

Installation of Submarine Gas Pipelines  
and Associated Facilities from  
To Kwa Wan to North Point for  
Former Kai Tak Airport Development

Consultancy Services for  
Feasibility Study and Detailed Design

Environmental Monitoring & Audit Manual

Document No. 237926/35/D

June 2010

The Hong Kong and China Gas Company Limited



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The Hong Kong and China Gas Company Limited

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**Mott MacDonald Hong Kong Limited**

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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 “Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for the Former Kai Tak Airport Development” (The Project).

For the purpose of this Manual, the "Engineer" should refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The Environmental Team (ET) Leader, who should be responsible for and in charge of the ET, should refer to the person delegated the role of executing the environmental monitoring and audit requirements.

## 1.2 Review of the EM&A Manual

It should be noted that this EM&A Manual is subject to changes. The Manual shall be reviewed and updated later, where necessary, near the commencement of construction of the Project.

## 1.3 Background

Mott MacDonald Hong Kong Ltd. was appointed by the Hong Kong and China Gas Company Limited to carry out the Feasibility Study and Detailed Design including the Environmental Impact Assessment for the proposed Project.

The scope of the proposed Project comprises the following:

- twin submarine gas pipelines across the Victoria Harbour from To Kwa Wan to North Point (a designated project under EIA Ordinance);
- two land gas pipelines at To Kwa Wan and North Point respectively (non designated project under EIA Ordinance); and
- two pigging stations for pigging operation at To Kwa Wan and North Point respectively (non designated project under EIA Ordinance).

The “submarine gas pipeline” component of the Project is classified as Designated Project under item H.2 of Part I of Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499). The dredging operation associated with the formation of trench for installation of submarine gas pipelines is classified as Designated Project under item C.12 (b) of Part I of Schedule 2 of the Environmental Impact Assessment Ordinance (Cap. 499) as it is less than 100m from a seawater intake point. An Environmental Permit (EP) issued under the EIAO is required for the construction and operation of the designated project. An Environmental Permit (EP) issued under the EIAO is required for the construction and operation of the designated project. An application for a EIA study brief under section 5(1) of the EIAO was submitted by

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the Hong Kong and China Gas Company Limited on 28 September 2007 with a Project Profile (No. PP-328/2007). The EPD issued an EIA Study Brief (No. ESB-171/2007) on 8 November 2007, detailing the requirements for carrying out and reporting the EIA study.

As the proposed To Kwa Wan pigging station is located within an area zoned "Other Specified Uses" annotated "Sewage Treatment Plant" ("OU(STP)") on the Draft Hung Hom Outline Zoning Plan (OZP) No. S/K9/23, planning permission from the Town Planning Board under Section 16 of the Town Planning Ordinance had been applied according to the Notes of the OZP as utility installation not ancillary to the specified use in "OU(STP)" zone requires planning permission.

As the proposed North Point pigging station is located within an area zoned "G/IC" and "Road" on the North Point OZP, planning permission from the Town Planning Board under Section 16 of the Town Planning Ordinance had been applied according to items 7 and 8 of the Notes of OZP as the proposed North Point pigging station in Road zone requires planning permission.

Approval of the Section 16 Applications for the two pigging stations from Town Planning Board were granted on 19 March 2010. Assessment of environmental impact for the pigging stations were incorporated in the approved planning permission applications for the two pigging stations prepared under Section 16 of the Town Planning Ordinance and therefore are not covered in details in the EIA report.

The decommissioning/ removal works of the existing cross-harbour submarine pipelines and gas pigging stations are not included in the scope of the proposed Project.

From the EIA, the recommendations for monitoring contained herein, are made.

## 1.4 Site Location

The proposed Project covers three areas, namely: Victoria Harbour, To Kwa Wan and North Point. The gas pipeline network would consist of a twin submarine gas pipeline across the Victoria Harbour, with two new land sections on both ends and two new pigging stations at To Kwa Wan and North Point respectively. The route of the proposed gas pipeline network is shown in **Figure 1.1**.

## 1.5 Sensitive Receivers

Sensitive receivers have been identified in the EIA and are shown on **Figures 1.2a-e**. Representative Sensitive Receivers (SRs) for water quality, marine ecology, noise, air quality and fisheries are selected according to the criteria set out in the Technical Memorandum on Environmental Impact Assessment Ordinance (EIAO-TM) and listed as follows:

- WSD Flushing Water Intakes (WSRs);
- Cooling Water Intakes (WSRs);
- Corals (WSR and Marine Ecological Sensitive Receivers);
- Fish Culture Zones (WSRs and Fisheries);
- Educational institutions including Po Leung Kuk Ngan Po Ling College and CCC Kei To Secondary School (NSRs and ASRs);
- Residential buildings including Wing Fai Mansion, Sunrise Villa, Model Housing Estate and Kut Cheong Mansion, Lai King Building and North Point Fire Services Married Quarters (NSRs and ASRs);



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- ICAC Headquarters, North Point Fire Station Fire Service Building, North Point Government Office, Eastern District Headquarters & North Point Division Police Station, Healthy Garden, La Place de Victoria, Harbour Plaza, North Point and Canossa College (ASRs);

## **1.6 Environmental Monitoring and Audit Requirements**

The EIA study identified the likely environmental impacts during construction and operation phases. These impacts can be minimised to acceptable levels with the implementation of environmental mitigation measures and environmental monitoring and audit requirements. An Implementation Schedule of the Environmental Mitigation Measures recommended in the EIA Report is described in **Annex A**. To ensure the environmental acceptability of the proposed Project, monitoring and audit requirements have been identified and are described in detail in the subsequent sections. A summary of the EM&A requirements on different environmental aspects studied in the EIA is provided below:

### **1.6.1 Water Quality**

Adverse water quality impact was not predicted during the construction and operation phase of the Project. Nevertheless, a marine water quality monitoring and audit programme is recommended during marine construction works to verify whether or not impact predictions are representative, and to ensure that the dredging works along the alignment of the proposed submarine gas pipelines do not result in unacceptable impacts. If monitoring shows unacceptable water quality impact, appropriate mitigation measures, such as changes in the operation of dredging works shall be introduced.

Details of the water quality monitoring and audit programme and the Event and Action Plan are provided in this Manual. Water quality monitoring will be carried out at selected potentially affected sensitive receivers. This Manual includes site-specific monitoring and auditing protocols for baseline and impact monitoring of marine water quality. Such protocols include but are not limited to the locations of monitoring stations, parameters and frequencies for monitoring, monitoring equipment, and reporting of monitoring results.

### **1.6.2 Waste Management**

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

### **1.6.3 Marine Ecology**

The placement of the second silt curtain at To Kwa Wan breakwaters described in the Report shall be subject to regular audit. Following implementation of the second silt curtain, the health and condition of the hard coral communities on the To Kwa Wan breakwaters potentially affected by the proposed works shall be monitored.

### **1.6.4 Fisheries**

The implementation of the water quality mitigation measures stated in **Section 2** of this Manual shall be checked as part of the environmental monitoring and audit procedures during the construction period. No other fisheries-specific measures are considered necessary.

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### **1.6.5 Hazard to Life**

The implementation of hazard to life mitigation measures stated in **Section 6** of this Manual shall be checked as part of the environmental monitoring and audit procedures during the construction period.

### **1.6.6 Landscape**

The implementation of landscape mitigation measures stated in Section 7 of this Manual shall be checked as part of the environmental monitoring and audit procedures.

### **1.6.7 Cultural Heritage**

A monitoring brief is required at the locations for which there was not 100% geophysical survey coverage. The detailed requirements are set out in Chapter 8 of this Manual. The monitoring brief can be completed at the same time as the monitoring of barge loading stated in **Chapter 3** of this Manual.

### **1.6.8 Noise**

Given the results from the impact predicted during the construction phase, the construction noise impact can be mitigated to acceptable level. Nevertheless, to ensure that the nearby NSRs will not be subjected to unacceptable construction noise impact, an EM&A programme is recommended.

### **1.6.9 Air Quality**

It is necessary to ensure proper implementation of the dust control measures as required under the Air Pollution Control (Construction Dust) Regulation. As the dredged mud is in high moisture content during the dredging process and the number of plant operated on landmain site is limited, no significant dust impact is anticipated, hence no specific construction dust monitoring is recommended, although environmental audits during the construction stage will be desirable to ensure proper implementation of air quality control measures.

## **1.7 Project Organisation**

The proposed project organisation is shown in **Figure 1.3**. The responsibilities of respective parties are:

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- project proponent and will assume overall responsibility for the project; and
- liaise with EPD on environmental issues associated with the project with IEC's advices.

### **Environmental Protection Department (EPD)**

- statutory enforcement body for environmental protection matters in Hong Kong.

### **The Contractor**

- provide assistance to ET in carrying out monitoring;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;

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- implement measures to reduce impact where Action and Limit levels are exceeded; and
- adhere to the procedures for carrying out complaint investigation in accordance with **Section 11.3**.

#### **The Engineer or Engineer Representative (ER)**

- to be employed by project proponent
- supervise the Contractors activities and ensure that the requirements in the Manual are fully complied with;
- inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with **Section 11.3**.

#### **The Environmental Team (ET)**

- to be employed by project proponent / contractor to carry out EM&A works;
- monitor the various environmental parameters as required in the Manual;
- analyse the EM&A data and review the success of EM&A programme to cost effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- carry out site inspections to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;
- audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- report on the EM&A results to the IEC, Contractor, the ER, and the EPD;
- 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; and
- adhere to the procedures for carrying out complaint investigation in accordance with **Section 11.3**.

The ET Leader shall have relevant professional qualifications and at least 7 years of experience in EM&A or environmental management subject to approval of the ER and the EPD.

#### **Independent Environmental Checker (IEC)**

- to be employed by project proponent / engineer to audit the results of the EM&A works carried out by the ET;
- check, review, verify the EM&A works performed by the ET;
- audit the monitoring activities and results;
- evaluate the EM&A reports submitted by the ET;
- review the proposals for mitigation measures submitted by the Contractor in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with **Section 11.3**.

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The IEC shall have relevant professional qualifications and at least 7 years of experience in environmental monitoring and audit (EM&A) or environmental management subject to approval of the ER and the EPD.

Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project. The ET shall not be in any way an associated body of the Contractor and the IEC. The IEC shall not be in any an associated body of the Contractor or the ET.

## **1.8 Construction Programme**

The construction of the proposed Project is scheduled to commence in January 2012 for completion by June 2014. The tentative project programme is given in **Figure 1.4**.

## 2. Water Quality

### 2.1 Introduction

As identified in the EIA Report, a key water quality issue of the construction phase would be dredging works for the pipeline trench. Marine water quality monitoring should be carried out during the course of marine construction works to ensure that any unacceptable increase in suspended solids/turbidity and decrease in dissolved oxygen due to dredging activities could be readily detected and timely action be taken to rectify the situation.

### 2.2 Water Quality Parameters

Monitoring for Dissolved Oxygen (DO), Dissolved Oxygen Saturation (DO%), temperature, turbidity, salinity, suspended solid (SS) and water depth should be undertaken at designated monitoring locations. All parameters should be measured in-situ whereas SS should be determined by the laboratory. DO should be presented in mg/L and in % saturation.

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

### 2.3 Sampling Procedures and Monitoring Equipment

(N.B. Water samples for all monitoring parameters should be collected, stored, preserved and analysis according to Standard Methods, APHA 21<sup>st</sup> ed. and/or methods agreed by the Director of Environmental Protection. In-situ measurements at monitoring locations including DO, temperature, turbidity, salinity and water depth should be collected by equipment with the characteristics and functions listed in the following sections).

The following equipment and facilities should be provided by the ET and used for the monitoring of water quality impacts:

#### 2.3.1 Dissolved Oxygen and Temperature Measuring Equipment

DO and water temperature should be measured in-situ by a DO/ temperature meter. 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 DO level in the range of 0-20 mg/l and 0-200% saturation; and
- a temperature of between 0 and 45 degree Celsius.

#### 2.3.2 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, such as a Hach model 2100P or similar approved.

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### **2.3.3 Salinity**

A portable salinometer with measuring range of 0-40 mg/L (YSI 30 Salinity meter or other approved instrument) should be used to determine the salinity of the water.

### **2.3.4 Water Depth Detector**

A portable, battery-operated echo sounder (Seafarer 700 or other approved instrument) would be used for the measurement of water depth at each designated monitoring station. The unit would be either handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

### **2.3.5 Positioning Device**

A digital Global Positioning System (GPS) should be used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### **2.3.6 Calibration of In-Situ Instruments**

All in-situ monitoring instruments would be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes should be checked with certified standard solutions before each use.

Wet bulb calibration for a DO probe should be carried out at least once per 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. In addition, the turbidity probe should be calibrated at least twice per month to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in  $\text{mgL}^{-1}$ ).

For the on-site calibration of field equipment, the BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters should be observed. Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring could proceed uninterrupted even when some equipment is under maintenance, calibration etc.

### **2.3.7 Water Sampling Equipment**

A water sampler comprises a transparent PVC cylinder, with a capacity of not less than 2 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 (Kahlsico Water Sampler or an approved similar instrument).

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

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### 2.3.8 Laboratory Measurement/Analysis

Analysis of suspended solids should be carried out in a HOKLAS or other international accredited laboratory. Water samples of about 1L should be collected at the monitoring stations for carrying out the laboratory suspended solids determination. The SS determination work should start within 24 hours after collection of the water samples. The SS analyses should follow the standard method APHA 2540D with a detection limit of 1mg/L as described in APHA Standard Methods for the Examination of Water and Wastewater, 21<sup>st</sup> Edition, unless otherwise specified.

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.

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 may also be required to submit to EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programmes to EPD or his representatives when requested.

## 2.4 Monitoring Locations

The proposed water quality monitoring stations are shown in **Table 2.1** and **Figure 2.1**. The monitoring stations proposed in this section are indicative subject to further review before construction phase. The final locations and number of the monitoring points should be agreed with EPD at least 2 weeks before undertaking any works. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such case exist, the ET Leader should propose updated monitoring locations and seek approval from the IEC and EPD.

It is proposed to monitor the water quality at six seawater intakes closest to the dredging area.

It is recommended to conduct the monitoring at the appropriate vertical levels of the abstraction points of the seawater intakes to collect information on the mitigated water quality condition if practicable. Four Control Stations are proposed to represent the project site in its undisturbed condition and their respective positions are also shown in **Table 2.1** and **Figure 2.1**.

Table 2.1 Water Quality Monitoring Stations

ID	Description	Easting	Northing
WM1	Tai Wan WSD Seawater Intake	837818.8258	818059.9297
WM2	City Garden	838278.6734	817209.9656
WM3	Provident Centre	838443.5777	817233.5234
WM4	North Point Government Offices	839536.1868	817215.6195
WM5	Quarry Bay WSD Seawater Intake	839781.4231	817107.8097
WM6	Taikoo Place	840026.6594	817000
C1	Control Station	836625.9264	817422.6424
C2	Control Station	836747.9445	816670.1762
C3	Control Station	840810.5828	817825.8986

ID	Description	Easting	Northing
C4	Control Station	840432.5877	816920.1674

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

- at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA report, which are likely to have water quality impacts;
- close to the sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring;
- two or more control stations which should be at locations representative of the project site in its undisturbed condition. Control stations should be located, as far as is practicable, both upstream and down stream of the works area.

Measurement should be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station would be monitored. The ET Leader should seek approval from the IEC and EPD on all the monitoring stations.

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

## 2.5 Baseline Monitoring

The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of marine construction works and to demonstrate the suitability of the proposed monitoring stations. The measurements should be taken at all designated monitoring stations, 3 days per week, at mid-flood and mid-ebb tides, for at least 4 consecutive weeks prior to the commencement of marine construction works.

Two consecutive measurements of DO concentration ( $\text{mgL}^{-1}$ ), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings should be taken. Water samples for SS ( $\text{mgL}^{-1}$ ) measurements should be collected at the same depths.

In addition to the above in-situ measurements, water temperature and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

The baseline monitoring campaign should be executed prior to commencement of marine construction works. In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader should liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

Baseline monitoring schedule should be submitted to the Contractor, IEC, ER and EPD one week prior to the commencement of baseline monitoring. The interval between two sets of monitoring would not be less than 36 hours.



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## 2.6 Impact Monitoring

During the course of the marine construction works, impact monitoring should be undertaken at all monitoring stations three days per week, at mid-ebb and mid-flood tides, with sampling /measurement. The interval between two sets of monitoring should not be less than 36 hours except where the Action and/or Limit levels is/are exceeded, in which case the monitoring frequency should be increased.

Two consecutive measurements of DO concentration ( $\text{mgL}^{-1}$ ), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings would be taken. Water samples for SS ( $\text{mgL}^{-1}$ ) measurements should be collected at the same depths. Duplicate water samples should be taken and analyzed.

In addition to the above in-situ measurements, water temperature and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

Proposed water quality monitoring schedule should be provided to the Contractor, IEC, ER and EPD on or before the first day of the monitoring month. The Contractor, IEC, ER and EPD should be notified immediately for any changes in schedule.

## 2.7 Post-Construction Monitoring

Upon completion of all marine construction activities, a post project water quality monitoring exercise should be carried out for four weeks upon completion of all marine activities, in the same manner as the impact monitoring during construction of the submarine gas pipelines.

## 2.8 Event and Action Plan for Water Quality

The Action and Limit (AL) Levels for water quality are defined in **Table 2.2**. The actions in accordance with the Action Plan in **Table 2.3** should be carried out if the water quality assessment criteria are exceeded at any designated monitoring points.

Table 2.2 Typical Action and Limit Levels for Water Quality

Parameters	Action Level	Limit Level
DO in mg/l (Surface, Middle & Bottom)	WSD Seawater Intakes	Surface and Middle
	2 mg/L	WSD Seawater Intakes
	Other Impact Monitoring Stations	2 mg/L
	5 percentile of baseline data	Other Impact Monitoring Stations
	4 mg/L or 1 percentile of baseline data	Bottom
	2 mg/L or 1 percentile of baseline data	

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Parameters	Action Level	Limit Level
SS in mg/l (depth-averaged)	WSD Seawater Intakes 10 mg/L	WSD Seawater Intakes 10 mg/L
	Other Impact Monitoring Stations 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	Other Impact Monitoring Stations 99 percentile of baseline data or 130% of upstream control station at the same tide of the same day
Turbidity (depth-averaged)	WSD Seawater Intakes 10 NTU	WSD Seawater Intakes 10 NTU
	Other Impact Monitoring Stations 95 percentile of baseline data or 120% of upstream control station at the same tide of the same day	Other Impact Monitoring Stations 99 percentile of baseline data or 130% of upstream control station at the same tide of the same day

Notes:

1. "Depth-averaged" is calculated by taking the arithmetic means of the readings of the three depths.
2. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.
3. For SS and turbidity, non-compliance of water quality results when monitoring results is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever necessary.

Table 2.3 Event and Action Plan for Water Quality for Construction Phase

Event	Action			
	ET Leader	IEC	ER	Contractor
<b>Action Level</b>				
1. Exceedance by one sampling day	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; and 6. Repeat measurement on next day of exceedance.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; and 2. Make agreement on the mitigation measures to be implemented.	1. Inform the ER 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 and IEC and propose mitigation measures to IEC and ER; and 6. Implement the agreed mitigation measures.
Exceedance for two or more consecutive sampling days	1. Repeat in-situ measurement to confirm finding; 2. Identify source(s) of impact; 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and 3. Assess the effectiveness of the implemented	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; and 3. Assess the effectiveness of the implemented	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 and IEC and propose

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Event	Action			
	ET Leader	IEC	ER	Contractor
	measures with IEC and Contractor;  6. Ensure mitigation measures are implemented;  7. Prepare to increase the monitoring frequency to daily; and  8. Repeat measurement on next day of exceedance.	mitigation measures.	mitigation measures.	mitigation measures to IEC and ER within 3 working days; and  6. Implement the agreed mitigation measures.
<b>Limit Level</b>				
Exceedance by one sampling day	1. Repeat in-situ measurement to confirm finding;  2. Identify source(s) of impact;  3. Inform IEC, Contractor and EPD;  4. Check monitoring data, all plant, equipment and Contractor's working methods;  5. Discuss mitigation measures with IEC, ER and Contractor;  6. Ensure mitigation measures are implemented; and  7. Increase the monitoring frequency to daily until no exceedance of Limit level.	1. Discuss with ET and Contractor on the mitigation measures;  2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and  3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; and  2. Request Contractor to critically review the working methods;  3. Make agreement on the mitigation measures to be implemented; and  4. Assess the effectiveness of the implemented mitigation measures.	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 and IEC and ER and propose mitigation measures to IEC and ER within 3 working days; and  6. Implement the agreed mitigation measures.
Exceedance for two or more consecutive sampling days	1. Repeat in-situ measurement to confirm finding;  2. Identify source(s) of impact;  3. Inform IEC, Contractor and EPD;  4. Check monitoring data, all plant, equipment and Contractor's working methods;  5. Discuss mitigation measures with IEC, ER and Contractor;  6. Ensure mitigation measures are implemented; and  7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	1. Discuss with ET and Contractor on the mitigation measures;  2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; and  3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; and  2. Request Contractor to critically review the working methods;  3. Make agreement on the mitigation measures to be implemented;  4. Assess the effectiveness of the implemented mitigation measures; and  5. Consider and instruct, if necessary, the Contractor to slow down or to stop all	1. Inform the ER 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 and IEC and ER and propose mitigation measures to IEC and ER within 3 working days;  6. Implement the agreed mitigation measures; and  7. As directed by the Engineer, to slow down or to stop all or part of the marine work or

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Event	ET Leader	IEC	Action	
			ER	Contractor
			or part of the marine work until no exceedance of Limit Level.	construction activities.

## 2.9 Mitigation Measures

The mitigation measures recommended for the construction phase of the submarine gas pipelines are presented in **Annex A**.

## 3. Waste Management

### 3.1 Introduction

The Contractor should have a plan in controlling the waste generated from the construction activities. Besides removal of waste material produced and implementation of recommended mitigation measures to minimise waste problems arising, a site waste inventory record should be maintained. The Contractor should mention good site practice to ensure that the waste impacts are minimised and should make sure that relevant disposal permits are obtained.

For the waste to be disposed appropriately, it is recommended that, if practical, the waste should be separated by category on-site by the Contractor. The following categories should be adopted:

- Construction and Demolition (C&D) materials;
- General refuse;
- Chemical waste; and
- Marine Dredged Sediment

### 3.2 Audit Requirements

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

### 3.3 Mitigation Measures

#### 3.3.1 Good Site Practices

Adverse impacts related to waste management such as air, odour, noise, wastewater discharge and public transport are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site
- Training of site personnel in proper waste management and chemical handling procedures, separation of chemical wastes with appropriate treatment which is mentioned in Section 4.6.5 of the EIA report
- Provision of sufficient waste disposal points and regular collection of waste
- Barges filled with dredged sediment shall be towed away immediately for disposal. In doing so, odour is not anticipated to be an issue to distant sensitive receivers

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- Well planned delivery programme for offsite disposal such that adverse impact from transporting sediment material is not anticipated
- Well maintained PME should be operated on site
- Regular cleaning and maintenance of the drainage systems for construction of the landing points
- Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers

### **3.3.2 Waste Reduction Measures**

Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Sort C&D material from demolition and decommissioning of the existing facilities to recover recyclable portions such as metals
- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal
- Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force
- Proper storage and site practices to minimise the potential for damage or contamination of construction materials
- Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.

### **3.3.3 Construction & Demolition Material**

In order to minimise impacts resulting from collection and transportation of C&D material for off-site disposal, the excavated materials should be reused on-site as backfilling material for landscaping works for the associated land mains as far as practicable. Surplus C&D material generated from the excavation works should be disposed of at public fill reception facilities for other beneficial uses. Other mitigation requirements are listed below:

- A Waste Management Plan should be prepared.
- A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed.
- In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills, and to control fly-tipping, a trip-ticket system (e.g. ETWB TCW No. 31/2004) should be included.

### **3.3.4 General Refuse**

General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

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### **3.3.5 Chemical Waste**

If chemical wastes are produced at the construction site, the Contractor would 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, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor should use a licensed collector to transport and dispose of the chemical wastes, to either the approved Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

### **3.3.6 Marine Dredged Sediment**

The basic requirements and procedures for dredged mud disposal are specified under the ETWB TCW No. 34/2002. The management of the dredging, use and disposal of marine mud is monitored by the MFC, while the licensing of marine dumping is the responsibility of the Director of Environmental Protection (DEP).

The dredged marine sediments would be loaded onto barges and transported to designated disposal sites depending on their level of contamination. Based on the chemical and biological screening results and subsequently the corresponding types of disposal required as evaluated in the EIA report, it was estimated that the volume of dredged sediment suitable for open sea disposal (Type 1) was estimated to be approximately 187,179m<sup>3</sup>. The volume of contaminated sediment requiring confined marine disposal (Type 2) was estimated to be approximately 76,936m<sup>3</sup>. The disposal site would be determined by the MFC and dumping licence should be obtained from EPD prior to the commencement of dredging works.

Based on the biological screening results, the volume of Type 3 contaminated sediment from the To Kwa Wan typhoon shelter would require special disposal arrangements. The volume of contaminated sediment requiring special treatment or disposal (Type 3) was estimated to be approximately 3,488m<sup>3</sup>.

The EIA report for "Wan Chai Development Phase II and Central-Wan Chai Bypass" proposed the use of geosynthetic container system for disposal of Type 3 sediment. Field trial test by using uncontaminated mud demonstrated its feasibility with negligible loss of contaminants for disposal of Type 3 sediments.

The proposed system is shown to be an effective system with negligible loss of contaminants to the environment during disposal. The arrangement of type 3 sediment encountered in this Project could possibly be followed by this method where the dredged sediments are sealed in geosynthetic containers and, at the disposal site, the containers should be dropped into the designated contaminated mud pit where they should be covered by further mud disposal and later by the mud pit capping, thereby meeting the requirements for fully confined mud disposal.

For the size and the specification of the geosynthetic container, reference is made with the study report from Wan Chai Development Phase II, Design and Construction (D&C) Consultancy (Agreement No. CE54/2001 (CE)) attached in Appendix 6.2 of the EIA Report for Wan Chai Development Phase II and Central-Wan Chai Bypass. The study report mentioned five type of geosynthetic containers and trial test was carried out to confirm the effectiveness of the disposal system, the report recommended the use of 300m<sup>3</sup> geosynthetic container, with outer woven fabric tensile strength of 200 kN/m and seam strength of 140 kN/m would be the effective method for contained disposal which meets ETWB TCW No. 34/2002

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requirements for assuring negligible loss of contaminants to marine environment during disposal. The detailed specification could be referred in Table 4.4 and Section 6.3.6 of this Study Report.

The use of 300m<sup>3</sup> geosynthetic containers system during the trial tests was demonstrated to be an effective method for contained disposal. Based on the quantity of the Type 3 contaminated sediment for this project, approximately 12 numbers of barge will be required.

In accordance with the ETWB TCW No. 34/2002, the contaminated material must be dredged and transported with great care, and the mitigation measures recommended in Section 3 of the EIA Report should be strictly followed. Furthermore, the dredged contaminated sediment must be effectively isolated from the environment upon final disposal and should be disposed of at the East Sha Chau Contaminated Mud Pits that is designated for the disposal of contaminated mud in Hong Kong.

During transportation and disposal of the dredged marine sediments for Type 1 and Type 2 disposal, the following measures should be taken to minimise potential impacts on water quality:

- Bottom opening of barges should be fitted with tight fitting seals to prevent leakage of material. Excess material should be cleaned from the decks and exposed fittings of barges and dredgers before the vessel is moved.
- Monitoring of the barge loading should be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels should be equipped with automatic self-monitoring devices as specified by the EPD.
- 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.



## 4. Marine Ecology

### 4.1 Introduction

The dredging work for the installation of the marine gas pipeline at To Kwa Wan would cause elevation of Suspended Solids and sedimentation that would potentially affect the coral communities colonizing the To Kwa Wan breakwaters when the dredger is operating in close distance. Marine dive survey conducted on 28th July, 2009 along the breakwaters seawall recorded one hard coral species *Oulastrea crispata*. The hard coral recorded were in very good health condition. Areas of 1 % coral cover were identified.

With the implementation of mitigation measures, it is predicted that the potential impact on coral communities would be minor. The placement of the second silt curtain for protecting the coral communities on To Kwa Wan breakwaters should be subject to regular audit. As a precautionary measure, coral monitoring is proposed in construction phase when the dredging works is being carried out within 250m distance. The objective of this monitoring is to verify the EIA predictions that only minor impact will occur. In the event that significant adverse impacts are identified as a consequence of the works, monitoring would also allow for implementation of appropriate remedial actions to reduce such impacts.

### 4.2 Audit Requirement

This curtain shall be moved along with the dredger as the works progresses. The curtain shall be arranged so that at least 15m of the curtain shall extend past the dredger in each direction. This curtain shall remain in a suitable position between the dredger and the corals until the dredger is 250m from the corals. The alignment for the moving curtain is depicted in **Figure 4.1**.

### 4.3 Monitor Requirement

Suitable monitoring of the coral areas is required to verify the effectiveness of the mitigation measure. This includes a Baseline Survey carried out before any work commences, Impact Monitoring carried out during the works period and a Final Report after the works are completed.

The Baseline Survey shall also include a coral tagging survey shall be carried out at three locations near the pipeline run, the Impact Monitoring Sites (Areas 1, 2 and 3), and at one location at the far end of the seawall in quadrature with the pipeline run, the Control Site (Area 4). One Impact Site should be located at each end of the seawall running parallel to the pipeline run. These are the first two locations (Areas 1 and 2). The third location should be located at the closest edge (South-west) end of the seawall in quadrature to the pipeline run (Area 3). One Control Site should be located at the closest edge (South-east) end of the seawall in quadrature to the pipeline run (Area 4). Indicative location map are presented in **Figure 4.1** to show the location of coral monitoring Impact Sites and Control Site.

This Baseline Survey should be carried out not more than one month before the commencement of the works. This survey shall be carried out by divers experienced with carrying out coral surveys in Hong Kong marine areas. A total of 10 colonies shall be tagged at each site, allowing for 30 impact coral colonies and 10 control colonies. Details of each tagged colony shall be recorded. Typically the following data and parameters shall be collected:

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- Species
- Size (cm<sup>2</sup>)
- Growth form
- Partial Mortality
- Sediment (thickness, type and colour)
- The general health of the coral using the Asian CoralWatch Chart

Each tagged colony will also be photographed and the location mapped. The information of selected corals collected during the baseline survey should be submitted to AFCD for approval. Impact Monitoring Surveys will be used to determine the impact that the works are imposing on the coral colonies. As with the Baseline Survey, these surveys shall be carried out by divers experienced with carrying out coral surveys in Hong Kong marine areas. The Impact Monitoring Survey should be commenced when the dredger operating within 250m from the breakwaters. The monitoring programme should be conducted once a week until the dredger leave the 250m distance from the breakwaters.

Information gathered during each impact monitoring survey should include observations on the health status of corals and sediment cover. It should also include condition of the tagged corals surroundings as well as the weather, sea and tidal conditions. Each tagged coral should be photographed for every monitoring event, maintaining the same aspect and orientation as photographs taken for the baseline survey as far as possible. The results of the Impact Monitoring Surveys should be reviewed with reference to findings of the baseline survey and the data from Control Site collected during the Impact Monitoring. All tags at the impact and control stations should be removed / retrieved after the monitoring is completed. The frequency of the Impact Monitoring should be once a week during the time the dredging works is being carried out within 250m of a coral area.

#### **4.4 Event Action Plan**

The major objective of the ecological monitoring programme is checking whether the sediment level impose significant adverse impact on the coral communities. A Compliance and Action plan shall be established that will evaluate the results of the Impact Monitoring against specific levels. The trigger parameter shall be the partial mortality of the corals. These levels are defined and explained below:

##### *Action level*

- If during Impact Monitoring a 15% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies at either of the Impact Monitoring Stations (i.e. Areas 1, 2 and 3) that is not recorded at the Control Station (i.e. Area 4), then the Action level is exceeded.

##### *Limit level*

- If during the Impact Monitoring a 25% increase in the percentage of partial mortality at more than 20% of any tagged coral colonies occurs that is not recorded at the Control Station (i.e. Area 4), then the Limit Level is exceeded.

If the defined Action Level or Limit Levels for coral monitoring are exceeded, the stepwise procedures set out in the following table should be implemented.

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Table 4.1: Stepwise procedures for Action and Limit Levels Exceedance

Event	The Marine Biologist
Action Level Exceedance	<p><b>Step 1</b> - Inform the Contractor, the Project Designer and AFCD and discuss the most appropriate method of reducing sediment in the discharge.</p> <p><b>Step 2</b> - Implement mitigation measures on site.</p> <p><b>Step 3</b> - If non-compliance continues, check and confirm the effectiveness of mitigation measures and repeat monitoring survey measurements.</p>
Limit Level Exceedance	Undertake Steps 1-3. If further exceedance of Limit Level, suspend construction works until an effective solution is identified. Once the solutions have been identified and agreed with all parties, construction works may commence.

## 4.5 Reporting

The Baseline Survey Report should be submitted to the EPD and the AFCD prior to the commencement of the works.

A Coral Impact Report shall be submitted to the EPD and the AFCD within 5 days of carrying out the actual survey. This survey should be concise and clearly state whether limits have been exceeded.

The Final Survey Report should be submitted to the EPD and the AFCD within two weeks after carrying out this survey. It should make reference to the results of the Baseline Survey as well as contain a summary of the Impact Survey results.

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## 5. Fisheries

The implementation of the water quality mitigation measures stated in Section 2 should be checked as part of the environmental monitoring and audit procedures during the construction period. No other fisheries-specific measures are considered necessary.

## 6. Hazard to Life

### 6.1 Introduction

Based on the evaluation of potential safety impacts, the risk associated with the proposed realigned gas facilities is considered low. Notwithstanding the low level of risk, risk minimisation measures have been incorporated into the design to further lower the risk and safeguard population in vicinity.

### 6.2 Mitigation Measures

The implementation schedule of the recommended hazard to life mitigation measures is presented in **Annex A**.

## 7. Landscape

### 7.1 Introduction

Potential landscape impact arising from the construction and operation of the Project have been evaluated. As the proposed project will be implemented in the urbanised areas and have no conflict with the existing landscape resources, potential adverse impacts on either landscape resources or landscape character areas are not anticipated.

### 7.2 Mitigation Measures

The EIA has recommended a series of landscape mitigation measures for both the construction and operational phases for the Project. These measures include the following as shown in **Tables 7.1 and 7.2**, which are also summarised in **Annex A**.

Mitigation measures for reducing, offsetting and compensating for impacts have been designed into the project during construction phase and are summarised in **Table 7.1**.

Table 7.1 Proposed Construction Phase Landscape Mitigation Measures

Mitigation Code	Mitigation Measure
CM1	Screening of construction works by hoardings/noise barriers around Works area in visually unobtrusive colours, to screen Works.
CM2	Hydroseeding or sheeting of stockpiles with visually unobtrusive material (in earth tone).
CM3	Ensure no run-off into the harbour adjacent to the site.

Mitigation measures for the two pigging stations during operation phase are identified for implementation in the approved planning permission applications for the two pigging stations under Section 16 of the Town Planning Ordinance and are summarised in **Table 7.2**. A landscape proposal should be submitted and implemented to the satisfaction of Planning Department or of the Town Planning Board under Section 16 of the Town Planning Ordinance to ensure the landscape mitigation measures are properly maintained throughout the operation phase of the Project. Any changes to the proposed landscape mitigation measures will follow the relevant procedures required by relevant authorities.

Table 7.2 Proposed Operation Phase Landscape Mitigation Measures

Mitigation Code	Mitigation Measure
OM1	The design and finish of the gas pigging station will be aesthetically compatible with the surroundings
OM2	Trellises will be constructed to screen the exposed pipes inside the proposed pigging stations
OM3	A planting strip of 1.5m width will be reserved in front of the boundary wall of the proposed To Kwa Wan pigging station
OM4	A 300mm wide planting strip will be provided at the seafront side along the boundary fence within the proposed North Point pigging station
OM5	A 300mm wide planting strip together with a 2m high visual barrier inside the existing fence will be provided on the east boundary along Hoi Yu Street at North Point

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### **7.3 Construction and Operational Phase Audit**

The Contractor shall implement landscape construction works and subsequent maintenance operations during the 12 month establishment period.

All measures undertaken by the Contractor during the construction phase and first year of the operational phase should be audited by the Environmental Team, on a regular basis to ensure compliance with the intended aims of the measures. Site inspections should be undertaken at least once every two weeks throughout the construction period and once every two months during the operational phase. The scope of the audit is detailed below. Operational phase auditing would be restricted to the last 12 months of the establishment works of the operational landscape measures.

- The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the Contractor outside the limit of the works;
- The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken;
- All landscaping works are carried out in accordance with the specifications;
- The planting of new trees and other plants, are carried out properly and within the right season; and
- All necessary horticultural operations and replacement planting are undertaken throughout the Establishment Period to ensure the healthy establishment.

## 8. Cultural Heritage

### 8.1 Introduction

The Marine Archaeological Investigation established high archaeological potential for the existence of archaeological remains buried within the sub seabed sediments. During dredging for Kai Tak airport a Ming Cannon was exposed and it is possible that other such artefacts remain buried. Soft marine mud extends across the study area thereby providing sufficient sediment to bury archaeological remains.

A geophysical survey was completed to establish archaeological potential. Three unidentified objects were located and a diver inspection was completed. They were found to be modern material. However, the geophysical survey did not provide 100% coverage due to gas blanking. In these areas no data was obtained and it was not possible to carry out an archaeological assessment. A monitoring brief is therefore required at the locations of the masked areas which are 50m from the centreline of the revised route as set out in **Figure 8.1**.

### 8.2 Monitoring Brief

It is understood that the dredging may take up to a year to complete. It is therefore not cost effective or practical to have a marine archaeologist on the dredging vessel for the whole time. However, it will be essential to have a commissioned qualified marine archaeologist on standby so that they can respond immediately, if required. The archaeologist does not need to be present on site but easily contactable via email or other means. The marine archaeologist will provide specialist advice and liaise with the Antiquities and Monuments Office (AMO) on behalf of the developer.

On every working barge a member of staff needs to be appointed as the Monitoring Officer. This person will monitor the dredged sediment and look out for unusual objects. A Guide to identifying finds and a Preliminary Record Form have been prepared and included in **Annex B** for reference to assist the Monitoring Officer.

It is understood that there is a separate requirement for monitoring of barge loading which is set out in Section 4.6 of the EIA. It would be cost effective to have the same person complete the two monitoring processes.

Immediately that an unusual object is identified, the Monitoring Officer shall inform the Master of the ship. The ship's position shall be noted and dredging within 50m of the location avoided. The Preliminary Record Form should be completed, copied to the AMO and contact with the marine archaeologist established. The object should be stored in seawater, in a clean container which should be covered. Any rust, concretion or marine growth should not be removed.

This procedure should not cause any delay to the dredging programme as work can continue in areas 50m away from the find.

It is important that the marine archaeologist is contacted as quickly as possible, preferably the same day as the discovery and formal archaeological advice should be sent to the AMO in no more than three working days.

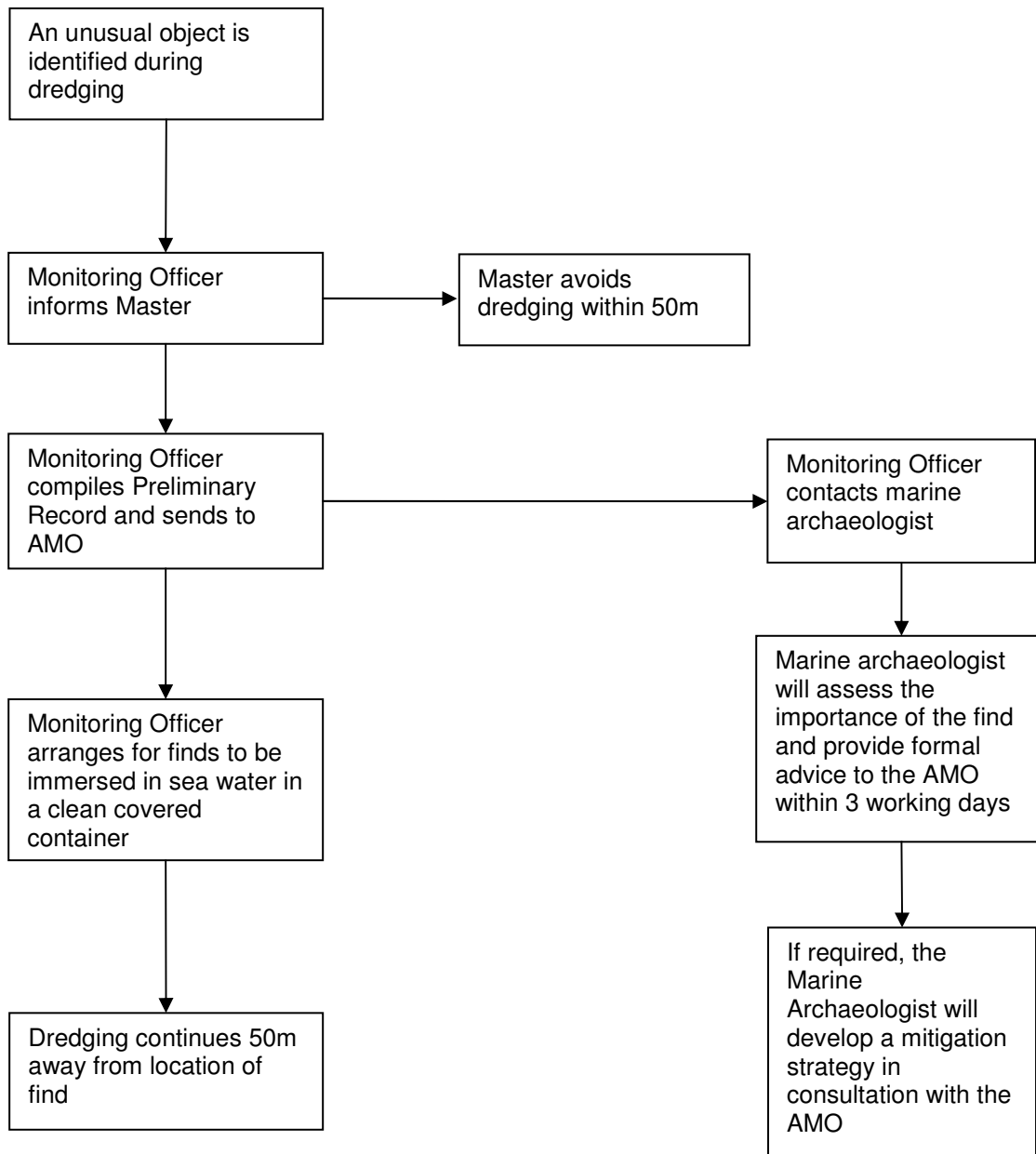


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The flow chart set out below shows the key stages that should be followed:

**Key Stages for the Monitoring Brief**

- The term Master is used for the person in control of the dredging vessel
- The Monitoring Officer is a member of the dredging vessel crew specifically appointed to watch the dredging spoil for unusual objects
- The Marine Archaeologist shall be appointed by the developer and be ready to respond immediately if required
- Antiquities and Monuments Office is abbreviated to AMO



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## **Types of Find**

'Finds' are considered here to mean all forms of artefact that can be found on or in the seabed. To be an artefact, the thing must have been made, modified, used or transported by people i.e. their presence on the seabed is not natural.

### **8.3 Guidelines for Identifying Finds of Archaeological Interest**

This Guide is provided to assist non professional archaeologists identify objects which may have archaeological potential.

#### **Rubber, Plastic etc.**

In most cases rubber, plastic and similar modern materials are not of archaeological interest and can be disregarded.

One exception is where such materials are found in the same area as aluminium objects and structures, which may indicate aircraft wreckage from World War Two. Such material should be reported.

#### **Iron and Steel**

The potential range and date of iron and steel objects is so wide that it is difficult to provide general guidance. In broad terms, iron and steel objects, which are covered by a thick concrete like coating ('concretion') are likely to be of archaeological interest and should be reported.

Pieces of metal sheet and structure may indicate a wreck and should be reported.

#### **Other Metals**

Items made of thin, tinned or painted metal sheet are unlikely to be of archaeological interest.

Aluminium objects may indicate aircraft wreckage from World War Two, especially if two or more pieces of aluminium are fixed together by rivets.

Copper and copper alloy (bronze, brass) objects might indicate a wreck, or they may be very old. All occurrences should be reported.

Precious metal objects and coins are definitely of archaeological interest because they are relatively easy to date. All occurrences should be reported.

#### **Bone**

Large quantities of animal bone may indicate a wreck (the remains of cargo or provisions) and should be reported. Objects made out of bone such as combs, harpoon points or decorative items can be very old and are definitely of archaeological interest. All occurrences should be reported.

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### **Wood**

Light coloured wood or wood that floats easily is probably modern and is unlikely to be of archaeological interest.

Pieces of wood that have been shaped or jointed may be of archaeological interest, especially if fixed with wooden pegs, bolts or nails.

Any wood with branches or bark is unlikely to be of archaeological interest.

### **Stone**

Large blocks of stone that have been pierced or shaped may have been used as anchors or weights for fishing nets. All occurrences should be reported.

The recovery of numerous stones may indicate the ballast mound of a wreck.

### **Pottery**

Any fragment of pottery is potentially of interest, especially if it is a large fragment. Items which look like modern domestic crockery can be discarded, but if the item has an unusual shape, glaze or fabric it should be reported.

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## 9. Noise

### 9.1 Introduction

The monitoring programme should be carried out by the ET to ensure that the noise level of construction works complies with the 75dB(A) criterion for domestic premises, with 70 dB(A) for schools and with a further reduction to 65dB(A) during examination periods.

### 9.2 Noise Parameters

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

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

### 9.3 Monitoring Equipment

As refer to the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level metres in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications should be used for carrying out the noise monitoring. The calibration of the sound level meters and their respective calibrators should be carried out in accordance with the manufacturer's requirements.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms<sup>-1</sup> or wind with gusts exceeding 10 ms<sup>-1</sup>.

The ET Leader is responsible for the provision and maintenance of the monitoring equipment. He should ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation should be clearly labelled. The location of equipment installation should be proposed by the ET Leader and agreed with the ER and EPD in consultation with the IEC.

### 9.4 Monitoring Locations

The noise monitoring locations (Refer to **Figure 9.1 and 9.2**) are summarised in **Table 9.1**. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader should propose updated monitoring locations and seek agreement from ER, IEC and EPD.

Table 9.1 Noise Monitoring Locations

ID	Area	Description
SCH02	To Kwa Wan	CCC Kei To Secondary School
FSQ	North Point	North Point Fire Services Married Quarters

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

- at locations close to the major site activities which are likely to have noise impacts;
- close to the noise sensitive receivers (any domestic premises, temporary housing accommodation, educational institution, place of public worship, should be considered as a noise sensitive receiver); and
- for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

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

## 9.5 Baseline Monitoring

The ET should carry out baseline noise monitoring prior to the commencement of the construction works. There should not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels  $L_{Aeq}$ ,  $L_{A10}$  and  $L_{A90}$  should be carried out daily for a period of at least two weeks in a sample period of 30 minutes between 0700 and 1900. Baseline monitoring schedule should be submitted to the Contractor, IEC, ER and EPD one week prior to the commencement of the baseline monitoring.

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

## 9.6 Impact Monitoring

During normal construction working hour (0700-1900 Monday to Saturday), monitoring of  $L_{Aeq, 30min}$  noise levels (or as six consecutive  $L_{Aeq, 5min}$  readings) should be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

Other noise sources such as road traffic may make a significant contribution to the overall noise environment. Therefore, the results of noise monitoring activities would take into account such influencing factors, which may not be presented during the baseline monitoring period.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in Section 9.7 should be carried out. This additional monitoring should be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

Proposed noise monitoring schedule should be provided to the Contractor, IEC, ER and EPD on or before the first day of the monitoring month. The Contractor, IEC, ER and EPD should be notified immediately for any changes in schedule.

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## 9.7 Event and Action Plan for Noise

The Action and Limit (AL) Levels for construction noise are defined in **Table 9.2**. Should non-compliance of the criteria occurs, action in accordance with the Event and Action Plan in **Table 9.3**, should be carried out.

Table 9.2 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received.	75* dB(A)
1900-2300 hrs on normal weekdays	When one documented complaint is received.	70 dB(A)
Restricted hours (2300-0700 hrs)	When one documented complaint is received.	55 dB(A)

Note:

\* 70 dB(A) for schools and 65 dB(A) during school examination periods.

Table 9.3 Event and Action Plan for Construction Noise

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

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## **9.8 Mitigation Measures**

The mitigation measures recommended for the construction phase of the submarine gas pipelines are presented in **Annex A**.

# 10. Construction Dust

## 10.1 Introduction

Potential air quality impacts arising from the construction and operation of the Project have been evaluated. As the number of construction plant involved in the cross harbour main laying activities at anytime on site would be limited, exceedance of Air Quality Objectives (AQOs) emissions of gaseous pollutants from these construction plants is not anticipated. Dust impact and SO<sub>2</sub> and NO<sub>2</sub> emissions from plants and site vehicles would be minimal. With the implementation of appropriate dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, adverse air quality impact is not anticipated.

Dust monitoring during the construction of the Project is therefore considered not necessary but weekly site audits are required to ensure that the dust control measures are properly implemented. Monitoring during operation phase is not required.

## 10.2 Audit Requirement

It is recommended that audits should be carried out by the Environmental Team on a weekly basis to ensure that the recommended mitigation measures are carried out by the Contractor. Special attention should be paid to the enforcement of dust control measures during construction process. The ET should consider the programme and site for construction works in determining the location to carry out the auditing.

## 10.3 Mitigation Measures

Effective control measures and good site practices should be implemented to meet the requirements of the Air Pollution Control (Construction Dust) Regulation and minimize construction dust impact.

During construction phase, the Contractor should make reference, but not limit himself, to the following measures:

- The works area for site clearance should be sprayed with water before, during and after the operation so as to maintain the entire surface wet;
- Restricting heights from which materials are to be dropped, as far as practicable to minimise the fugitive dust arising from unloading/ loading;
- Immediately before leaving a construction site, all vehicles should be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage;
- Where a vehicle leaving a construction site is carrying a load of dusty materials, the load should be covered entirely by clean impervious sheeting to ensure that the dusty materials would not leak from the vehicle;
- Any stockpile of dusty materials should be covered entirely by impervious sheeting; and/or placed in an area sheltered on the top and 4 sides;



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- All dusty materials should be sprayed with water immediately prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.

# 11. Site Environmental Audit

## 11.1 Introduction

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 Leader 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 formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He should submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

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

- the EIA 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);
- the contract specifications on environmental protection;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results.

The Contractor should update the ET Leader with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works should be submitted to the IEC and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor should follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET Leader to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections should also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

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## 11.2 Compliance with Legal and Contractual Requirements

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

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval should also be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Annex A**.

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

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

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

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

## 11.3 Environmental Complaints

Handling of environmental complaints should follow the environmental complaint flow diagram and reporting channel as presented in **Figure 11.1**.

During the complaint investigation work, the Contractor and ER should cooperate with the IEC and ET Leader in providing all necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor should promptly carry out the mitigation works. The ER should ensure that the measures have been carried out by the Contractor. Sample of the complaint log is shown in **Annex C**.

## 12. Reporting

### 12.1 General

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

Types of reports that the ET Leader should 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 should be made available to the Director of Environmental Protection. The exact details of the frequency, distribution and time frame for submission should be agreed with EPD prior to commencement of works.

### 12.2 Electronic Reporting

To facilitate the public inspection of the Baseline Monitoring Report and monthly EM&A Reports, via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports should be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by EPD and should be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EM&A Reports should be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EM&A Reports should be provided in the main text from where the respective references are made. All graphics in the report should be in interlaced GIF format unless otherwise agreed by the EPD. The content of the electronic copies of the EM&A Reports must be the same as the hard copies.

### 12.3 Baseline Monitoring Report

The ET Leader should prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report should be submitted to all parties: the Contractor, the IEC, the ER and the EPD. The ET Leader should liaise with the relevant parties on the exact number of copies they want. The format and content of the report, and the representation of the baseline monitoring data should be in a format to the satisfaction of EPD and include, but not be limited to the following:

- a. up to half a page executive summary;
- b. brief project background information;
- c. drawings showing locations of the baseline monitoring stations;
- d. monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;

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- parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency and duration;
  - QA/QC results and detection limits;
- e. details on influencing factors, including
- major activities, if any, being carried out on the Site during the period;
  - weather conditions during the period;
  - other factors which might affect the results.
- f. determination of the Action and Limit Levels (AL Levels) for each monitoring parameter and statistical analysis of the baseline data; the analysis should conclude if there is any significant difference between control and impact stations for the parameters monitored, and the following information should be recorded:
- graphical plots of monitored parameters in the month annotated against;
  - the major activities being carried out on site during the period;
- g. revisions for inclusion in the EM&A Manual; and
- h. comments and conclusions.

## 12.4 EM&A Reports

The results and findings of all EM&A work required in the Manual should be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report should be prepared by the ER, endorsed by IEC and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. Before submission of the first EM&A report, the ET Leader should liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement. The ET Leader should review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

### i. First Monthly EM&A Report

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

- a. 1-2 pages executive summary;
- Breaches of AL levels;
  - Complaints Log;
  - Notifications of any summons and successful prosecutions;
  - Reporting Changes; and
  - Future key issues.
- b. Basic Project Information
- Project organisations including key personnel contact names and telephone numbers;
  - Programme;
  - Management structure; and
  - Works undertaken during the month.

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c. Environmental Status

- Work undertaken during the month with illustrations (such as location of works daily dredging/filling rates percentage fines in the fill material used); and
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

d. Summary of EM&A requirements

- All monitoring parameters;
- AL Levels;
- Event-Action Plans;
- Environmental mitigation measures, as recommended in the project EIA Report; and
- Environmental requirements in contract documents.

e. Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation schedule (in Annex A).

f. Monitoring Results

To provide 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;
- Any other factors which might affect the monitoring results; and
- QA/QC results and detection limits.

g. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

h. Others

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

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- Advice on the solid and liquid waste management status.

## ii. Subsequent Monthly EM&A Reports

The subsequent Monthly EM&A Reports should include the following:

- a. Executive Summary (1-2 pages)
  - Breaches of AL levels;
  - Complaint Log;
  - Notifications of any summons and successful prosecutions;
  - Future key issues.
- b. Environmental Status
  - Works undertaken during the month with illustrations including key personnel contact names and telephone number; and
  - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

### c. Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for air, noise, water quality and ecological impacts etc, as recommended in the EIA Report, summarised in the updated implementation schedule (see Annex A).

### d. Monitoring Results

To provide 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;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- e. Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions
    - Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
    - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
    - Record of all notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
    - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and

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- A description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- f. Others
- An account of the future key issues as reviewed from the works programme and work method statements; and
  - Advice on the solid and liquid waste management status.
- g. Appendix
- AL levels
  - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
    - i) major activities being carried out on site during the period;
    - ii) weather conditions during the period; and
    - iii) any other factors which might affect the monitoring results
  - Monitoring schedule for the present and next reporting period
  - Cumulative statistics
  - On complaints, notifications of summons and successful prosecutions
  - Outstanding issues and deficiencies

**iii. Quarterly EM&A Summary Reports**

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

- a. up to half a page executive summary;
- b. basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- c. a brief summary of EM&A requirements including:
  - monitoring parameters;
  - environmental quality performance limits (AL Levels); and
  - environmental mitigation measures, as recommended in the EIA Report;
- d. advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- e. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- f. graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- g. advice on the solid and liquid waste management status;



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- h. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- i. an quarterly assessment of constructional impacts on water quality at the project site including but not limited to comparison of the difference between the quarterly mean and 1.3 times of the ambient which is defined as 30% increase of the baseline data or EPD data of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the liaison water quality times of the ambient mean ( $p < 0.05$ );
- j. a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- k. a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- l. a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- m. comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- n. proponents' contacts and any hotline telephone number for the public to make enquiries.

**iv. Final EM&A Review Reports**

The Final EM&A Report should contain at least the following information:

- a. Executive Summary (1-2 pages);
- b. drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- c. basic project information including a synopsis of the project organisation contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- d. a brief summary of EM&A requirements including:
  - (i) environmental mitigation measures, as recommended in the project EIA Report;
  - (ii) environmental impact hypotheses tested;
  - (iii) AL Levels;
  - (iv) all monitoring parameters; and
  - (v) Event-Action Plans;
- e. a summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report summarized in the updated implementation schedule;

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- f. graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project, including the post project monitoring (for the past twelve months for annual report) for all monitoring stations against:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- g. a summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- h. a review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- i. a description of the actions taken in the event of non-compliance;
- j. a summary record of all complaints received (written or verbal) for each media liaison and consultation undertaken, action and follow-up procedures taken;
- k. a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection pollution control legislations locations and nature of the breaches, investigation, follow-up actions taken and results;
- l. a review of the validity of EIA Report predictions and identification of shortcomings in EIA Report recommendations;
- m. a review of the effectiveness and efficiency of the mitigation measures; and
- n. a review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigatory action when necessary.

## 12.5 Data Keeping

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

## 12.6 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in Tables 2.3 and 9.3, when the environmental quality limits are exceeded, the ET Leader should immediately notify the ER and EPD, as appropriate. The notification should be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Annex D**.