAN)
Sok Kwu Wan
MO TAT WAN
LUNG KOK SHAN
Wong Chuk Kok
LAMMA ISLAND
SHEK PAI WAN
TUNG O WAN
MOUNT STENHOUSE
(SHAN TEI TONG)
SHAM WAN
Yuen Kok
Tai Kok

0 200 400 600m
1 : 15 000 SCALE BAR

J:\356283\REPORT\ENV\EMA\160523\FIG 1-1.dgn DATE: 23/05/2016 TIME: 09:55:25 USER: yim42169

Notes

Key to symbols

PROJECT BOUNDARY

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	MAY 16	MING	GENERAL REVISION	DC	EC
P1	MAR 16	MING	FIRST ISSUE	EH	EC

MOTT MACDONALD

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F +852 2827 1823
W www.mottmac.com.hk

Client

HK Electric 港燈

Project

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Title

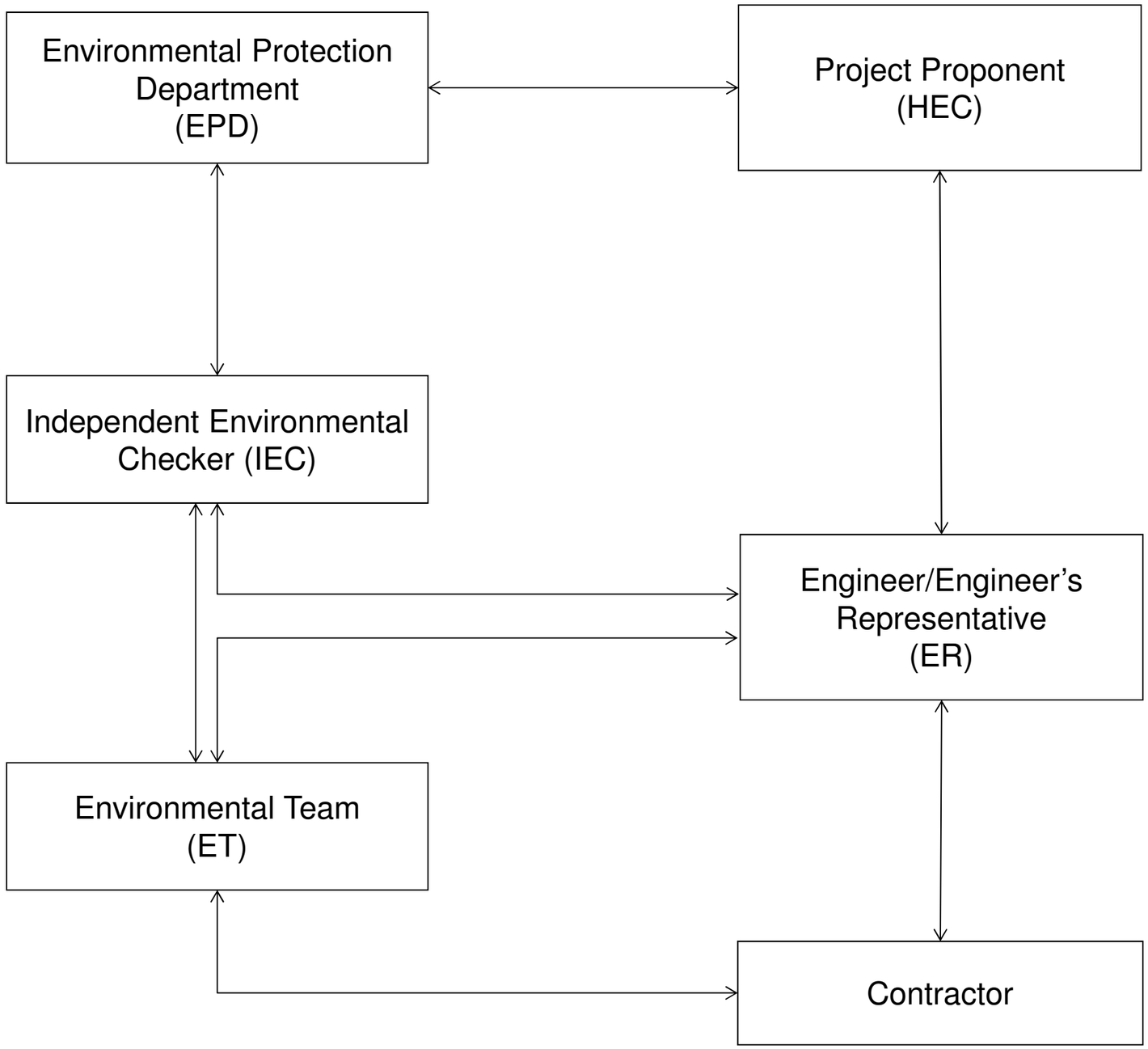
PROJECT AREA

Designed	EH		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	EH		Approved	EC	

Scale at A1	Status	Rev
1:15000	PRE	P2

Drawing Number

FIGURE 1.1



Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	MAR 16	MING	FIRST ISSUE	DC	EC

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Project

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

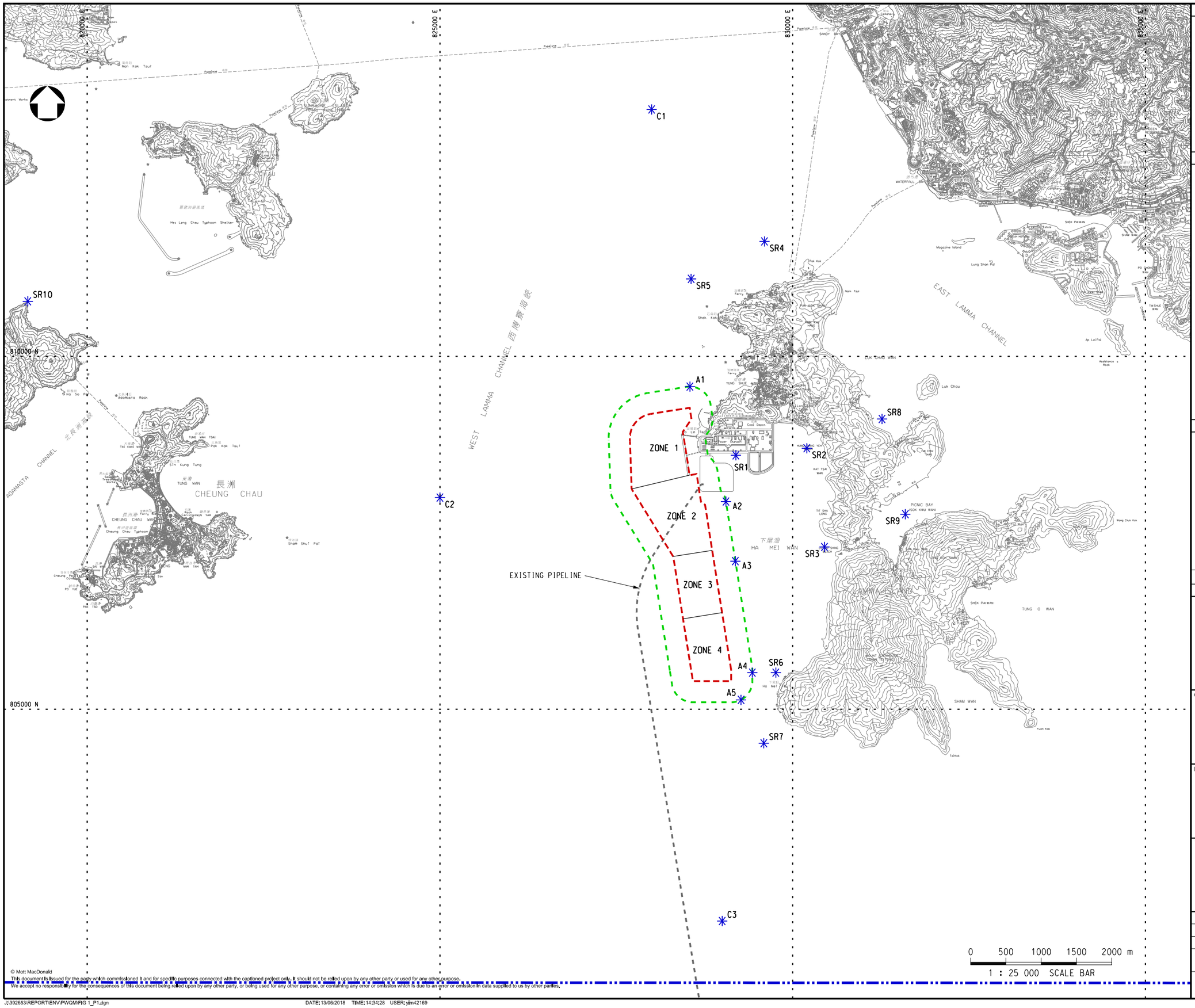
Title

PROJECT ORGANISATION CHART

Designed	HY		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	HY		Approved	EC	

Scale at A1: N.T.S.
Status: PRE
Rev: P1
Drawing Number

FIGURE 1.2



Notes

Key to symbols

- HKSAR BOUNDARY
- PROJECT BOUNDARY
- 300m BUFFER
- WATER QUALITY MONITORING LOCATION

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	JUN 18	MING	FIRST ISSUE	DC	EC

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Project

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

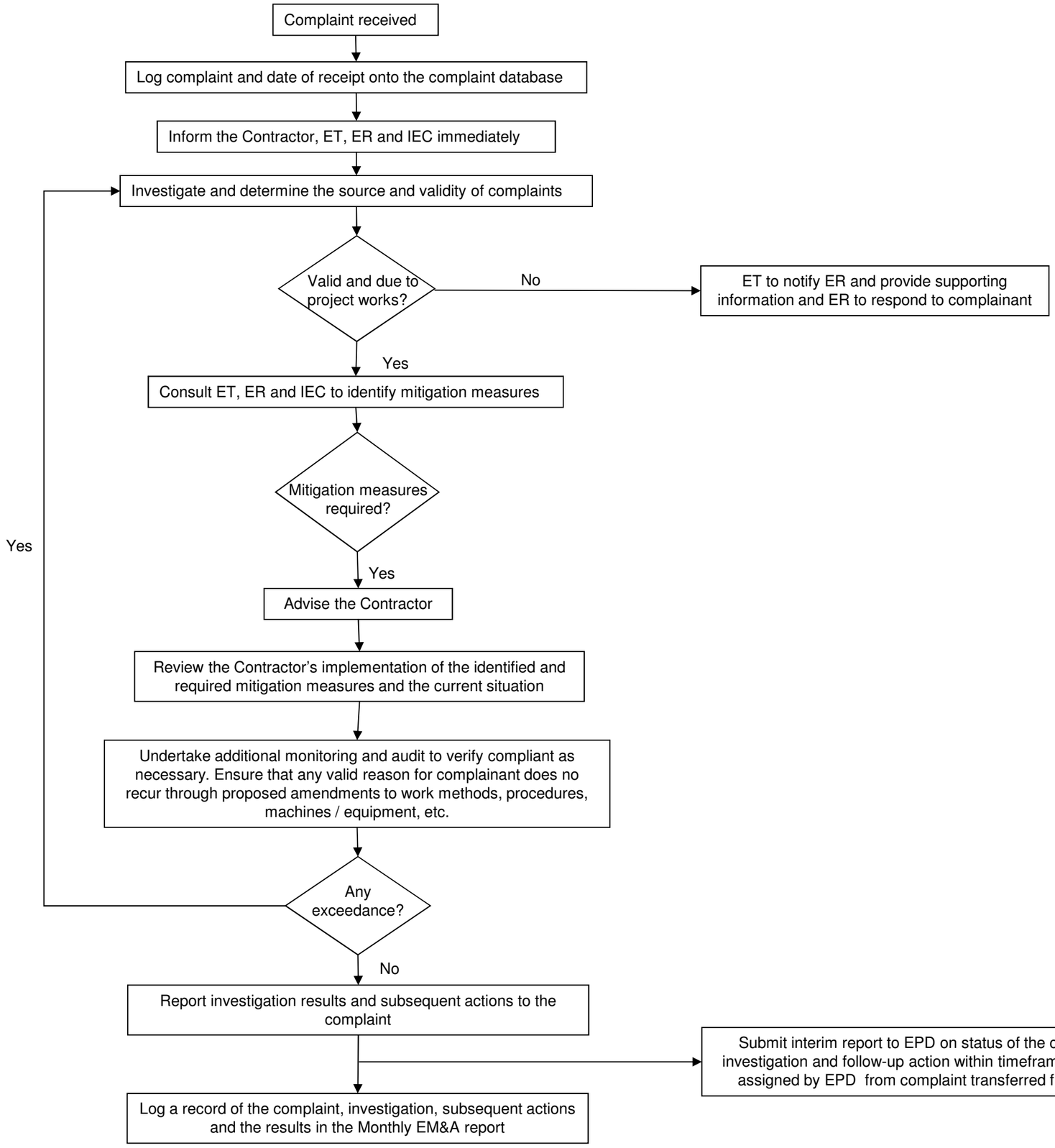
Title

WATER QUALITY MONITORING LOCATIONS

Designed	DC		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	DC		Approved	EC	
Scale at A1	1:25000	Status	PRE	Rev	P1

Drawing Number

FIGURE 2.1



Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	MAR 16	MING	FIRST ISSUE	DC	EC

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Project

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Title

FLOW CHART OF COMPLAINT INVESTIGATION PROCEDURES

Designed	HY		Eng check	DC	
Drawn	MING		Coordination	DC	
Dwg check	HY		Approved	EC	
Scale at A1	N.T.S.	Status	PRE	Rev	P1

Drawing Number

FIGURE 8.1

Appendix A. Sample Environmental Monitoring Data Recording Sheet

Regular Water Quality Monitoring Data Record Sheet

Location			
Date			
Start Time (hh:mm)			
Weather			
Sea Conditions			
Tidal Mode			
Water Depth (m)			
Monitoring Results		1st reading	2nd reading or Duplicate
Salinity	(mg/l)		
Temperature	°C		
pH			
DO Saturation	(%)		
DO	(mg/l)		
Turbidity	(NTU)		
SS Sample ID			
SS	(mg/l)		
Observed construction activities	<100m from location		
	>100m from location		
Other Observations			

	Name & Designation	Signature	Date
Recorded by :			
Checked by:			

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

Appendix B. Implementation Schedule for Environmental Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
Water Quality Impact									
3.8	2.10	Specific mitigation measures to be applied to all dredging activities of the project include: ▪ Dredging shall be conducted by either closed grab dredgers and/or TSHDs. The grab dredgers shall not be operating at the same time as the TSHDs. ▪ The dredging rates for the Project shall not exceed the maximum allowable dredging rates specified in **Section 3.7.1.3** for each respective working zone and for the respective dredging method. ▪ If dredging work is carried out in more than one working zone in any day, the lowest maximum allowable dredging rate in the affected zones should apply in total for that day. ▪ Cage-type silt curtains (at least 10 m depth) should be used for the grab dredger options. ▪ Where grab dredger is used, the closed grab capacity should not be less than 8 m^3 (except near the submarine pipeline where smaller grabs may be used).	Control dredging activities to prevent adverse impacts at WSRs due to SS release from dredging works	Contractor	Within working zones of the project		✓	✓	EIA recommendations
3.8	2.10	Good site practices shall be adopted including: General ▪ Works should not cause foam, oil, grease or litter or other objectionable matter to be present in the water within and adjacent to the works site. ▪ Vessels should be sized to maintain adequate	Implement good site practices to avoid water quality impacts due to marine works	Contractor	Within project site boundary and project vessels travelling to/from the project site		✓	✓	EIA recommendations

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		clearance of the seabed during all states of the tide in order to reduce undue turbidity generated by turbulence from vessel movement or propeller wash. ▪ Vessel speeds should be reduced to no more than 10 knots within the project site boundary Grab Dredger ▪ Care should be taken during lowering and lifting grabs to minimise unnecessary disturbance to the seabed. ▪ The Contractor should ensure that grabs are tightly closed. TSHD ▪ No overflow is permitted and use of lean mixture overboard (LMOB) system is prohibited. ▪ Any pipe leakages should be repaired quickly. ▪ Plant should not be operated with leaking pipes. Barges and Hoppers ▪ Fitted with tight fitting seals to their bottom openings to prevent leakage of material. ▪ Should not be filled to a level which will cause overflow of materials during loading and transportation. ▪ Loading should be controlled to prevent splashing of dredged material into the surrounding waters. ▪ Excess materials should be cleaned from decks and exposed fitting before the vessel is moved. ▪ Adequate freeboard should be maintained to ensure that decks are not washed by wave action.							
Marine Ecological Impact									

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
4.7	3.2	Mitigation measures to be applied: ▪ Avoid dredging Zone 4 of the navigation channel during the calving season for the Finless Porpoise from February to April, with the exception of necessary hotspot / localised dredging being kept under the recommended maximum allowable dredging rates ▪ Vessel movements to disposal grounds are recommended to bypass the Finless Porpoise habitat area in southwest and east Lamma ▪ Implement a maximum speed limit of 10 knots in south and east Lamma waters ▪ All vessel operators working on the Project should be thoroughly briefed on the possible occurrence of Finless Porpoise within and in the vicinity of the Project Area and along routes to the Project Area, as well as rules for safe vessel operation around cetaceans and slowing down to 10 knots in the presence of cetaceans in south and east Lamma waters ▪ Water quality mitigation measures specified above	Minimise impacts to the cetacean Finless Porpoise which has low density of usage of the Project Area in dry season	Contractor	Within project site boundary and project vessels travelling to/from the project site		✓	✓	EIA recommendations
Fisheries Impact									
5.5	4.1	Recommendations in the Water Quality Impact Assessment chapter (refer to **Section 3.8**) for minimizing water quality impacts will also minimize any adverse environmental impact to fisheries	Control dredging activities to prevent adverse impacts at WSRs due to SS release from dredging works	Contractor	Within working zones of the project		✓	✓	EIA recommendations
Hazard to Life Impact									
6.7	5.2 and 5.3	<u>General</u> 1. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to check and confirm all anchors are secured in position before the working vessels are allowed to travel inside the non-anchor zone.	To further minimize the potential risk to the submarine pipeline due to the dredging works	Engineer	Construction Site		✓	✓	EIA recommendations

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		2. Recommend the Contractor to avoid the working vessel traveling during berthing and unberthing of coal vessel		Contractor					
		3. Recommend the Contractor to avoid the working vessel travelling after sunset or under low visibility when the works area is near the submarine pipeline.		Contractor and Engineer					
		4. Recommend the Contractor to check the weather information from Marine Department before deploying the vessel to the dredging zone.		Contractor					
		5. Recommend the Contractor to consider the preliminary coal vessel shipping plan provided by HK Electric when scheduling the programme of the dredging works.		Contractor, Engineer and HK Electric					
		6. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to check and confirm if all large and moveable objects must be tightly secured on the dredger by lashing, before it is allowed to travel inside the non-anchor zone. The condition of the lashing will be checked daily when the dredger is near the submarine pipeline and under adverse weather such as typhoon, strong monsoon, and rough sea condition.		Engineer					
		7. Recommend vessel owners use electrical appliance for cooking and smoking onboard is not allowed when the dredging works is within non-anchoring zone.		Contractor and Engineer					
		8. Recommend vessel owners to store dangerous goods in an explosion proof cabinet, if any, according to the statutory requirements at all times.		Contractor and Engineer					
		9. Recommend the Contractor to check any loosen anchoring system on board regularly to avoid drifting of the working vessel towards		Contractor					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		slipway of gas pipeline.							
		10. Recommend the Contractor to prepare and submit an Emergency Response Plan (ERP) to cater for drifting of working vessel to Engineer for review. The ERP provides the necessary safety actions required to avoid or minimize the impact of jetty facilities and submarine gas pipeline.		Contractor and Engineer					
		11. Recommend the Engineer to send a foreman to ensure the visibility is good before the working vessel travels near the seawall in each time.		Contractor and Engineer					
		12. Recommend the Engineer to provide an indicator (e.g. flashing lamp) onshore at the point where the pipeline transits from onshore to seabed. The indicator should be able to be clearly seen from the working vessel's cabin at distance.		Engineer					
		13. Recommend the Engineer to impose a safe traveling speed to the working vessels when they are traveling or working near the seawall.		Engineer					
		14. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to request the Contractor (i.e. dredging operator) to provide maintenance records of the working vessel.		Contractor and Engineer					
		15. Recommend the working vessel not to stay right above the submarine pipeline unless it is necessary.		Contractor and Engineer					
		16. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a diver to the seabed to locate the point where the pipeline transits from the section with rock armour to that without rock armour.		Engineer					
		17. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to put buoys in the sea to indicate the transition point.		Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		18. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to request the Contractor (i.e. dredging operator) to provide maintenance records and valid examination certificates of lifting appliances and lifting gears for the dredgers to ensure that all lifting facilities on board are in good order.		Contractor and Engineer					
		19. Recommend the Contractor (i.e. dredging operator) to prepare a method statement for dredging works in close proximity of the submarine pipeline. In the method statement, the measurement technique and frequency have to be specified to ensure the dredged profile can be measured speedily and accurately with high resolution and to ensure over-dredging will not happen. The method statement has to be reviewed and approved by the Engineer (as hired by the HK Electric to manage the dredging works).		Contractor and Engineer					
		20. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to ensure the dredging works will be conducted in accordance with the method statement.		Engineer					
		21. The dredged profile measurement has to be conducted with the presence of the foreman.		Engineer					
		22. Recommend the foreman to have a proper knowledge/experience in conducting the dredged profile measurement. The foreman should also have the capability in interpreting the measurement result and take appropriate corrective action.		Engineer					
		23. The measurement results have to be submitted to the Engineer for review at the same day the measurement is conducted.		Contractor and Engineer					
		24. Recommend the Contractor to conduct underwater survey by diver at the location of		Contractor and Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		submarine gas pipeline immediately after completion of dredging works there.							
		<u>Specific for Grab Dredging</u>							
		1. Recommend to provide a buoy for anchor location and possibly to provide buoys above submarine pipeline alignment.		Contractor and Engineer					
		2. Recommend the Contractor to deploy a guard boat to alert third party vessel not to travel inside the dredging works area.		Contractor					
		3. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to double-check if the anchor dropping point is within the designated anchorage area, before the anchor is dropped into the sea.		Engineer					
		4. Recommend the Engineer to verify the accuracy of all GPS/DGPS system.		Engineer					
		5. Recommend the tug boat to travel at a low speed in each time the anchor is placed on the tug boat. This allows the tugboat master to react for emergency.		Contractor					
		6. Recommend the Engineer and Contractor to check the length of anchor chain is sufficient to cover the non-anchor zone area and double check the anchorage location with respect to the length of anchor before dropping of anchors.		Contractor and Engineer					
		7. Recommend the Contractor to deploy a guard boat to monitor the separation distance between the anchor chain and other incoming vessel.		Contractor					
		8. Recommend the Contractor to observe tidal conditions and sea current in the work area and take precautionary measures as necessary to enable safe working conditions.		Contractor					
		9. Recommend the Contractor to check the depth of the seabed and maintain the bottom		Contractor and Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		of the silt curtain to be above the seabed.							
		10. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to verify if the dredger is near or right above the submarine pipeline every time the dredger arrives at the project site boundary or when it needs to be relocated.		Engineer					
		11. When the dredger is in close proximity of the submarine pipeline, it is recommended to prohibit the Contractor to allow free-falling of the grab when the dredging works is taken place near the submarine pipeline. The grab will always be lowered slowly to the seabed. The foreman should regularly check if this prohibition is followed.		Contractor and Engineer					
		12. Recommend to have a trial run for the dredging works when it is conducted right above and in close proximity of the submarine pipeline. An established communication network should be maintained between the dredger's operator, the foreman, the Engineer and HK Electric during the trial run.		Contractor, Engineer and HK Electric					
		13. Recommend operator to regularly monitor the pressure fluctuation in the submarine pipeline during the dredging works near the pipeline.		HK Electric					
		14. Recommend to use a much smaller grab for dredging works with control movement near the submarine pipeline.		Contractor and Engineer					
		15. The type of grab (e.g. size, weight) used for the dredging works near the submarine pipeline has to be reviewed by the Engineer, taking the design of the rock armour into account, before the dredging works is started.		Contractor and Engineer					
		16. When the dredging is getting close to the submarine pipeline without rock armour, the type of grab (e.g. size, weight) used for the dredging works has to be reviewed by the		Contractor and Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		Engineer, better to conservatively assume rock armour is not present.							
		17. Recommend the foreman to confirm that only the type of grab approved by the Engineer is installed in the dredger before the dredging works is started near the submarine pipeline.		Engineer					
		18. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to have a visual examination of the integrity of the wire cable of the grab hosting system before the dredging is allowed to move near the submarine pipeline without rock armour.		Engineer					
		19. Recommend the foreman to remind the dredger master to observe if there is any rock being dredged from the seabed when the dredging works is taken place in close proximity of the submarine pipeline.		Engineer					
		20. Recommend the grab is retrieved back to inside the dredger after the completion of dredging works in each working day.		Contractor and Engineer					
		21. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to regularly check the location of the dredger using GPS to see if the dredger is carried away by sea current.		Engineer					
		22. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to conduct a thorough examination of the structural integrity of the existing seawall to ensure it is structurally sound for a nearby dredging works. If necessary, remedy action (e.g. providing temporary supporting structure) is taken before the dredging works is allowed.		Engineer					
		23. Based on the condition of the seawall structure, the Engineer (as hired by HK Electric to manage the dredging works) needs		Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		to recommend and impose a minimal separation distances between the seawall and the dredging works.							
		24. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to monitor the condition of the seawall structure throughout the dredging works.		Engineer					
		25. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator), to ensure the separation distance is maintained every time the dredger is relocated near the seawall structure.		Engineer					
		26. Recommend the hopper barge operator to monitor the draught of barge to ensure that the hopper barge will not be overloaded.		Contractor					
		27. Recommend the Engineer (as hired by HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator) to confirm all the anchors have been completely retrieved from the seabed before allowing the dredger/barge to travel.		Engineer					
		28. Recommend to request the tug boat to travel around the dredger to observe if all the anchors have been completely lifted up before it tugs the dredger.		Contractor and Engineer					
		29. Recommend to request the hopper barge not to stay near the submarine pipeline and this will be confirmed by the foreman who is hired by the Engineer.		Contractor and Engineer					
		<u>Specific for TSHD</u>							
		1. Recommend to request the working vessel to leave the Channel in case it is on fire.		Contractor and Engineer					
		2. Recommend the dredging path to consider		Contractor and					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		potential infringement to nearby structure (e.g. seawall).		Engineer					
		3. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to request the Contractor (i.e. dredging operator) to provide maintenance record for the dredger to ensure the sea-worthiness of the dredgers.		Engineer					
		4. Recommend the TSHD not to lower the suction pipe in close proximity of the submarine pipeline. This has to be monitored by the foreman hired by the Engineer.		Contractor and Engineer					
		5. Recommend to request the Contractor (i.e. dredging operator) to prepare and submit an Emergency Response Plan (ERP) to the Engineer for review. The ERP provides the necessary safety actions required to avoid or minimize the impact to the submarine pipeline due to failure of suction pipe gantries system.		Contractor and Engineer					
		6. Recommend the Engineer to provide the Contractor (i.e. dredging operator) the design details and location of the submarine pipeline (e.g. details of rock armour).		Contractor, Engineer and HK Electric					
		7. Recommend the TSHD to travel in a slow speed when the dredging works is near the submarine pipeline.		Contractor and Engineer					
		8. Recommend to request the Contractor (i.e. dredging operator) to prepare and submit an Emergency Response Plan (ERP) to the Engineer for review. The ERP provides the necessary safety actions required to avoid or minimize the impact to the submarine pipeline when the draghead is stuck with the rock armour or the seabed.		Contractor and Engineer					
		9. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to request the TSHD owner to provide maintenance records and valid examination certificates of the compensator to ensure it is in good order.		Contractor and Engineer					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		10. Recommend the Engineer (as hired by the HK Electric to manage the dredging works) to send a foreman, who is independent of the Contractor (i.e. dredging operator) to confirm the operability of the compensator by observing the movement of the hydraulic cylinder of the compensator when the dredging works is carried out near the submarine pipeline.		Engineer					
		11. Recommend the foreman to remind the dredger master to observe if liquid flow is reduced by clogging of suction pipe.		Engineer					
		12. Recommend to request the TSHD not to stay near the submarine pipeline unless it is necessary and this will be confirmed by the foreman who is hired by the Engineer.		Contractor and Engineer					
Noise Impact									
7.10	6.1	A daily log book should be maintained to record the number and type of plants deployed for auditing purpose.	Ensure construction plants are kept to within the maximum numbers / types to avoid noise impacts at NSRs	Contractor	Within the Project site / During construction phase		✓	✓	EIAO and Noise Control Ordinance
Waste Management Implications									
8.5.1	7.2 and 7.3	▪ The Category L marine sediment will require Type 1 Open Sea Disposal. No dredging work is allowed to proceed until all matters on management of dredged sediments have been resolved and all relevant arrangements have been endorsed by the relevant authorities including MFC and EPD. ▪ The distance between the barge and the dredging point should be shortened as far as possible to avoid dropping of sediment from the close grab to seawater ▪ During transportation and disposal of the dredged marine sediments, the following measures should be taken to minimise potential impacts:	Minimise impacts in relation to sediment handling	Contractor	Within project site boundary and project vessels travelling to/from the project site		✓	✓	EIA recommendations

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
		o Bottom opening of barges will be fitted with tight fitting seals to prevent leakage of material; o Excess material shall be cleaned from the decks and exposed fittings of barges and dredgers before the vessel is moved; o Monitoring of the barge loading should be conducted to ensure that loss of material does not take place during transportation; o Barges or hopper barges should not be filled to a level that would cause the overflow of materials or sediment laden water during loading or transportation; o Dumping barges should be installed with Real Time Tracking and Monitoring of Vessel (RTTMV) system for monitoring the mud dumping activities; and o All conditions stipulated in the dumping permit should be strictly followed.							
8.5.2	7.2 and 7.3	If chemical wastes are produced, the Contractor will be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the "Code of Practice on the Packaging Labelling and Storage of Chemical Wastes". Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidising, irritant, toxic, harmful, corrosive, etc. Licensed collector should be deployed to transport and dispose of the chemical wastes at the approved Chemical Waste Treatment Centre or other licensed recycling facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.	Implement good practices to avoid chemical waste impact.	Contractor	Within working zones of the project		✓	✓	Code of Practice on the Packaging Labelling and Storage of Chemical Wastes; Waste Disposal (Chemical Waste) (General) Regulation
8.5.3	7.2	General refuse should be stored in enclosed bins	Implement good	Contractor	Within working zones		✓	✓	Waste Disposal

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to implement the measure?	Location of the measure	*When to implement the measure?			What requirements or standards for the measure to achieve
						Des	C	O	
	and 7.3	or compaction units and delivered to the refuse collection point accordingly. The Contractor should remove general refuse regularly to avoid odour nuisance or pest/vermin problem. Preferably an enclosed and covered container should be provided to minimise the refuse contaminate the marine environment. Sufficient recycling containers are recommended to be provided to encourage recycling of such waste as aluminium cans, plastics and waste paper.	practices to avoid odour nuisance or pest/vermin problem and waste impact.		of the project				Ordinance and Public Health and Municipal Services Ordinance - Public Cleansing and Prevention of Nuisances Regulation

* Des = Design stage, C = Construction stage, O = Operation stage recurrent dredging

Appendix C. Maximum Allowable Dredging Rates for Concurrent Dredging in Different Zones

	Concurrent Dredging Scenarios *(shown as shaded cells)*										
Zone	**Two Concurrent Zones**						**Three Concurrent Zones**				**All Zones**
1											
2											
3											
4											
Grab Dredger – Wet Season (April to September)											
Zone with lowest rate	4	1	3	3	4	4	3	4	4	4	4
Maximum Dredging Rate in Total (m^3/hr)	1,600	3,000	2,640	2,640	1,600	1,600	2,640	1,600	1,600	1,600	1,600
Maximum Dredging Rate* in Total (m^3/day)	38,500	72,100	63,500	63,500	38,500	38,500	63,500	38,500	38,500	38,500	38,500
Grab Dredger – Dry Season (October to March)											
Zone with lowest rate	1	1	1	3	4	4	1	1	1	4	1
Maximum Dredging Rate in Total (m^3/hr)	2,070	2,070	2,070	3,730	2,400	2,400	2,070	2,070	2,070	2,400	2,070
Maximum Dredging Rate* in Total (m^3/day)	49,800	49,800	49,800	89,600	57,800	57,800	49,800	49,800	49,800	57,800	49,800
TSHD – Wet Season (April to September)											
Zone with lowest rate	4	2	3	3	4	4	3	4	4	4	4
Maximum Dredging Rate in Total (m^3/hr)	920	3,280	2,710	2,710	920	920	2,710	920	920	920	920
Maximum Dredging Rate* in Total (m^3/day)	22,200	78,800	65,100	65,100	22,200	22,200	65,100	22,200	22,200	22,200	22,200
TSHD – Dry Season (October to March)											
Zone with lowest rate	4	1	1	2	4	4	1	4	4	4	4
Maximum Dredging Rate in Total (m^3/hr)	2,630	3,280	3,280	5,730	2,630	2,630	3,280	2,630	2,630	2,630	2,630
Maximum Dredging Rate* in Total (m^3/day)	63,300	78,900	78,900	137,600	63,300	63,300	78,900	63,300	63,300	63,300	63,300

Note:
The allowable dredging rates are the total for all dredgers working simultaneously.
Grab dredgers shall not be operated concurrently with TSHDs.
*Refers to dredging over a 24 hour period. Notwithstanding this, the maximum hourly dredging rate for the Project shall not be exceeded in any given hour of dredging works.

Appendix D. Sample Template for the Interim Notifications

Sample template for the interim notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

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

Location Plan

Prepared by:

Designation:

Signature:

Date:

Sample template for the interim notifications of Exceedances

Incident Report on Alert Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Alert Levels	
Measured Level	
Possible reason for Alert Level Non-compliance	
Actions taken / to be taken	
Remarks	

Location Plan

Prepared by:

Designation:

Signature:

Date: