

1 February 2016

By Fax (3698 5999) and By Post

Ove Arup & Partners
Chief Resident Engineer's Office
5 Ying Hei Road, Tung Chung, Lantau
Hong Kong

Attention: Mr. Paul Appleton

Dear Sir,

**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 – HZMB HKBCF – Reclamation Works
Annual EM&A Review Report for March 2013 to February 2014**

Reference is made to the Environmental Team's submission of the Annual EM&A Review Report for March 2013 to February 2014 certified by the ET Leader (ET's ref.: "60249820/C/RMKY16012902" dated 29 January 2016) and provided to us via e-mail on 29 January 2016.

We are pleased to inform you that we have no adverse comment on the captioned Annual EM&A Review Report for March 2013 to February 2014.

The ET Leader and the dolphin specialist of the ET are reminded that the EM&A report should never be regarded as a platform to express their own opinions towards a government topic, or to advocate his/her personal ideas, and also our verification to your report does not release any of your obligation in the EM&A Manual under the applicable Environmental Permit(s) for this project.

Thank you very much for your attention and please feel free to contact the undersigned should you require further information.

Yours faithfully,
For and on behalf of
Ramboll Environ Hong Kong Limited



Raymond Dai
Independent Environmental Checker

c.c.	HyD	Mr. Matthew Fung	(By Fax: 3188 6614)
	HyD	Mr. Wai-Ping Lee	(By Fax: 3188 6614)
	AECOM	Ms. Echo Leong	(By Fax: 2317 7609)
	CHEC	Mr. Lim Kim Chuan	(By Fax: 2578 0413)

Internal: DY, YH, LP, CL, ENPO Site

Q:\Projects\HYDZHMBEEM00\02_Proj_Mgt\02_Corr\HYDZHMBEEM00_0_3831L.16.doc


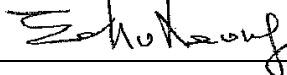
China Harbour Engineering Company Limited

Contract No. HY/2010/02

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

Annual Review Report for
March 2013- February 2014

[01/2016]

	Name	Signature
Prepared & Checked:	Y T Tang	
Reviewed, Approved and Certified:	Echo Leong (ETL)	

Version:	Rev. 0	Date: 29 January 2016
<p>Disclaimer</p> <p>This report is prepared for China Harbour Engineering Company Limited and is given for its sole benefit in relation to and pursuant to Contract No. HY/2010/02 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities-Reclamation Works and may not be disclosed to, quoted to or relied upon by any person other than China Harbour Engineering Company Limited without our prior written consent. No person (other than China Harbour Engineering Company Limited) into whose possession a copy of this report comes may rely on this report without our express written consent and China Harbour Engineering Company Limited may not rely on it for any purpose other than as described above.</p>		

AECOM Asia Co. Ltd.
15/F, Grand Central Plaza, Tower 1, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong
Tel: (852) 3922 9000 Fax: (852) 2317 7609 www.aecom.com

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	1
1 INTRODUCTION	3
1.1 Background	4
1.2 Scope of Report	4
1.3 Contract Organization	5
1.4 Summary of Construction Works	5
2 SUMMARY OF EM&A PROGRAMME REQUIREMENTS	7
2.1 Monitoring Parameters	7
2.2 Environmental Quality Performance (Action/Limit Levels)	8
2.3 Environmental Mitigation Measures	8
3 MONITORING RESULTS	9
3.1 Air Quality Monitoring	9
3.2 Noise Monitoring	12
3.3 Water Quality Monitoring	16
3.4 Dolphin Monitoring	26
4 ENVIRONMENTAL SITE INSPECTION AND AUDIT	26
5 ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS	40
5.1 Summary of Solid and Liquid Waste Management	40
6 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES	41
6.1 Implementation Status of Environmental Mitigation Measures	41
7 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT	42
7.1 Summary of Exceedances of the Environmental Quality Performance Limit	42
8 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS	43
8.1 Summary of Environmental Compliants, Notification of Summons and Successful Prosecutions	43
9 REVIEW OF THE VALIDITY OF THE EIA PREDICTION	45
10 REVIEW OF ENVIRONMENTAL IMPLEMENTATION STATUS	45
11 REVIEW OF EM&A PROGRAMME	45
12 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS	46
12.1 Comments on mitigation measures	46
12.2 Air Quality Impact	46
12.3 Construction Noise Impact	46
12.4 Water Quality Impact	46
12.5 Chemical and Waste Management	47
12.6 Landscape and Visual Impact	47
12.7 Recommendations on EM&A Programme	47
12.8 Conclusions	48

List of Tables

Table 1.1	Contact Information of Key Personnel
Table 3.1	Summary of Number of Monitoring Events for 1-hr & 24-hr TSP Concentration
Table 3.2	Summary of Number of Exceedances for 1-hr & 24-hr TSP Monitoring
Table 3.3	Maximum Predicted TSP concentrations under the “Mitigated” scenario
Table 3.4	Summary of Number of Monitoring Events for Impact Noise
Table 3.5	Summary of Number of Monitoring Exceedances for Impact Noise
Table 3.6	Construction Noise Impact at Noise Sensitive Receivers
Table 3.7	Summary of Construction Noise Monitoring Results in the Reporting Period
Table 3.8	Summary of Number of Monitoring Events for Impact Water Quality
Table 3.9	Summary of Water Quality Exceedances in Mar 13-Feb 14
Table 3.10	Summary of number of water quality exceedances per monitoring day
Table 3.11	Comparison of depth averaged dissolved oxygen levels (Surface & Mid-depth, Bottom depth) during baseline and impact monitoring period (mgL ⁻¹)
Table 3.12	Ambient and Tolerance Values for Suspended Sediment Concentrations (mgL ⁻¹) in the Vicinity of Sensitive Receivers adopted in the EIA
Table 3.13	Calculated Elevations in Suspended Sediment Concentrations at Sensitive Receivers (mgL ⁻¹) under the 2012 mitigated scenario from the EIA
Table 3.14	Baseline suspended solids levels and 30% of baseline mean (mgL ⁻¹)
Table 3.15	Average suspended solids levels at sensitive receivers (mgL ⁻¹) in January 2014
Table 3.16	Summary of Dolphin Monitoring Action And Limit Level Exceedances

Figures

Figure 1	General Contract Layout Plan
Figure 2	Impact Air Quality and Noise Monitoring Stations and Wind Station
Figure 3	Impact Water Quality Monitoring Stations
Figure 4	Impact Dolphin Monitoring Line Transect Layout Map
Figure 5	Environmental Complaint Handling Procedure

List of Appendices

Appendix A	Contract Organization for Environmental Works
Appendix B	Three Month Rolling Construction Programmes
Appendix C	Implementation Schedule of Environmental Mitigation Measures (EMIS)
Appendix D	Summary of Action and Limit Levels
Appendix E	Graphical Presentation of Impact Air Quality Monitoring Results
Appendix F	Graphical Presentation of Impact Daytime Construction Noise Monitoring Results
Appendix G	Graphical Presentation of Impact Water Quality Monitoring Results
Appendix H	Impact Dolphin Monitoring - Result Tables and Graphical Presentations
Appendix I	Quarterly Summary of Waste Flow Table
Appendix J	Cumulative Statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions
Appendix K	Event Action Plan

EXECUTIVE SUMMARY

Contract No. HY/2010/02 – Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Work (here below, known as “the Contract”) 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 Contract, i.e. the amended Environmental Permits (EPs) issued on 17 July 2015 (EP-353/2009/I) and 13 March 2015 (EP-354/2009/D) (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 Contract’s reclamation works (i.e. the Engineer for the Contract).

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

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

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

The construction phase of the Contract 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 March 2013 and 28 February 2014. As informed by the Contractor, major activities in the reporting period were:-

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
- Band drain installation trial
- Band drain installation
- Backfill cellular structure
- Instrumentation works
- Construction of temporary seawall
- Ground investigation
- Installation of silt screen at sea water intake of HKIA
- Cone penetration test;
- Silt curtain deployment and repairing
- Sand blanket trial
- Stone blankets laying.
- Construction of cellular structure

Land-based Works

- Site office erection and construction at Works Area WA2;
- Public Works Regional Laboratory erection and construction at Works Area WA3;
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Constructing site access at Works Area WA2 to Ying Hei Road, Tung Chung;
- Drainage works at Works Area WA2 and WA3;
- Geotextile fabrication at Works Area WA2 and WA4; and
- Stone column installation barges setup and their maintenance works at Works Area WA4.

- Silt curtain fabrication at Works Area WA2 and WA4;
- Maintenance works of Site Office at Works Area WA2
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Silt curtain fabrication at Works Area WA4
- Erection of site office for CHEC(GD) at Works Area WA2
- Green roof construction at Works Area WA2
- Construction of Temporary Marine Access at Works Area WA2
- Maintenance of Temporary Marine Access 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	62 sessions
1-hour TSP monitoring	62 sessions
Noise monitoring	48 sessions
Impact water quality monitoring	155 sessions
Impact dolphin monitoring	24 surveys
Joint Environmental site inspection	51 sessions

Breaches of Action and Limit Levels for Air Quality

A total of 15 Action level and 5 Limit Level exceedances were recorded during the 24-hr TSP impact monitoring period. No exceedance of 1-hour TSP exceedance level was recorded at all monitoring station during the 1-hr TSP impact monitoring period. Investigation into the possible causes of each exceedance was undertaken and reported in the respective monthly EM&A reports, the investigations results confirmed that the air quality exceedances were not related to Contract.

Breaches of Action and Limit Levels for Noise

One complains was received and therefore one (1) Action Level Exceedance of construction noise was recorded in the reporting period. Investigation into the possible causes of such exceedance was undertaken and reported in the respective monthly EM&A reports, the investigations results confirmed that the limit level exceedance was not related to Contract.

Breaches of Action and Limit Levels for Water Quality

Fifty-six (56) Action Level exceedances and seven (7) Limit Level exceedances were recorded at measured suspended solids (SS) values (in mg/L), one (1) Action Level exceedances were recorded at measured turbidity (in NTU), six (6) Action Level exceedance was recorded at measured DO (Bottom) (mg/L) and one (1) Limit Level exceedance was recorded at measured DO (S&M) (mg/L) during the reporting period. Investigation result shows that all the exceedances were not due to the Contract works except the Action Level Exceedance recorded at SR5 and Limit Level Exceedance recorded at IS10 on 18 Dec 13 were related to Contract.

Triggering of Event and Action Plan for Impact Dolphin Monitoring

One (1) Limit level exceedance and Six (6) Action Level Exceedances were recorded in the reporting period for impact dolphin monitoring. The investigation results showed that although no unacceptable changes in environmental parameters of this Contract have been measured, at this time it is not possible to make a conclusive assessment of this Contract's specific impact on dolphins. Event and Action Plan for Impact Dolphin Monitoring was triggered. For investigation results please refer to Appendix L of the corresponding quarterly reports.

Implementation Status and Review of Environmental Mitigation Measures

Most of the recommended mitigation measures, as included in the EM&A programme, were implemented properly in the reporting period. 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 was effective since 19 November 2012.

The recommended environmental mitigation measures effectively minimize the potential environmental impacts from the Contract. The EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.

Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively.

Complaint, Notification of Summons and Successful Prosecution

Eleven (11) environmental complaints were received in the reporting period.

One (1) summons and one (1) successful prosecution was received in the reporting period.

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 Contract”) 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 Contract 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), October 2012 (EP-353/2009/E), April 2013 (EP-353/2009/F), August 2013 (EP-353/2009/G), January 2015 (EP-353/2009/H) and July 2015 (EP-353/2009/I). 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), January 2014 (EP-354/2009/B), December 2014 (EP-354/2009/C) and March 2015 (EP-354/2009/D).
- 1.1.4 The Contract is a designated Project and is governed by the current permits for the Contract, i.e. the amended EPs issued on 17 July 2015 (EP-353/2009/I) and 13 March 2015 (EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only).
- 1.1.5 A Contract Specific EM&A Manual, which included all Contract-relation contents from the original EM&A Manuals for the Contract, 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 Contract’s reclamation works (i.e. the Engineer for the Contract).
- 1.1.7 China Harbour Engineering Company Limited (CHEC) was awarded by HyD as the Contractor to undertake the construction work of the Contract.
- 1.1.8 ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) for the Contract.
- 1.1.9 AECOM Asia Co. Ltd. (AECOM) was appointed by CHEC to undertake the role of Environmental Team for the Contract for carrying out the EM&A works.
- 1.1.10 The construction phase of the Contract under the EPs was commenced on 12 March 2012 and will be tentatively completed by early Year 2016.
- 1.1.11 According to the Contract 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 Contract commenced on 12 March 2012.

1.2 Scope of Report

- 1.2.1 This is the second Annual EM&A Review 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 Contract from 12 March 2012 and 28 February 2013.

1.3 Contract Organization

1.3.1 The Contract 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
Engineer's Representative (ER) (Ove Arup & Partners Hong Kong Limited)	Chief Resident Engineer	Roger Marechal	2528 3031	2668 3970
IEC / ENPO (ENVIRON Hong Kong Limited)	Independent Environmental Checker	Raymond Dai	3743 0788	3548 6988
	Environmental Project Office Leader	Y.H. Hui	3743 0788	3548 6988
Contractor (China Harbour Engineering Company Limited)	General Manager (S&E)	Daniel Leung	3157 1086	2578 0413
	Environmental Officer	Richard Ng	3693 2253	2578 0413
	24-hour Hotline	Alan C.C. Yeung	9448 0325	--
ET (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 Contract under the EP commenced on 12 March 2012.

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

Marine-based Works

- Cone penetration test;
- Geotextile laying and fabrication;
- Stone column installation trial;
- Silt curtain fabrication and deployment; and
- Stone column installation
- Maintenance of Silt curtain
- Silt curtain deployment and repairing
- Sand blanket trial
- Stone blankets laying.
- Band drain installation trial
- Stone column installation
- Construction of cellular structure
- Backfill cellular structure

Land-based Works

- Site office erection and construction at Works Area WA2;
- Public Works Regional Laboratory erection and construction at Works Area WA3;
- Maintenance works of Public Works Regional Laboratory at Works Area WA3
- Constructing site access at Works Area WA2 to Ying Hei Road, Tung Chung;
- Drainage works at Works Area WA2 and WA3;
- Geotextile fabrication at Works Area WA2 and WA4; and
- Stone column installation barges setup and their maintenance works at Works Area WA4.
- Silt curtain fabrication at Works Area WA2 and WA4;
- Hoarding erection at Work Areas Portion D and Works Area WA2
- Sign board erection at Works Area WA2

1.4.3 The construction programme of the Contract is shown in Appendix B.

1.4.4 The general layout plan of the Contract 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.

2 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

2.1 Monitoring Parameters

- 2.1.1 The Contract Specific EM&A Manual designated 4 air quality monitoring stations, 2 noise monitoring stations, 21 water monitoring stations (9 Impact Stations, 7 Sensitive Receiver Stations and 5 Control/Far Field Stations) to monitor environmental impacts on air quality, noise and water quality respectively. Pre-set and fixed transect line vessel based dolphin survey was required in two AFCD designated areas (Northeast and Northwest Lantau survey areas). The impact dolphin monitoring at each survey area should be conducted twice per month.
- 2.1.2 For impact air quality monitoring, monitoring locations AMS2 (Tung Chung Development Pier) and AMS7 (Hong Kong SkyCity Marriott Hotel) were set up at the proposed locations in accordance with Contract Specific EM&A Manual. The conditional omission of Monitoring Station AMS6 was effective since 19 November 2012. For monitoring location AMS3 (Ho Yu College), as proposed in the Contract 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. Due to hand over of work site where the AMS3A and NMS3A was located, it was proposed to EPD on 27 December 2014 to relocate both monitoring station to alternative location AMS3B and NMS3B and approval of such relocation was given by the EPD on 2 January 2014. The monitoring stations AMS3A and NMS3A were renamed to monitoring station AMS3B and NMS3B respectively after relocation on 29 January 2014.
- 2.1.3 For impact noise monitoring, monitoring locations NMS2 (Seaview Crescent Tower 1) was set up at the proposed locations in accordance with Contract Specific EM&A Manual. However, for monitoring location NMS3 (Ho Yu College), as proposed in the Contract 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 was adopted for this alternative noise monitoring location.
- 2.1.4 In accordance with the Contract Specific EM&A Manual, twenty-one 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 Contract/ ambient water quality conditions.
- 2.1.5 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. 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.
- 2.1.6 The monitoring locations used during the reporting period are depicted in Figures 2, 3 and 4 respectively.
- 2.1.7 The Contract Specific EM&A Manual also required environmental site inspections for air quality, noise, water quality, chemical, waste management, marine ecology and landscape and visual impact.

2.2 Environmental Quality Performance (Action/Limit Levels)

- 2.2.1 The environmental quality performance limits (i.e. Action and/or Limit Levels) of air, water quality and Chinese White Dolphin monitoring were derived from the baseline air and water quality monitoring results at the respective monitoring stations, while the environmental quality performance limits of noise monitoring were defined in the EM&A Manual.
- 2.2.2 The environmental quality performance limits of air quality, noise, water and Chinese White Dolphin monitoring are given in Appendix D.

2.3 Environmental Mitigation Measures

- 2.3.1 Relevant environmental mitigation measures were stipulated in the Particular Specification and EPs (EP-353/2009/I and EP-354/2009/D) (for TMCLKL Southern Landfall Reclamation only) for the Contractor to adopt. A list of environmental mitigation measures and their implementation statuses are given in Appendix C.

3 MONITORING RESULTS

3.1 Air Quality Monitoring

3.1.1 Introduction

- 3.1.1.1. In accordance with the Contract Specific EM&A Manual, impact 1-hour Total Suspended Particulates (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 at the 4 monitoring stations (AMS2, AMS3A/B¹, AMS6 and AMS7).
- 3.1.1.2. The monitoring locations for impact air quality monitoring are depicted in Figure 2. However, 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.
- 3.1.1.3. The weather was mostly sunny, with occasional cloudy and occasional rainy in the reporting period. The major dust source in the reporting period included construction activities from the Contract, as well as nearby traffic emissions.
- 3.1.1.4. The number of monitoring events and exceedances recorded in each month of the reporting period are presented in Table 3.1 and Table 3.2 respectively.
- 3.1.1.5. The baseline and impact air quality monitoring data are provided in the baseline monitoring report and monthly EM&A reports respectively. The graphical plots of the impact air quality monitoring results are provided in Appendix E. No specific trend of the monitoring results or existence of persistent pollution source was noted.

Table 3.1 Summary of Number of Monitoring Events for 1-hr & 24-hr TSP Concentration

Monitoring Parameter	Location	No. of monitoring events	
		Mar 13 – Feb 14	
1-hr TSP	AMS2	186	
	AMS3A/B ¹	186	
	AMS7	186	
24-hr TSP	AMS2	62	
	AMS3A/B ¹	62	
	AMS7	62	

Table 3.2 Summary of Number of Exceedances for 1-hr & 24-hr TSP Monitoring

Monitoring Parameter	Location	Level of Exceedance	Level of Exceedance	
			Mar 13 – Feb 14	
1-hr TSP	AMS2	Action	0	
		Limit	0	
	AMS3A/B ¹	Action	0	
		Limit	0	
	AMS7	Action	0	
		Limit	0	
Total			0	
24-hr TSP	AMS2	Action	0	
		Limit	0	
	AMS3A/B ¹	Action	11	
		Limit	5	

¹ The monitoring stations AMS3A was renamed to monitoring station AMS3B respectively after relocation on 29 January 2014.

	AMS7	Action	4
		Limit	0
	Total		20

3.1.2 Environmental Mitigation Measures

3.1.2.1 Relevant Air mitigation measures, as recommended in the EIA Report were stipulated in the EM&A Manual for the Contractor to adopt. The implementation status of air quality mitigation measures is depicted in Appendix C.

3.1.3 Summary of Actions Taken in the event of Non-Compliance

3.1.3.1 Other than the mitigation measures implemented as mentioned in Appendix C, in the event of non-compliance, actions were taken in accordance with the Event-Action Plan in the EM&A Manual. The Contractor was notified immediately. Investigation was carried out within three working days of identification of non-compliance such as identifying the air pollution sources, checking the implementation status of the mitigation measures, etc., and measurement was repeated to confirm the investigation findings. Further investigation was carried out to identify the source of pollution when deemed necessary. In summary, no direct evidence between the exceedance at AMS3A/B², AMS7 and the Hong Kong Boundary Crossing Facilities - reclamation works could be established for all non-compliances and therefore no action was required to be taken.

3.1.4 Review of Reasons for and the implications of Non-Compliance

3.1.4.1 A total of 15 Action level and 5 Limit Level exceedances were recorded during the 24-hr TSP impact monitoring period. No exceedance of 1-hour TSP exceedance level was recorded at all monitoring station during the 1-hr TSP impact monitoring period. Investigation into the possible causes of each exceedance was undertaken and reported in the respective monthly EM&A reports.

3.1.5 Environmental Acceptability of the Contract

3.1.5.1 Trend of 1-hour and 24-hour TSP

3.1.5.1.1 The 24-hour TSP monitoring results were well below the Action and Limit levels, despite the exceedance caused by non Contract activities at AMS3A/B² and few isolated events at AMS7. The trend of TSP at AMS2, AMS3A/B² and AMS7 were comparable to the baseline range and showed no noticeable deterioration of air quality during the impact monitoring period.

3.1.5.2 Correlation between exceedances with possible dust generating activities

3.1.5.2.1 Possible dust generating activities of the Contract did not cause any noticeable deterioration in air quality at Hong Kong Boundary Crossing Facilities – Reclamation Works. With proper implementation of air quality mitigation measures, the monitoring results showed no adverse air quality impact.

3.1.5.3 Comparison of EM&A results with EIA predictions

Table 3.3 Maximum Predicted TSP concentrations under the “Mitigated” scenario

ASR	Location	Predicted Daily Concentrations*		Average Impact 1-hour TSP Levels, µg/m ³	Average Impact 24-hour TSP Levels, µg/m ³
		1-hour	24-hour		

² The monitoring station AMS3A was renamed to monitoring station AMS3B respectively after relocation on 29 January 2014.

AMS7	Hong Kong SkyCity Marriott Hotel	344	92	80	72
------	----------------------------------	-----	----	----	----

*Extracted from Table 5-8 of the EIA report

3.1.5.3.1 At 1-hour and 24-hour TSP monitoring station at AMS7, the average 24-hour TSP levels recorded in the EM&A programme were in similar magnitude as the Daily dust level predicted in the EIA.

3.1.6 Practicality and Effectiveness of the EIA process and the EM&A programme

3.1.6.1 Monitoring and auditing of air quality was recommended for the construction phase of the Contract in the EIA to ensure no exceedance of the TSP standard at the sensitive receiver.

3.1.6.2 The air quality monitoring methodology was effective in monitoring the air quality impacts of the Contract. Baseline monitoring of 1-hour and 24-hour TSP helped to determine the ambient TSP levels at the sensitive receiver prior to commencement of construction works. During periods when there were possible dust generating construction activities, impact monitoring of 24-hour TSP helped to determine whether the Contract caused unacceptable air quality impacts on the sensitive receiver. As the scope of the Contract mainly includes reclamation works during the reporting period and dust generation from the construction activities such as wind erosion and sand filling is the key concern during the construction phase. The monitoring of TSP was therefore considered to be cost effective for the Contract.

3.1.6.3 All recommended mitigation measures were applicable to the Contract. As discussed above, the Contract did not cause unacceptable air quality impacts. However, as the nature of the Contract is reclamation works of approximately 130 hectares of land in size, some mitigation measures in practice were generally focused on dust generating activities only. Nevertheless, the mitigation measures implemented were effective and efficient in controlling air quality impacts.

3.1.6.4 Monitoring and audit of 24-hour TSP levels had ensured that any deterioration in air quality was readily detected and timely actions taken to rectify any non-compliance. Assessment and analysis of 24-hour TSP results collected throughout the baseline and impact monitoring periods also demonstrated the environmental acceptability of the Contract. Weekly site inspections had ensured that the EIA recommended air quality mitigation measures were effectively implemented. The EM&A program is considered to be cost effective.

3.1.7 Conclusion

3.1.7.1 Air quality monitoring for the Contract was conducted during the baseline and impact monitoring periods. Key construction activities including geotextile laying, stone column installation, stone blanket laying, construction of cellular structure and backfill cellular structure. The trend of 1-Hour TSP and 24-hour TSP was comparable to the baseline range and showed no noticeable deterioration of air quality during the monitoring period. Although exceedances were recorded, they were isolated and short-term events. There is no evidence of long-term deteriorating trend.

3.1.7.2 The average 24-hour TSP levels recorded at AMS7 in EM&A programme were in similar magnitude with the Daily dust level predicted in the EIA. No TSP level was predicted by the Project EIA at AMS2 and AMS3A/B³ and therefore, no comparison of EM&A data with EIA predictions could be made. Air quality mitigation measures implemented were effective in controlling air quality impacts.

³ The monitoring station AMS3A was renamed to monitoring station AMS3B respectively after relocation on 29 January 2014.

3.2 Noise Monitoring

3.2.1 Introduction

3.2.1.1 Impact noise monitoring was conducted at the 2 monitoring stations (NMS2 and NMS3A/B⁴) for at least once per week during 07:00 – 19:00 in the reporting period.

3.2.1.2 The monitoring locations used during the reporting period are depicted in Figure 2.

3.2.1.3 Major noise sources during the noise monitoring included construction activities of the Contract and nearby traffic noise.

3.2.1.4 The number of impact noise monitoring events and exceedances are summarized in Table 3.4 and Table 3.5 respectively.

Table 3.4 Summary of Number of Monitoring Events for Impact Noise

Monitoring Parameter	Location	No. of monitoring events
		Mar 13 - Feb 14
Noise	NMS2	48
	NMS3A/B ⁴	48

Table 3.5 Summary of Number of Monitoring Exceedances for Impact Noise

Monitoring Parameter	Location	Level of Exceedance	No. of Exceedance(s)	
Noise	NMS2	Action	0	
		Limit	0	
	NMS3A/B ⁴	Action	0	
		Limit	0	
	Total			0

⁴ The monitoring station NMS3A were renamed to monitoring station NMS3B after relocation on 29 January 2014.

3.2.1.5 The graphical plots of the trends of the monitoring results are provided in Appendix F. No specific trend of the monitoring results or existence of persistent pollution source was noted.

3.2.2 Environmental Mitigation Measures

3.2.2.1. Relevant noise mitigation measures, as recommended in the EIA Report were stipulated in the EM&A Manual for the Contractor to adopt. The implementation status of noise mitigation measures is depicted in Appendix C. Construction Noise Permits were applied and complied with when construction works were carried out during restricted hours.

3.2.3 Non-compliance (exceedances) of the Environmental Quality Performance Limits (Action and Limit Levels)

3.2.3.1 Summary of Non-compliance (Exceedances)

3.2.3.1.1 Table 3.5 summarised the number exceedance recorded at each monitoring station throughout the impact monitoring period. There was no exceedance recorded at both NMS2 and NMS3A/B⁵.

3.2.3.1.2 One complains was received; one (1) Action Level Exceedance of construction noise was recorded in the reporting period. Investigation into the possible causes of such exceedance was undertaken and reported in the respective monthly EM&A reports, the investigations results confirmed that the limit level exceedance was not related to Contract.

3.2.3.2 Summary of Actions Taken in the event of Non-Compliance

3.2.3.2.1 Investigation was carried out within three working days of identification of non-compliance. Assessments showed that all exceedances were not due to the works and therefore no action was required to be taken and these were verified by the IEC.

3.2.3.3 Review of Reasons for and the implications of Non-Compliance

3.2.3.3.1 There was one (1) action level exceedance recorded due to one noise complaint was received. Investigation into the possible causes of each exceedance was undertaken and reported in the respective monthly EM&A reports.

3.2.3.3.2 In summary, the average impact noise levels recorded in the reporting period were generally within the range of the predicted construction noise levels in the Project EIA.

3.2.4 Environmental Acceptability of the Contract

3.2.4.1 Trend of Measured Noise Level (Leq)

3.2.4.1.1 Other than an isolated event, the noise monitoring results for all monitoring stations were below the Limit levels. The trend showed no noticeable noise impact from the Contract during the impact monitoring period.

3.2.4.2 Correlation between exceedances with possible noise generating activities

3.2.4.2.1 No Exceedance was recorded for all monitoring stations. The impact noise levels recorded were generally similar to the predicted construction noise levels in the Project EIA.

3.2.4.2.2 For the complaint received during the monitoring period, investigation results confirmed that such exceedance was not related to the major construction activities of the Contract. Field observations indicated that construction activities, like sheet piling, percussive piling and excavation, were carrying out in nearby private developments (which are located at eastern and southern side of the Works Area WA2) during the course of monitoring, which contribute to the measured noise level. Therefore,

⁵ The monitoring station NMS3A were renamed to monitoring station NMS3B after relocation on 29 January 2014.

noise generating activities of the Contract did not cause any noticeable noise impact at the sensitive receivers.

3.2.5 Comparison of EM&A results with EIA predictions

3.2.5.1 The EIA predicted that noise emitted by the use of Powered Mechanical Equipment (PME) on site would be the major source of noise impact during construction. The Construction Noise Impact at Noise Sensitive Receivers are summarised in Table 3.6 (extracted from Table 6-9 of the EIA Report).

Table 3.6 Construction Noise Impact at Noise Sensitive Receivers

NSR	Location	Predicted Noise Levels, dB(A)	
		Total Noise Impacts, dB(A)	Criterion, dB(A)
NMS2	Seaview Crescent Tower 1	74	75

3.2.5.2 During the construction period of the Contract, one (1) noise complaint was received in the impact monitoring period. The measured impact noise levels of the Contract for each monitoring station are summarised in Table 3.7 for comparison with EIA.

Table 3.7 Summary of Construction Noise Monitoring Results in the Reporting Period

NSR	Location	Average, dB(A),	Range, dB(A),	Limit Level, dB(A),
		Leq,30 mins	Leq,30 mins	Leq,30 mins
NMS2	Seaview Crescent Tower 1	66	62 - 68*	75
NMS3A/B ⁺	Site Boundary of Site Office Area at Works Area WA2	65	57 - 69*	70

* +3dB(A) Façade correction included

3.2.5.3 The average impact noise levels recorded in EM&A during impact monitoring were all within the range of the predicted construction noise levels in the EIA Report. ET's assessment had shown that exceedances recorded were not due to the works of Reclamation Works and this had been verified by the IEC.

3.2.6 Practicality and Effectiveness of the EIA process and the EM&A programme

3.2.6.1 Monitoring and auditing of noise was recommended for the construction phase of the Contract in the EIA process to ensure compliance with the appropriate criterion at the receivers.

3.2.6.2 The noise monitoring methodology was effective in monitoring the noise impacts of the Contract. Baseline noise monitoring determined the ambient noise levels at the sensitive receivers prior to commencement of construction works. During periods when possible noise generating construction activities were on-going, impact noise monitoring would determine whether the Contract caused adverse noise impacts on the sensitive receivers. The monitoring methodology which focus on $L_{eq,30\text{ minute}}$ therefore considered to be cost effective for the Contract.

3.2.6.3 Noise mitigation measures recommended in the EIA Report were stipulated in the EM&A Manual for the Contractor to implement during the construction phase of the Contract. The list of noise mitigation measures is depicted in Appendix C. All recommended mitigation measures were applicable to the Contract. As discussed above, the Contract did not cause adverse noise impacts to the receivers. Therefore, the mitigation measures implemented were effective and efficient in controlling noise impacts.

3.2.6.4 Monitoring and audit of noise levels ensured that any noise impact to the receivers would readily be detected and timely actions could be taken to rectify any non-compliance. Assessment and analysis of noise results collected throughout the baseline and impact monitoring periods also demonstrated the environmental acceptability of the Contract. Weekly site inspections ensured that the EIA

recommended noise mitigation measures were effectively implemented. The EM&A program is considered to be cost effective.

3.2.7 Conclusion

- 3.2.7.1 The trend of L_{eq} was comparable to the baseline range and showed no noticeable noise impact during the impact monitoring period. Although exceedance was recorded, there was no evidence of long-term increasing trend. The average impact noise levels recorded in EM&A programme were all lower than the construction noise levels predicted in the EIA.

3.3 Water Quality Monitoring

3.3.1 Introduction

3.3.1.1 Impact water quality monitoring was conducted 3 times per week during mid-ebb and mid-flood tides at 21 water monitoring stations (9 Impact Stations, 7 Sensitive Receiver Stations and 5 Control/Far Field Stations).

3.3.1.2 The monitoring locations used during the reporting period are depicted in Figure 3.

3.3.1.3 Number of impact water quality monitoring events and exceedances recorded in the reporting period at each impact station are summarized in Table 3.8 and Table 3.9 respectively.

Table 3.8 Summary of Number of Monitoring Events for Impact Water Quality

Monitoring Parameter	Tide	No. of monitoring events	
		Mar 13 - Feb 14	
Water Quality	Mid-Ebb	155	
	Mid-Flood	155	

Table 3.9 Summary of Water Quality Exceedances in Mar 13-Feb 14

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	1 (10 June 13)	0	0	0	3 (7 Aug 13, 22 Nov 13; 10 Jan14)	0	4
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)6	Action	0	0	0	0	0	0	2 (11 Nov 13 and 16 Sept 13)	4 (8 May 13, 7 Aug 13; 11 & 20 Nov 13)	2	4
	Limit	0	0	0	0	0	0	0	0	0	0
IS7	Action	0	0	0	0	0	0	0	4 (8 May 13; 7 Aug 13; 20 Nov 13 and 18 Oct 13)	0	4
	Limit	0	0	0	0	0	0	0	0	0	0
IS8	Action	0	0	0	0	0	0	0	3 (10 Apr and 8 May, 13; 6 Jan14)	0	3
	Limit	0	0	0	0	0	0	0	1 (20 Dec13)	0	1

Station	Exceedance Level	DO (S&M)		DO (Bottom)		Turbidity		SS		Total	
		Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood
IS(Mf)9	Action	0	0	0	0	0	0	1 (8 May 13)	7 (8 May 13, 15 Nov13, 4 Oct 13 and 6 Sept 13; 18 Dec 13; 6 & 15 Jan14)	1	7
	Limit	0	0	0	0	0	0	0	(1) 17 Jan14	0	1
IS10	Action	0	0	1 (10 June 13)	1 (10 June 13)	0	0	0	4 (26 July 13; 6 Nov13, 7 Oct 13 and 30 Sept 13)	1	5
	Limit	0	0	0	0	0	0	0	(2) 25 Oct 13; 18 Dec13	0	2
IS(Mf)11	Action	0	0	1 (10 June 13)	1 (10 June 13)	0	0	0	0	1	1
	Limit	0	0	0	0	0	0	0	0	0	0
IS(Mf)16	Action	0	0	0	0	0	0	5 (29 Mar 13, 23 Aug 13; 4 & 22 Nov 13 and 04 Oct 13)	3 (22 Apr 13; 16 Oct 13; 21 Feb14)	5	3
	Limit	0	0	0	0	0	0	0	0	0	0
IS17	Action	0	0	0	0	0	1 (29 Apr 13)	2 (4 & 15 Nov 13)	0	2	1
	Limit	0	0	0	0	0	0	0	0	0	0
SR3	Action	0	0	0	0	0	0	0	3 (7 Aug 13; 22 Nov13; 10 Jan14)	0	3
	Limit	0	0	0	0	0	0	0	0	0	0

Station	Exceedance Level	DO (S&M)		DO (Bottom)		Turbidity		SS		Total	
		Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood	Ebb	Flood
SR4(N)	Action	0	0	0	0	0	0	0	3 (10 Apr 13; 13 Nov13 and 18 Sept 13)	0	3
	Limit	0	0	0	0	0	0	1 (24 June 13)		1	0
SR5	Action	0	0	0	0	0	0	0	7 (26 Apr 13; 26 and 31 July 13; 6 Nov13, 7 Oct 13 and 30 Sept 13; 18 Dec 13)	0	7
	Limit	0	0	0	0	0	0	0	2 (29 Mar 13; 25 Oct 13)	0	2
SR6	Action	0	0	0	0	0	0	0	2 (6 Nov13; 3 Jan14)	0	2
	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	1 (6 Dec13)	0	1
	Limit	0	0	0	0	0	0	0	0	0	0
SR10B (N)	Action	0	0	0	1 (10 June 13)	0	0	0	2 (6 Nov13; 21 Oct 13)	0	3
	Limit	0	1 (10 June 13)	0	0	0	0	0	0	0	1
Total	Action	0	0	2	4	0	1	10	46	63	
	Limit	0	1	0	0	0	0	1	6	8	

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

3.3.1.4 Please refer to the monthly EM&A report (March 2013 to February 2014) accordingly for the details of the captioned exceedances.

3.3.1.5 The graphical plots of the trends of the monitoring results are provided in Appendix G. No specific trend of the monitoring results or existence of persistent pollution source was noted.

3.3.2 Environmental Mitigation Measures

3.1.2.1 Relevant water quality mitigation measures, as recommended in the EIA Report were stipulated in the EM&A Manual for the Contractor to adopt. The implementation status of water quality mitigation measure is depicted in Appendix C.

3.3.3 Non-compliance (exceedances) of the Environmental Quality Performance Limits (Action and Limit Levels)

3.3.3.1 Summary of Non-compliance (Exceedances)

3.3.3.1.1 Table 3.9 summarised the number of dissolved oxygen, turbidity and suspended solids exceedances recorded at each sensitive receiver station throughout the impact monitoring period. A total of 71 exceedances were recorded during the entire construction period with 63 Action level exceedances and 8 Limit level exceedances.

3.3.4 Review of Reasons for and the implications of Non-Compliance

3.3.4.1 Fifty-six (56) Action Level exceedances and seven (7) Limit Level exceedances were recorded at measured suspended solids (SS) values (in mg/L), one (1) Action Level exceedances were recorded at measured turbidity (in NTU), six (6) Action Level exceedance was recorded at measured DO (Bottom) (mg/L) and one (1) Limit Level exceedance was recorded at measured DO (S&M) (mg/L) during the reporting period. Investigation result shows that all the exceedances were not due to the Contract works except the Action Level Exceedance recorded at SR5 and Limit Level Exceedance recorded at IS10 on 18 Dec 13 were related to Contract.

3.3.4.2 The exceedances note at IS10 and SR5 on 18 Dec 13 were considered as Contract related. The silt curtain integrity checking record on 4 January 14 shows that the disconnected silt curtain observed on 18 Dec 13 at northwest of HKBCF were rectified and the Contractor was further reminded to ensure provision of ongoing maintenance to the silt curtains and to carry out maintenance work once defects were found. For details of investigation please refer to monthly EM&A Report December 2014.

3.3.4.3 After review of the investigation results of the water quality exceedances (for detail of investigations please refer to section 4 of monthly EM&A report (Mar 13 to Feb 14), ambient conditions were considered to have effects on the water quality monitoring results. Exceedances were considered to be due to a combination of the following potential causes: 1. Rough sea condition caused by adverse weather and relatively strong current experienced during the monitoring period and 2. During the time when exceedances of DO were recorded at monitoring stations, relatively low DO values were also recorded at corresponding upstream Control Stations during ebb tide or flood tides indicating these exceedances of DO were unlikely to be contributed by Contract works. This indicated these exceedances of DO were unlikely to be contributed by Contract works. 3. Local effects in the vicinity of the monitoring station where exceedance was recorded.

3.3.5 Environmental Acceptability of the Contract

3.3.5.1 Trend of water quality

Dissolved Oxygen

3.3.5.1.1 The dissolved oxygen levels recorded in the impact monitoring period showed a seasonal trend in which lower DO levels were recorded during the wet season and higher DO levels were recorded during the dry season. One reason for this seasonal trend may have been the increase in water temperature during the wet season leading to decreases in the solubility of oxygen in water and vice

versa during the dry season. The trend of dissolved oxygen levels was presented in Appendix G. Other than an isolated action level exceedance, the trend of dissolved oxygen levels at each monitoring stations in Appendix G did not show any noticeable deterioration of dissolved oxygen levels.

Turbidity

3.3.5.1.2 The turbidity levels were fairly distributed at most monitoring station during the reporting period. While trend of turbidity levels at impact station IS17, IS(Mf)16, IS(Mf)9 and IS(Mf)6 were more fluctuated and a higher turbidity level were recorded from March 13 to May 13 and from October 13 to December 13. The trend of turbidity levels of each monitoring station was shown in Appendix G. However, despite one isolated event, turbidity levels of all monitoring stations were still lower than the Action Level during the monitoring period.

Suspended Solids

3.3.5.1.3 The trend of suspended solid levels of each impact monitoring station was shown similar with the control stations of each tide, i.e , slightly fluctuated between the period from September to December 2012. The trend of suspended solid levels of each monitoring station was shown in Appendix G.

3.3.6 Correlation between exceedances with possible marine construction activities

3.3.6.1 With proper implementation of water quality mitigation measures, marine construction activities of the Contract were not observed to cause any unacceptable water quality impacts to the sensitive receiver stations.

Table 3.10 Summary of number of water quality exceedances per monitoring month

Month	Sand Filling Rate m ³ /month	Depth averaged DO	Depth averaged Turbidity	Depth averaged SS	Total
Mar-13	52568	0	0	2	2
Apr-13	119967	0	1	4	5
May-13	448159	0	0	5	5
Jun-13	245188.5	7	1	1	9
Jul-13	252327.4	0	0	3	3
Aug-13	287182.6	0	1	5	6
Sep-13	368995	0	0	5	5
Oct-13	602966	0	0	8	8
Nov-13	593481	0	0	15	15
Dec-13	930460	0	0	5	5
Jan-14	952135	0	0	7	7
Feb-14	886830	0	0	1	1

- 3.3.6.2 As shown in Table 3.10, there was no apparent correlation between the dredging and filling rates and the number of water quality exceedances recorded per monitoring day.
- 3.3.6.3 For dissolved oxygen, the numbers of dissolved oxygen exceedances show no noticeable deterioration of dissolved oxygen or correlation between filling rate and dissolve oxygen exceedance.
- 3.3.6.4 For turbidity, the numbers of turbidity exceedances show no noticeable deterioration of turbidity or correlation between filling rate and turbidity exceedance.
- 3.3.6.5 For suspended solids, the numbers of suspended solids exceedances show no noticeable deterioration of suspended solid or correlation between filling rate and suspended exceedance.
- 3.3.6.6 The trend did not show any correlation between water quality impact and the filling rates during the impact monitoring period.
- 3.3.6.7 With proper implementation of water quality mitigation measures, marine construction activities of the Contract were not observed to cause any unacceptable water quality impacts to the sensitive receiver stations.

3.3.7 Comparison of EM&A results with EIA predictions

3.3.7.1 Results from the sensitive receiver stations were compared with the EIA predictions for the sensitive receivers in the following manner:

- WSR 27 - San Tau Beach SSSI with SR3
- WSR 22c- Tai Ho Wan Inlet (outside) with SR4(N)
- WSR 25 - Cooling water intake at HK International Airport with SR5

Dissolved oxygen (DO)

- 3.3.7.2 According to Section 9.10.7.4 of the EIA Report, the dissolved oxygen depletion from the loss of sediment to suspension during the construction of the reclamation for HKBCF was calculated to be 0.4 mg/L at WSR25. Since, as stated in the Table 9.6a of the EIA report the DO of the NW Western water is generally high with average ranges between 5.7 – 6.8 mg/L and depletion will not be detrimental to the ecological systems of the area. The average Depth averaged DO record at SR5 is 7.8 mg/L in January 2014 when the filling rate/month is the highest during the reporting period and therefore no significant dissolved oxygen depletion from was noted during impact monitoring.
- 3.3.7.3 The baseline dissolved oxygen levels and the level of depletion during impact monitoring at each sensitive receiver are summarised in Tables 5.7.

Table 3.11 Comparison of depth averaged dissolved oxygen levels (Surface & Mid-depth, Bottom depth) during baseline and impact monitoring period (mgL⁻¹)

Sensitive Receiver in Baseline	Associated Location during Impact Monitoring	Monitoring Depth	Baseline mean		Impact mean (January 2014)		Depletion during Impact Monitoring	
			Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
SR3	SR3*	Surface & mid	6.8	6.7	8.3	8.2	-1.5	-1.5
		Bottom	-	6.2	-	-	-	-
SR4 [^]	SR4(N)**	Surface & mid	6.1	6.3	8.1	8.2	-2	-1.9
		Bottom	6.0	6.2	8.1	8.2	-2.1	-2
SR5	SR5**	Surface & mid	6.4	6.3	7.8	7.8	-1.4	-1.5
		Bottom	6.1	6.1	7.8	7.7	-1.7	-1.6
SR6	SR6**	Surface & mid	6.6	6.5	7.8	7.8	-1.2	-1.3
		Bottom	6.2	6.1	7.8	7.8	-1.6	-1.7
SR7	SR7**	Surface & mid	6.3	6.0	7.8	7.9	-1.5	-1.9

		Bottom	6.1	5.9	7.8	7.9	-1.7	-2
SR10A	SR10A	Surface & mid	6.0	6.0	7.7	7.7	-1.7	-1.7
		Bottom	5.7	5.8	7.7	7.7	-2	-1.9
SR10B^	SR10B(N)**	Surface & mid	6.1	6.0	7.7	7.8	-1.6	-1.8
		Bottom	6.2	5.8	7.7	7.8	-1.5	-2

^Due to safety issue, the water quality monitoring location of SR4 has been changed to SR4(N) during impact monitoring.

*Only mid-depth station of DO were monitored at SR3 in mid-ebb during baseline monitoring, in both mid-ebb and mid-flood during impact monitoring as the water depth less than 3m.

** The mid-depth station of DO was omitted at SR4(N) during impact monitoring as the water depth is less than 6m.

3.3.7.4 Comparing baseline averaged dissolved oxygen levels with EM&A results; no significant depletion was found at all sensitive receiver locations. There was no adverse effect on dissolved oxygen concentrations as a result of the filling works of the Contract as the depleted dissolved oxygen concentrations did not breach the Water Quality Objectives nor did they exceed the AL levels adopted for the Contract.

Suspended solids (SS)

3.3.7.5 The EIA determined the acceptability of elevations in suspended sediment concentrations based on the Water Quality Objectives. The Water Quality Objectives for suspended sediments for the North Western Water Control Zones were defined as being an allowable elevation of 30% above the background. The ambient and tolerance values for suspended sediment concentrations in the vicinity of sensitive receivers adopted in Table 9.11 of the EIA Report are presented in Table 3.12.

Table 3.12 Ambient and Tolerance Values for Suspended Sediment Concentrations (mgL⁻¹) in the Vicinity of Sensitive Receivers adopted in the EIA

Sensitive Receiver in EIA Report	Associated EPD Station	Ambient value (90th Percentile)		Tolerance value (30% Tolerance)	
		Dry Season	Wet Season	Dry Season	Wet Season
WSR 27	NM5,6,8	8.3	5.6	2.5	1.7
WSR 22c	NM1,2,3	5.5	3.7	1.7	1.1
WSR 25	NM1,2,3	5.5	3.7	1.7	1.1

3.3.7.6 The use of single layer silt curtain system has been modelled in the 2012 mitigated scenario. The predicted suspended sediment concentrations under the 2012 mitigated scenario of the Contract as shown in Table 9.21 in the EIA Report are summarised in Table 3.13.

Table 3.13 Calculated Elevations in Suspended Sediment Concentrations at Sensitive Receivers (mgL⁻¹) under the 2012 mitigated scenario from the EIA

Sensitive Receiver in EIA Report	Associated Location during Impact Monitoring	Calculated Elevations	
		Dry Season	Wet Season
WSR 27	SR3	0.0	0.0
WSR 22c	SR4(N)	0.1	0.0
WSR 25	SR5	3.0	2.7

- 3.3.7.7 For suspended solids, as the baseline monitoring was conducted in October 2011 which is the transitional season or just the start of dry season while no data were recorded in the wet season, direct comparison with the EIA predictions could not be made. The comparison of EM&A results with baseline results in the following paragraphs was based on the criteria of acceptability of 30 percent elevations above the background as defined in the Water Quality Objectives which was also used in scenario predictions in the EIA.
- 3.3.7.8 Baseline water quality monitoring for the Contract was conducted during the transitional season. The mean baseline suspended solids level at each sensitive receiver and 30 percent of the baseline mean are presented in Table 3.14.

Table 3.14 Baseline suspended solids levels and 30% of baseline mean (mgL⁻¹)

Associated Location in Baseline Report	Baseline mean		30% of baseline mean	
	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
SR3	14.0	16.3	4.2	4.9
SR4	11.3	12.2	3.4	3.7
SR5	10.6	11.9	3.2	3.6
SR6	11.9	11.9	3.6	3.6
SR7	11.4	10.4	3.4	3.1
SR10A	10.2	10.2	3.1	3.1
SR10B	11.5	11.1	3.5	3.3

3.3.7.9 The average elevations in suspended solids concentrations of January 2014 were compared with the baseline levels are provided in Table 3.15.

Table 3.15 Average suspended solids levels at sensitive receivers (mgL⁻¹) in January 2014

Sensitive Receiver in Baseline	Associated Location during Impact Monitoring	Impact SS Mean (in January 2014)			
		Mid-ebb	Elevation	Mid-flood	Elevation
SR3	SR3	9.1	-4.9	11.3	-5.0
SR4	SR4(N)*	7.2	-4.1	8.8	-3.4
SR5	SR5	7.7	-2.9	11.6	-0.3
SR6	SR6	7.4	-4.5	11.4	-0.5
SR7	SR7	8.8	-2.6	9.5	-0.9
SR10A	SR10A	5.1	-5.1	8.0	-2.2
SR10B	SR10B(N)*	5.2	-6.3	7.7	-3.4

*Due to safety issue, the water quality monitoring location of SR4 & SR10b have been changed to SR4(N) & SR10B(N) respectively during impact monitoring.

3.3.7.10 With the highest filling rate in January 2014, the elevations in suspended solids levels were below 30 percent of the baseline suspended solids levels at all stations. Regional influences would have effects on the deterioration in water quality than activities at the work site. A combination of the following potential causes: 1. Rough sea condition caused by adverse weather and relatively strong current experienced during the monitoring period and 2. During the time when exceedances of DO were recorded at monitoring stations, relatively low DO values were also recorded at corresponding upstream Control Stations during ebb tide or flood tides indicating these exceedances of DO were unlikely to be contributed by Contract works. This indicated these exceedances of DO were unlikely to be contributed by Contract works. 3. Local effects in the vicinity of the monitoring station where exceedance was recorded.

3.3.8 Practicality and Effectiveness of the EIA process and the EM&A programme

3.3.8.1 Monitoring and audit of water quality was recommended for the construction phase of the Contract in the EIA process to ensure any deterioration in water quality would be readily detected and timely action could be taken to rectify the situation.

3.3.8.2 Baseline water quality monitoring determined the ambient water quality in the region prior to commencement of construction works. Impact water quality monitoring helped to determine whether the Contract would cause unacceptable water quality impacts on the sensitive receivers. Post-Contract water quality monitoring upon completion of all marine construction activities helped to demonstrate the return of ambient conditions that existed prior to commencement of the construction works.

3.3.8.3 Water quality mitigation measures were recommended in the EIA and a list of water quality mitigation measures were stipulated in the EM&A Manual for the Contractor to implement during the construction phase of the Contract. The list of water quality mitigation measures is depicted in Appendix C. All recommended mitigation measures were applicable to the Contract. Precautionary measures including installation of silt curtains were also implemented to prevent migration of suspended solids towards the sensitive receivers. Monitoring results showed that water quality at sensitive receivers was affected by regional water quality influenced by tidal and climatic conditions, local impacts from the vicinity of the receivers. As discussed above, the Contract was not observed to cause unacceptable water quality impacts to the sensitive receivers. Therefore, the mitigation measures implemented were effective and efficient in controlling water quality impacts.

3.3.8.4 Monitoring and audit of water quality ensured that any water quality impacts to the receivers would be readily detected and timely actions could be taken to rectify any non-compliance. Assessment and analysis of water quality results collected throughout the baseline, impact and post-Contract monitoring periods also demonstrated the environmental acceptability of the Contract. Weekly site

inspections ensured that the EIA recommended water quality mitigation measures were effectively implemented.

3.3.9 Conclusion

- 3.3.9.1 Water quality monitoring for the Contract was conducted during the baseline and impact monitoring periods. For dissolved oxygen, turbidity and suspended solids levels, a total of 36 exceedances were recorded. Assessment indicated that there was no correlation between the filling rates and the number of water quality exceedances recorded. Exceedances were considered to be due to a combination of factors including 1. Rough sea condition caused by adverse weather and relatively strong current experienced during the monitoring period and 2. During the time when exceedances of DO were recorded at monitoring stations, relatively low DO values were also recorded at corresponding upstream Control Stations during ebb tide or flood tides indicating these exceedances of DO were unlikely to be contributed by Contract works. This indicated these exceedances of DO were unlikely to be contributed by Contract works. 3. Local effects in the vicinity of the monitoring station where exceedance was recorded.
- 3.3.9.2 The DO and SS levels recorded at SR3, SR4 (N) and SR5 were in similar magnitude as predicted in the Project EIA. No comparison could be made from SR6 to SR10B(N) as predictions were not made in the Project EIA. For turbidity, as no prediction was made in the Project EIA, no comparison could be made. With the implementation of water quality mitigation measures recommended in the EIA and water quality mitigation measures implemented during the EM&A programme, marine construction activities of the Contract did not cause any unacceptable water quality impacts to the sensitive receivers.

3.4 Dolphin Monitoring

3.4.1 Introduction

- 3.4.1.1 In accordance with the requirements specified in Section 9.3 of the EM&A Manual, monthly vessel-based surveys were conducted to monitor impacts on the Indo-Pacific humpback or Chinese white dolphin (*Sousa chinensis*). The surveys were conducted in the areas known as NEL and NWL and travelled the transect lines depicted in Figure 4.
- 3.4.1.2 The total transect length for NEL and NWL combined is approximately 111km although some Contract and other works at times have caused temporary truncation of some lines, particularly lines 1,2,9 and 10.
- 3.4.1.3 Surveys were conducted twice per month, using combined line transect and photo-identification techniques. The research team comprised qualified and experienced researchers and Marine Mammal Observers (MMO).
- 3.4.1.4 The mitigation measures for dolphins are included in the Environmental Permit for this Contract are included in Appendix C.

3.4.2 Environmental Mitigation Measures

- 3.4.2.1 Relevant mitigation measures for dolphins, as recommended in the EIA Report were stipulated in the EM&A Manual for the Contractor to adopt. The implementation status of mitigation measures for dolphins is depicted in Appendix C.

3.4.3 Summary of Actions Taken in the event of Non-Compliance

- 3.4.3.1 Action Level and Limit Level (AL/LL) values were implemented during this reporting period. This Contract reports on AL/LL relevant to NEL and NWL monitoring areas (see Appendix D; Table 5).
- 3.4.3.2 One (1) Limit level exceedance and Six (6) Action Level Exceedances were recorded in the reporting period for impact dolphin monitoring. The investigation results showed that although no unacceptable changes in environmental parameters of this Contract have been measured, at this time it is not possible to make a conclusive assessment of this Contract's specific impact on dolphins. Event and Action Plan for Impact Dolphin Monitoring was triggered. For investigation results please refer to Appendix L of the corresponding quarterly reports.

Table 3.16 Summary of Dolphin Monitoring Limit level and Action level Exceedances

Quarterly period		STG*	ANI**	Level Exceeded
March 2013- May 2013	NEL	0.0	0.0	Limit Level
	NWL	3.0	8.6	
June 2013- August 2013	NEL	1.8	1.8	Action
	NWL	5.7	16.6	Action
September 2013- November 2013	NEL	0.0	0.0	Action
	NWL	6.7	24.7	Action
December 2013- February 2014	NEL	0.5	0.5	Action
	NWL	4.5	20.7	Action

* STG represents groups of dolphins (recorded on effort)

** ANI represents number of individual dolphins (recorded on effort)

3.4.4 Summary of Survey Effort and Dolphin Sightings

3.4.4.1 Vessel-based surveys have been conducted monthly from March 2013 to February 2014, i.e., during the second year of the construction phase. A total of 50 survey days were completed between March 2013-February 2014 (Table 1 of Appendix H). A total of 2667.1km were completed whereas 2595.4km were conducted under favourable conditions (defined as Beaufort Sea State 3 or better and with visibility of >1km) between March 2013-February 2014 (Table 2 of Appendix H). Between March 2013-February 2014, a total of 135 dolphin sightings were recorded, 91 as on effort and 44 as opportunistic⁶ (Figure 1 of Appendix H). In the first year of impact monitoring (2012-13), 49 survey days were completed, with a total of 2627.5km completed with 2601.4km were conducted under favourable conditions. In both years, >97% of the total track length covered was under favourable conditions. In the first year of impact monitoring, a total of 203 dolphin sightings were recorded, 145 as on effort and 58 as opportunistic. The total number of sightings has decreased between the first and second year and year two of impact monitoring.

3.4.5 Distribution

3.4.5.1 Sightings of dolphins were divided into quarterly periods and an increase then decrease in the number of sightings is depicted as the year progresses through each quarter, i.e., lowest use in March – May 2013, high use in June – November 2013 and, again, lower use in December 2013-February 2014. NEL is used during the summer and autumn periods when the number of sightings in Hong Kong waters is highest (Figure 2 of Appendix H). This is a similar pattern to the first year of impact monitoring, although the overall number of sightings within NEL during the second year of monitoring is less.

3.4.6 Encounter Rate

3.4.6.1 Encounter rates of “on effort” sightings (i.e., groups) per area per quarter for this reporting period⁷. For NEL, so few sightings occurred that trends are difficult to discern; the highest number of dolphins were encountered in Summer months (June – August) with an encounter rate of < 1 (encounters per 100km surveyed) for the rest of the year. NWL encounter rates show a distinct patterns of increasing rate from spring to summer with the lowest rate recorded in winter. This pattern is also apparent in the long term monitoring data collated by AFCD. Observation of encounter rates for both areas combined indicates that winter and spring encounter rates are reduced when compared to summer and autumn. This trend is apparent in the first year of impact monitoring too. In both years one and two of impact monitoring, no on effort encounters were noted in the quarter March – May in NEL. NEL encounter rates for other quarters are lower in year two, ranging from 2 to 6 dolphins (Year 1) to <1 to 2 dolphins (Year 2) per 100km effort. Within NWL, quarterly encounter rates range from 3 to 6 dolphins (Year 1) and 5 to 9 dolphins (Year 2) per 100km on effort.

3.4.7 Group Size

3.4.7.1 The majority of all sightings recorded were of less than five individual dolphins (75%). Mother and calves were often associated with larger groups (5 or more individual dolphins) and it has been hypothesised that these large groups provide protection and support to calves and mothers. In Hong Kong waters in the past, larger groups have been associated with active fishing trawlers, although trawling was discontinued in Hong Kong prior to the period that this report covers. There is no particular behavioural activity associated with larger group size and the distribution of larger groups is not focused in any particular area (Figure 4 of Appendix H). In the first year of impact monitoring, larger group sizes were associated with fishing vessels. As trawlers are now prohibited in Hong Kong

⁶ “On effort” sightings are classified as those sightings which are made when the vessel is on the designated trackline and observers are actively searching. “Opportunistic sightings” are those sightings which occur while travelling between tracklines, additional sightings made when travelling back to a transect line after photographing a dolphin group and/or any dolphins noted when transiting between areas or on passage to transect lines.

⁷ The same calculation as implemented in the AFCD Annual Monitoring Reports was used; [(total ‘on effort’ sightings/total track conducted in Beaufort Sea State 3 or better)*100] for both NEL and NWL separately and for the two areas combined.

waters, there were fewer larger groups recorded between years, may be due to the absence of these trawlers.

3.4.8 Habitat use

- 3.4.8.1 The EM&A Manual stipulated that surveys be conducted in such a way as to be comparable to the baseline survey for this Contract (September -November 2011) and to the long term annual monitoring conducted by AFCD. As such, analyses of density per survey effort (DPSE) and sightings per survey effort (SPSE) were calculated in accordance with the methodology detailed in AFCD reports (e.g., AFCD 2012⁸). The survey areas are divided into 1km x 1km squares and the relative number of sightings and densities are calculated for each block. NEL has 55 blocks and NWL has 90 blocks (only blocks of more than 0.75km² are included). For the period March 2013-February 2014, DPSE was calculated in six categories, ranging from low use to high use. NEL and NWL have 0% and 10% of each respective area classified as high use (> 60 DPSE); 0% (NEL) and 14% (NWL) as moderate use (20.1-60 DPSE); and 100% (NEL) and 76% (NWL) as low use (< 20 DPSE). (Figure 5 of Appendix H).
- 3.4.8.2 For the period March 2013-February 2014, SPSE was calculated in six categories, ranging from low use to high use. NEL and NWL have 0% and 8% of each respective area classified as high use (> 15 SPSE); 9% (NEL) and 20% (NWL) as moderate use (5.1-15 SPSE); and 91% (NEL) and 72% (NWL) as low use (< 5 SPSE) (Figure 6 of Appendix H).
- 3.4.8.3 For the period February 2011 – January 2012, DPSE was calculated in six categories, ranging from low use to high use. NEL and NWL have 4% and 17% of each respective area classified as high use (> 60 DPSE); 20% (NEL) and 16% (NWL) as moderate use (20.1-60 DPSE); and 76% (NEL) and 68% (NWL) as low use (< 20 DPSE) (Figure 7 of Appendix H). These figures were compared to impact monitoring data for March 2013-February 2014 (Table 3 of Appendix H). For DPSE in NWL, there was an increase in low use grid cells, a decrease in moderate use cells and a decrease in high use cells. Noting the geographical location of the cells between advanced and impact monitoring, (Figures 8 of Appendix H) there are less high use cells in the centre of the NWL area indicating that habitat utilisation of this area has decreased. In NEL, no more high use areas are noted, only low use. The previously most frequented areas adjacent to the Brothers islands are still frequented by dolphins, however, the area along the coast of northern Lantau which was previously frequented by dolphins, has no sightings. This indicates that fewer dolphins occur in NEL and the area they use has reduced. Looking at the pattern observed in year one of impact monitoring, a higher density of dolphins occurred close to HKBCF compared to advanced monitoring, however, by year two, the number and area in which the dolphins occur has reduced.
- 3.4.8.4 For the period February 2011 – January 2012, SPSE was calculated in six categories, ranging from low use to high use. NEL and NWL have 9% and 22% of each respective area classified as high use (> 15 SPSE); 31% (NEL) and 27% (NWL) as moderate use (5.1-15 SPSE); and 60% (NEL) and 51% (NWL) as low use (< 5 SPSE) (Figure 7 of Appendix H). These figures were compared to impact monitoring data for March 2013-February 2014 (Table 3 of Appendix H). For SPSE in NWL, there has been an increase in low use grid cells and a reduction in both moderate and high use area. This correlates with that observed for DPSE, unsurprisingly as they are derived from interrelated data (see Figures 3 and 4 of Appendix H). For SPSE in NEL, this is also true, with an observed increase in low use areas and a concomitant decrease in high and moderate use cells, when compared to impact monitoring.
- 3.4.8.5 For March 2012 – February 2013, construction activities at HKBCF steadily increased and both DSPE and SPSE, showed a consistent high use of those areas directly adjacent to HKBCF. In March 2013 – February 2014, HKBCF peaked in activity and several other Contracts were initiated in the NEL area. Data from the year end of the reporting year indicate that the NEL habitat is being used less than the previous year.

3.4.9 Mother and Calf Pairs

- 3.4.9.1 Sightings of mothers and calves were made throughout the year mainly in the north of NWL and once, in NEL adjacent to the HKBCF site. (Figure 8 of Appendix H). Although it is often difficult to

⁸ Agriculture, Fisheries and Conservation Department (AFCD) 2012. *Annual Marine Mammal Monitoring Programme April 2011-March 2012.*) The Agriculture, Fisheries and Conservation Department, Government of the Hong Kong SAR.

identify calves, using high resolution images and the identity of mothers, it is sometimes possible to track poorly marked individual calves, while they still stay in close proximity to their mother. Calves were sighted on 25 occasions and comprise a minimum of six individuals using the identity of the mothers to assign identity to the calves. Six known females, HZMB 026, HZMB 044, HZMB 050, HZMB 073, HZMB 098 and HZMB 116 were all photographed with calves. The calf of HZMB 026 was first photographed in January 2013 (outside this reporting year) and again in June 2013. HZMB 026 has not been sighted within this reporting year again. HZMB 044 is a well-known individual and is recorded in AFCD records as NL98. She was first sighted with a calf in September 2012 (outside this reporting year) which was still with her in April 2013. She was sighted again February 2014, and although no calf was closely associated with her, there were two large calves/juvenilles in the group either of which are the correct age class to be a calf born in 2012. HZMB 050 was sighted with a large calf in February 2013 (outside this reporting year) and again in January 2014. Sightings of this individual with a calf have been seen throughout the reporting year. HZMB 073 was first sighted with a calf in October 2012 (outside this reporting year) and again in April 2013. HZMB 073 was also sighted in May 2013, however, there was no calf associated with her during this encounter. Given the behavior of calves to stay closely associated with their mothers for a year plus, it is likely that the calf of HZMB 073 is deceased. No further sightings of HZMB 073 have been recorded since May 2013. HZMB 098 is a well known individual which also features in the AFCD photo identification catalogue (NL104). She was sighted with a calf in May 2013 and most recently in August 2014 (outside the reporting year) still with her calf. HZMB 116 was identified initially in December 2013 when she had a calf. She was subsequently sighted in August 2014 (outside the reporting year) with also with the calf (Figure 9 of Appendix H). In the first year of monitoring, a minimum of 14 individual calves were recorded.

3.4.10 Activities and Associations with Fishing Boats

- 3.4.10.1 Four distinctive behavioural categories were defined; “associated with fishing trawler”, “feeding”, “travelling” and “surface active”. Three other categories were also defined; “multiple” (more than one behaviour was observed at one time), “other” and “unknown”. During the spring (March – May 2013) and winter (December 2013 – February 2014), dolphins were most often engaged in travelling activities (Figure 10 of Appendix H). An increase in travelling activities is noted in Dec 2013-Feb 2014 when compared to Dec 2012-Feb 2013. During the summer and autumn months (June – November 2013) foraging activities (both feeding and associated with fishing vessels) was the predominant activity (Figure 11 of Appendix H). This was also the case in June to November 2012 (Figure 12 of Appendix H). Although a ban is in place on commercial trawling, a style of purse seine fishing has become more common in Hong Kong waters and dolphins are often associated with this type of fishing when it occurs in the habitat (Figure 13 of Appendix H).
- 3.4.10.2 During surveys conducted in 2011-12, specific behavioural information was only recorded for approximately 20% of all sightings made. In 2012-13, the area of Lung Kwu Chau in NWL is highlighted as an important feeding area as it is again in 2013-14. The area to the south of NWL is also important for feeding/surface active behaviours (Figure 14 of Appendix H) which highlights the continued importance of this area for multiple activities for all age classes of dolphins, including mother and calf groups.

3.4.11 Photo Identification Catalogue

- 3.4.11.1 A total of 107 dolphins comprise the photo identification catalogue established specifically for the HZMB Project (Table 4 of Appendix H). Not all dolphins photographed are identifiable as only individuals with unambiguous marks, cuts and/or pigmentation or with uniquely shaped fins can be included in the photo-identification catalogue. Of the identifiable dolphins recorded, the most often sighted dolphins (HZMB 002, HZMB 041; HZMB 044 and HZMB 054) were seen on eleven, nine, nine and fourteen separate days, respectively. Of the 107 dolphins identified during impact monitoring, 53 individuals (just under half) were seen only once between March 2012 and February 2014 (Table 4 of Appendix H). The photo-identification catalogue numbered 94 individuals in year one of impact monitoring. As many of the dolphins that use the waters of NEL and NWL are noted as residents (by other studies, e.g., AFCD annual monitoring) they might therefore, be more likely to be added to the catalogue during the initial effort of the study and thereafter, a lower number of newly identified individuals would be added to the catalogue yearly. This has also been the case in

studies elsewhere of resident delphinid populations. In addition, fewer numbers of dolphins were seen in year one compared to year two of the impact study.

3.4.12 **Dolphin Abundance**

- 3.4.12.1 It was not possible to calculate a meaningful abundance estimate for NEL as only 5 on effort sightings were made within the reporting period. For NEL and NWL combined, the overall abundance estimate is 38 [95% CI 6.2, 97.8]).

3.4.13 Environmental Acceptability of the Contract

- 3.4.13.1 It was recognized in the EIA that the HZMB is adjacent to upon several areas of importance to the dolphin population of Hong Kong. As such, it was stipulated in the EM&A Manual for the HKBCF that a suitable analytical technique be proposed and implemented so that significant changes could be detected. A multi-parameter spatial (sometimes known as predictive) model was proposed and reviewed by management authorities and analyses developed as and when data has been made available. The purpose of the model was to make predictions of future habitat use, derived from baseline information, and compare these predictions to actual observations. Environmental covariates, such as salinity, temperature, depth, etc., which may also be drivers of dolphin habitat use, are also tested within spatial models so as to either eliminate or incorporate any influence these may have. The model thus incorporated environmental variables salinity, temperature, turbidity, depth, tidal state, time of day, as well as information associated with the sighting, e.g., groups size, behavior, boat association. Following the October 2015 CWD trend meeting, ENPO suggested that the brief information regarding density surface modelling presented in Quarterly EM&A Reports and Annual EM&A Review Reports be provided as a separate report with details for review before incorporating it into the EM&A reports. This ET agreed all such data and results be provided separately for review before incorporating into this and subsequent reports. It is anticipated that the detailed density surface modelling report will be ready for review in early 2016. Following the October 2015 CWD trend meeting, ENPO suggested that the brief information regarding density surface modelling presented in Quarterly EM&A Reports and Annual EM&A Review Reports be provided as a separate report with details for review before incorporating it into the EM&A reports. This ET agreed all such data and results be provided separately for review before incorporating into this and subsequent reports. It is anticipated that the detailed density surface modelling report will be ready for review in early 2016.

3.4.14 Summary

- 3.4.14.1 The variable nature of habitat use, group size, behavior, mother and calf occurrence and encounter rates by small delphinids and the ability to detect significant change in small populations is a challenge faced by many research studies. Historical data from AFCD also shows such variability (in AFCD annual monitoring reports). A view of individual distribution and behavioural activities for the reporting year do show that areas of importance, such as Lung Kwu Chau, are still being frequented, behavioural activities appear similar to that known from pre construction information and that several calves have survived throughout the reporting year and beyond. There is an emerging trend for NEL where it seems that fewer sightings are being made and it is likely that data from the third year of activities will confirm this. This is to be expected given that marine construction has been increasing in NEL both with Contract related activities and other marine civil works.
- 3.4.14.2 The modelling approach shows that there has been a significant change in habitat use from baseline to construction phase and areas of previous high density, although still frequented, are still being used by dolphins for many activities. The more spatially explicit model derived from point transect data shows that during the first year of construction, dolphins were shifted, understandably, from the cordoned off HKBCF site itself and, instead, occurred in higher density around the northeast section of the HKBCF site. The modeling approach can be used to test changes in distribution as the works progress whereas the line transect data provides information from the NEL and NWL habitat and the point transect data provides finer scale information on habitat shifts immediately adjacent to the HKBCF site and the Brothers Islands.

3.4.15 Verification of Impact Statements Stated in EIA and Supporting Documentation

- 3.4.15.1 The Statements made in the EIA and supporting documents are descriptive and do not provide a quantitative framework against which to compare data gathered the impact monitoring for the purposes of verifying impact on CWD. Further, some statements made pertain only to the operational phase of HZMB (that is, when all in water construction works are completed) and not the explicit impacts of the many different construction activities which are required to construct HZMB. In the interests of thoroughness, any impact statements made in key documents relevant to HKBCF are extracted here and commented on with regards to the data gathered from this the reporting year of construction activities at HKBCF.
- 3.4.15.2 The EIA report for HZMB⁹ makes several statements with regards to impact on cetaceans during the construction phase in sections pertaining to water quality and bioaccumulation:
- 3.4.15.3 Construction Phase: In section 10.6.4.25 of the EIA report, it is stated that, “Contract has low potential to cause increased sewage discharge, therefore this potential impact is insignificant. The potential water quality impacts due to site runoff, sewage from workforce and wastewater from various construction activities, and accidental spillage would be controlled through the implementation of suitable mitigation measures, including temporary drainage system, chemical toilets, etc”
- 3.4.15.4 This Contract has consistently maintained water quality objectives as described in the EM&A Manual except where noted in Section 7.1.5. These exceptions, however, were subsequently found to be unrelated to Contract works.
- 3.4.15.5 In Section 10.6.4.37 of the EIA report, it is stated that, “Thus insignificant bioaccumulation impacts from the construction of HKBCF and HKLR are predicted for CWD (except perhaps with the exception of silver – as per 10.6.4.32)”
- 3.4.15.6 It is noted that for both of the above impact predictions to be investigated more thoroughly, long term trends in pathogens and toxin loads in CWD should be analysed. This has recently been completed for the Pearl River Delta (PRD) population of CWD and it is noted that both bioaccumulation and biomagnification are significantly higher than populations elsewhere (Gui et al 2014¹⁰). In light of this new information, the statements made in the EIA may need to be re-assessed and the allowable limits for water quality parameters revised.
- 3.4.15.7 In Section 10.7.2.8 of the EIA report, it is stated that, “164 ha of sea area (138 ha reclamation and 26 ha works area) will be lost during construction due to HKBCF reclamation near the northeast Airport Island. Although the sea area is only utilised by limited number of individual CWD, it is of moderate ecological value due to the close proximity with dolphin hotspot. Moderate impact is anticipated and mitigation measures are required. As the habitat loss due to construction would largely be carried forward to the operational phase and become permanent habitat loss, mitigation measures for operational phase (see Section 10.7.4) will mitigate this impact as well”
- 3.4.15.8 At HKBCF, moderate impact is anticipated but the degree or type of impact is not quantified in any numerical, spatial or temporal scale. In the second year of construction activities at HKBCF there is an emerging pattern of decreased habitat use as indicated by encounter rate and number and type of “high” density cells in NEL. It is anticipated that this trend will become more apparent in 2014-2015 reporting year. Anecdotal information from press reports indicate that a higher than usual mortality has been reported in recent months. Appropriate review of these data should be made by the responsible authority to investigate any possible relationship with both anthropogenic activities and natural processes in the dolphins habitat. The impact of “permanent habitat loss” as a result of the HKBCF reclamation Section 10.7.4. of the EIA), is stated to be fully mitigated by the establishment of a Marine Protected Area after the construction phase of the Contract is completed. This predication

⁹ Ove Arup & Partners Hong Kong Ltd 2009 HZMB – HKBCF & HKLR EIA Report. 24037-REP-125-01 Pages 83-5, 97, 115

¹⁰ Gui, D., Yu, R., He, X., Tu, Q., Chen, L. and Wu, Y. Bioaccumulation and biomagnification of persistent organic pollutants in Indo-Pacific humpback dolphins (*Sousa chinensis*) from the Pearl River Estuary, China. *Chemosphere* 114:106-113

cannot be assessed until the HZMB operational phase starts and the Marine Park Area is established.

3.4.15.9 The Ecological Baseline Survey¹¹ defines an Impact Index which is used to predict impact for each area through which the HZMB structure passes. HKBCF is located in the area defined as the “Northeast Lantau Section (NELS) – from the eastern edge of the airport platform to its connection to the North Lantau Highway”.

3.4.15.10 It is noted that this report states (Section 5.7.10) that, “it is imperative that cumulative impacts along the whole alignment [of HZMB] are thoroughly assessed”.

3.4.15.11 A reference to cumulative impacts is made in Section 10.7.6 of the EIA. Section 10.7.6.3 is relevant to HKBCF. This refers only to the cumulative impact of the permanent loss of CWD habitat and no other impacts of either the construction or operational phase of the HZMB Project. Nonetheless, the conclusion of this section states that the setting up of a marine park “effectively mitigates” CWD habitat loss. As such, this prediction cannot be verified until such a time as a marine park is established.

3.4.15.12 As a rigorous cumulative assessment has not yet been conducted, there is little quantitative information against which impact survey observations can be made. Further, there are no predictions which deal specifically with the activities at HKBCF and no predictions of direct, temporary or residual impacts on CWD. As such, it is anticipated that impacts to the CWD population which have not been defined in the original EIA will occur as construction activities progress at HKBCF. At this time, a cumulative impact assessment has not yet been conducted

3.4.16 **Practicality and Effectiveness of the EM&A Programme**

3.4.16.1 Monitoring and auditing of marine mammals was recommended for the construction phase of HKBCF to evaluate impact on marine mammals.

3.4.16.2 Combined line transect and photo-identification methodologies have been used as part of the AFCD long term monitoring programme for over 15 years. As such, a long term data set can be used to establish trends in population distribution and abundance over the long term.

3.4.16.3 The AFCD annual monitoring reports for the period 2011-2012, 2012-13 and 2013-14 have all stated that a significant decline had been detected in population abundance in the NEL area over the last decade. Only long term inter annual abundance estimates can be used to detect such changes. This decline was noted prior to construction had begun at HKBCF.

3.4.17 **Conclusion**

3.4.17.1 Between March 2013 and February 2014, dolphins have not been deterred from the area immediately adjacent to HKBCF although both habitat use and the number of sightings have decreased.

3.4.17.2 Marine mammal monitoring was conducted between March 2013 and February 2014 in accordance with EM&A Manual methodologies. These methodologies have been invaluable in the past in determining both broad scale and long term patterns of distribution, abundance, association, habitat use and behavioral activities. There is historically much variation in these parameters and most observations to date have concurred with observations documented previously with the now emerging trend of decreased habitat use within NEL. As AFCD reports have reported a significant decline in this area prior to HKBCF construction activities, it is difficult to distinguish how much HKBCF activities may have influenced this existing decline.

¹¹ Agreement No. MW 01/2003. Hong Kong- Zhuhai- Macao Bridge: Hong Kong Section and the North Lantau Highway Connection: Ecological Baseline Survey. Final 9 Month Ecological Baseline Survey Report the (p 42 – 43)

4 ENVIRONMENTAL SITE INSPECTION AND AUDIT

4.1.1 Site Inspection

4.1.1.1 Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures for the Contract. In the reporting period, 52 site inspections were carried out. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.

4.1.1.2 Particular observations during the site inspections are described below:

Air Quality

4.1.1.3 Stockpile of sand was observed entire surface wet at WA2 and at works area at Portion A. The Contractor was reminded that stockpile of aggregate or dusty materials shall be sprayed with water so as to maintain the entire surface wet; or covered entirely by impervious sheeting or placed in sheltered areas to mitigate potential fugitive dust emission. (Reminder)

4.1.1.4 Side curtain attached to the tipping point of a conveyor belt on a filling barge was provided to filling barge but was observed not fully enclosed. The Contractor was reminded to provide a fully enclosed side curtain for filling activities. (Reminder)

4.1.1.5 Dark smoke was observed emitted on barges when sand material was being transferred to another barge. The Contractor was reminded to rectify the situation such as to maintain their equipment in good condition to prevent emission of dark smoke. The Contractor maintained their equipment in good condition to prevent emission of dark smoke. (Closed)

4.1.1.6 Bags of cement was observed not entirely covered by impervious sheeting, the Contractor was reminded to keep the bags of cement covered entirely by impervious sheeting. The Contractor rectified the situation and kept the bags of cement covered entirely by impervious sheeting. (Closed)

Noise

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

4.1.1.8 Plants mounted on construction vessels were observed acoustically-decoupled, but a generator was still observed not totally acoustically-decoupled on barge Shang Ho Bo 601 and on barge Fai Yu 3228. The Contractor was advised to continue to provision of enhancement works i.e. to provide sufficient acoustic decoupling measure(s) such as acoustic mat to noisy equipment. The Contractor was reminded that insufficient/inadequate mitigation measures must be swiftly rectified. The Contractor provided sufficient acoustic decoupling measures to generator on Fai Yu 3228. (Reminder)

4.1.1.9 Noise Emission Label (NEL) of an air compressor was observed missing. The Contractor was reminded to properly display the NEL on all compressors. The Contractor properly display the NEL the Compressors observed on Kiu Chi. (Closed)

Water Quality

4.1.1.10 Disconnected silt curtain was observed at the western side of the silt curtain. The Contractor was advised to provide sufficient mitigation measures and swiftly carry out maintenance once defects of the perimeter silt curtain are found during the daily checking and/or monthly diver inspection. (Closed)

4.1.1.11 Defects were observed at portion B (southwest part of the perimeter silt curtain), E2 (northeast part of the perimeter silt curtain) and around portion C2a (northwest part of the perimeter silt curtain) and at portions E1, C2a and C2c. The Contractor rectified the defects of the silt curtain at portion B

(southwest part of the perimeter silt curtain), E2 (northeast part of the perimeter silt curtain) and around portion C2a (northwest part of the perimeter silt curtain) so the silt can be effectively prevented from dispersing from the inside to the outside of the site boundary. Contractor rectified the defects of the localized silt curtain. (Closed)

- 4.1.1.12 Defect was observed within the side of the enclosing silt curtain on barge AP4 and when stone column was installed. The contractor was rectified the defected silt curtain in order to prevent silt plumes from dispersing out from the vicinity of active stone column works. The contractor rectified the defected silt curtain in order to prevent silt plumes from dispersing out from the vicinity of active stone column works.
- 4.1.1.13 A fuel tank which is not in use was observed without drip tray or bunding. The Contractor was reminded to provide mitigation measures such as drip tray or bunding to fuel tank before use. (Reminder)
- 4.1.1.14 Oil drums, chemical containers and generator were observed without the provision of drip trays at Portion, on barge 天駿 3, on barge SHB205, on temporary rock bund and on Portion A. Generator was observed without bunding or drip tray on Sanhang Floating Crane 7, on barge Evershine No.1, barge 401 and FTB17. Machine and generator were observed without drip tray/tarpaulin sheet underneath at rock bund and works area at Portion A and on steel cell. The Contractor provided drip trays to oil drums, chemical container and generator to retain leakage, if any. (Closed)
- 4.1.1.15 Containers of chemical to be used and chemical waste were placed together in Hong Fai. The Contractor should store the chemical and chemical waste separately. Subsequently, the Contractor stored the chemical and chemical waste separately. (Closed)
- 4.1.1.16 Movable lighting machineries were observed to be placed on bare ground of Portion D, on SHB205 and at works area at Portion A without the provision of drip trays. It was observed that drip trays were provided to movable lighting machineries at temporary rock bund and at works area at portion A and on SHB205. The Contractor was advised to continue to provide drip tray or equivalent measures to retain potential oil leakage to movable lighting machineries. (Closed)
- 4.1.1.17 Trays of oil drums were found to be placed near to the shore. The Contractor should secure the oil drums with drip tray away from the shore to ensure no washing off of oil occurs. (Closed)
- 4.1.1.18 One of the existing bunding was found too low on Shang Ho Bo 601, barge FTB 17 and FTB19. The Contractor was reminded to enhance the height of the existing bunding to effectively contain potential oil leakage. The Contractor enhanced the height of the existing bunding to effectively contain potential oil leakage. (Closed)
- 4.1.1.19 The screw at the outlet of a drip tray on barge AP4, FTB20, SHB 208 barge Evershine No.1, FTB17, SHB402, on barge SHB401, on Barge Fai Yu 3228, on barge AP4, on barge Evershine 668, on barge Yat Fai, at works area of portion A and on temporary rock bund 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. (Closed)
- 4.1.1.20 The silt curtain enclosing the stone column installation works was observed removed and as informed by the Contractor, this is due to maintenance of the stone column installation facility. The Contractor was reminded to install a layer of silt curtain near the active stone column installation points. (Reminder)
- 4.1.1.21 Litter and silty plumes were observed when filling material was being used for filling cellular structure number C057. The Contractor stopped the activity to prevent litter and silty plumes from dispersing. The Contractor was advised to provide mitigation measures such as silt curtain to enclose active filling activities at cellular structures to prevent litter and silty plumes from dispersing. (Reminder)

- 4.1.1.22 It was observed that the frame of bunding on barge SHB 401 and on barge Fai Yu 3228 were deformed. The Contractor was reminded to fix the deformed part of frame so that the bunding may have appropriate height to confine potential oil leakage. (Reminder)
- 4.1.1.23 Oil stain was observed on barge FTB19 and SHB205, on barge Fai Yu 3228, Evershine No.1, barge Yat Fat, barge Kiu Chiu and on temporary rock bund. The Contractor was reminded to provide mitigation measures such adsorbents to clean the oil stain. The Contractor immediately provided mitigation measures such as adsorbents to clean the oil stain and treated the used absorbents as chemical waste. (Closed)
- 4.1.1.24 Oil stain was discovered over the sea on 25 July 2013 at 11:20 near the cell K038 at Portion B. The Contractor was advised to follow the actions stated on the Spill Response Plan and clear the oil waste on sea. The Contractor rectified the situation and clear the oil waste on sea using absorption boom according to the Spill Response Plan. The used absorption boom was disposed of as chemical waste. (Closed)
- 4.1.1.25 Turbid water was observed at the southwestern silt curtain entrance area. Refer to the photo taken and site observations, sources of impact likely due to the turbine activities and/or movement of vessel at shallow water (at near the entrance at southwestern of the Construction site and/or when vessel's propeller was turn on at shallow water). The dispersion of turbid water from the inside of the perimeter silt curtain to the outside of the perimeter silt curtain is potentially due to defects of perimeter silt curtain at certain sections and/or insufficient overlapping at entrance/exit of the perimeter silt curtain. The Contractor was advised to regularly evaluate the integrity of the perimeter silt curtain by reviewing the results obtained from daily checking or/and monthly diver inspections specified by the Silt Curtain Deployment Plan. The Contractor was advised to provide sufficient mitigation measures and swiftly carry out maintenance once defects of the perimeter silt curtain are found during the above mentioned daily checking and/or monthly diver inspection. The Contractor was provided mitigation measures and carried out maintenance above mentioned defects of the perimeter silt curtain are found. (Closed)
- 4.1.1.26 The Contractor was advised to regularly evaluate the integrity of the perimeter silt curtain by reviewing the results obtained from daily checking or/and monthly diver inspections specified by the Silt Curtain Deployment Plan. The Contractor was advised to provide sufficient mitigation measures and swiftly carry out maintenance once defects of the perimeter silt curtain are found during the above mentioned daily checking and/or monthly diver inspection. (Closed)
- 4.1.1.27 During site inspection audit, sandfilling seem to be conducted at one end of the temporary rock bund. The Contractor was reminded to conduct sandfilling behind at least 200m leading temporary rock bund/seawall. (Reminder)

Chemical and Waste Management

- 4.1.1.28 Oil drums were found improperly stored on barge Chi Full, Kiu Chi (AP1), FTB20, FTB17, SHB 209, Fai Yui 3228, FTB19, SHB 205, Sun Moon Kee, on barge SHB401, on rock bund, works area at Portion A, on an area outside Contractor's site office. 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)
- 4.1.1.29 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)
- 4.1.1.30 Oil drums were found without proper labels on barge FTB 18, FTB 19, FTB17, SHB 209 and Evershine No.1. 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. The Contractor provided mitigation measures such as labeling to all oil drums. (Closed)

- 4.1.1.31 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)
- 4.1.1.32 Oil stains were observed on the barge surface of barge SHB 208 and FTB 20. The Contractor was reminded to clear the oil stain using absorbent material and dispose of as chemical waste. The Contractor was cleared the oil stain using absorbent material and dispose of as chemical waste. (Closed)
- 4.1.1.33 Oil was observed within the mechanical parts of a machine on FTB18. The Contractor was reminded to prevent oil being transferred from inside the drip tray to the barge surface. (Reminder)
- 4.1.1.34 General waste was observed improperly covered. The Contractor immediately provided mitigation measures such as to remove the general waste via a waste collector. The Contractor was reminded to provide mitigation measures such bin bag(s) or container to properly cover all general waste. (Reminder)
- 4.1.1.35 Waste water was observed accumulated inside bunding on FTB21. The Contractor was reminded to clear the waste oil with water and disposed of as chemical waste. The Contractor cleared the waste oil with water and disposed of as chemical waste. (Closed)
- 4.1.1.36 A battery and chemical container was observed placed on barge FTB20 without drip tray. The Contractor was relocated that battery and chemical container inside the drip tray immediately. (Closed)
- 4.1.1.37 Bags of waste were observed accumulated on barge Four Sea 8, barge Hing Fai, barge AP4 and various locations on a works area at Portion A. The Contractor was reminded to clear the waste regularly to prevent accumulation. (Reminder)
- 4.1.1.38 Litter and general refuse was observed accumulated on sea. The Contractor was reminded to avoid/clear any foam, oil, grease, chemicals, litter, food or other objectionable matter due to the Contract works presented in the water within and adjacent to the works site. The Contractor avoided any foam, oil, grease, chemicals, litter, food or other objectionable matter due to the Contract works presented in the water within and adjacent to the works site. The Contractor was reminded to collect and clear the waste on sea regularly. (Closed)

- 4.1.1.39 General refuse were found on various location of the works area at Portion A. The Contractor was reminded to clear the general refuse regularly. The Contractor was reminded to maintain the site in a clean and tidy condition i.e. to properly store the general refuse at designated waste storage area(s). The Contractor cleared the general maintain the site in a clean and tidy condition. (Closed)
- 4.1.1.40 Rubbish bin was observed without being covered; the Contractor was reminded to properly store general waste and covers all rubbish bins. The Contractor properly store general waste and covers all rubbish bins. (Closed).
- 4.1.1.41 Construction waste such as band drain was observed along the northern edge of works area at Portion A and on edge of temporary rock bund. The Contractor was advice to properly store and dispose construction waste such as band drain. (Closed)

Landscape and Visual Impact

- 4.1.1.42 No adverse observation was identified in the reporting period.

Others

- 4.1.1.43 The Contractor was reminded to properly display relevant Environmental Permit at an appropriate location i.e. near entrance on barge Kam Shun 368, so that it may be easily noticed. (Reminder)
- 4.1.1.44 Water was observed accumulate inside car tyre on barge Yat Fat. The Contractor was reminded to keep the site clean and tidy and clear the water accumulated inside car to prevent mosquito breeding. The Contractor rectified the situation by clearing the car tyre on barge Yat Fat. (Closed)
- 4.1.1.45 The Contractor has rectified most of the observations as identified during environmental site inspection in the reporting period. 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.

5 ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS

5.1 Summary of Solid and Liquid Waste Management

- 5.1.1 The Contractor registered as a chemical waste producer for this Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting.
- 5.1.2 As advised by the Contractor, 7,540,721.9 m³ of imported fill were imported for the Contract use in the reporting period. 24.3kg of metals, 956kg of paper/cardboard packaging, 550.1kg of plastics, 14,000kg of chemical waste and 312m³ of others, e.g. general refuse were generated and disposed of in the reporting period. Summary of waste flow table is detailed in Appendix I.
- 5.1.3 The Contractor is advised to properly maintain on site C&D materials and wastes 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.
- 5.1.4 The Contractor is reminded that chemical waste containers 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, Labelling and Storage of Chemical Wastes.

6 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

6.1 Implementation Status of Environmental Mitigation Measures

- 6.1.1 As informed by the Contractor on 9 May 13, one summons was received on 29 April 13 regarding the suspected violation case of Noise Control Ordinance (Cap.400) at Works Area WA4 on 31 Oct 2012. The details of the non-compliance, investigation actions taken including follow-up site inspection conducted out by the ET and rectification actions and preventive actions provided by the Contractor was summarized at section 7 of the Quarterly EM&A summary report for September 2012 – November 2012. As informed by the Contractor in August 13, the Contractor was subsequently prosecuted on 21 May 2013 for breaching Cap.400 Noise Control Ordinance.
- 6.1.2 A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in Appendix C. Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively. .
- 6.1.3 Training of marine travel route for marine vessels operator was given to relevant staff and relevant records were kept properly.
- 6.1.4 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.
- 6.1.5 Acoustic decoupling measures on noisy plants on construction vessels were checked regularly and these measures were well implemented.
- 6.1.6 The Contractor was reminded to carry out necessary actions to rectify the above deficiencies and the Contractor was reminded not to operate those PME during restricted hours without compliance with the CNP conditions.
- 6.1.7 The Contractor was reminded to strictly comply with the condition of the CNP.

7 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

7.1 Summary of Exceedances of the Environmental Quality Performance Limit

- 7.1.1. A total of 15 Action level and 5 Limit Level exceedances were recorded during the 24-hr TSP impact monitoring period. No exceedance of 1-hour TSP exceedance level was recorded at all monitoring station during the 1-hr TSP impact monitoring period. Investigation into the possible causes of each exceedance was undertaken and reported in the respective monthly EM&A reports.
- 7.1.2. One complains was received; one (1) Action Level Exceedance of construction noise was recorded in the reporting period. Investigation into the possible causes of such exceedance was undertaken and reported in the respective monthly EM&A reports, the investigations results confirmed that the limit level exceedance was not related to Contract.
- 7.1.3. The Contractor was recommended to continue implementing existing noise mitigation measures.
- 7.1.4. Fifty-six (56) Action Level exceedances and seven (7) Limit Level exceedances were recorded at measured suspended solids (SS) values (in mg/L), one (1) Action Level exceedances were recorded at measured turbidity (in NTU), six (6) Action Level exceedance was recorded at measured DO (Bottom) (mg/L) and one (1) Limit Level exceedance was recorded at measured DO (S&M) (mg/L) during the reporting period. Investigation result shows that all the exceedances were not due to the Contract works except the Action Level Exceedance recorded at SR5 and Limit Level Exceedance recorded at IS10 on 18 Dec 13 were related to Contract.
- 7.1.5. Cumulative statistics on exceedances is provided in Appendix J.

8 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

8.1 Summary of Environmental Compliants, Notification of Summons and Successful Prosecutions

- 8.1.1 Total of eleven (11) environmental complaints were received in the reporting period. The Environmental Complaint Handling Procedure is annexed in Figure 5.
- 8.1.2 One (1) complaint was referred by EPD to ET 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-Contract related.
- 8.1.3 One (1) complaint was referred by EPD regarding oil dumping observed from various vessels operating for HZMB HK Contracts near Tung Chung Development Pier over the past few months. The investigation results showed that the complaint was non-Contract related.
- 8.1.4 One (1) complaint referred to the Contractor by EPD on 10 May 2013 regarding the scattered debris of silt curtain noted at Sha Lou Wan and Tung Chung Bay. Immediate inspection and clean up action was taken by the Contractor.
- 8.1.5 One (1) follow-up complaint referred by EPD was received on 23 May 2013 regarding the oil stain noted near Tung Chung Development Pier for past few months.
- 8.1.6 One (1) complaint was logged by the Contractor regarding the leakage from work barges causing water pollution near Tuen Mun Richland Garden received on 26 Sept 13. With refer to the available information such as photo record of the incident cannot indicate that the leakage from work barges was caused by the vessel of this Contract and the complaint could not be concluded as Contract related.
- 8.1.7 As informed by the Contractor on 5 Nov 13, one (1) noise complaint received on 14 Sept 13 was referred to the Contractor of HKBCF on 1 Nov 13. The captioned complaint involves noise generated by a tug boat operating near a pier at Tung Chung around 05:55am-06:45am on 14 Sept 13. After investigation, the complaint is considered not likely to be related to the construction works
- 8.1.8 As informed by the Contractor, complaint received from Penta-Ocean – Gitanes Joint Venture (CV/2012/03) mentioned that the formation works of the Contaminated Mud Pit CMP1 to the South of the Brothers (CMP1 of SB) which has been completed in mid-August 2013 and the pit has been commissioned for receiving contaminated marine mud from other Contracts starting from 16 August 2013. However, it was recently observed that some of the Contract vessels of HY/2010/02 had berthed within the said pit and those anchorages would likely cause disruption to the underlying contaminated mud and thus induce unfavourable contamination impact to the surrounding marine environment. In this regard, they reminded the contractor to avoid berthing of their vessels within the boundary of CMP1 of SB thereafter for the sake of environmental concern. After investigation, the complaint is considered not likely to be related to the construction works.
- 8.1.9 As informed by the Contractor on 5 Dec 13, one complaint was noted on 12 Nov regarding a barge moving through the southern channel. After investigation, the noise complaint was considered as non-Contract related.
- 8.1.10 As informed by the Contractor on 12 Dec 13. A complaint involves the leakage of sand from barges causing water discoloration at sea near Tuen Mun Pierhead Garden and sand material without properly covered was blown to the inside of the residential area which caused disturbance to residence. With refer to available information provided and monitoring data recorded on 09 Dec 13, it cannot indicate that the water quality impact and air quality impact were caused by the vessel of this Contract and therefore the complaint could not be concluded as related to this Contract

- 8.1.11 As informed by the Contractor on 6 Jan 14, A complaint involves barges loaded with sand material without properly covered was blown to the inside of the residential area of Tuen Mun Pierhead Garden which caused disturbance to residence was received on 27 Dec 13. With refer to available information provided, it cannot indicate that the water quality impact and air quality impact were caused by the vessel of this Contract and therefore the complaint could not be concluded as related to this Contract.
- 8.1.12 EPD referred a complaint from complainant who advised that blackish mud was found along the edge of the construction site of Hong Kong-Zhuhai-Macao Bridge Hong Kong Project near the airport in the morning of 18 January 2014. After receipt of the complaint, site daily was reviewed and follow-up investigation has been conducted and excavation and dredging activities were not observed within the site boundary of HKBCF during the joint site inspection audit. Therefore in accordance with the investigation results, the complaint is considered as not related to contract HY/2010/02
- 8.1.13 1 summons and 1 prosecution were recorded in this reporting period. As informed by the Contractor on 9 May 13, one summons was received on 29 April 13 regarding the suspected violation case of Noise Control Ordinance (Cap.400) at Works Area WA4 on 31 Oct 2012. The details of the non-compliance, investigation actions taken including follow-up site inspection conducted out by the ET and rectification actions and preventive actions provided by the Contractor was summarized at section 7 of the Quarterly EM&A summary report for September 2012 – November 2012. As informed by the Contractor in August 13, the Contractor was subsequently prosecuted on 21 May 2013 for breaching Cap.400 Noise Control Ordinance.
- 8.1.14 Statistics on complaints, notifications of summons and successful prosecutions are summarized in Appendix J.

9 REVIEW OF THE VALIDITY OF THE EIA PREDICTION

- 9.1 A total of 15 Action level and 5 Limit Level exceedances were recorded during the 24-hr TSP impact monitoring in the reporting period and it was considered not related to the Contract works. All the rest of air quality monitoring results in the reporting period were below the Action Levels established in the baseline air quality monitoring carried out in November 2011. The result was in line with the Environmental Impact Assessment (EIA) prediction that dust generation would be controlled and would not exceed the acceptable criteria, with proper implementation of the recommended dust mitigation measures.
- 9.2 Only one (1) construction noise monitoring exceedance was recorded in the reporting period. This is generally in line with the EIA and ERR prediction that with the implementation of noise mitigation measures, the construction noise from the Contract works will meet the stipulated criterion at the residential NSRs and at a majority of the education institutions as predicted by the EIA.
- 9.3 71 water quality monitoring exceedances were recorded in the reporting period and it was considered not related to the Contract works except 1 Action Level exceedance recorded at SR5 and Limit Level Exceedance recorded at IS10 on 18 Dec 13 were considered as related to Contract. As rectification was provided by the Contractor and recurrence of Contract related exceedance was not observed in the subsequent monitoring events. Considering all the rest of water quality monitoring results in the reporting period were below the Action Levels established in the baseline water quality monitoring carried out in November 2011. The result was in line with the Environmental Impact Assessment (EIA) prediction that water quality impact would be controlled and would not exceed the acceptable criteria, with proper implementation of the recommended water quality mitigation measures.

10 REVIEW OF ENVIRONMENTAL IMPLEMENTATION STATUS

- 10.1 The impact air quality, noise and water quality monitoring programme ensured that any environmental impact to the receivers would be readily detected and timely actions could be taken to rectify any non-compliance. The environmental monitoring results indicated that the construction activities in general were in compliance with the relevant environmental requirements and were environmentally acceptable. The weekly site inspection ensured that all the environmental mitigation measures recommended in the EIA were effectively implemented. Despite the minor deficiencies found during site audits, the Contractor had taken appropriate actions to rectify deficiencies within reasonable timeframe. Therefore, the effectiveness and efficiency of the mitigation measures were considered high in most of the time.
- 10.2 For all the parameters under monitoring as mentioned in Section 3, the measured levels were in line with the EIA predictions generally. This indicates that the mitigation measures were effectively implemented.

11 REVIEW OF EM&A PROGRAMME

- 11.1 The environmental monitoring methodology was considered well established as the monitoring results were found in line with the EIA predictions.
- 11.2 As effective follow up actions were promptly taken once exceedances were recorded, no further exceedance occurred for each case. The EM&A programme was considered successfully and

12 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

12.1 Comments on mitigation measures

12.1.1 According to the environmental site inspections performed in the reporting period, the following recommendations were provided:

12.2 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.

12.3 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.

12.4 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.

12.5 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 and oil drums should be properly stored and labelled.
- All plants and vehicles on site should be properly maintained to prevent oil leakage.
- 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 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.

12.6 Landscape and Visual Impact

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

12.7 Recommendations on EM&A Programme

- 12.7.1. The impact monitoring programme for air quality, noise, water quality and dolphin ensured that any deterioration in environmental condition was readily detected and timely actions taken to rectify any non-compliance. Assessment and analysis of monitoring results collected demonstrated the environmental impacts of the Contract. With implementation of recommended effective environmental mitigation measures, the Contract's environmental impacts were considered as environmentally acceptable. The weekly environmental site inspections ensured that all the environmental mitigation measures recommended were effectively implemented.
- 12.7.2. The recommended environmental mitigation measures, as included in the EM&A programme, effectively minimize the potential environmental impacts from the Contract. Also, the EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.

12.8 Conclusions

- 12.8.1 The construction phase and EM&A programme of the Contract commenced on 12 March 2012.
- 12.8.2 A total of 15 Action level and 5 Limit Level exceedances were recorded during the 24-hr TSP impact monitoring period. No exceedance of 1-hour TSP exceedance level was recorded at all monitoring station during the 1-hr TSP impact monitoring period. Investigation into the possible causes of each exceedance was undertaken and reported in the respective monthly EM&A reports, the investigations results confirmed that the air quality exceedances were not related to Contract. Possible dust generating activities of the Contract did not cause any noticeable deterioration in air quality at the area. The average 24-hour TSP level recorded at AMS7 in EM&A programme was lower than the daily dust level predicted in the EIA.
- 12.8.3 There was (1) one action level exceedance recorded due to one noise complaint was received. Noise generating activities of the Contract did not cause any noticeable noise impact at the sensitive receivers. The impact noise levels recorded were generally similar to the predicted construction noise levels in the Project EIA.
- 12.8.4 Fifty-six (56) Action Level exceedances and seven (7) Limit Level exceedances were recorded at measured suspended solids (SS) values (in mg/L), one (1) Action Level exceedances were recorded at measured turbidity (in NTU), six (6) Action Level exceedance was recorded at measured DO (Bottom) (mg/L) and one (1) Limit Level exceedance was recorded at measured DO (S&M) (mg/L) during the reporting period. Investigation result shows that all the exceedances were not due to the Contract works except the Action Level Exceedance recorded at SR5 and Limit Level Exceedance recorded at IS10 on 18 Dec 13 were related to Contract. After review of investigation results of water quality exceedances (for detail of investigations please refer to section 4 of monthly EM&A report (Mar 12 to Feb 13), ambient conditions were considered to have effects on the water quality monitoring results. Exceedances were considered to be due to a combination of the following potential causes 1. Rough sea condition caused by adverse weather and relatively strong current experienced during the monitoring period and 2. During the time when exceedances of DO were recorded at monitoring stations, relatively low DO values were also recorded at corresponding upstream Control Stations during ebb tide or flood tides indicating these exceedances of DO were unlikely to be contributed by Contract works. This indicated these exceedances of DO were unlikely to be contributed by Contract works. 3. Local effects in the vicinity of the monitoring station where exceedance was recorded. With proper implementation of water quality mitigation measures, marine construction activities of the Contract did not cause any unacceptable water quality impacts to the receivers.
- 12.8.5 One (1) Limit level exceedance and six (6) Action Level Exceedances were recorded in the reporting period for impact dolphin monitoring. The investigation results showed that although no unacceptable changes in environmental parameters of this Contract have been measured, at this time it is not possible to make a conclusive assessment of this Contract's specific impact on dolphins. Event and Action Plan for Impact Dolphin Monitoring was triggered. For investigation results please refer to Appendix L of the corresponding quarterly reports.
- 12.8.6 Environmental site inspection was carried out 52 times in the reporting period. Recommendations on remedial actions were given to the Contractors for the deficiencies identified during the site audits.
- 12.8.7 Eleven (11) environmental complaints were received in the reporting period.
- 12.8.8 One (1) summons and one (1) successful prosecution was received in the reporting period.
- 12.8.9 As discussed in the above sections, the Contract did not cause unacceptable environmental impacts or disturbance to air quality, noise, water quality in the vicinity near the reclamation works.
- 12.8.10 Apart from the above mentioned monitoring, most of the recommended mitigation measures, as included in the EM&A programme, were implemented properly in the reporting period.

- 12.8.11 The recommended environmental mitigation measures effectively minimize the potential environmental impacts from the Contract. The EM&A programme effectively monitored the environmental impacts from the construction activities and ensure the proper implementation of mitigation measures. No particular recommendation was advised for the improvement of the programme.
- 12.8.12 Moreover, regular review and checking on the construction methodologies, working processes and plants were carried out to ensure the environmental impacts were kept minimal and recommended environmental mitigation measures were implemented effectively.