

**China Harbour Engineering Company Limited**

Contract No. HY/2010/02

**Hong Kong – Zhuhai – Macao Bridge  
Hong Kong Boundary Crossing  
Facilities –  
Reclamation Works**

**Monthly EM&A Report for March 2013**

[04/2013]

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By Fax (2268 3970) and By Post

Attention: Mr. Michael Lo

Dear Mr. Lo,

**Re: Agreement No. CE 48/2011 (EP)  
Environmental Project Office for the  
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities,  
and Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2010/02  
Hong Kong – Zhuhai – Macao Bridge  
Hong Kong Boundary Crossing Facilities – Reclamation Work  
Performance Review Report for Sand Filling Silt Curtain System on 19 March  
2013 (Version 3.0)**

Reference is made to the Environmental Team's submission of the performance review report for sand filling silt curtain system (Version 3.0) (letter ref. 60249820/rmky/C/13041201) dated 12 April 2013) copied to us by E-mail on 15 April 2013.

We are pleased to inform you that we have no adverse comment on the captioned report.

Thank you very much for your kind attention and please do not hesitate to contact the undersigned should you have any queries.

Yours sincerely,



Raymond Dai  
Independent Environmental Checker

c.c.	HyD	Mr. Matthew Fung	(By Fax: 3188 6614)
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## EXECUTIVE SUMMARY

Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Project”) mainly comprises reclamation at the northeast of the Hong Kong International Airport of an area of about 130-hectare for the construction of an artificial island for the development of the Hong Kong Boundary Crossing Facilities (HKBCF), and about 19-hectare for the southern landfall of the Tuen Mun - Chek Lap Kok Link (TMCLKL). It is a designated project and is governed by the current permits for the Project, i.e. the amended Environmental Permits (EPs) issued on 16 Oct 2012 (EP-353/2009/E) and 8 December 2011 (EP-354/2009/A) (for TMCLKL Southern Landfall Reclamation only).

Ove Arup & Partners Hong Kong Limited (Arup) was appointed by Highways Department (HyD) as the consultants for the design and construction assignment for the Project’s reclamation works (i.e. the Engineer for the Project).

China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Project.

ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) for the Project.

AECOM Asia Co. Ltd. (AECOM) was appointed by CHEC to undertake the role of Environmental Team for the Project for carrying out the environmental monitoring and audit (EM&A) works.

The construction phase of the Project under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016. The EM&A programme, including air quality, noise, water quality and dolphin monitoring and environmental site inspections, was commenced on 12 March 2012.

This report documents the findings of EM&A works conducted in the period between 1 and 31 March 2013. As informed by the Contractor, major activities in the reporting period were:-

### **Marine-based Works**

- Cellular structure installation
- Laying geo-textile
- Sand blanket laying trial
- Maintenance of silt curtain
- Stone column installation
- Backfill cellular structure
- Instrumentation works
- Ground investigation
- Connecting arc cell installation (guide pile)

### **Land-based Works**

- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Geo-textile fabrication at Works Area WA2
- Silt curtain fabrication at Works Area WA4
- Erection of site office at Works Area WA2

A summary of monitoring and audit activities conducted in the reporting period is listed below:

24-hour Total Suspended Particulates (TSP) monitoring	5 sessions
1-hour TSP monitoring	5 sessions
Noise monitoring	4 sessions
Impact water quality monitoring	13 sessions
Impact dolphin monitoring	2 surveys
Joint Environmental site inspection	4 sessions

### **Breaches of Action and Limit Levels for Air Quality**

Two (2) 24-hour TSP results exceeded the Action Level on 4 and 9 March 2013 at monitoring station AMS3A and one (1) 24-hour TSP result exceeded the Limit Level on 15 March 2013 monitoring station AMS3A in the

reporting month. All 1-hour TSP results were below the Action and Limit Level at all monitoring locations in the reporting month.

#### **Breaches of Action and Limit Levels for Noise**

No Action/Limit Level exceedance of construction noise was recorded in the reporting month.

#### **Breaches of Action and Limit Levels for Water Quality**

No Action/Limit Level exceedance was recorded in the reporting month.

#### **Impact Dolphin Monitoring**

A total of three dolphin sightings were recorded during the two surveys, one on the 18 March 2013 and two on the 28 March 2013. Of the three sightings, two were “on effort” (which are all under favourable condition) and one was “opportunistic”. A total of ten individuals were sighted from the two impact dolphin surveys in the reporting period. Sighting details are summarised and plotted in Appendix K and Figure 5c, respectively.

Behaviour: two groups were feeding and one group was associated with multiple behaviour (feeding and travelling).

#### **Complaint, Notification of Summons and Successful Prosecution**

One (1) complaint was referred by EPD to ET on 4 March 2013 regarding the construction noise impact from cranes operating from the barges for the Hong Kong –Zhuhai-Macao Bridge Hong Kong Project generating squeak noise in the evening of 1 Mar 2013 causing annoyance to him/her. The investigation results show that the complaint was non-project related.

No notification of summons and successful prosecution was received in the reporting month.

#### **Reporting Change**

There was no reporting change required in the reporting period.

#### **Future Key Issues**

Key issues to be considered in the coming month included:-

- Site runoff should be properly collected and treated prior to discharge;
- Minimize loss of sediment from filling works;
- Regular review and maintenance of silt curtain systems, drainage systems and desilting facilities;
- Exposed surfaces/soil stockpiles should be properly treated to avoid generation of silty surface run-off during rainstorm;
- Regular review and maintenance of wheel washing facilities provided at all site entrances/exits;
- Conduct regular inspection of various working machineries and vessels within works areas to avoid any dark smoke emission;
- Suppress dust generated from work processes with use of bagged cements, earth movements, excavation activities, exposed surfaces/soil stockpiles and haul road traffic;
- Quieter powered mechanical equipment should be used;
- Provision of proper and effective noise control measures for operating equipment and machinery on-site, such as erection of movable noise barriers or enclosure for noisy plants;
- Closely check and replace the sound insulation materials regularly;
- Better scheduling of construction works to minimize noise nuisance;
- Properly store and label oil drums and chemical containers placed on site;
- Proper chemicals, chemical wastes and wastes management;
- Maintenance works should be carried out within roofed, paved and confined areas;
- Collection and segregation of construction waste and general refuse on land and in the sea should be carried out properly and regularly; and
- Proper protection and regular inspection of existing trees, transplanted/retained trees.

## 1 INTRODUCTION

### 1.1 Background

- 1.1.1 Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Project”) mainly comprises reclamation at the northeast of the Hong Kong International Airport of an area of about 130-hectare for the construction of an artificial island for the development of the Hong Kong Boundary Crossing Facilities (HKBCF), and about 19-hectare for the southern landfall of the Tuen Mun - Chek Lap Kok Link (TMCLKL).
- 1.1.2 The environmental impact assessment (EIA) reports (Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities – EIA Report (Register No. AEIAR-145/2009) (HKBCFEIA) and Tuen Mun – Chek Lap Kok Link – EIA Report (Register No. AEIAR-146/2009) (TMCLKLEIA), and their environmental monitoring and audit (EM&A) Manuals (original EM&A Manuals), for the Project were approved by Environmental Protection Department (EPD) in October 2009.
- 1.1.3 EPD subsequently issued the Environmental Permit (EP) for HKBCF in November 2009 (EP-353/2009) and the Variation of Environmental Permit (VEP) in June 2010 (EP-353/2009/A), November 2010 (EP-353/2009/B), November 2011 (EP-353/2009/C), March 2012 (EP-353/2009/D) and October 2012 (EP-353/2009/E). Similarly, EPD issued the Environmental Permit (EP) for TMCLKL in November 2009 (EP-354/2009) and the Variation of Environmental Permit (VEP) in December 2010 (EP-354/2009/A).
- 1.1.4 The Project is a designated project and is governed by the current permits for the Project, i.e. the amended EPs issued on 16 October 2012 (EP-353/2009/E) and 8 December 2011 (EP-354/2009/A) (for TMCLKL Southern Landfall Reclamation only).
- 1.1.5 A Project Specific EM&A Manual, which included all project-relation contents from the original EM&A Manuals for the Project, was issued in May 2012.
- 1.1.6 Ove Arup & Partners Hong Kong Limited (Arup) was appointed by Highways Department (HyD) as the consultants for the design and construction assignment for the Project’s reclamation works (i.e. the Engineer for the Project).
- 1.1.7 China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Project.
- 1.1.8 ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) for the Project.
- 1.1.9 AECOM Asia Co. Ltd. (AECOM) was appointed by CHEC to undertake the role of Environmental Team for the Project for carrying out the EM&A works.
- 1.1.10 The construction phase of the Project under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016.
- 1.1.11 According to the Project Specific EM&A Manual, there is a need of an EM&A programme including air quality, noise, water quality and dolphin monitoring and environmental site inspections. The EM&A programme of the Project commenced on 12 March 2012.

### 1.2 Scope of Report

- 1.2.1 This is the thirteenth monthly EM&A Report under the Contract No. HY/2010/02 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Works. This report presents a summary of the environmental monitoring and audit works, list of activities and mitigation measures proposed by the ET for the Project in March 2013.



### 1.3 Project Organization

1.3.1 The project organization structure is shown in Appendix A. The key personnel contact names and numbers are summarized in Table 1.1.

**Table 1.1 Contact Information of Key Personnel**

Party	Position	Name	Telephone	Fax
<b>Engineer's Representative (ER)</b>  (Ove Arup & Partners Hong Kong Limited)	Chief Resident Engineer	Roger Marechal	3698 5700	2698 5999
<b>IEC / ENPO</b>  (ENVIRON Hong Kong Limited)	Independent Environmental Checker	Raymond Dai	3743 0788	3548 6988
	Environmental Project Office Leader	Y. H. Hui	3743 0788	3548 6988
<b>Contractor</b>  (China Harbour Engineering Company Limited)	General Manager (S&E)	Daniel Leung	3157 1086	2578 0413
	Environmental Officer	C. M. Wong	3157 1086	2578 0413
	24-hour Hotline	Alan C.C. Yeung	9448 0325	--
<b>ET</b>  (AECOM Asia Company Limited)	ET Leader	Echo Leong	3922 9280	2317 7609

### 1.4 Summary of Construction Works

1.4.1 The construction phase of the Project under the EP commenced on 12 March 2012.

1.4.2 As informed by the Contractor, details of the major works carried out in this reporting period are listed below:-

#### **Marine-based Works**

- Cellular structure installation
- Laying geo-textile
- Sand blanket laying trial
- Maintenance of silt curtain
- Stone column installation
- Backfill cellular structure
- Instrumentation works
- Ground investigation
- Connecting arc cell installation (guide pile)
- 

#### **Land-based Works**

- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Geo-textile fabrication at Works Area WA2



- Silt curtain fabrication at Works Area WA4
- Erection of site office at Works Area WA2

1.4.3 The 3-month rolling construction programme of the Project is shown in Appendix B.

1.4.4 The general layout plan of the Project site showing the detailed works areas is shown in Figure 1.

1.4.5 The environmental mitigation measures implementation schedule are presented in Appendix C.

## **1.5 Summary of EM&A Programme Requirements**

1.5.1 The EM&A programme required environmental monitoring for air quality, noise, water quality, marine ecology and environmental site inspections for air quality, noise, water quality, waste management, marine ecology, and landscape and visual impact. The EM&A requirements for each parameter described in the following sections include:-

- All monitoring parameters;
- Monitoring schedules for the reporting month and forthcoming month;
- Action and Limit levels for all environmental parameters;
- Event / Action Plan;
- Environmental mitigation measures, as recommended in the Project EIA reports; and
- Environmental requirement in contract documents.

## 2 AIR QUALITY MONITORING

### 2.1 Monitoring Requirements

2.1.1 In accordance with the Project Specific EM&A Manual, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at 4 air quality monitoring stations were established. Impact 1-hour TSP monitoring was conducted for at least three times every 6 days, while impact 24-hour TSP monitoring was carried out for at least once every 6 days. The Action and Limit level of the air quality monitoring is provided in Appendix D.

### 2.2 Monitoring Equipment

2.2.1 24-hour TSP air quality monitoring was performed using High Volume Sampler (HVS) located at each designated monitoring station. The HVS meets all the requirements of the Project Specific EM&A Manual. Portable direct reading dust meters were used to carry out the 1-hour TSP monitoring. Brand and model of the equipment is given in Table 2.1.

**Table 2.1 Air Quality Monitoring Equipment**

Equipment	Brand and Model
Portable direct reading dust meter (1-hour TSP)	Sibata Digital Dust Monitor (Model No. LD-3 and LD-3B)
High Volume Sampler (24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Air Sampler (Model No. TE-5170)

### 2.3 Monitoring Locations

2.3.1 Monitoring locations AMS2 and AMS7 were set up at the proposed locations in accordance with Project Specific EM&A Manual. For AMS6 (Dragonair/CNAC (Group) Building), permission on setting up and carrying out impact monitoring works was sought, however, access to the premise has not been granted yet on this report issuing date. For monitoring location AMS3 (Ho Yu College), as proposed in the Project Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact air quality monitoring was conducted at site boundary of the site office area in Works Area WA2 (AMS3A) respectively. Same baseline and Action Level for air quality, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative air quality location.

2.3.2 Reference is made to ET’s proposal of the omission of air monitoring station (AMS 6) dated on 1 November 2012 and EPD’s letter dated on 19 November 2012 regarding the conditional approval of the proposed omission of air monitoring station (AMS 6) for Contract No. HY/2010/02. The aforesaid omission of Monitoring Station AMS6 will be effective since 19 November 2012.

2.3.3 Figure 2 shows the locations of monitoring stations. Table 2.2 describes the details of the monitoring stations.

**Table 2.2 Locations of Impact Air Quality Monitoring Stations**

Monitoring Station	Location	Description
AMS2	Tung Chung Development Pier	Rooftop of the premise
AMS3A	Site Boundary of Site Office Area at Works Area WA2	On ground at the area boundary
AMS6*	Dragonair/CNAC (Group) Building	On ground at boundary of the premise
AMS7	Hong Kong SkyCity Marriott Hotel	On ground at boundary of the premise

\*Remarks: Reference is made to EPD conditional approval of the omission of air monitoring station (AMS 6) for the project. The omission will be effective on 19 November 2012.

## 2.4 Monitoring Parameters, Frequency and Duration

2.4.1 Table 2.3 summarizes the monitoring parameters, frequency and duration of impact TSP monitoring.

**Table 2.3 Air Quality Monitoring Parameters, Frequency and Duration**

Parameter	Frequency and Duration
1-hour TSP	Three times every 6 days while the highest dust impact was expected
24-hour TSP	Once every 6 days

## 2.5 Monitoring Methodology

### 2.5.1 24-hour TSP Monitoring

- (a) The HVS was installed in the vicinity of the air sensitive receivers. The following criteria were considered in the installation of the HVS.
- (i) A horizontal platform with appropriate support to secure the sampler against gusty wind was provided.
  - (ii) No two samplers should be placed less than 2 meters apart.
  - (iii) The distance between the HVS and any obstacles, such as buildings, was at least twice the height that the obstacle protrudes above the HVS.
  - (iv) A minimum of 2 meters separation from walls, parapets and penthouse for rooftop sampler.
  - (v) A minimum of 2 meters separation from any supporting structure, measured horizontally is required.
  - (vi) No furnace or incinerator flues nearby.
  - (vii) Airflow around the sampler was unrestricted.
  - (viii) Permission was obtained to set up the samplers and access to the monitoring stations.
  - (ix) A secured supply of electricity was obtained to operate the samplers.
  - (x) The sampler was located more than 20 meters from any dripline.
  - (xi) Any wire fence and gate, required to protect the sampler, did not obstruct the monitoring process.
  - (xii) Flow control accuracy was kept within  $\pm 2.5\%$  deviation over 24-hour sampling period.
- (b) Preparation of Filter Papers
- (i) Glass fibre filters, G810 were labelled and sufficient filters that were clean and without pinholes were selected.
  - (ii) All filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not

variable by more than  $\pm 3$  °C; the relative humidity (RH) was < 50% and not variable by more than  $\pm 5$ %. A convenient working RH was 40%.

- (iii) All filter papers were prepared and analysed by ALS Technichem (HK) Pty Ltd., which is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes.

(c) Field Monitoring

- (i) The power supply was checked to ensure the HVS works properly.
- (ii) The filter holder and the area surrounding the filter were cleaned.
- (iii) The filter holder was removed by loosening the four bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully.
- (iv) The filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter.
- (v) The swing bolts were fastened to hold the filter holder down to the frame. The pressure applied was sufficient to avoid air leakage at the edges.
- (vi) Then the shelter lid was closed and was secured with the aluminum strip.
- (vii) The HVS was warmed-up for about 5 minutes to establish run-temperature conditions.
- (viii) A new flow rate record sheet was set into the flow recorder.
- (ix) On site temperature and atmospheric pressure readings were taken and the flow rate of the HVS was checked and adjusted at around 1.1 m<sup>3</sup>/min, and complied with the range specified in the updated EM&A Manual (i.e. 0.6-1.7 m<sup>3</sup>/min).
- (x) The programmable digital timer was set for a sampling period of 24 hrs, and the starting time, weather condition and the filter number were recorded.
- (xi) The initial elapsed time was recorded.
- (xii) At the end of sampling, on site temperature and atmospheric pressure readings were taken and the final flow rate of the HVS was checked and recorded.
- (xiii) The final elapsed time was recorded.
- (xiv) The sampled filter was removed carefully and folded in half length so that only surfaces with collected particulate matter were in contact.
- (xv) It was then placed in a clean plastic envelope and sealed.
- (xvi) All monitoring information was recorded on a standard data sheet.
- (xvii) Filters were then sent to ALS Technichem (HK) Pty Ltd. for analysis.

(d) Maintenance and Calibration

- (i) The HVS and its accessories were maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply.
- (ii) 5-point calibration of the HVS was conducted using TE-5025A Calibration Kit prior to the commencement of baseline monitoring. Bi-monthly 5-point calibration of the HVS will be carried out during impact monitoring.
- (iii) Calibration certificate of the HVSs are provided in Appendix E.

## 2.5.2 1-hour TSP Monitoring

(a) Measuring Procedures

The measuring procedures of the 1-hour dust meter were in accordance with the Manufacturer's Instruction Manual as follows:-

- (i) Turn the power on.
- (ii) Close the air collecting opening cover.
- (iii) Push the "TIME SETTING" switch to [BG].
- (iv) Push "START/STOP" switch to perform background measurement for 6 seconds.
- (v) Turn the knob at SENSI ADJ position to insert the light scattering plate.
- (vi) Leave the equipment for 1 minute upon "SPAN CHECK" is indicated in the display.
- (vii) Push "START/STOP" switch to perform automatic sensitivity adjustment. This measurement takes 1 minute.
- (viii) Pull out the knob and return it to MEASURE position.
- (ix) Push the "TIME SETTING" switch the time set in the display to 3 hours.

- (x) Lower down the air collection opening cover.
  - (xi) Push “START/STOP” switch to start measurement.
- (b) Maintenance and Calibration
- (i) The 1-hour TSP meter was calibrated at 1-year intervals against a continuous particulate TEOM Monitor, Series 1400ab. Calibration certificates of the Laser Dust Monitors are provided in Appendix E.
  - (ii) 1-hour validation checking of the TSP meter against HVS is carried out on half-year basis at the air quality monitoring locations.

## 2.6 Monitoring Schedule for the Reporting Month

2.6.1 The schedule for air quality monitoring in March 2013 is provided in Appendix F.

## 2.7 Results and Observations

2.7.1 The monitoring results for 1-hour TSP and 24-hour TSP are summarized in Table 2.4 and 2.5 respectively. Detailed impact air quality monitoring results are presented in Appendix G.

**Table 2.4 Summary of 1-hour TSP Monitoring Results in the Reporting Period**

	Average ( $\mu\text{g}/\text{m}^3$ )	Range ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
<b>AMS2</b>	87	82 – 96	374	500
<b>AMS3A</b>	89	83 – 98	368	500
<b>AMS7</b>	85	80 – 94	370	500

**Table 2.5 Summary of 24-hour TSP Monitoring Results in the Reporting Period**

	Average ( $\mu\text{g}/\text{m}^3$ )	Range ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
<b>AMS2</b>	82	48 - 99	176	260
<b>AMS3A</b>	221	115 - 377	167	260
<b>AMS7</b>	105	53 - 127	183	260

- 2.7.2 The major dust source in the reporting period included construction activities from the Project, construction activities by other contacts, as well as nearby traffic emissions.
- 2.7.3 All 1-hour TSP results were below the Action and Limit Level at all monitoring locations in the reporting month.
- 2.7.4 However, two (2) 24-hour TSP result exceeded the Action Level on 4 and 9 March 2013 at monitoring station AMS3A and one (1) 24-hour TSP result exceeded the Limit Level on 15 March 2013 monitoring station AMS3A in the reporting month.
- 2.7.5 For the one (1) 24-hour TSP result exceeded the Limit Level on 04 March 13 at monitoring station AMS3A, according to information provided by the Contractor, land-based construction activity such as transloading and delivery of geotextile and installing sand bags were undertaken at Works Area WA2 during the monitoring period which is unlikely to cause fugitive dust emission.
- 2.7.5.1 Functional checking on HVS at AMS3A was done. Air flow of the HVS was checked and the flow was steady during the 24-hr TSP sampling at AMS3A. The filter paper was re-weighted by the assigned HOKLAS laboratory and the result was reconfirmed.

2.7.5.2 Construction activities, like sheet piling and percussive piling, were carrying out by nearby private development project during the course of monitoring, which are close to the monitoring station AMS3A but beyond the site boundary of Works Area WA2. Trucks were observed passing exposed soil surfaces at those construction sites of nearby private development project. Please also see photo and layout map attached for reference of site conditions.

2.7.5.3 As refer to the wind data collected at wind station at Works Area WA2 during the monitoring period on 4 and 5 March 13 (please see attached) south-southeast wind was prevailing during the monitoring period. Construction works carried out at construction sites of nearby private development project may contribute to the measured dust levels at the monitoring station AMS3A.

2.7.5.4 The 1-hr TSP values recorded at AMS3A on 4 March 2013, which are within the monitoring period of the 24-hr TSP, were 85 g/m<sup>3</sup>, 83 g/m<sup>3</sup> and 84 g/m<sup>3</sup> respectively. All measured values are well below the Action and Limit Levels.

2.7.5.5 The measured 24-hr TSP values recorded at AMS2 and AMS7 (which are closer to the marine-based works areas) on the same monitoring date were 99 g/m<sup>3</sup> and 124 g/m<sup>3</sup> respectively, which are below the Action and Limit Levels.

2.7.5.6 The following dust mitigation measures have been implemented at Works Area WA2:

- Works Area WA2's surface was hard-paved, compacted or hydro-seeded
- Vehicle washing facility was provided at vehicle exit points,
- Measures for preventing fugitive dust emission are provided, e.g. tarpaulin covers.

2.7.5.7 The dust exceedance was therefore considered not to be due to the Project works.

2.7.5.8 The Contractor was recommended to continue implementing existing dust mitigation measures.

2.7.6 For the one (1) 24-hour TSP result exceeded the action Level on 09 March 13 at monitoring station AMS3A, according to information provided by the Contractor, land-based construction activity such as transloading and delivery of geotextile and installing sand bags to vessels was being undertaken at Works Area WA2 during the monitoring period.

2.7.6.1 Functional checking on HVS at AMS3A was done. Air flow of the HVS was checked and the flow was steady during the 24-hr TSP sampling at AMS3A. The filter paper was re-weighted by the assigned HOKLAS laboratory and the result was reconfirmed.

2.7.6.2 As informed by the Contractor, construction activities like sheet piling and percussive piling, were carrying out by nearby private development project during the course of monitoring, which are close to the monitoring station AMS3A but beyond the site boundary of Works Area WA2. Traffics were observed passing exposed soil surfaces at those construction sites of nearby private development project. Please also see photo and layout map attached for reference of site conditions.

2.7.6.3 As refer to the wind data collected at wind station at Works Area WA2 during the monitoring period on 8 and 9 March 13 (as attached) south wind was prevailing during the monitoring period. Construction works carried out at construction sites of nearby private development project may contribute to the measured dust levels at the monitoring station AMS3A.

2.7.6.4 The 1-hr TSP values recorded at AMS3A on 09 March 2013, which are within the monitoring period of the 24-hr TSP, were 96 g/m<sup>3</sup>, 97 g/m<sup>3</sup> and 98 g/m<sup>3</sup> respectively. All measured values are well below the Action and Limit Levels.

2.7.6.5 The measured 24-hr TSP values recorded at AMS2 and AMS7 (which are closer to the marine-based works areas) on the same monitoring date were 89 g/m<sup>3</sup> and 124 g/m<sup>3</sup> respectively, which are below the Action and Limit Levels.

2.7.6.6 The following dust mitigation measures have been implemented at Works Area WA2:

- Works Area WA2's surface was hard-paved, compacted or hydro-seeded
- Vehicle washing facility was provided at vehicle exit points,
- Measures for preventing fugitive dust emission are provided, e.g. tarpaulin covers.

2.7.6.7 The dust exceedance was therefore considered not to be due to the Project works.

2.7.6.8 The Contractor was recommended to continue implementing existing dust mitigation measures.

2.7.7 For the one (1) 24-hour TSP result exceeded the Limit Level on 15 March 13 at monitoring station AMS3A, according to information provided by the Contractor, land-based construction activity such as using canvas to cover sand material and stitching geotextile were being undertaken at Works Area WA2 during the monitoring period.

2.7.7.1 Functional checking on HVS at AMS3A was done. Air flow of the HVS was checked and the flow was steady during the 24-hr TSP sampling at AMS3A. The filter paper was re-weighted by the assigned HOKLAS laboratory and the result was reconfirmed.

2.7.7.2 As informed by the Contractor, construction activities like sheet piling and percussive piling, were carrying out by nearby private development project during the course of monitoring, which are close to the monitoring station AMS3A but beyond the site boundary of Works Area WA2. Traffics were observed passing exposed soil surfaces at those construction sites of nearby private development project. Please also see photo and layout map attached for reference of site conditions.

2.7.7.3 As refer to the wind data collected at wind station at Works Area WA2 during the monitoring period on 14 and 15 March 13 (as attached) southeast winds was prevailing during the monitoring period. Construction works carried out at construction sites of nearby private development project may contribute to the measured dust levels at the monitoring station AMS3A.

2.7.7.4 The 1-hr TSP values recorded at AMS3A on 15 March 2013, which are within the monitoring period of the 24-hr TSP, were  $85 \text{ g/m}^3$ ,  $85 \text{ g/m}^3$  and  $83 \text{ g/m}^3$  respectively. All measured values are well below the Action and Limit Levels.

2.7.7.5 The measured 24-hr TSP values recorded at AMS2 and AMS7 (which are closer to the marine-based works areas) on the same monitoring date were  $99 \text{ g/m}^3$  and  $127 \text{ g/m}^3$  respectively, which are below the Action and Limit Levels.

2.7.7.6 The following dust mitigation measures have been implemented at Works Area WA2:

- Works Area WA2's surface was hard-paved, compacted or hydro-seeded
- Vehicle washing facility was provided at vehicle exit points,
- Measures for preventing fugitive dust emission are provided, e.g. tarpaulin covers.

2.7.7.7 The dust exceedance was therefore considered not to be due to the Project works.

2.7.7.8 The Contractor was recommended to continue implementing existing dust mitigation measures.

2.7.8 The event action plan is annexed in Appendix L.

2.7.9 Meteorological information collected from the wind station during the monitoring periods on the monitoring dates, as shown in Figure 2, including wind speed and wind direction, is annexed in Appendix H.



### 3 NOISE MONITORING

#### 3.1 Monitoring Requirements

3.1.1 In accordance with the Project Specific EM&A Manual, impact noise monitoring was conducted for at least once per week during the construction phase of the Project. The Action and Limit level of the noise monitoring is provided in Appendix D.

#### 3.2 Monitoring Equipment

3.2.1 Noise monitoring was performed using sound level meter at each designated monitoring station. The sound level meters deployed comply with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meters at a known sound pressure level. Brand and model of the equipment is given in Table 3.1.

**Table 3.1 Noise Monitoring Equipment**

Equipment	Brand and Model
Integrated Sound Level Meter	Rion NL-31
Acoustic Calibrator	Rion NC-73

#### 3.3 Monitoring Locations

3.3.1 Monitoring locations NMS2 was set up at the proposed locations in accordance with Project Specific EM&A Manual. However, for monitoring location NMS3 (Ho Yu College), as proposed in the Project Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact noise monitoring was conducted at site boundary of the site office area in Works Area WA2 (NMS3A) respectively. Same baseline noise level (as derived from the baseline monitoring data recorded at Ho Yu College) and Limit Level were adopted for this alternative noise monitoring location.

Remarks: Monitoring

3.3.2 Figure 2 shows the locations of the monitoring stations. Table 3.2 describes the details of the monitoring stations.

**Table 3.2 Locations of Impact Noise Monitoring Stations**

Monitoring Station	Location	Description
NMS2	Seaview Crescent Tower 1	Free-field on the rooftop of the premise
NMS3A	Site Boundary of Site Office Area at Works Area WA2	Free-field on ground at the area boundary.

#### 3.4 Monitoring Parameters, Frequency and Duration

3.4.1 Table 3.3 summarizes the monitoring parameters, frequency and duration of impact noise monitoring.

**Table 3.3 Noise Monitoring Parameters, Frequency and Duration**

Parameter	Frequency and Duration
30-mins measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). $L_{eq}$ , $L_{10}$ and $L_{90}$ would be recorded.	At least once per week

### 3.5 Monitoring Methodology

#### 3.5.1 Monitoring Procedure

- (a) The sound level meter was set on a tripod at a height of 1.2 m above the ground for free-field measurements at NMS2. A correction of +3 dB(A) shall be made to the free field measurements.
- (b) All measurement at NMS3A were free field measurements in the reporting month at NMS3A. A correction of +3 dB(A) shall be made to the free field measurements.
- (c) The battery condition was checked to ensure the correct functioning of the meter.
- (d) Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:-
  - (i) frequency weighting: A
  - (ii) time weighting: Fast
  - (iii) time measurement:  $L_{eq(30\text{-minutes})}$  during non-restricted hours i.e. 07:00 – 1900 on normal weekdays.
- (e) Prior to and after each noise measurement, the meter was calibrated using the acoustic calibrator for 94dB(A) at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
- (f) During the monitoring period, the  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  were recorded. In addition, site conditions and noise sources were recorded on a standard record sheet.
- (g) Noise measurement was paused during periods of high intrusive noise (e.g. dog barking, helicopter noise) if possible. Observations were recorded when intrusive noise was unavoidable.
- (h) Noise monitoring was cancelled in the presence of fog, rain, wind with a steady speed exceeding 5m/s, or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

#### 3.5.2 Maintenance and Calibration

- (a) The microphone head of the sound level meter was cleaned with soft cloth at regular intervals.
- (b) The meter and calibrator were sent to the supplier or HOKLAS laboratory to check and calibrate at yearly intervals.
- (c) Calibration certificates of the sound level meters and acoustic calibrators are provided in Appendix E.

### 3.6 Monitoring Schedule for the Reporting Month

3.6.1 The schedule for construction noise monitoring in March 2013 is provided in Appendix F.

### 3.7 Monitoring Results

3.7.1 The monitoring results for construction noise are summarized in Table 3.4 and the monitoring data is provided in Appendix I.

**Table 3.4 Summary of Construction Noise Monitoring Results in the Reporting Period**

	Average, dB(A), $L_{eq}$ (30 mins)	Range, dB(A), $L_{eq}$ (30 mins)	Limit Level, dB(A), $L_{eq}$ (30 mins)
NMS2	66	65 –67*	75
NMS3A	64	62 – 66	70^

\*+3dB(A) Façade correction included

^ Daytime noise Limit Level of 70 dB(A) applies to education institutions

3.7.2 No noise Action Level and Limit Level exceedance was recorded at all monitoring stations in the reporting month.

3.7.3 Major noise sources during the noise monitoring included construction activities of the Project, construction activities by other contracts and nearby traffic noise.

3.7.4 The event action plan is annexed in Appendix L.

## 4 WATER QUALITY MONITORING

### 4.1 Monitoring Requirements

4.1.1 Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action was taken to rectify the situation. For impact water quality monitoring, measurements were taken in accordance with the Project Specific EM&A Manual. Appendix D shows the established Action/Limit Levels for the environmental monitoring works.

### 4.2 Monitoring Equipment

4.2.1 Table 4.1 summarises the equipment used in the impact water quality monitoring programme.

**Table 4.1 Water Quality Monitoring Equipment**

Equipment	Brand and Model
Dissolved Oxygen (DO) and Temperature Meter, Salinity Meter and Turbidimeter	YSI Model 6820
pH Meter	YSI Model 6820 or Thermo Orion 230A+
Positioning Equipment	JRC DGPS 224 Model JLR-4341 with J-NAV 500 Model NWZ4551
Water Depth Detector	Eagle Cuda-168
Water Sampler	Kahlsio Water Sampler (Vertical) 2.2 L with messenger

### 4.3 Monitoring Parameters, Frequency and Duration

4.3.1 Table 4.2 summarises the monitoring parameters, frequency and monitoring depths of impact water quality monitoring as required in the Project Specific EM&A Manual.

**Table 4.2 Impact Water Quality Monitoring Parameters and Frequency**

Monitoring Stations	Parameter, unit	Frequency	No. of depth
<p><i>Impact Stations:</i> IS5, IS(Mf)6, IS7, IS8, IS(Mf)9, IS10, IS(Mf)11, IS(Mf)16, IS17</p> <p><i>Control/Far Field Stations:</i> CS(Mf)3, CS(Mf)5, CS4, CS6, CSA</p> <p><i>Sensitive Receiver Stations:</i> SR3-SR7, SR10A&amp;SR10B</p>	<ul style="list-style-type: none"> <li>• Depth, m</li> <li>• Temperature, °C</li> <li>• Salinity, ppt</li> <li>• Dissolved Oxygen (DO), mg/L</li> <li>• DO Saturation, %</li> <li>• Turbidity, NTU</li> <li>• pH</li> <li>• Suspended Solids (SS), mg/L</li> </ul>	<p>Three times per week during mid-ebb and mid-flood tides (within ± 1.75 hour of the predicted time)</p>	<p>3 (1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station will be monitored).</p>

#### 4.4 Monitoring Locations

- 4.4.1 In accordance with the Project Specific EM&A Manual, twenty-one stations (9 Impact Stations, 7 Sensitive Receiver Stations and 5 Control/Far Field Stations) were designated for impact water quality monitoring. The nine Impact Stations (IS) were chosen on the basis of their proximity to the reclamation and thus the greatest potential for water quality impacts, the seven Sensitive Receiver Stations (SR) were chosen as they are close to the key sensitive receives and the five Control/ Far Field Stations (CS) were chosen to facilitate comparison of the water quality of the IS stations with less influence by the Project/ ambient water quality conditions.
- 4.4.2 Due to safety concern and topographical condition of the original locations of SR4 and SR10B, alternative impact water quality monitoring stations, naming as SR4(N) and SR10B(N), were adopted, which are situated in vicinity of the original impact water quality monitoring stations (SR4 and SR10B) and could be reachable.
- 4.4.3 Same baseline and Action Level for water quality, as derived from the baseline monitoring data recorded, were adopted for these alternative impact water quality monitoring stations.
- 4.4.4 The locations of these monitoring stations are summarized in Table 4.3 and depicted in Figure 3.

**Table 4.3 Impact Water Quality Monitoring Stations**

Station	Description	East	North
IS5	Impact Station (Close to HKBCF construction site)	811579	817106
IS(Mf)6	Impact Station (Close to HKBCF construction site)	812101	817873
IS7	Impact Station (Close to HKBCF construction site)	812244	818777
IS8	Impact Station (Close to HKBCF construction site)	814251	818412
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850
IS10	Impact Station (Close to HKBCF construction site)	812577	820670
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497
IS17	Impact Station (Close to HKBCF construction site)	814539	820391
SR3	Sensitive receivers (San Tau SSSI)	810525	816456
SR4(N)	Sensitive receivers (Tai Ho)	814705	817859
SR5	Sensitive receivers (Artificial Reef in NE Airport)	811489	820455
SR6	Sensitive receivers (Sha Chau and Lung Kwu Chau Marine Park)	805837	821818
SR7	Sensitive receivers (Tai Mo Do)	814293	821431
SR10A	Sensitive receivers (Ma Wan FCZ)1	823741	823495
SR10B(N)	Sensitive receivers (Ma Wan FCZ)2	823683	823187
CS(Mf)3	Control Station	809989	821117
CS(Mf)5	Control Station	817990	821129
CS4	Control Station	810025	824004
CS6	Control Station	817028	823992
CSA	Control Station	818103	823064

## 4.5 Monitoring Methodology

### 4.5.1 Instrumentation

- (a) The in-situ water quality parameters, viz. dissolved oxygen, temperature, salinity, turbidity and pH, were measured by multi-parameter meters (i.e. Model YSI 6820 CE-C-M-Y) and pH meter (i.e. Thermo Orion 230A+) respectively.

### 4.5.2 Operating/Analytical Procedures

- (a) Digital Differential Global Positioning Systems (DGPS) were used to ensure that the correct location was selected prior to sample collection.
- (b) Portable, battery-operated echo sounders were used for the determination of water depth at each designated monitoring station.
- (c) All in-situ measurements were taken at 3 water depths, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth was less than 6 m, in which case the mid-depth station was omitted. Should the water depth be less than 3 m, only the mid-depth station was monitored.
- (d) At each measurement/sampling depth, two consecutive in-situ monitoring (DO concentration and saturation, temperature, turbidity, pH, salinity) and water sample for SS. The probes were retrieved out of the water after the first measurement and then re-deployed for the second measurement. Where the difference in the value between the first and second readings of DO or turbidity parameters was more than 25% of the value of the first reading, the reading was discarded and further readings were taken.
- (e) Duplicate samples from each independent sampling event were collected for SS measurement. Water samples were collected using the water samplers and the samples were stored in high-density polythene bottles. Water samples collected were well-mixed in the water sampler prior to pre-rinsing and transferring to sample bottles. Sample bottles were pre-rinsed with the same water samples. The sample bottles were then be packed in cool-boxes (cooled at 4°C without being frozen), and delivered to ALS Technichem (HK) Pty Ltd. for the analysis of suspended solids concentrations. The laboratory determination work would be started within 24 hours after collection of the water samples. ALS Technichem (HK) Pty Ltd. is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes. For QA/QC procedures, one duplicate samples of every batch of 20 samples was analyzed.
- (f) The analysis method and reporting and detection limit for SS is shown in Table 4.4.

**Table 4.4 Laboratory Analysis for Suspended Solids**

Parameters	Instrumentation	Analytical Method	Reporting Limit	Detection Limit
Suspended Solid (SS)	Weighting	APHA 2540-D	0.5mg/L	0.5mg/L

- (g) Other relevant data were recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the construction site in the field log sheet for information.

### 4.5.3 Maintenance and Calibration

- (a) All in situ monitoring instruments would be calibrated and calibrated by ALS Technichem (HK) Pty Ltd. before use and at 3-monthly intervals throughout all stages of the water quality monitoring programme. Calibration details are provided in Appendix E.
- (b) The dissolved oxygen probe of YSI 6820 was calibrated by wet bulb method. Before the calibration routine, the sensor for dissolved oxygen was thermally equilibrated in water-saturated air. Calibration cup is served as a calibration chamber and it was loosened from airtight condition before it is used for the calibration. Calibration at ALS Technichem (HK) Pty Ltd. was carried out once every three months in a water sample with a known concentration

of dissolved oxygen. The sensor was immersed in the water and after thermal equilibration, the known mg/L value was keyed in and the calibration was carried out automatically.

- (c) The turbidity probe of YSI 6820 is calibrated two times a month. A zero check in distilled water was performed with the turbidity probe of YSI 6820 once per monitoring day. The probe will be calibrated with a solution of known NTU at ALS Technichem (HK) Pty Ltd. once every three months.

#### 4.6 Monitoring Schedule for the Reporting Month

4.6.1 The schedule for impact water quality monitoring in March 2013 is provided in Appendix F.

#### 4.7 Results and Observations

4.7.1 Impact water quality monitoring results and graphical presentations are provided in Appendix J.

4.7.2 No Action/Limit Level exceedance was recorded in the reporting month.

**Table 4.5 Summary of Water Quality Exceedances**

Station	Exceedance Level	DO (S&M)		DO (Bottom)		Turbidity		SS		Total	
		Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood
IS5	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)6	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS7	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS8	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)9	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS10	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)11	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)16	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
IS17	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR3	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR4(N)	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR5	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR6	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR7	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR10A	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
SR10B (N)	Action	0	0	0	0	0	0	0	0	0	0
	Limit	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>Action</b>	0	0	0	0	0	0	0	0	0	
	<b>Limit</b>	0	0	0	0	0	0	0	0	0	

Note: S: Surface; and  
M: Mid-depth.



4.7.3 The event action plan is annexed in Appendix L.

## 5 DOLPHIN MONITORING

### 5.1 Monitoring Requirements

- 5.1.1 Vessel based surveys for the Chinese White Dolphin (CWD), *Sousa chinensis*, are to be conducted by a dedicated team comprising a qualified marine mammal ecologist and experienced marine mammal observers (MMOs). The purpose of the surveys are to evaluate the impact of the HKCBF reclamation and, if deemed detrimental, to take appropriate action as per the EM&A manual.
- 5.1.2 This 'Impact Monitoring' follows several months of 'Baseline Monitoring' so similar survey methodologies have been adopted to facilitate comparisons between datasets. Further, the data collected are compatible with, and are available for, incorporation into the data set managed by the Agriculture, Fisheries and Conservation Department (AFCD) as part of Hong Kong's long term Marine Mammal Monitoring Programme.

### 5.2 Monitoring Equipment

- 5.2.1 Table 5.1 summarises the equipment used for the impact dolphin monitoring.

**Table 5.1 Dolphin Monitoring Equipment**

Equipment	Model
Commercially licensed motor vessel	15m in length with a 4.5m viewing platform
Global Positioning System (GPS) x2	Garmin 18X-PC Geo One Phottix
Computers (Corei7) x2	Windows /MSO 10 Logger
AIS receiver	Logger – GPS linked
Camera	Nikon D90 300m 2.8D fixed focus Nikon D90 20-300m zoom lens
Laser Rangefinder	Infinitor LRF1000/Visionking 900
Marine Binocular x3	Nexus 7 x 50 marine binocular with compass and reticules Fujinon 7 x 50 marine binocular with compass and reticules

### 5.3 Monitoring Frequency and Conditions

- 5.3.1 Dolphin monitoring is conducted twice per month in each survey area.
- 5.3.2 Dolphin monitoring is conducted only when visibility is good (e.g., over 1km) and the sea condition is at a Beaufort Sea State of 4 or better.
- 5.3.3 When thunder storm, black rain or typhoon warnings are in force, all survey effort is stopped.

### 5.4 Monitoring Methodology and Location

- 5.4.1 The impact dolphin monitoring is vessel-based and combines line-transect and photo-ID methodology. The survey follows pre-set and fixed transect lines in the two areas defined by AFCD as:

Northeast Lantau survey area; and

Northwest Lantau survey area.

- 5.4.2 The co-ordinates for the transect lines and layout map have been provided by AFCD and are shown in Table 5.2 and Figure 4.

**Table 5.2 Impact Dolphin Monitoring Line Transect Co-ordinates (Provided by AFCD)**

ID	HK Grid System		Long Lat in WGS84	
	X	Y	Long	Lat
1	804671	814577	113.870308	22.269741
1	804671	831404	113.869975	22.421696
2	805475	815457	113.878087	22.277704
2	805477	826654	113.877896	22.378814
3	806464	819435	113.887615	22.313643
3	806464	822911	113.887550	22.345030
4	807518	819771	113.897833	22.316697
4	807518	829230	113.897663	22.402113
5	808504	820220	113.907397	22.320761
5	808504	828602	113.907252	22.396462
6	809490	820466	113.916965	22.323003
6	809490	825352	113.916884	22.367128
7	810499	820690	113.926752	22.325043
7	810499	824613	113.926688	22.360464
8	811508	820847	113.936539	22.326475
8	811508	824254	113.936486	22.357241
9	812516	820892	113.946329	22.326894
9	812516	824254	113.946279	22.357255
10*	813525	818270	113.956156	22.303225
10*	813525	824657	113.956065	22.360912
11	814556	818449	113.966160	22.304858
11	814556	820992	113.966125	22.327820
12	815542	818807	113.975726	22.308109
12	815542	824882	113.975647	22.362962
13	816506	819480	113.985072	22.314192
13	816506	824859	113.985005	22.362771
14	817537	820220	113.995070	22.320883
14	817537	824613	113.995018	22.360556
15	818568	820735	114.005071	22.325550
15	818568	824433	114.005030	22.358947
16	819532	821420	114.014420	22.331747
16	819532	824209	114.014390	22.356933
17	820451	822125	114.023333	22.338117
17	820451	823671	114.023317	22.352084
18	821504	822371	114.033556	22.340353
18	821504	823761	114.033544	22.352903
19	822513	823268	114.043340	22.348458
19	822513	824321	114.043331	22.357971
20	823477	823402	114.052695	22.349680
20	823477	824613	114.052686	22.360610
21	805476	827081	113.877878	22.382668
21	805476	830562	113.877811	22.414103
22	806464	824033	113.887520	22.355164
22	806464	829598	113.887416	22.405423
23	814559	821739	113.966142	22.334574
23	814559	824768	113.966101	22.361920

\*Remark: Due to the presence of deployed silt curtain systems at the site boundaries of the Project, some of the transect lines shown in Figure 5 could not be fully surveyed during the regular survey. Transect 10 is reduced from 6.4km to approximately 3.6km in length due to the HKBCF construction site. Therefore the total transect length for both NEL and NWL combined is reduced to approximately 111km.

## **5.5 Monitoring Procedures**

- 5.5.1 The study area incorporates 23 transects which are to be surveyed twice per month. Each survey day lasts approximately 9 hours.
- 5.5.2 The survey vessel departs from Tung Chung Development Pier, Tsing Yi Public Pier or the nearest safe and convenient pier.
- 5.5.3 When the vessel reaches the start of a transect line, “on effort” survey begins. Areas between transect lines and traveling to and from the study area are defined as “off effort”.
- 5.5.4 The transect line is surveyed at a speed of 6-8 knots (11-14 km/hr). For the sake of safety, the speed was sometimes a bit slower to avoid collision with other vessels. During some periods, tide and current flow in the survey areas exceeds 7 knots which can affect survey speed. There are a minimum of four marine mammal observers (MMOs) present on each survey, rotating through four positions, observers (2), data recorder (1) and ‘rest’ (1). Rotations occur every 30 minutes or at the end of dolphin encounters. The data recorder records effort, weather and sightings data directly onto the programme Logger and is not part of the observer team. The observers search with naked eye and binoculars between 90° and 270° abeam (bow being 0°).
- 5.5.5 When a group of dolphins is sighted, position, bearing and distance data are recorded immediately onto the computer and, after a short observation, an estimate made of group size. These parameters are linked to the time-GPS-ships data which are automatically stored in the programme Logger throughout the survey period. In this manner, information on heading, position, speed, weather, effort and sightings are stored in a format suitable for use with DISTANCE software for subsequent line transect analyses.
- 5.5.6 Once the vessel leaves the transect line, it is deemed to be “off effort”. The dolphins are approached with the purpose of taking high resolution pictures for proper photo-identification of individual CWD. Attempts to photograph all dolphins in the group are made. Both the left and right hand sides of the dorsal fin area of each dolphin in the group are photographed, if possible. On finishing photographing, the vessel will return to the transect line at the point of departure and “on effort” survey is resumed.
- 5.5.7 Sightings which are made while on the transect line are referred to as “on effort sightings”, while not on the actual transect line are referred to as an “opportunistic sightings” (e.g. another group of dolphins is sighted while travelling back to the transect line). Only “on effort sightings” can be used in analyses which require effort or rate quantification, e.g., encounter rate per 100km searched. This is also how “on effort sightings” are treated in the baseline report. “Opportunistic sightings” provide additional information on individual habitat use and population distribution and they are noted accordingly.
- 5.5.8 As time and GPS data are automatically logged throughout the survey and are linked to sightings data input, start and end times of encounters and deviation from the transect lines are recorded and can be subsequently reviewed.

## **5.6 Monitoring Schedule for the Reporting Month**

- 5.6.1 The schedule for dolphin monitoring in March 2013 is provided in Appendix F.

## **5.7 Results and Observations**

- 5.7.1 Dolphin surveys were conducted on 18, 19, 27 and 28 March 2013. In summary, a total of 222.6km of “on effort” survey was conducted while 95% of “on effort” survey was conducted under favourable conditions (Beaufort Sea State 3 or better). The details are shown below:-

5.7.2 The effort summary and sightings data are shown in Tables 5.3 and 5.4, respectively. The survey effort conducted in March 2013 are plotted in Figure 5a-c. For Table 5.3, only on-effort information is included. Transects conducted in all Beaufort Sea State are included. Compared to previous monthly reports, the whole number Beaufort Sea State scale is used so as to ease comparison with other dolphin monitoring reports.

**Table 5.3 Impact Dolphin Monitoring Survey Effort Summary**

Survey	Date	Status	Sea State (on effort only)	Distance (km)
1	18-03-13	ON	1	77.8
	<b>Total</b>			<b>77.8</b>
	19-03-13	ON	1	29.9
	19-03-13	ON	2	3.6
<b>Total</b>			<b>33.5</b>	
2	27-03-13	ON	1	6.8
	27-03-13	ON	2	28.4
	<b>Total</b>			<b>35.2</b>
	28-03-13	ON	1	37
	28-03-13	ON	2	18.1
	28-03-12	ON	3	9.2
	28-03-13	ON	4	11.8
	<b>Total</b>			<b>76.1</b>
<b>Total in March 2013</b>				<b>222.6</b>

\*Remark: Surveys conduct under Beaufort Sea State 3 or below are considered as under favourable condition.

**Table 5.4 Impact Dolphin Monitoring Survey Details in March 2013**

Date	Location (transect line)	No. Sightings "ON EFFORT"	No. Sightings "OPPORTUNISTIC"
18-03-13	NW & NE Lantau (1-10,21,22)	0	1
19-03-13	NE Lantau (11-20,23)	0	0
27-03-13	NW Lantau (1-3,21)	0	0
28-03-13	NW & NE Lantau (4-20,22,23)	2	0
<b>Total in March 2013</b>		<b>2</b>	<b>1</b>

5.7.3 A total of three dolphin sightings were recorded during the two surveys, one on the 18 March 2013 and two on the 28 March 2013. Of the three sightings, two were "on effort" (which are all under favourable condition) and one was "opportunistic". A total of ten individuals were sighted from the two impact dolphin surveys in the reporting period. Sighting details are summarised and plotted in Appendix K and Figure 5c, respectively.

5.7.4 Behaviour: two groups were feeding and one group was associated with multiple behaviour (feeding and travelling).

5.7.5 Noteworthy Observations: other non-project related marine works were observed in both NWL and NEL areas, respectively; in particular in the vicinity of transect line 2, 4, 5, 11, 12 and 23.

5.7.6 The event action plan is annexed in Appendix L.

## 6 ENVIRONMENTAL SITE INSPECTION AND AUDIT

### 6.1 Site Inspection

6.1.1 Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures for the Project. In the reporting month, 4 site inspections were carried out on 7, 14, 21, and 28 March 2013.

6.1.2 Particular observations during the site inspections are described below:

#### ***Air Quality***

6.1.3 No adverse observation was identified in the reporting month.

#### ***Noise***

6.1.4 An idle air compressor was found without a valid noise emission label on FTB19. The Contractor was reminded to stick a valid noise emission label onto the compressor prior to operation of the compressor. (Reminder)

#### ***Water Quality***

6.1.5 Defects at parts of the perimeter silt curtain at portions E1, C2a and C2c were rectified. The Contractor was reminded to keep monitor and well maintain of the silt curtain more frequently to ensure the silt curtain are fully functional. (Closed)

6.1.6 One of the existing bunding was found too low on barge FTB19. The Contractor was reminded to enhance the height of the existing bunding to effectively contain potential oil leakage. (Follow up)

6.1.7 The screw at the outlet of a drip tray on barge AP4 was observed missing. The Contractor provided effective mitigation measures to effectively seal the outlet of the drip tray to prevent potential oil seepage in April 2013. The Contractor was advised to provide effective mitigation measures to effectively seal the outlet of the all drip tray to prevent potential oil seepage. (Follow up)

#### ***Chemical and Waste Management***

##### ***Waste***

6.1.8 Oil drums were found improperly stored on barge SHB 209, Fai Yui 3228, FTB19 and SHB 205, Sun Moon Kee. The Contractor immediately provided mitigation measures and put the oil drum inside bunding or remove the oil drum. The Contractor was reminded to provide mitigation measures such as drip tray or bunding to all oil drums. (Reminder)

6.1.9 Vibratory clamps were found improperly stored on barge SHB305. The Contractor should provide proper measures, like drip trays and tarpaulin sheet coverage, to retain any leaked oil from the plants. Vibratory clamps found improperly stored on barge SHB305 were removed in the reporting month. (Closed)

6.1.10 Oil drums were found without proper labels on barge FTB 19. The Contractor provided mitigation measures and labeled the oil drums. The Contractor was reminded to provide mitigation measures such as labeling to all oil drums. (Reminder)

6.1.11 General waste was observed uncovered on barge Fai Yui 3228 and SHB305. The Contractor rectified the condition upon notification by providing bin bags to waste and relocated them to a waste collection point. The Contractor was reminded to keep the barge surface clean and tidy. (Reminder)

#### **Landscape and Visual Impact**

6.1.12 No relevant works was carried out in the reporting month.

**Others**

6.1.13 No adverse observation was identified in the reporting month.

6.1.14 The Contractor had rectified most of the observations as identified during environmental site inspection in the reporting month. Rectifications of remaining identified items are undergoing by the Contractor. Follow-up inspections on the status on provision of mitigation measures will be conducted to ensure all identified items are mitigated properly.

**6.2 Advice on the Solid and Liquid Waste Management Status (To be updated)**

6.2.1 The Contractor had registered as a chemical waste producer for this Project. Receptacles were available for general refuse collection and sorting.

6.2.2 As advised by the Contractor, 121,154.5 m<sup>3</sup> of fill were imported for the Project use in the reporting period. 2000.0 L of chemical waste (liquid) were generated and disposed of in the reporting period. 13 tonnes of general refuse were generated and disposed of in the reporting period. Monthly summary of waste flow table is detailed in Appendix M.

6.2.3 The Contractor is advised to properly maintain on site C&D materials and wastes storage, collection, sorting and recording system, dispose of C&D materials and wastes at designated ground and maximize reuse / recycle of C&D materials and wastes. The Contractor is reminded to properly maintain the site tidiness and dispose of the wastes accumulated on site regularly and properly.

6.2.4 The Contractor is reminded that chemical waste should be properly treated and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes.



### 6.3 Environmental Licenses and Permits

6.3.1 The environmental licenses and permits for the Project and valid in the reporting month is summarized in Table 6.1.

**Table 6.1 Summary of Environmental Licensing and Permit Status**

Statutory Reference	License/ Permit	License or Permit No.	Valid Period		License/ Permit Holder	Remarks
			From	To		
EIAO	Environmental Permit	EP-353/2009/E	16/10/2012	N/A	HyD	Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities
		EP-354/2009/A	08/12/2010	N/A		Tuen Mun – Chek Lap Kok Link (TMCLKL Southern Landfall Reclamation only)
APCO	NA notification	--	30/12/2011	--	CHEC	Works Area WA2 and WA3
APCO	NA notification	--	17/01/2012	--	CHEC	Works Area WA4
WDO	Chemical Waste Producer Registration	5213-951-C1186-21	30/3/2012	N/A	CHEC	Chemical waste produced in Contract HY/2010/02
WDO	Chemical Waste Producer Registration	5213-974-C3750-01	31/10/2012	--	CHEC	Registration as Chemical Waste Producer at To Kau Wan(WA4)
WDO	Chemical Waste Producer Registration	5213-839-C3750-02	13/09/2012	--	CHEC	Registration as Chemical Waste Producer at TKO 137(FB)
WDO	Billing Account for Disposal of Construction Waste	7014181	05/12/2011	N/A	CHEC	Waste disposal in Contract HY/2010/02
NCO	Construction Noise Permit	GW-RS1111-12	01/11/2012	30/04/2013	CHEC	Works Area WA3 in Siu Ho Wan
NCO	Construction Noise Permit	GW-RS0122-13	08/02/2013	04/08/2013	CHEC	Marine-based areas in Contract HY/2010/02
NCO	Construction Noise Permit	N/A	Application in process	N/A	CHEC	Works Area WA 4 in Contract HY/2010/02

### 6.4 Implementation Status of Environmental Mitigation Measures

6.4.1 As mentioned in section 6.1.5 above, defects were noticed at parts of the perimeter silt curtain at portions E1, C2a, C2c and those defective parts are yet to be rectified. Although maintenance works were noted during site inspections and on the records provided by the Contractor. However, there is still parts of the silt curtain were found defective in the reporting month therefore the Contractor was reminded again to swiftly complete the rectification works of the perimeter silt curtain in particular the

portions where defects were observed to ensure the sediment plume generated by construction activities could be prevented from discharging to areas outside the site boundary. Meanwhile, ET shall follow up the situation and continue to closely monitor progress of the maintenance work and report the progress accordingly.

- 6.4.2 In response to the site audit findings, the Contractors carried out corrective actions.
- 6.4.3 A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in Appendix C. Most of the necessary mitigation measures were implemented properly.
- 6.4.4 Training of marine travel route for marine vessels operator was given to relevant staff and relevant records were kept properly.
- 6.4.5 Regarding the implementation of dolphin monitoring and protection measures (i.e. implementation of Dolphin Watching Plan, Dolphin Exclusion Zone and Silt Curtain integrity Check), regular checking were conducted by the experienced MMOs within the works area to ensure no dolphin was trapped by the enclosed silt curtain systems. Any dolphin spotted within the enclosed silt curtain systems was reported and recorded. Relevant procedures were followed and measures were well implemented. Silt curtain systems were also inspected timely in accordance to the submitted plan. All inspection records were kept properly.
- 6.4.6 Acoustic decoupling measures on noisy plants on construction vessels were checked regularly and these measures were well implemented.

## **6.5 Summary of Exceedances of the Environmental Quality Performance Limit**

- 6.5.1 Two (2) 24-hour TSP result exceeded the Action Level on 4 and 9 March 2013 at monitoring station AMS3A and one (1) 24-hour TSP result exceeded the Limit Level on 15 March 2013 monitoring station AMS3A in the reporting month. All 1-hour TSP results were below the Action and Limit Level at all monitoring locations in the reporting month.
- 6.5.2 For construction noise, no Action and Limit Level exceedance was recorded at all monitoring stations in the reporting period.
- 6.5.3 For water quality, no Action/Limit Level exceedance was recorded in the reporting month.
- 6.5.4 Cumulative statistics on exceedance is provided in Appendix N.

## **6.6 Summary of Complaints, Notification of Summons and Successful Prosecutions**

- 6.6.1 The Environmental Complaint Handling Procedure is annexed in Figure 6.
- 6.6.2 One (1) complaint was referred by EPD to ET on 4 March 13 regarding the construction noise impact from cranes operating from the barges for the Hong Kong –Zhuhai-Macao Bridge Hong Kong Project generating squeak noise in the evening of 1 Mar 2013 causing annoyance to him/her. The investigation results show that the complaint was non-project related.
  - 6.6.2.1 With refer to the site daily of 1 Mar 13 provided by the Contractor, 1 cranes operated at Zone S3 and S4 respectively and 4 cranes operated in Zone C of CNP No.RS0122-13 (please see attached Plan no.1 for respective zones). Squeak noise or other abnormal noise was unlikely to be generated by their operation on 1 Mar 13. Moreover, considering the distance between reclamation area and Tung Chung residential area is around 1.8 km, the noise to the residential area should be low.
  - 6.6.2.2 As informed by the Contractor, the tug boats, derrick barges, pelican barges working at the site of HKBCF have been maintained in good working condition and no squeak nor other abnormal noise emitted will cause annoyance to any person at any noise sensitive receiver which in compliance with the CNP no. RS0122-13.

6.6.2.3 As a result, the noise complaint was considered as non-project related.

6.6.2.4 Nevertheless, the Contractor was reminded to maintain tug boats, derricks barges and pelican barges in good working conditions from which neither squeak nor other abnormal noise emitted was a source of annoyance to any person at any noise sensitive receiver.

6.6.3 No notification of summons and prosecution was received in the reporting period.

6.6.4 Statistics on complaints, notifications of summons and successful prosecutions are summarized in Appendix N.

## FUTURE KEY ISSUES

### 6.7 Construction Programme for the Coming Months

6.7.1 As informed by the Contractor, the major works for the Project in April and May 2013 will be:-

#### ***Marine-based Works***

- Cellular structure installation
- Connecting arc cell installation
- Laying geo-textile
- Sand blanket laying
- Maintenance of silt curtain
- Stone column installation
- Laying stone blanket
- Backfill cellular structure
- Band drain installation
- Instrumentation works
- Rubble mound seawall construction
- Construction of temporary seawall
- Ground investigation

#### ***Land-based Works***

- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Geo-textile fabrication at Works Area WA2
- Silt curtain fabrication at Works Area WA4
- Erection of site office at Works Area WA2

### 6.8 Key Issues for the Coming Month

6.8.1 Key issues to be considered in the coming months:-

- Site runoff should be properly collected and treated prior to discharge;
- Minimize loss of sediment from filling works;
- Regular review and maintenance of silt curtain systems, drainage systems and desilting facilities;
- Exposed surfaces/soil stockpiles should be properly treated to avoid generation of silty surface runoff during rainstorm;
- Regular review and maintenance of wheel washing facilities provided at all site entrances/exits;
- Conduct regular inspection of various working machineries and vessels within works areas to avoid any dark smoke emission;
- Suppress dust generated from work processes with use of bagged cements, earth movements, excavation activities, exposed surfaces/soil stockpiles and haul road traffic;
- Quieter powered mechanical equipment should be used;
- Provision of proper and effective noise control measures for operating equipment and machinery on-site, such as erection of movable noise barriers or enclosure for noisy plants;
- Closely check and replace the sound insulation materials regularly;
- Better scheduling of construction works to minimize noise nuisance;
- Properly store and label oil drums and chemical containers placed on site;
- Proper chemicals, chemical wastes and wastes management;
- Maintenance works should be carried out within roofed, paved and confined areas;
- Collection and segregation of construction waste and general refuse on land and in the sea should be carried out properly and regularly; and
- Proper protection and regular inspection of existing trees, transplanted/retained trees.

### 6.9 Monitoring Schedule for the Coming Month

6.9.1 The tentative schedule for environmental monitoring in April 2013 is provided in Appendix F.

## 7 CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Conclusions

- 7.1.1 The construction phase and EM&A programme of the Project commenced on 12 March 2012.
- 7.1.2 Two (2) 24-hour TSP result exceeded the Action Level on 4 and 9 March 2013 at monitoring station AMS3A and one (1) 24-hour TSP result exceeded the Limit Level on 15 March 2013 monitoring station AMS3A in the reporting month. All 1-hour TSP results were below the Action and Limit Level at all monitoring locations in the reporting month.
- 7.1.3 For construction noise, no Action and Limit Level exceedance was recorded at all monitoring stations in the reporting period.
- 7.1.4 For water quality, no Action/Limit level exceedance was recorded in the reporting month.
- 7.1.5 A total of three dolphin sightings were recorded during the two surveys, one on the 18 March 2013 and two on the 28 March 2013. Of the three sightings, two were “on effort” (which are all under favourable condition) and one was “opportunistic”. A total of ten individuals were sighted from the two impact dolphin surveys in the reporting period. Sighting details are summarised and plotted in Appendix K and Figure 5c, respectively.
- 7.1.6 Behaviour: two groups were feeding and one group was associated with multiple behaviour (feeding and travelling).
- 7.1.7 Environmental site inspection was carried out 4 times in March 2013. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.
- 7.1.8 One (1) complaint was referred by EPD to ET on 4 March 13 regarding the construction noise impact from cranes operating from the barges for the Hong Kong –Zhuhai-Macao Bridge Hong Kong Project generating squeak noise in the evening of 1 Mar 2013 causing annoyance to him/her. The investigation results show that the complaint was non-project related.
- 7.1.9 No notification of summons and prosecution was received in the reporting period.

### 7.2 Recommendations

- 7.2.1 According to the environmental site inspections performed in the reporting month, the following recommendations were provided:

#### ***Air Quality Impact***

- All working plants and vessels on site should be regularly inspected and properly maintained to avoid dark smoke emission.
- All vehicles should be washed to remove any dusty materials before leaving the site.
- Haul roads should be sufficiently dampened to minimize fugitive dust generation.
- Wheel washing facilities should be properly maintained and reviewed to ensure properly functioning.
- Temporary exposed slopes and open stockpiles should be properly covered.
- Enclosure should be erected for cement debagging, batching and mixing operations.
- Water spraying should be provided to suppress fugitive dust for any dusty construction activity.

#### ***Construction Noise Impact***

- Quieter powered mechanical equipment should be used as far as possible.

- Noisy operations should be oriented to a direction away from sensitive receivers as far as possible.
- Proper and effective noise control measures for operating equipment and machinery on-site should be provided, such as erection of movable noise barriers or enclosure for noisy plants. Closely check and replace the sound insulation materials regularly
- Vessels and equipment operating should be checked regularly and properly maintained.
- Noise Emission Label (NEL) shall be affixed to the air compressor and hand-held breaker operating within works area.
- Better scheduling of construction works to minimize noise nuisance.

#### ***Water Quality Impact***

- Regular review and maintenance of silt curtain systems, drainage systems and desilting facilities in order to make sure they are functioning effectively.
- Construction of seawall should be completed as early as possible.
- Regular inspect and review the loading process from barges to avoid splashing of material.
- Silt, debris and leaves accumulated at public drains, wheel washing bays and perimeter u-channels and desilting facilities should be cleaned up regularly.
- Silty effluent should be treated/ desilted before discharged. Untreated effluent should be prevented from entering public drain channel.
- Proper drainage channels/bunds should be provided at the site boundaries to collect/intercept the surface run-off from works areas.
- Exposed slopes and stockpiles should be covered up properly during rainstorm.

#### ***Chemical and Waste Management***

- All types of wastes, both on land and floating in the sea, should be collected and sorted properly and disposed of timely and properly. They should be properly stored in designated areas within works areas temporarily.
- All chemical containers, batteries and oil drums should be properly stored and labelled.
- All plants and vehicles on site should be properly maintained to prevent oil leakage. Proper measures, like drip trays and/or bundings, should be provided for retaining leaked oil/chemical from plants.
- All kinds of maintenance works should be carried out within roofed, paved and confined areas.
- All drain holes of the drip trays utilized within works areas should be properly plugged to avoid any oil and chemical waste leakage.
- Oil stains on soil surface, accumulated oil mixture and empty chemical containers should be cleared and disposed of as chemical waste.
- Regular review should be conducted for working barges and patrol boats to ensure sufficient measures and spill control kits were provided on working barges and patrol boats to avoid any spreading of leaked oil/chemicals.

#### ***Landscape and Visual Impact***

- All existing, retained/transplanted trees at the works areas should be properly fenced off and regularly inspected.