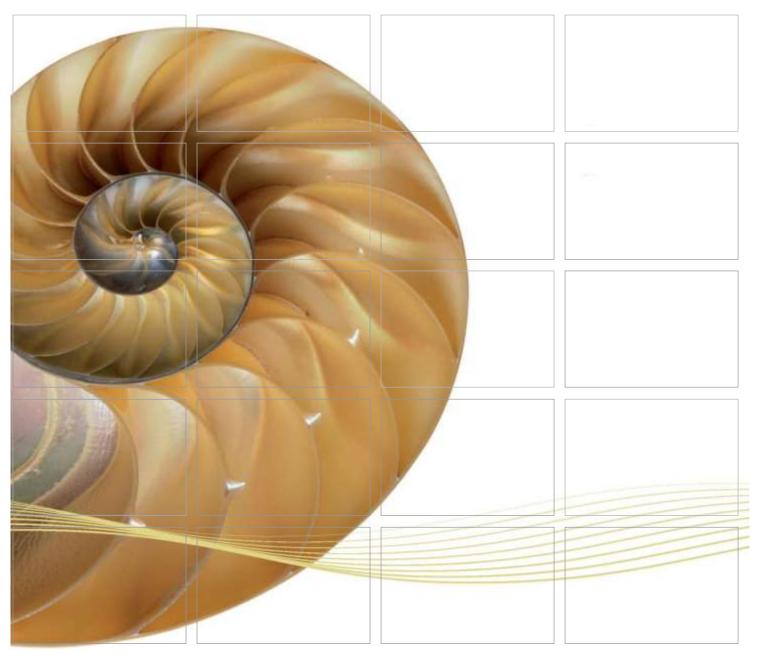
#### Report



# Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link Southern Connection Viaduct Section

Ninth Quarterly Environmental Monitoring & Audit (EM&A) Report

26 July 2016

Environmental Resources Management 16/F, Berkshire House 25 Westlands Road Quarry Bay, Hong Kong Telephone 2271 3000 Facsimile 2723 5660

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# Contract No. HY/2012/07 Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

Ninth Quarterly Environmental Monitoring & Audit (EM&A) Report

## Document Code: 0215660 9th Qtr EM&A 20160726.doc

# **Environmental Resources Management**

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Client:		Project N	0:			
Gammo	n	021566	0			
This document presents the Ninth Quarterly EM&A Report for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.			Date: 26 July 2016 Approved by:  Mr Craig Reid Partner			
		Certified I	· · Tam			
		ET Leade	er I I			
	9 <sup>th</sup> Quarterly EM&A Report	VAR	JT	CAR	26/07/16	
Revision	Description	Ву	Checked	Approved	Date	
This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.  We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.		☐ Pul	ernal	Coerthau	16:11:230° No. 11:15:4114991 BS	





Ref.: HYDHZMBEEM00\_0\_4507L.16

23 August 2016

**AECOM** 

By Fax (3691 2899) and By Post

Supervising Officer's Representative's Office 780 Cheung Tung Road, Lantau, N.T.

Attention: Mr. Daniel Ip

Dear Mr. Ip,

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/2012/07 TM-CLKL Southern Connection Viaduct Section
9th Quarterly EM&A Summary Report (Dec. 2015 to Feb. 2016)

Reference is made to the 9th Quarterly Environmental Monitoring and Audit (EM&A) Report (Dec. 2015 to Feb. 2016) (ET's ref.: "0215660\_9th Qtr EM&A\_20160726.doc" dated 26 July 2016) certified by the ET Leader and provided to us via e-mail on 23 Aug. 2016.

Please be informed that we have no adverse comments on the captioned report.

Thank you for your attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y. H. Hui should you have any queries.

Yours sincerely,

Angofa Doy

F. C. Tsang

Independent Environmental Checker

Tuen Mun – Chek Lap Kok Link

c.c.

HyD - Mr. Stephen Chan (By Fax: 3188 6614) HyD - Mr. Vico Cheung (By Fax: 3188 6614) AECOM - Mr. Conrad Ng (By Fax: 3922 9797) ERM - Mr. Jovy Tam (By Fax: 2723 5660) Gammon - Mr. Roy Leung (By Fax: 3520 0486)

Internal: DY, YH, ENPO Site

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#### **EXECUTIVE SUMMARY**

Under *Contract No. HY/2012/07*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Southern Connection Viaduct Section of the Tuen Mun - Chek Lap Kok Link Project (TM-CLK Link Project) while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). Ramboll Environ Hong Kong Ltd. was employed by the HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) in accordance with *Environmental Permit No. EP-354/2009/A*. Further applications for variation of environmental permit (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

Part of the Southern Landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where is a reclamation area constructed by *Contract HY/2010/02* under *Environmental Permit No. EP/353/2009/I*. Upon the agreement and confirmation between the Supervising Officer Representatives and Contractors of *HY/2010/02* and *HY/2012/07* in September 2015, part of the reclamation area for southern landfall was subsequently handed-over to *Contract No. HY/2012/07*.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively completed by 2018. The impact monitoring of the EM&A programme, including air quality, noise, water quality and marine ecological monitoring as well as environmental site inspections, commenced on 31 October 2013.

This is the Ninth Quarterly EM&A Report presenting the EM&A works carried out during the period from 1 December 2015 to 29 February 2016 for the Southern Connection Viaduct Section in accordance with the Updated EM&A Manual of the TM-CLK Link Project. As informed by the Contractor, major activities in the reporting period included:

#### December 2015

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Construction and installation of pile caps;
- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land GI, trial pits & lab testing;
- Installation of pier head segment; and
- Slope work of Viaducts A, B & C.

#### January 2016

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land GI, trial pits & lab testing;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

#### February 2016

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

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

II

24-hour TSP monitoring 18 sessions

1-hour TSP monitoring 18 sessions

Noise monitoring 18 sessions

Water quality monitoring 38 sessions

Dolphin monitoring 6 sessions

Joint Environmental site inspection 13 sessions

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

No exceedance of Action and Limit Levels was recorded for air quality monitoring in the reporting period.

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

No exceedance of Action and Limit Levels was recorded for construction noise monitoring in the reporting period.

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

No exceedance of Action and Limit Levels was recorded for water quality monitoring in the reporting period.

#### **Impact Dolphin Monitoring**

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between December 2015 and February 2016, whilst no unacceptable impact from the construction activities of the TM-CLKL Southern Connection Viaduct Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting quarter. The exceedances are considered unlikely due to the works of this Project upon further investigation.

Daily marine mammal exclusion zone monitoring was undertaken during the period of marine works under this Contract. No Passive Acoustic Monitoring (PAM) was implemented as the marine piling works were not carried out outside the daylight hours in this reporting period. No sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) was recorded in the monitoring period during the exclusion zone monitoring.

#### **Environmental Complaints, Non-compliance & Summons**

No environmental complaint, notification of summons and successful prosecution was received in the reporting period.

#### **Reporting Change**

There was no reporting change in this reporting period.

#### **Upcoming Works for the Next Reporting Period**

Works to be undertaken in the coming quarter include the following:

#### March 2016

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

#### **April 2016**

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Construction of marine section of berth at Southern Landfall;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

#### May 2016

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Construction of marine section of berth at Southern Landfall;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;

IV

- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

#### **Future Key Issues**

Potential environmental impacts arising from the above upcoming construction activities in the coming quarterly period are mainly associated with air quality, noise, marine water quality, marine ecology and waste management issue.

#### INTRODUCTION

#### 1.1 BACKGROUND

1

According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated increase in cross boundary traffic, developments in the Northwest New Territories (NWNT), and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL (the Project) was prepared in accordance with the EIA Study Brief (No. *ESB-175/2007*) and the *Technical Memorandum of the Environmental Impact Assessment Process (EIAO-TM*). The EIA Report was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA Report (EIAO Register Number: *AEIAR-146/2009*), an Environmental Permit (*EP-354/2009*) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and EP variation (*EP-354/2009A*) was issued on 8 December 2010. Further applications for variation of environmental permit (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

Under *Contract No. HY/2012/07*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Southern Connection Viaduct Section of TM-CLKL ("the Contract") while AECOM Asia Company Limited was appointed by HyD as the Supervising Officer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). Ramboll Environ Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO) in accordance with *Environmental Permit No. EP-354/2009/A*.

Part of the Southern Landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where is a reclamation area constructed by *Contract HY/2010/02* under *Environmental Permit No. EP/353/2009/I*. Upon the agreement and confirmation between the Supervising Officer Representatives and Contractors of *HY/2010/02* and *HY/2012/07* in September 2015, part of the

reclamation area for southern landfall was subsequently handed-over to *Contract No. HY/2012/07*.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively be completed by 2018. The impact monitoring phase of the EM&A programme, including air quality, noise, water quality and marine ecological monitoring as well environmental site inspections, commenced on 31 October 2013.

The general layout plan of the Contract components is presented in *Figures 1.1* & 1.2a to 1.

#### 1.2 Scope of Report

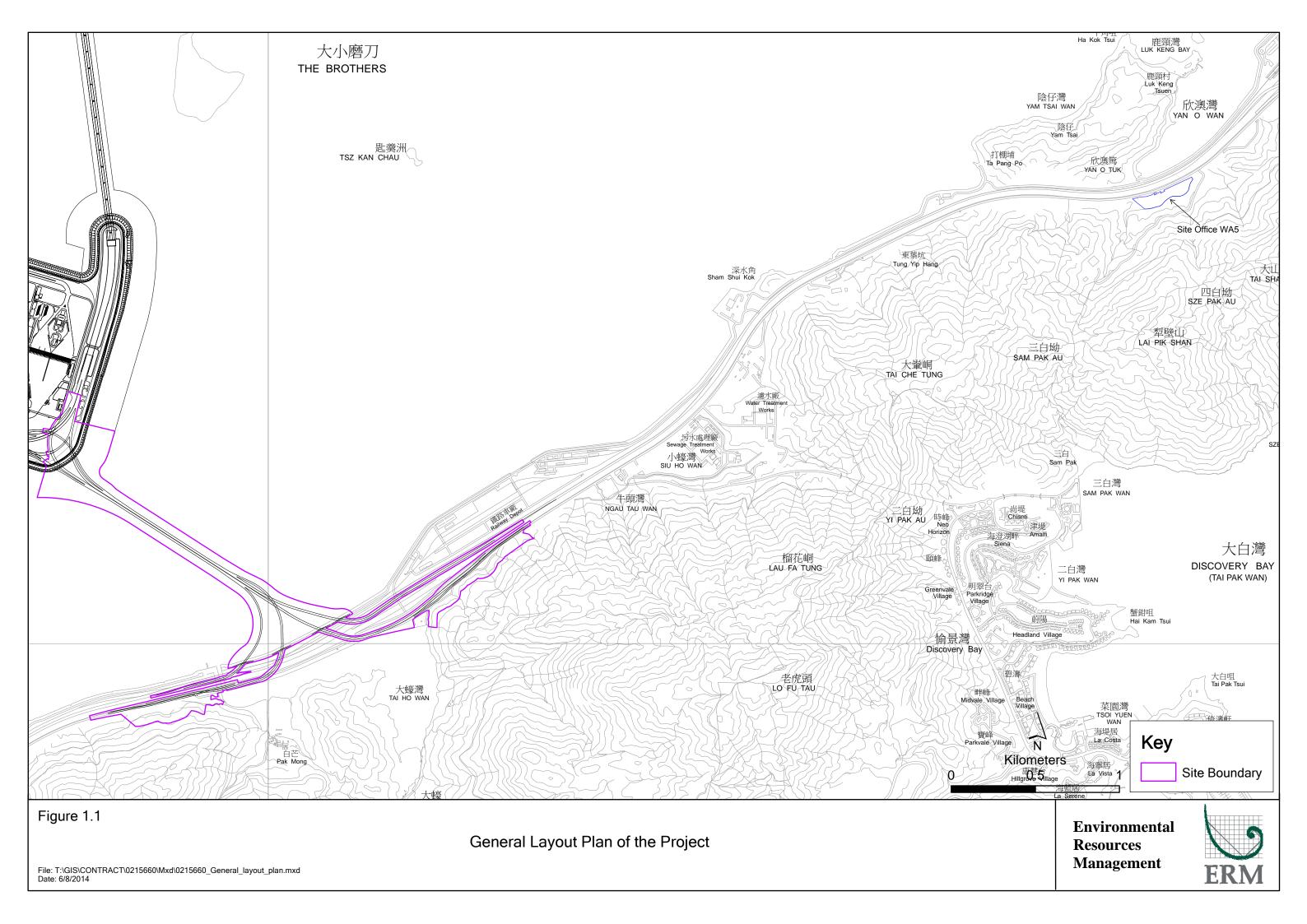
This is the Ninth Quarterly EM&A Report under the *Contract No. HY/2012/07 Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section.* This report presents a summary of the environmental monitoring and audit works from 1 December 2015 to 29 February 2016.

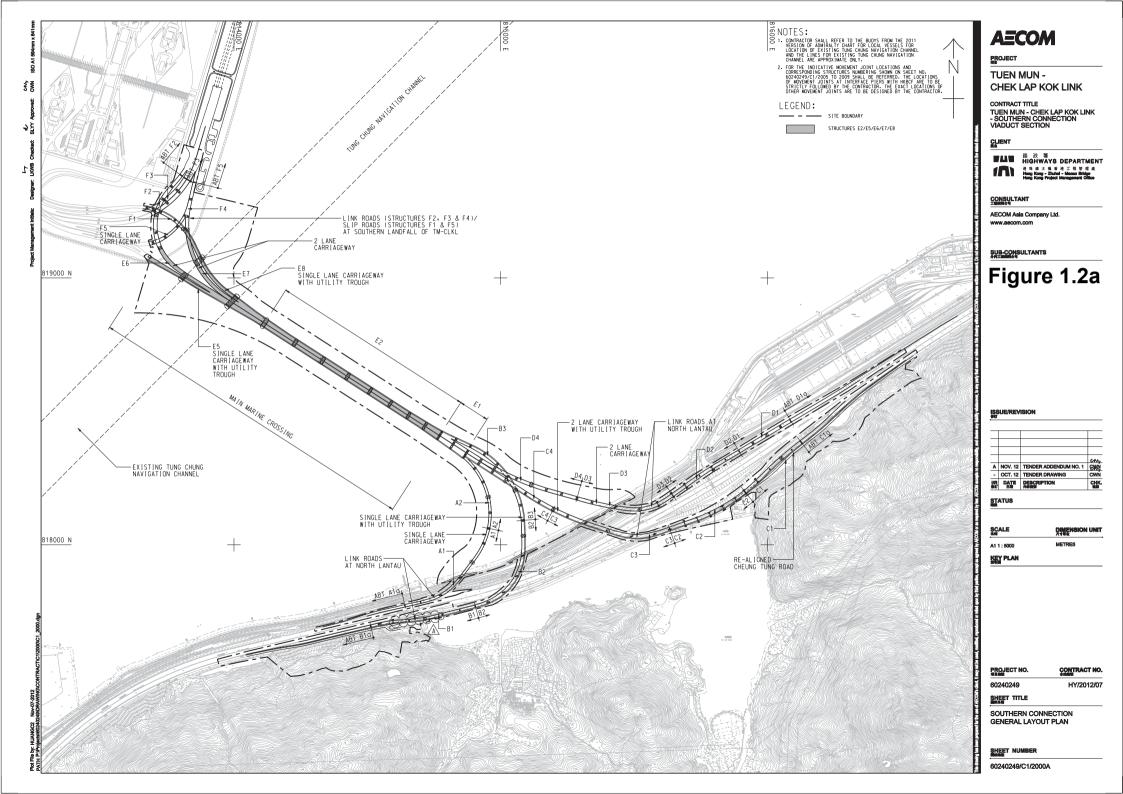
#### 1.3 ORGANIZATION STRUCTURE

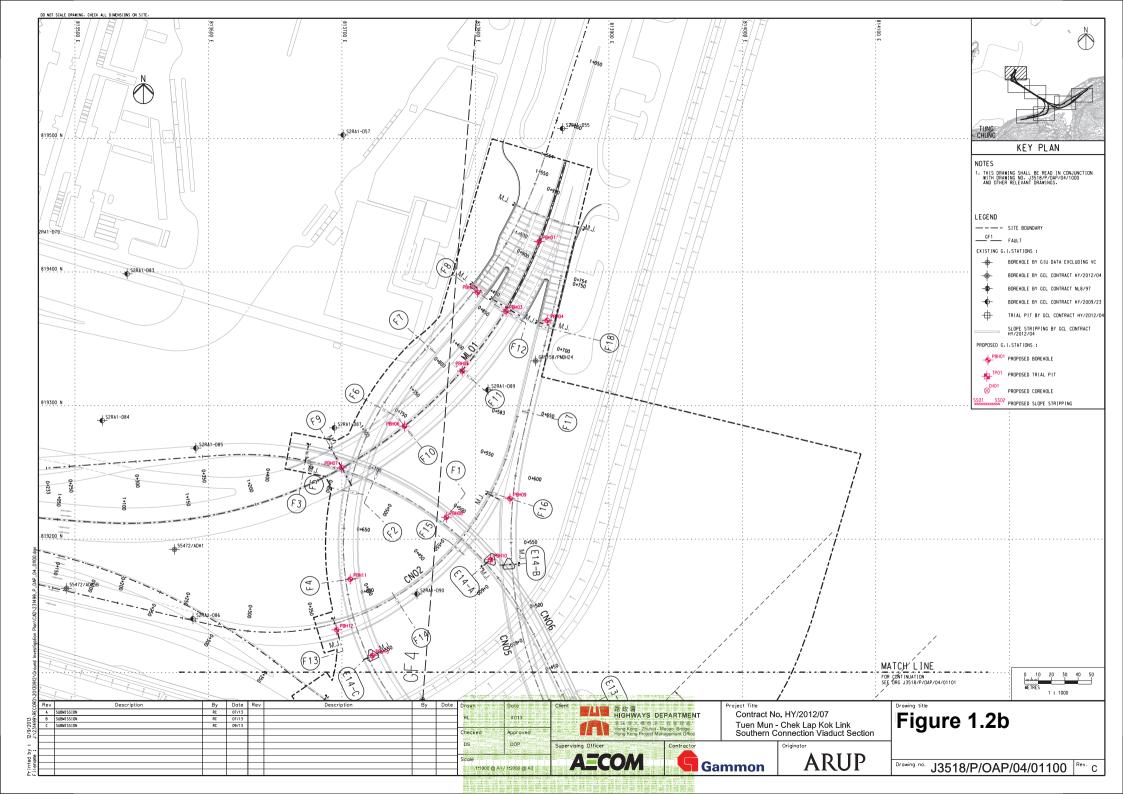
The organization structure of the Contract is shown in *Appendix A*. The key personnel contact names and contact details are summarized in *Table 1.1* below.

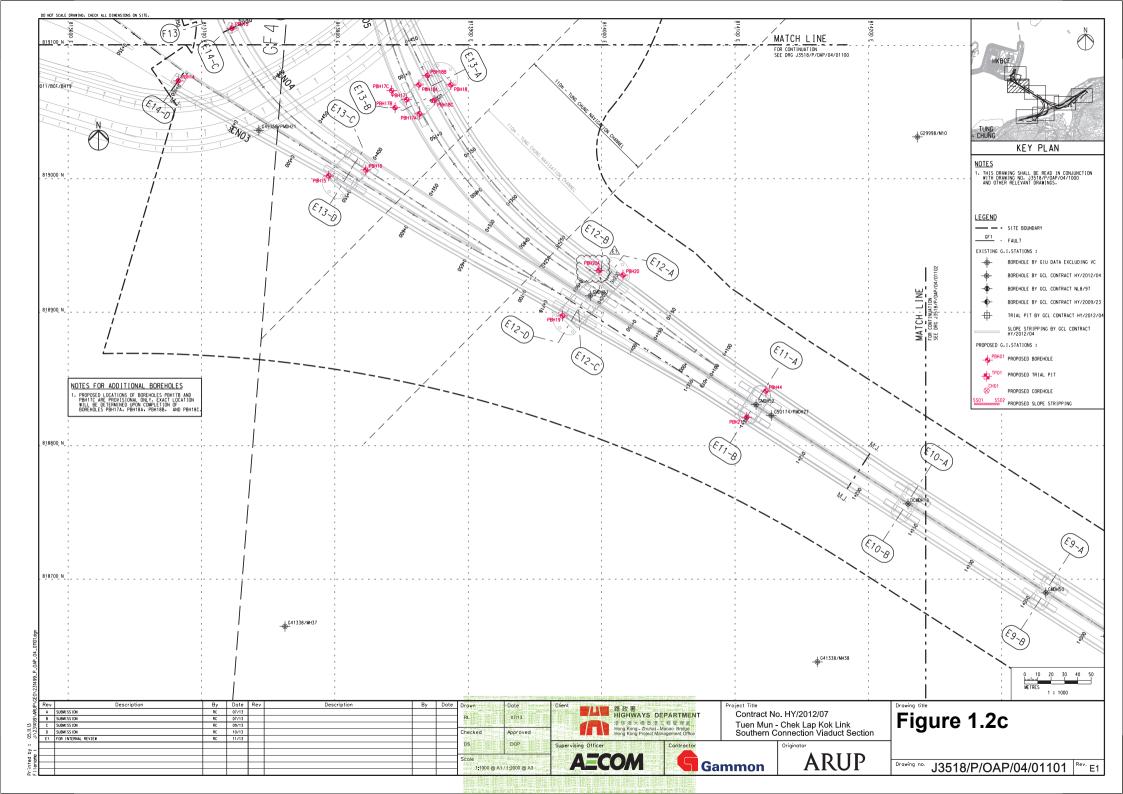
Table 1.1 Contact Information of Key Personnel

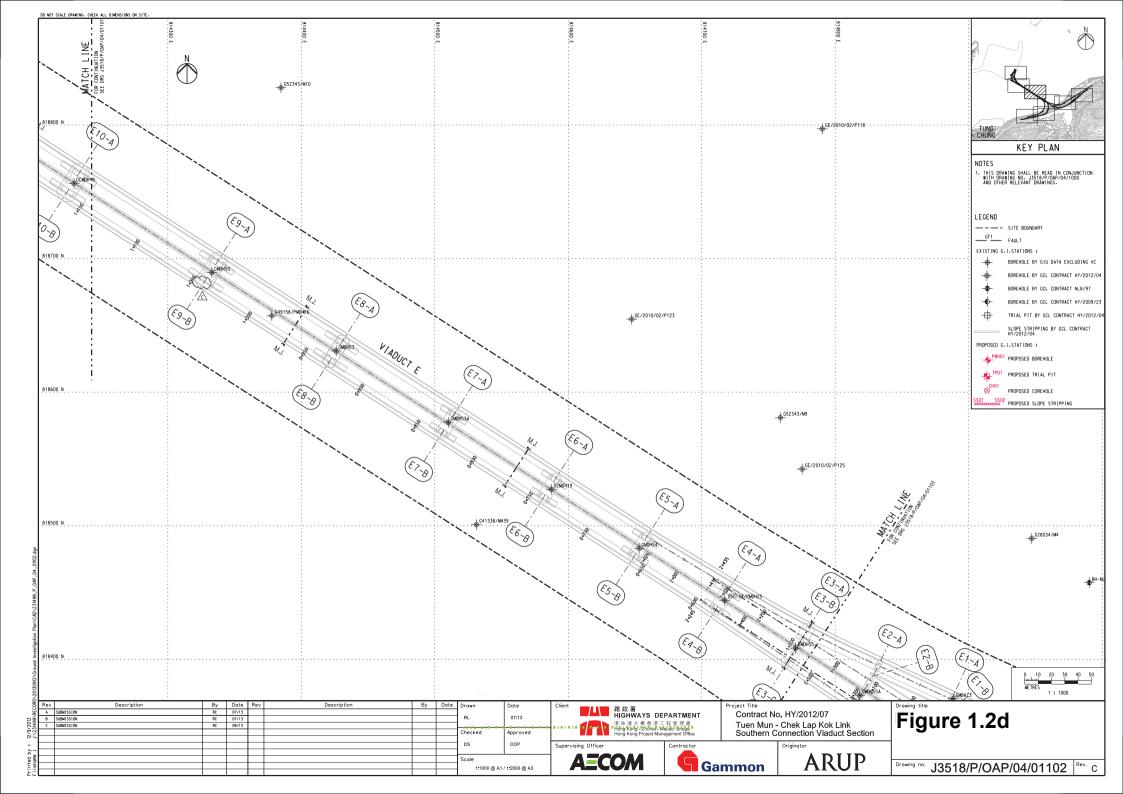
Party	Position	Name	Telephone	Fax
SOR	Chief Resident	Daniel Ip	3553 3800	2492 2057
(AECOM Asia	Engineer			
Company Limited)				
	Resident Engineer	Kingman Chan	3691 2950	3691 2899
ENPO / IEC (Ramboll Environ	ENPO Leader	Y.H. Hui	3547 2133	3465 2899
Hong Kong Ltd.)	IEC	Dr. F.C. Tsang	3547 2134	3465 2899
Contractor	Environmental	Brian Kam	3520 0387	3520 0486
(Gammon Construction Limited)	Manager			
,	Environmental	Roy Leung	3520 0387	3520 0486
	Officer			
	24-hour Complaint		9738 4332	
	Hotline			
ET (ERM-HK)	ET Leader	Jovy Tam	2271 3113	2723 5660

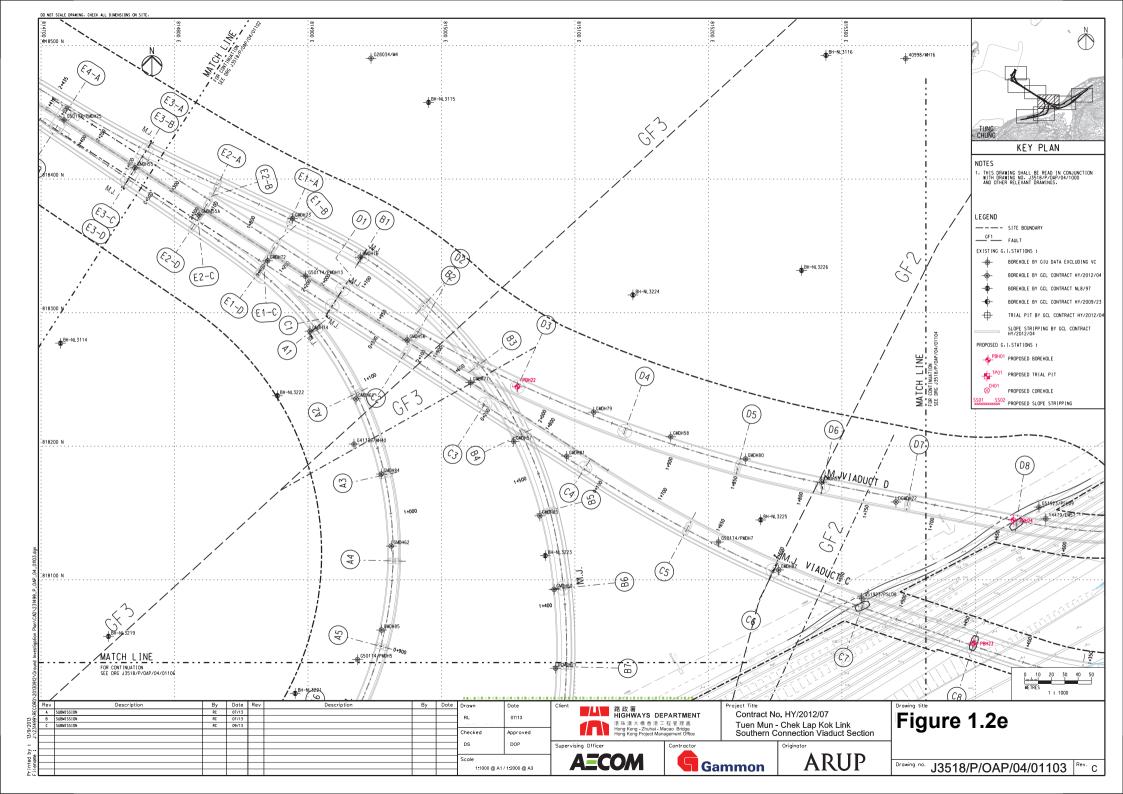


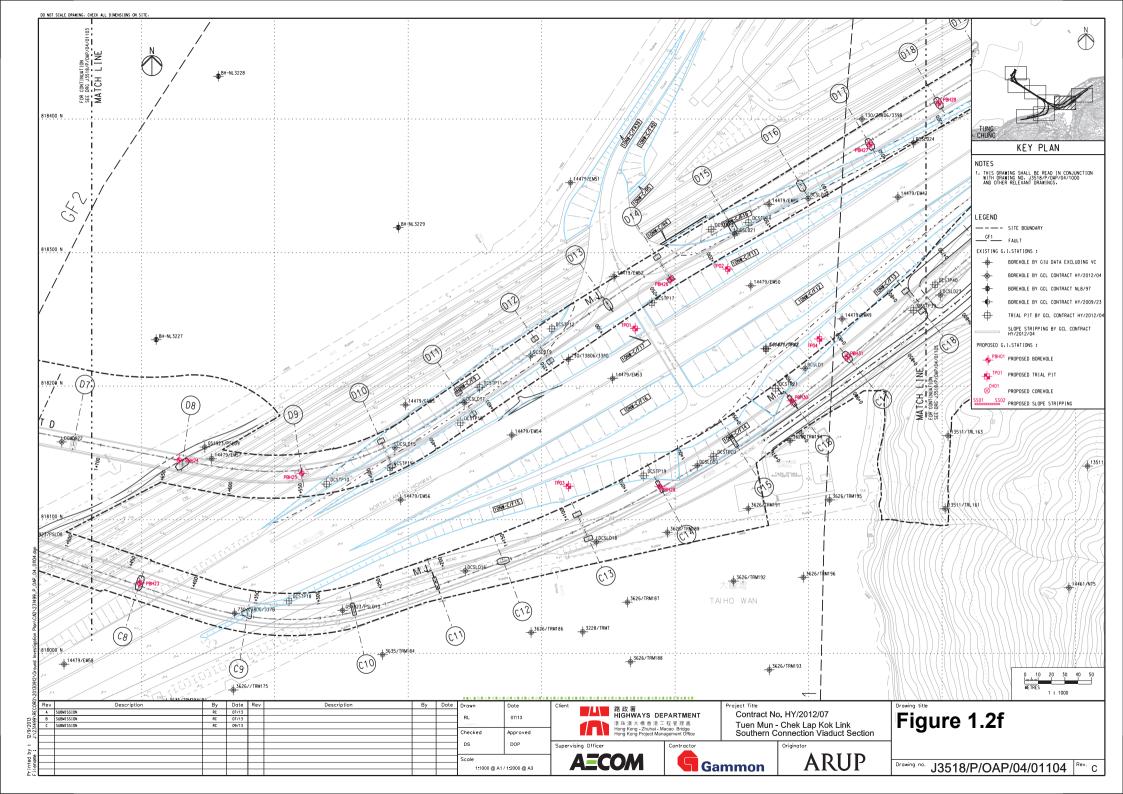


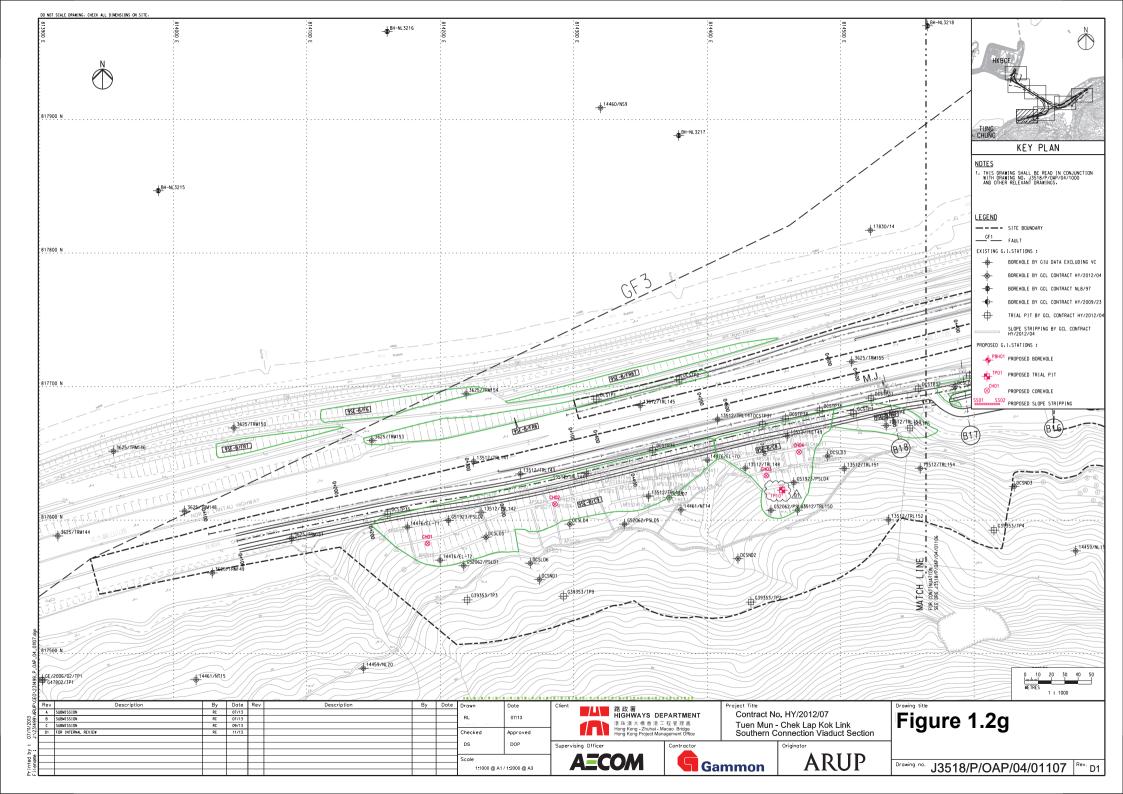


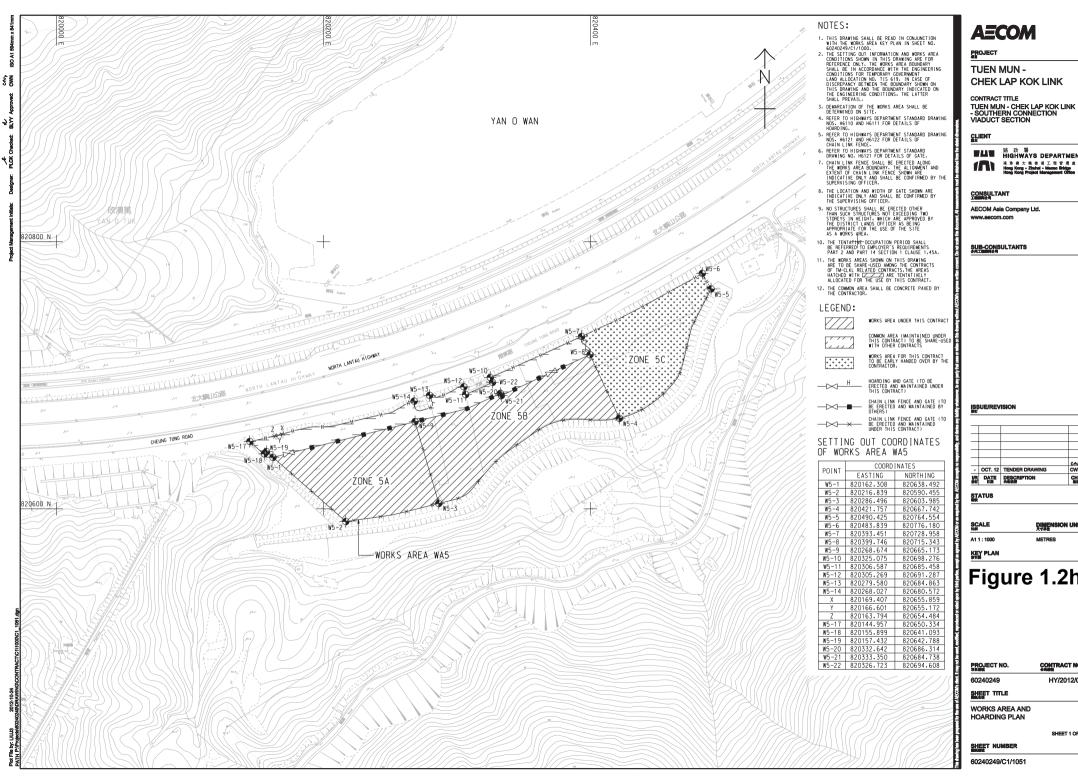












#### **AECOM**

PROJECT

TUEN MUN -CHEK LAP KOK LINK

CONTRACT TITLE

■ B 政 署 HIGHWAYS DEPARTMENT

CONSULTANT

AECOM Asia Company Ltd.

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Figure 1.2h

PROJECT NO.

CONTRACT NO. HY/2012/07

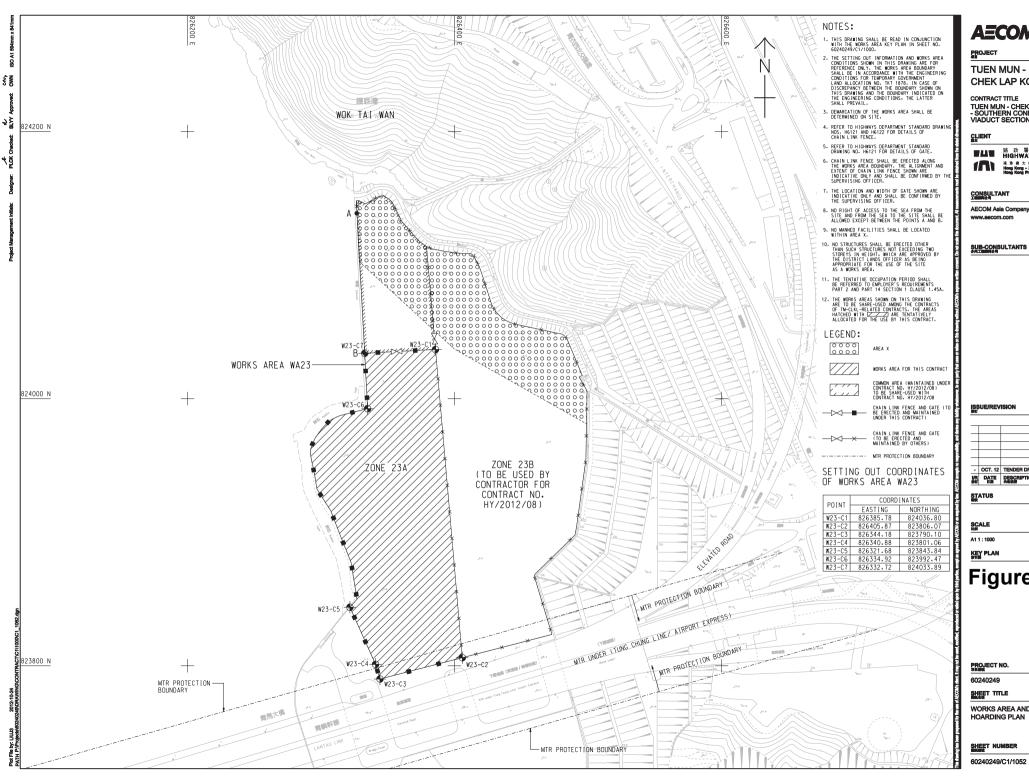
SHEET TITLE

WORKS AREA AND HOARDING PLAN

SHEET 1 OF 2

SHEET NUMBER

60240249/C1/1051



#### **AECOM**

TUEN MUN -CHEK LAP KOK LINK

CONTRACT TITLE TUEN MUN - CHEK LAP KOK LINK - SOUTHERN CONNECTION VIADUCT SECTION

■ B 政 署 HIGHWAYS DEPARTMENT 送取 表大 集 香 港 工 程 管 理 意 Hong Kong - Zhahal - Macano Bridge

AECOM Asia Company Ltd.

ISSUE/REVISION

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Figure 1.2i

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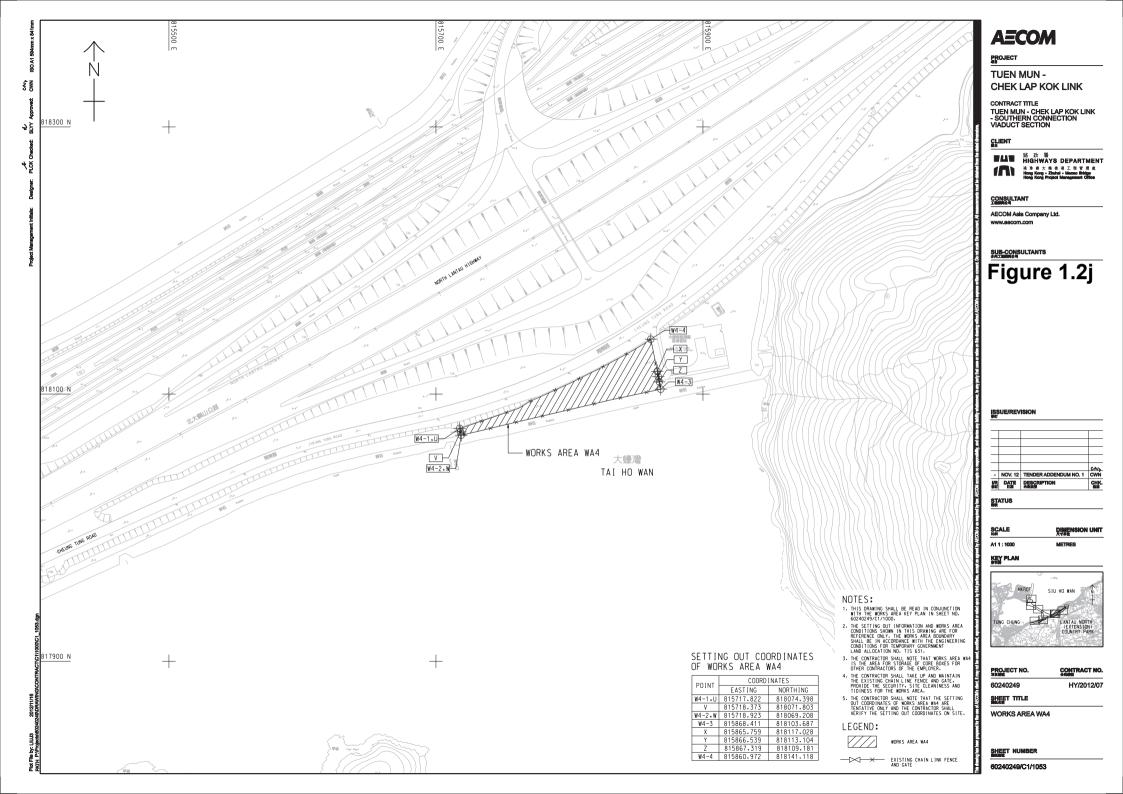
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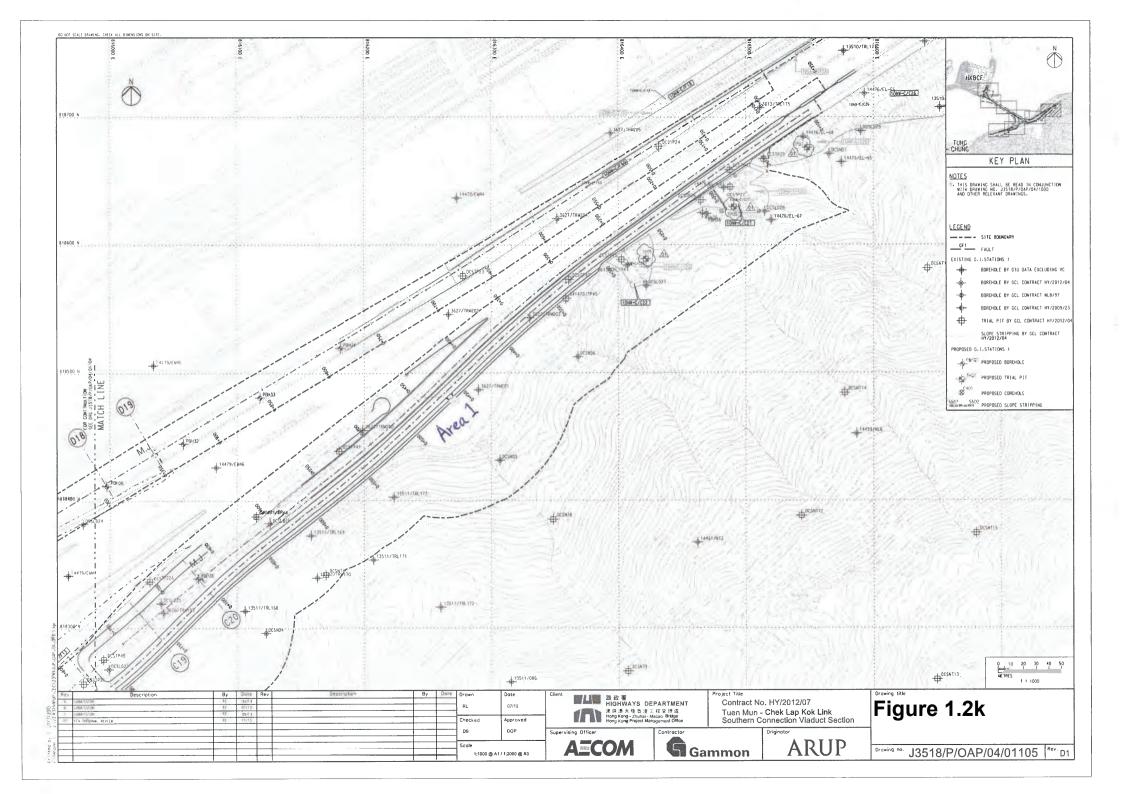
WORKS AREA AND HOARDING PLAN

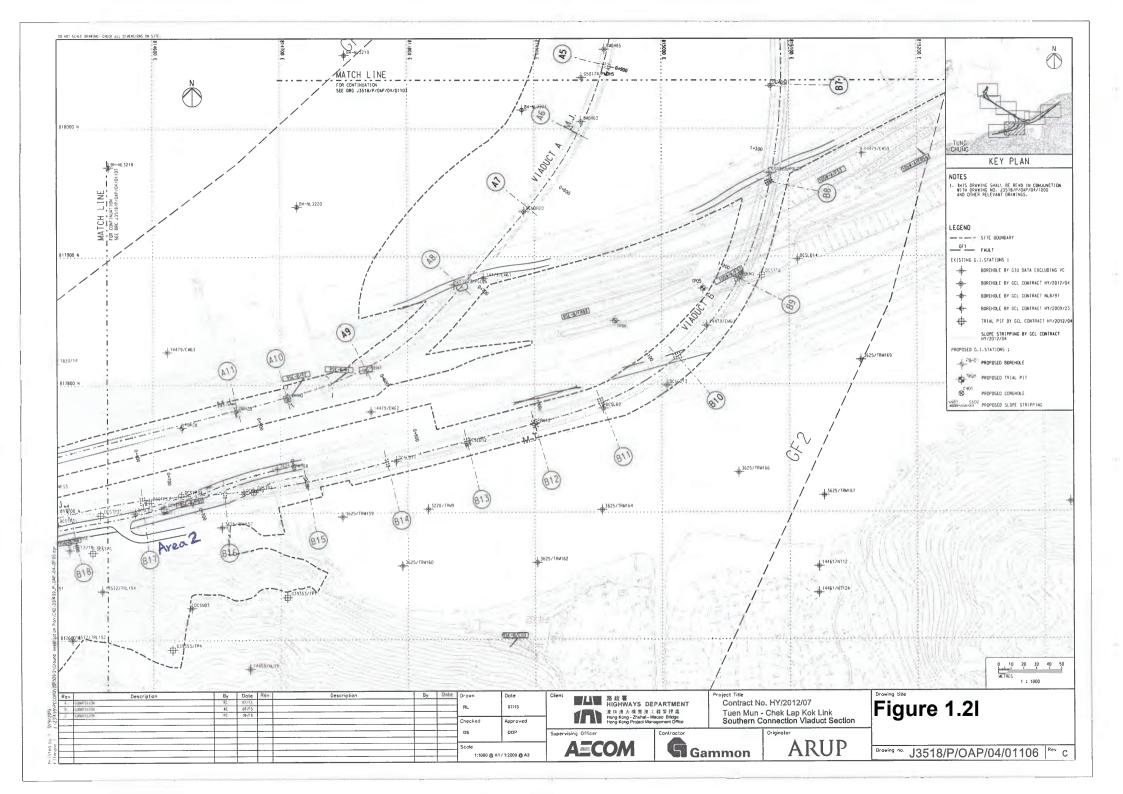
SHEET 2 OF 2

SHEET NUMBER

60240249/C1/1052







#### 1.4 SUMMARY OF CONSTRUCTION WORKS

The construction phase of the Contract commenced on 31 October 2013. The rolling construction programme for the period of December 2015 to February 2016 is shown in *Appendix B*.

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

#### December 2015

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Construction and installation of pile caps;
- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land GI, trial pits & lab testing;
- Installation of pier head segment; and
- Slope work of Viaducts A, B & C.

#### January 2016

#### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

#### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Predrilling at Viaduct F;
- Additional land GI, trial pits & lab testing;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

#### February 2016

#### Marine Works

Construction and installation of pile caps;

- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

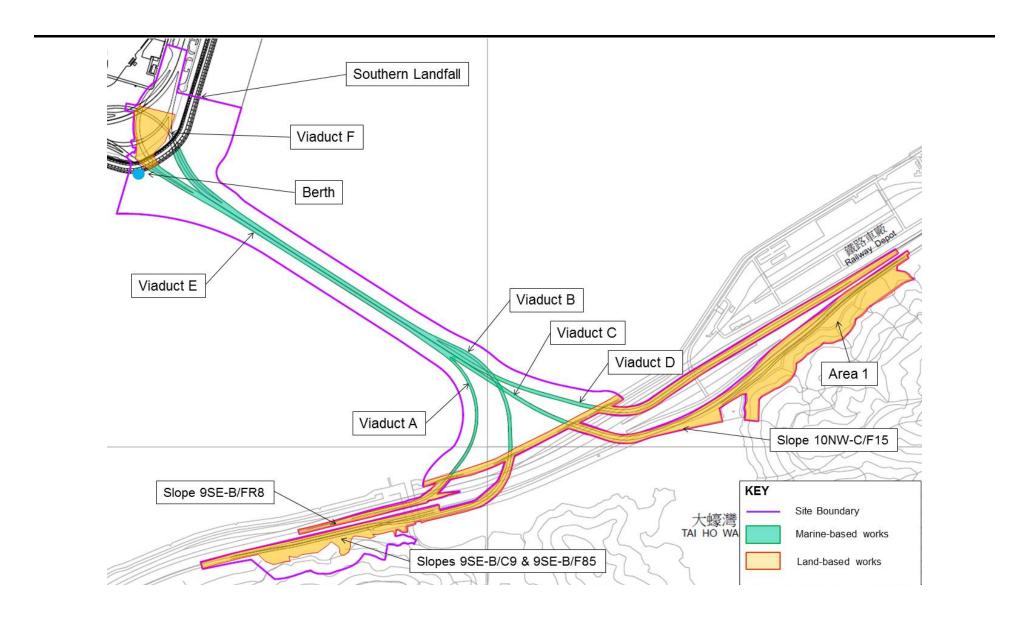
#### Land-based Works

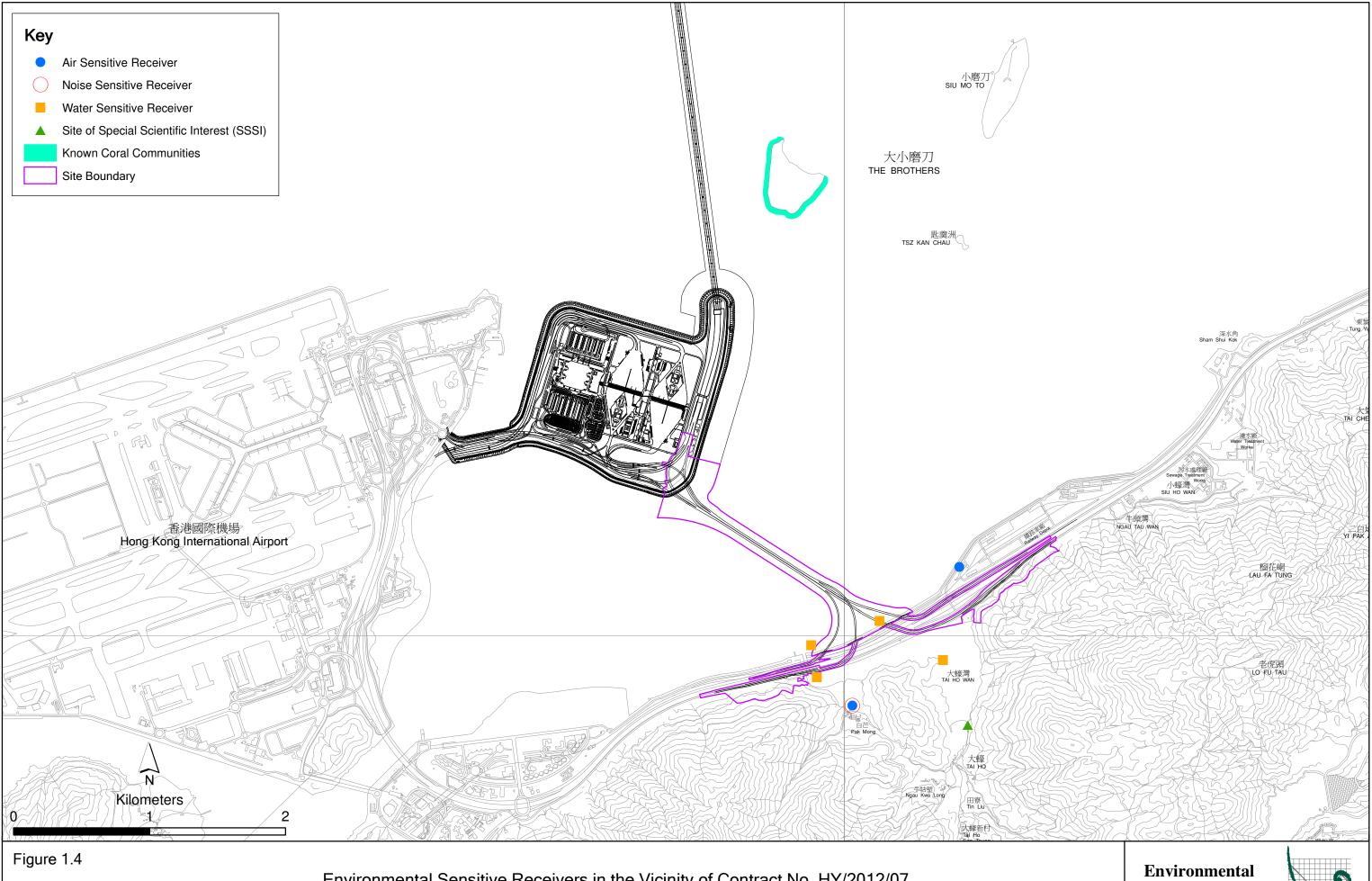
- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

The locations of the construction activities are shown in *Figure 1.3*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.4*.

The environmental mitigation measures implementation schedule is presented in *Appendix C*.

Figure 1.3 Locations of Construction Activities in the Reporting Period





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Environmental Sensitive Receivers in the Vicinity of Contract No. HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section

Environmental Resources Management



#### 1.5 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

The EM&A programme required environmental monitoring for air quality, noise, water quality and marine ecology as well as environmental site inspections for air quality, noise, water quality, waste management, marine ecology and landscape and visual impacts. The EM&A requirements and related findings for each component are described in the following sections, which include:

- Monitoring parameters;
- Monitoring schedules for the reporting months and forthcoming months;
- Action and Limit levels for all environmental parameters;
- Event Action Plan;
- Results and observations;
- Environmental mitigation measures, as recommended in the approved EIA Report; and
- Environmental requirement in contract documents.

#### 2 EM&A RESULTS

The EM&A programme required environmental monitoring for air quality, noise, water quality and marine ecology as well as environmental site inspections for air quality, noise, water quality, waste management, marine ecology and landscape and visual impacts. The EM&A requirements and related findings for each component are summarized in the following sections.

#### 2.1 AIR QUALITY

The baseline air quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) during October 2011 has included the two monitoring stations ASR9A and ASR9C for this project. Thus, the baseline monitoring results and Action/Limit Level presented in HKZMB Baseline Monitoring Report (1) are adopted for this Project.

#### 2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual, impact 1-hour TSP monitoring was conducted three (3) times every six (6) days while the highest dust impact was expected. Impact 24-hour TSP monitoring was carried out once every six (6) days. The Action and Limit Levels of the air quality monitoring is provided in *Appendix D*.

1-hour TSP and 24-hour TSP monitoring were conducted at 2 alternative air quality monitoring stations, ASR8A (Area 4) and ASR9 (Entrance of MTR Depot) during the reporting period in accordance with the requirement of the Updated EM&A Manual. The monitoring stations are indicated in *Figure 2.1* and details are presented in *Table 2.1*.

High Volume Samplers (HVSs) were used for carrying out 1-hour and 24-hour TSP monitoring during the reporting period. The HVSs meets all requirements of the Updated EM&A Manual. Brand and model of the equipment are given in *Table 2.2*.

Wind data monitoring equipment was installed at Area 4 during the reporting period for logging wind speed and wind direction. The wind sensor was setup such that it was clear of obstructions or turbulence caused by building. The wind data monitoring equipment is recalibrated at least once every six months.

<sup>(1)</sup> Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong - Zhuhai - Macao Bridge Hong Kong Projects - Investigation. Baseline Environmental Monitoring Report (Version C). Submitted on 8 March 2012 and subsequently approved by EPD.

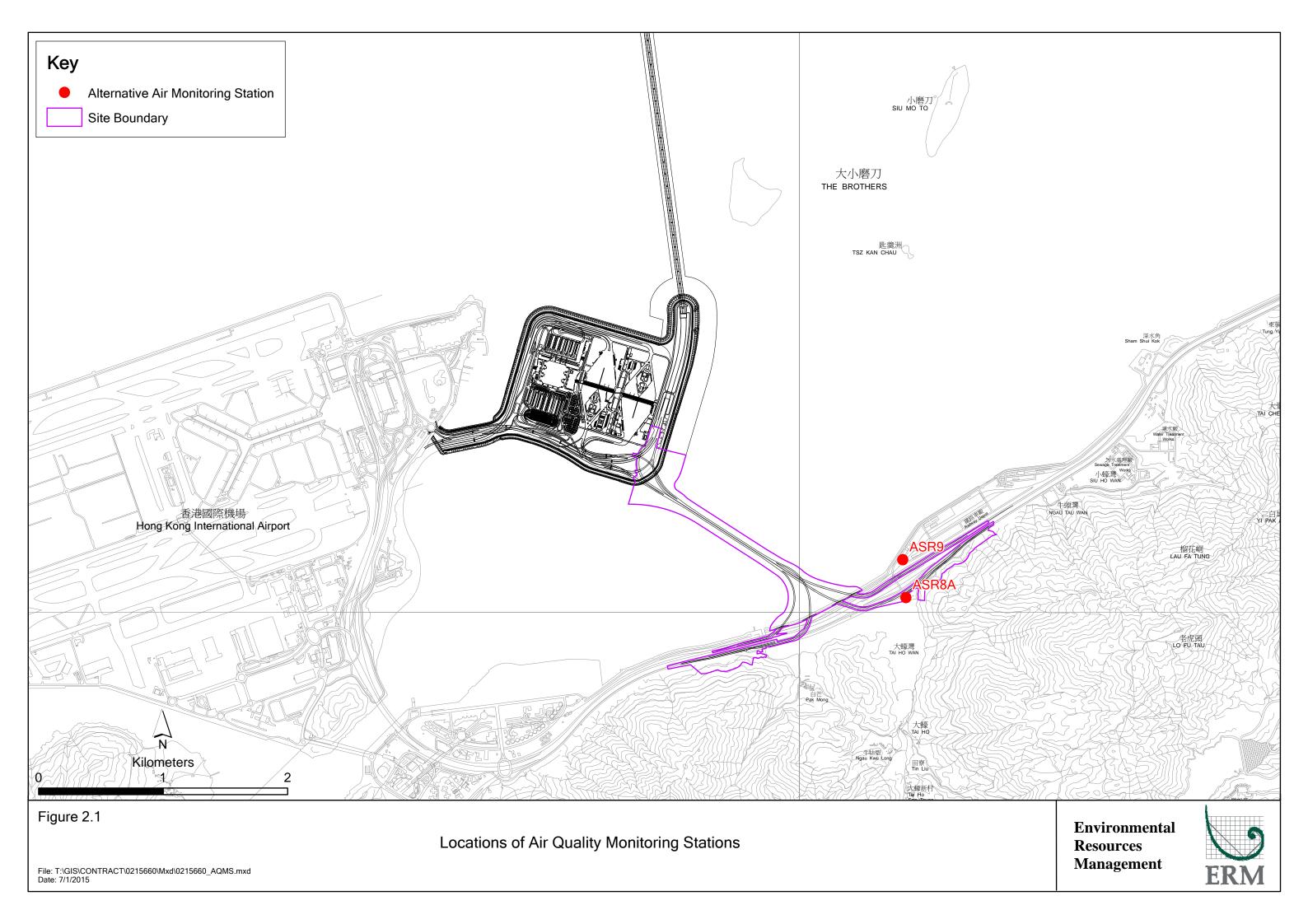


Table 2.1 Locations of Impact Air Quality Monitoring Stations and Monitoring Dates in this Reporting Period

Monitoring Station (1)	Monitoring Period	Location	Description	Parameters & Frequency
ASR8A	1, 7, 10, 16, 22, 28 and 31 December	Area 4	On ground at the Area 4	• 1-hour Total Suspended Particulates (1-hour TSP,
ASR9	2015 6, 12, 18, 21 and 27 January 2016 2, 5, 11, 17, 23 and 29 February 2016	MTR Depot	On the ground nearby MTR Depot Entrance	<ul> <li>μg/m³), 3 times per day every 6 days</li> <li>24-hour Total Suspended Particulates (24-hour TSP, μg/m³), daily for 24-hour every 6 days</li> </ul>

#### Note:

#### Table 2.2 Air Quality Monitoring Equipment

Equipment	Brand and Model
High Volume Sampler	Tisch Environmental Mass Flow Controlled
(1-hour TSP and 24-hour TSP)	Total Suspended Particulate (TSP) High
	Volume Sampler (Model No. TE-5170)
Wind Sensor	Global Water (Wind Speed Sensor: WE550; Wind Direction Sensor: WE570)
Wind Anemometer for calibration	Lutron (Model No. AM-4201)

#### 2.1.2 Action & Limit Levels

The Action and Limit Levels of the air quality monitoring are provided in *Appendix D*. The Event and Action plan is presented in *Appendix J*.

#### 2.1.3 Monitoring Schedule for the Reporting Quarter

The schedules for air quality monitoring in the reporting quarter are provided in *Appendix E*.

#### 2.1.4 Results and Observations

The monitoring results for 1-hour TSP and 24-hour TSP are summarized in *Tables 2.3* and 2.4, respectively. Monitoring results are presented graphically in *Appendix F*. Detailed impact air quality monitoring results and meteorological information were reported in the *Twenty-sixth* to *Twenty-eighth Monthly EM&A Reports*.

<sup>(1)</sup> Air Quality Monitoring Stations ASR9A and ASR9C at Siu Ho Wan MTRC Depot proposed in accordance with the Updated EM&A were relocated to ASR9 and ASR8A respectively.

Table 2.3 Summary of 1-hour TSP Monitoring Results in this Reporting Period

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (µg/m³)
December 2015	ASR 8A	92	62 - 131	394	500
	ASR 9	94	57 - 145	393	500
January 2016	ASR 8A	71	49 - 118	394	500
	ASR 9	63	45 - 111	393	500
February 2016	ASR 8A	89	39 - 153	394	500
	ASR 9	105	39 - 172	393	500

Table 2.4 Summary of 24-hour TSP Monitoring Results in this Reporting Period

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (µg/m³)
December 2015	ASR 8A	64	54 - 81	178	260
	ASR 9	78	65 - 113	178	260
January 2016	ASR 8A	54	47 - 64	178	260
	ASR 9	56	49 - 64	178	260
February 2016	ASR 8A	64	51 - 100	178	260
	ASR 9	73	55 - 114	178	260

The major dust sources in the reporting period include construction activities under the Contract as well as nearby traffic emissions.

In this reporting period, a total of eighteen (18) monitoring events were undertaken within the reporting period, in which no Action or Limit Level exceedance for 1-hour and 24-hour TSP for air quality was recorded during the reporting period.

#### 2.2 Noise Monitoring

The baseline noise monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) during the period of 18 October to 1 November 2011 has included the monitoring station NSR1 for this project. Thus, the baseline monitoring results and Action/ Limit Level presented in HKZMB Baseline Monitoring Report (1) are adopted for this Project.

#### 2.2.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual, impact noise monitoring should be conducted once per week during the construction phase of the Contract.

Noise monitoring was conducted at the alternative noise monitoring station, NSR1A (Pak Mong Village Pavilion) during the reporting period in accordance with the requirement of Updated EM&A Manual. *Figure 2.2* shows the location of the monitoring station. *Table 2.5* describes the details of the monitoring station.

Noise monitoring was performed using sound level meter at the designated monitoring station in the reporting quarter. The deployed sound level meter complies with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meter at a known sound pressure level. Brand and model of the equipment is given in *Table 2.6*.

<sup>(1)</sup> Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong - Zhuhai - Macao Bridge Hong Kong Projects - Investigation. Baseline Environmental Monitoring Report (Version C). Submitted on 8 March 2012 and subsequently approved by EPD.

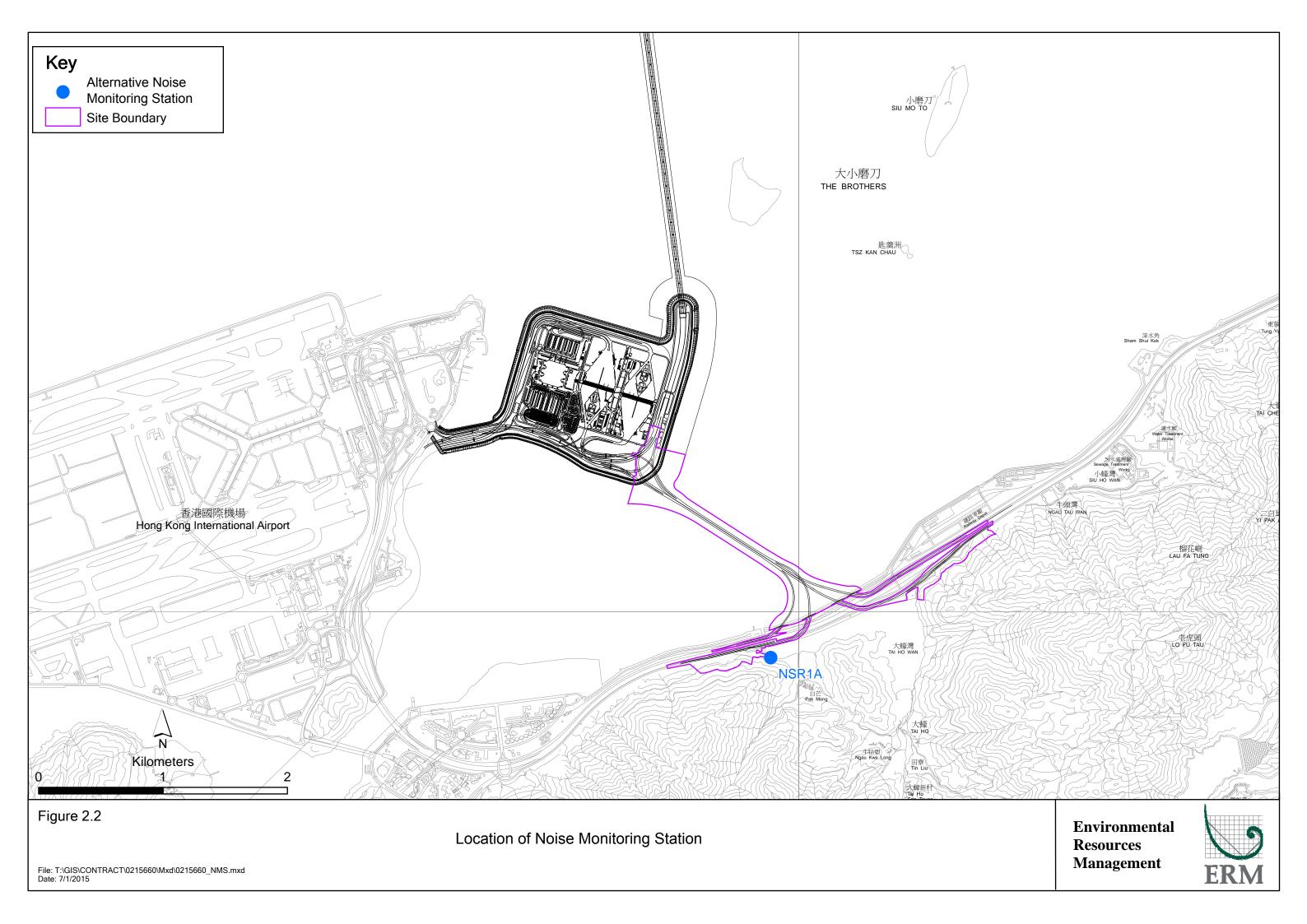


Table 2.5 Location of Impact Noise Monitoring Station and Monitoring Dates in this Reporting Period

Monitoring Station	Monitoring Period	Location	Parameters & Frequency
NSR1A	1, 7, 10, 16, 22, 28 and 31 December 2015 6, 12, 18, 21 and 27 January 2016 2, 5, 11, 17, 23 and 29 February 2016	Pak Mong Village Pavilion	<ul> <li>30-mins measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). L<sub>eq</sub>, L<sub>10</sub> and L<sub>90</sub> would be recorded.</li> <li>At least once a week</li> </ul>

#### Note:

### Table 2.6 Noise Monitoring Equipment

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

### 2.2.2 Action and Limit Levels

The Action and Limit levels of the noise monitoring are provided in *Appendix D*. The Event and Action plan is presented in *Appendix J*.

### 2.2.3 Monitoring Schedule for the Reporting Quarter

The schedules for noise monitoring in the reporting quarter are provided in *Appendix E*.

### 2.2.4 Results and Observations

The monitoring results for noise monitoring are summarized in *Table 2.7*. Monitoring results are presented graphically in *Appendix G* and detailed impact noise monitoring results are reported in the *Twenty-sixth* to *Twenty-eighth Monthly EM&A Reports*.

Table 2.7 Summary of Construction Noise Monitoring Results at NSR1A in the Reporting Period

Month	Average , dB(A), L <sub>eq</sub>	Range, dB(A), L <sub>eq</sub>	Limit Level, dB(A), L <sub>eq</sub>
	(30mins)	(30mins)	(30mins)
December 2015	60	59 - 62	75
January 2016	61	59 - 62	75
February 2016	60	58 - 63	75

A total of eighteen (18) monitoring events were undertaken in the reporting period with no Action Level and Limit Level exceedance recorded at the monitoring station in the reporting period. No action is thus required to be undertaken in accordance with the Event Action Plan presented in *Appendix J*.

<sup>(1)</sup> Noise Monitoring Station NSR1 at Pak Mong Village proposed in accordance with the Updated EM&A was relocated to NSR1A.

Major noise sources during the noise monitoring included construction activities, nearby traffic noise and aircraft noise.

### 2.3 WATER QUALITY MONITORING

The baseline water quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) between 6 and 31 October 2011 has included all monitoring stations except SR4a for the Project. Thus, the baseline monitoring results except for station SR4a and Action/Limit Level presented in HKZMB Baseline Monitoring Report <sup>(1)</sup> are adopted for this Project. Baseline water quality monitoring was conducted at station SR4a from 29 August to 24 September 2013.

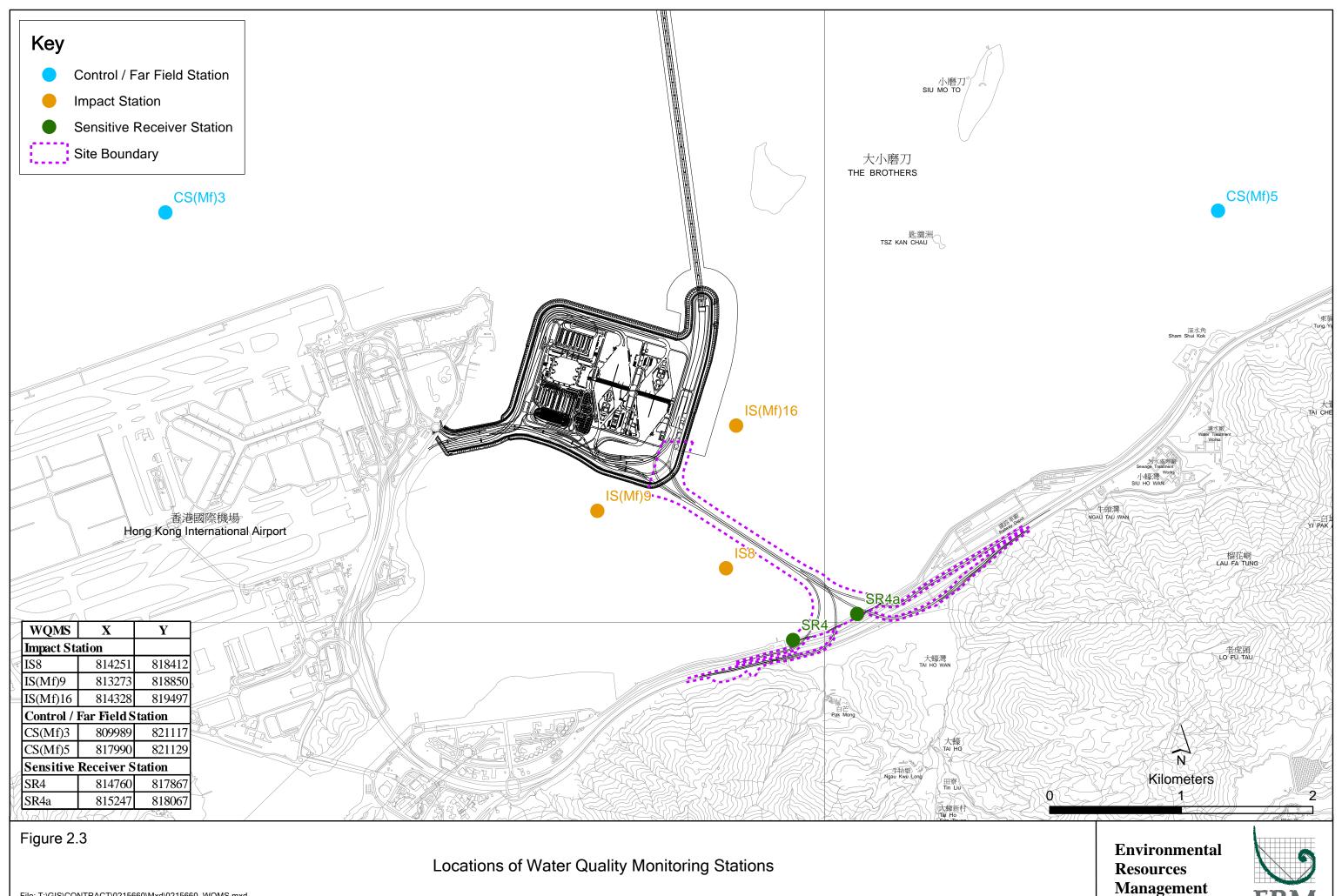
### 2.3.1 Monitoring Requirements and Equipment

Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action was taken to rectify the situation. Impact water quality monitoring was undertaken three days per week during the construction period at seven water quality monitoring stations in accordance with the Updated EM&A Manual (*Figure* 2.3; *Table* 2.8).

Table 2.8 Locations of Water Quality Monitoring Stations and the Corresponding Monitoring Requirements

Station	Type	Coor	dinates	*Parameters, unit	Depth	Frequency
ID						
		Easting	Northing			
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	<ul> <li>Temperature(°C)</li> <li>pH(pH unit)</li> <li>Turbidity (NTU)</li> <li>Water depth (m)</li> <li>Salinity (ppt)</li> </ul>	3 water depths: 1m below sea surface, mid-depth	Impact monitoring: 3 days per week, at mid-flood and mid-ebb
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497	<ul><li>DO (mg/L and % of saturation)</li><li>SS (mg/L)</li></ul>	and 1m above sea bed. If the water depth is less than	tides during the construction period of the Contract.
IS8	Impact Station(Close to HKBCF construction site)	814251	818412		3m, mid- depth sampling only. If water depth	
SR4	Sensitive receiver (Tai Ho Inlet)	814760	817867		less than 6m, mid- depth may	
SR4a	Sensitive receiver	815247	818067		be omitted.	
CS(Mf)3	Control Station	809989	821117			

<sup>(1)</sup> Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong - Zhuhai - Macao Bridge Hong Kong Projects - Investigation. Baseline Environmental Monitoring Report (Version C). Submitted on 8 March 2012 and subsequently approved by EPD.



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Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
CS(Mf)5	Control	817990	821129			
	Station					

Notes:

In addition to the parameters presented monitoring location/position, time, water depth, sampling depth, tidal stages, weather conditions and any special phenomena or works underway nearby were also recorded.

*Table 2.9* summarizes the equipment used in the impact water quality monitoring programme.

### Table 2.9 Water Quality Monitoring Equipment

Equipment	Brand and Model
DO, Temperature meter and Salinity	YSI Pro2030
Turbidimeter	HACH Model 2100Q
pH meter	Thermo Scientific Orion 2 Star
Positioning Equipment	Koden913MK2 with KBG-3 DGPS antenna
Water Depth Detector	Speedtech Instrument SM-5
Water Sampler	Kemmerer 1520 (1520-C25) 2.2L with messenger

### 2.3.2 Action & Limit Levels

The Action and Limit Levels of the water quality monitoring are provided in *Appendix D*.

### 2.3.3 Monitoring Schedule for the Reporting Quarter

The schedules for water quality monitoring in the reporting quarter are provided in *Appendix E*. The water quality monitoring on 9 February 2016 was cancelled due to suspension of marine works during holiday.

### 2.3.4 Results and Observations

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting period. Monitoring results are presented graphically in *Appendix H* and detailed impact water quality monitoring results were reported in the *Twenty-sixth* to *Twenty-eighth Monthly EM&A Reports*.

In this reporting period, a total of thirty-eight (38) monitoring events were undertaken with no Action Level and Limit Level exceedance recorded at the monitoring station in the reporting period. No action is thus required to be undertaken in accordance with the Event Action Plan presented in *Appendix J*.

### 2.4 DOLPHIN MONITORING

### 2.4.1 Monitoring Requirements

Impact dolphin monitoring is required to be conducted by a qualified dolphin specialist team to evaluate whether there have been any effects on the dolphins. In order to fulfil the EM&A requirements and make good use of available resources, the on-going impact line transect dolphin monitoring data collected by HyD's *Contract No. HY/2011/03 Hong Kong-Zhuhai-Macao Bridge.* Hong Kong Link Road - Section between Scenic Hill and Hong Kong Boundary Crossing Facilities on the monthly basis is adopted to avoid duplicates of survey effort.

### 2.4.2 Monitoring Equipment

*Table 2.10* summarizes the equipment used for the impact dolphin monitoring.

Table 2.10 Dolphin Monitoring Equipment

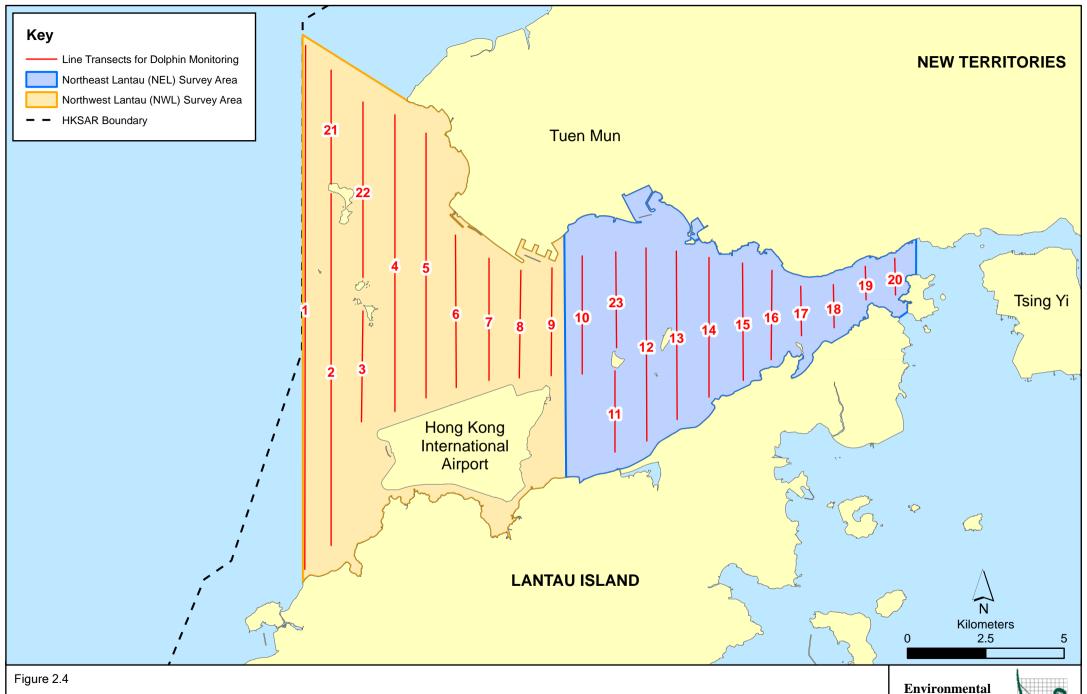
Equipment	Model
Global Positioning System (GPS)	Garmin 18X-PC
	Geo One Phottix
Camera	Nikon D90 300m 2.8D fixed focus
	Nikon D90 20-300m zoom lens
Laser Binoculars	Infinitor LRF 1000
Marine Binocular	Bushell 7 x 50 marine binocular with compass
Vessel for Monitoring	and reticules
	65 foot single engine motor vessel with
	viewing platform 4.5m above water level

### 2.4.3 Monitoring Parameter, Frequencies & Duration

Dolphin monitoring should cover all transect lines in Northeast Lantau (NEL) and the Northwest Lantau (NWL) survey areas twice per month throughout the entire construction period. The monitoring data should be compatible with, and should be made available for, long-term studies of small cetacean ecology in Hong Kong. In order to provide a suitable long-term dataset for comparison, identical methodology and line transects employed in baseline dolphin monitoring was followed in the impact dolphin monitoring.

### 2.4.4 Monitoring Location

The impact dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in *Figure 2.4*. The co-ordinates of all transect lines are shown in *Table 2.11* below.



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Layout of Transect Lines of Dolphin Monitoring in Northwest and Northeast Lantau Areas

Environmental Resources Management



 Table 2.11
 Impact Dolphin Monitoring Line Transect Co-ordinates

	Line No.	Easting	Northing	Lin	e No.	Easting	Northing
1	Start Point	804671	814456	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805475	815913	14	Start Point	817537	820220
2	End Point	805477	826654	14	End Point	817537	824613
3	Start Point	806464	819435	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	819771	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	820220	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	820466	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	820880	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	821123	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	821303	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	820872	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818853	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807				
12	End Point	815542	824882				

### 2.4.5 Action & Limit Levels

The action and limit levels of dolphin impact monitoring are shown in *Appendix D*. The Event and Action plan is presented in *Appendix J*.

### 2.4.6 Monitoring Schedule for the Reporting Period

The dolphin monitoring schedules for the reporting period are shown in *Appendix E*.

### 2.4.7 Results & Observations

A total of 907.45 km of survey effort was collected, with 95.1% of the total survey effort being conducted under favourable weather conditions (i.e.

Beaufort Sea State 3 or below with good visibility). Among the two areas, 347.07 km and 560.38 km of survey effort were conducted in NEL and NWL survey areas respectively. The total survey effort conducted on primary lines was 655.90 km, while the effort on secondary lines was 251.55 km. Survey effort conducted on both primary and secondary lines were considered as oneffort survey data. The survey efforts are summarized in *Appendix I*.

During the six sets of monitoring surveys in December 2015 to February 2016, a total of fourteen (14) groups of fifty-seven (57) Chinese White Dolphins were sighted. All except one (1) dolphin sightings were made during on-effort search, and ten (10) of thirteen (13) dolphin sightings were made on primary lines. In this quarterly period, all dolphin groups were sighted in NWL. Summary table of the dolphin sightings is shown in *Appendix I*.

Encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data from the primary transect lines under favourable conditions (Beaufort 3 or below) in the reporting period with the results presented in *Tables 2.12* and *2.13*.

Table 2.12 Individual Survey Event Encounter Rates

Survey Area	Survey period	Encounter rate (STG)	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)  Primary Lines Only
	Set 1: 2 <sup>nd</sup> / 7 <sup>th</sup> Dec 2015	0.0	0.0
	Set 2: 9th / 15th Dec 2015	0.0	0.0
NEL	Set 3: 8th /11th Jan 2016	0.0	0.0
	Set 4: 13th / 19th Jan 2016	0.0	0.0
	Set 5: 2 <sup>nd</sup> / 3 <sup>rd</sup> Feb 2016	0.0	0.0
	Set 6: 16th /22nd Feb 2016	0.0	0.0
	Set 1: 2 <sup>nd</sup> / 7 <sup>th</sup> Dec 2015	4.12	17.84
	Set 2: 9th / 15th Dec 2015	4.78	11.94
NWL	Set 3: 8th /11th Jan 2016	2.79	9.78
	Set 4: 13th / 19th Jan 2016	1.36	10.90
	Set 5: 2 <sup>nd</sup> / 3 <sup>rd</sup> Feb 2016	1.35	6.75
	Set 6: 16th /22nd Feb 2016	1.44	8.66

Note: Dolphin Encounter Rates are deduced from the six sets of surveys (two surveys in each set) in the reporting period in Northeast (NEL) and Northwest Lantau (NWL)

Table 2.13 Quarterly Average Encounter Rates

Survey Area	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	December 2015 - September - February 2016 November 2011		December 2015 – February 2016	September - November 2011
Northeast Lantau	0.0	$6.00 \pm 5.05$	0.0	22.19 ± 26.81
Northwest Lantau	2.64 ± 1.52	9.85 ± 5.85	10.98 ± 3.81	44.66 ± 29.85

Note: encounter rates deduced from the baseline monitoring period (September- November 2011) have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions

The average dolphin group size in NWL waters during December 2015 to February 2016 was slightly higher than the ones recorded during the three month baseline period. Eight (8) of the fourteen (14) groups were composed of one to three (1-3) individuals, while three (3) other groups were moderate in size with five to six (5-6) individuals per group. Moreover, three (3) large dolphin groups with eight to ten (8-10) individuals were sighted during the present quarterly period. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in *Table 2.14*.

Table 2.14 Comparison of Quarterly Average Encounter Rates

	Average Dolphin Group Size				
	December 2015 - February 2016	September - November 2011			
Overall	4.07 ± 3.22 (n = 14)	$3.72 \pm 3.13 $ (n = 66)			
Northeast Lantau	N/A (n = 0)	3.18 ± 2.16 (n = 17)			
Northwest Lantau	4.07 ± 3.22 (n = 14)	3.92 ± 3.40 (n = 49)			

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between December 2015 and February 2016.

During this quarter of dolphin monitoring, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations.

Although the dolphins infrequently occurred along the alignment of TM-CLKL Southern Connection Viaduct in the past and during the baseline monitoring period, it is apparent that dolphin usage has been significantly reduced in NEL, and many individuals have shifted away from the important habitat around the Brothers Islands.

It is critical to monitor the dolphin usage in North Lantau region in the upcoming quarters, to determine whether the dolphins are continuously

affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

### 2.4.8 Marine Mammal Exclusion Zone Monitoring

Daily marine mammal exclusion zone monitoring was undertaken during the period of marine works under this Contract. No sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) was recorded in the monitoring period during the exclusion zone monitoring.

Passive Acoustic Monitoring (PAM) was decommissioned in this reporting period as no marine piling works was carried out outside the daylight hours since September 2015. Daytime marine mammal exclusion zone was still in effect to cater for temporary staging installation and uninstallation works.

### 2.5 EM&A SITE INSPECTION

Site inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. Thirteen (13) site inspections were carried out in the reporting quarter on 2, 9, 16, 22 and 29 December 2015; 7, 13, 20 and 28 January 2016; and 4, 12, 17 and 25 February 2016.

Key observations during the site inspections in this reporting period are summarized in *Table 2.15*.

Table 2.15 Specific Observations Identified during the Weekly Site Inspection in this Reporting Period

Inspection Date	Location & Environmental Observations	Recommendations/ Remarks
2 December 2015	Area 1	Area 1
	<ul> <li>Exposed area was dry.</li> </ul>	<ul> <li>Exposed area should be watered to avoid</li> </ul>
	Cover for dump truck (RY 916) was	dust emission.
	damaged.	<ul> <li>The damaged cover should be repaired.</li> </ul>
	Slope B/C9	Slope B/C9
	<ul> <li>Checklist for wetsep was not displayed.</li> </ul>	<ul> <li>Checklist for wetsep should be displayed.</li> </ul>
	Stagnant water was found accumulated in	Stagnant water should be cleaned up
	the skip next to wetsep.	regularly.
9 December 2015	Pier C2	Pier C2
	<ul> <li>Excessive soil was found in gutter.</li> </ul>	<ul> <li>Gutter should be cleaned up regularly.</li> </ul>
	• Expired dumping permit was displayed.	<ul> <li>Expired dumping permit should not be</li> </ul>
		displayed.

Inspection Date	Location & Environmental Observations	Recommendations/ Remarks
16 December 2015  22 December 2015	Site Access 6A  Stagnant water was accumulated in drip tray. Site Access 5C  Refuse was found in drainage. Pier D11  Some chemical containers were not placed in drip tray. Seafront (near Pier B8)  Some chemical containers were not placed in drip tray.	<ul> <li>Site Access 6A</li> <li>Stagnant water should be removed regularly.</li> <li>Site Access 5C</li> <li>Refuse in drainage should be cleaned up regularly.</li> <li>Pier D11</li> <li>Chemical containers should be placed in drip tray.</li> <li>Seafront (near Pier B8)</li> <li>Chemical containers should be placed in drip tray.</li> </ul> Pier E12
	<ul><li>Some chemical containers were not placed in drip tray.</li><li>Valve of a drip tray was opened.</li></ul>	<ul> <li>Chemical containers should be placed in drip tray.</li> <li>Valve of drip tray should be closed to avoid discharge.</li> </ul>
29 December 2015	<ul><li>A breaker head was not placed in drip tray.</li><li>Soil stockpile was not covered.</li></ul>	<ul> <li>Area 1</li> <li>Equipment containing engine oil should be placed in drip tray.</li> <li>Soil stockpile should be covered by tarpaulin sheet.</li> <li>Construction material or equipment should be placed away from natural habitat.</li> </ul>
7 January 2016	<ul> <li>Abutment D</li> <li>A drip tray for generator was not plugged.</li> <li>Some chemical containers were not placed in drip tray.</li> <li>Stagnant water was accumulated in a drip tray.</li> <li>Equipment was placed too close to natural habitat.</li> <li>Unpaved area was partially dry.</li> <li>Site Access 6A</li> <li>Refuse was found in drainage.</li> </ul>	<ul> <li>Abutment D</li> <li>Drip tray should be plugged.</li> <li>Chemical containers should be placed in drip tray.</li> <li>Stagnant water was removed regularly.</li> <li>Equipment should be placed away from natural habitat.</li> <li>Sufficient watering should be applied to unpaved area regularly.</li> <li>Site Access 6A</li> <li>Refuse in drainage should be cleaned up regularly.</li> </ul>
13 January 2016	<ul> <li>Southern Landfall</li> <li>Checklist and contact person for a wetsep were not displayed.</li> <li>Chemical containers were not placed in drip tray.</li> <li>Pier E9</li> <li>Gutter was not properly installed.</li> <li>Pier E7</li> <li>An expired dumping permit was displayed.</li> </ul>	<ul> <li>Southern Landfall</li> <li>Checklist and contact person for wetsep should be properly displayed.</li> <li>Chemical containers should be placed in drip tray.</li> <li>Pier E9</li> <li>Gutter should be properly installed.</li> <li>Pier E7</li> <li>The expired dumping permit was removed immediately.</li> </ul>

Inspection Date	Location & Environmental Observations	Recommendations/ Remarks
20 January 2016	Site Access 4B	Site Access 4B
	<ul> <li>Chemical containers were not properly</li> </ul>	<ul> <li>Chemical containers should be properly</li> </ul>
	labelled.	labelled.
	<ul> <li>Checklist for wetsep was not displayed.</li> </ul>	<ul> <li>Checklist for wetsep should be displayed.</li> </ul>
	Site Access 6B	Site Access 6B
	<ul> <li>Bund next to drainage inlet was</li> </ul>	<ul> <li>Sandbag was provided immediately to the</li> </ul>
	insufficient.	drainage inlet.
	Area 1	Area 1
	<ul> <li>A cover for dump truck was damaged.</li> </ul>	<ul> <li>Damaged cover for dump truck should be</li> </ul>
	<ul> <li>Refuse was accumulated in drainage.</li> </ul>	repaired.
	<ul> <li>Construction material was placed too close</li> </ul>	<ul> <li>Refuse in drainage should be removed</li> </ul>
	to natural habitat.	regularly.
		Construction material should be placed
		away from natural habitat.
28 January 2016	Area 2	Area 2
20 January 2010	Soil stockpile was not well covered.	<ul> <li>More tarpaulin sheet should be provided to</li> </ul>
	Excessive soil was found at the site	the soil stockpile.
	entrance.	<ul> <li>Excessive soil was cleaned up immediately.</li> </ul>
	CNP was not well displayed.	<ul> <li>CNP should be well displayed.</li> </ul>
	Pier B13	Pier B13
	Refuse was found accumulated on site.	Refuse should be cleaned up regularly.
	Pier C13	Pier C13
	Refuse was found accumulated in drainage	Refuse in drainage should be cleaned up
	on slope.	regularly.
	•	,
4 February 2016	Pier E4	Pier E4
	<ul> <li>A drip tray for generator was not plugged.</li> </ul>	<ul> <li>Drip tray should be plugged.</li> </ul>
	<ul> <li>Stagnant water was accumulated in a drip</li> </ul>	<ul> <li>Stagnant water should be removed</li> </ul>
	tray for chemical container.	regularly.
	<ul> <li>A generator was not well placed on</li> </ul>	<ul> <li>Generator on marine platform should be</li> </ul>
	decoupling pad.	well placed on decoupling pad.
	Pier B6	Site Access 6A
	<ul> <li>Chemical containers on deck and pile cap</li> </ul>	<ul> <li>Chemical containers should be placed in</li> </ul>
	were not placed in drip tray.	drip tray.
12 February 2016	Pier D12	Pier D12
	<ul> <li>Some chemical containers were not placed</li> </ul>	<ul> <li>Chemical containers should be placed in</li> </ul>
	in drip tray.	drip tray.
	Site Access 6A	Site Access 6A
	A chemical container was not placed in drip	-
	tray.	drip tray.
	Pier D16	Pier D16
	A drip tray for generator was not plugged.  Abuta and D.	• Drip tray for generator should be plugged.
	Abutment D  The land was partially dry	Abutment D  Watering was applied immediately.
17 February 2016	The land was partially dry.  Pier E12	• Watering was applied immediately. Pier E12
17 rebluary 2016	<ul> <li>Sandbags were insufficient to avoid runoff.</li> </ul>	<ul> <li>Sandbags were provided immediately.</li> </ul>
	Pier E6	Pier E6
	<ul> <li>A chemical container was not placed in drip</li> </ul>	
	tray.	tray immediately.
	<ul> <li>A drip tray for generator was not plugged.</li> </ul>	The drip tray was plugged immediately.
25 February 2016	Pier D12	Pier D12
25 rebluary 2016	The ground was partially dry.	Watering should be applied regularly
	<ul> <li>Refuse was found in drainage.</li> </ul>	<ul> <li>Refuse in drainage should be cleaned up</li> </ul>
	Pier E9	regularly.
	Some excessive soil was found in gutter.	Pier E9
	Some excessive son was found in gutter.	Gutter should be cleaned up regularly.
		Gutter should be cleaned up regularry.

The Contractor has rectified all of the observations identified during environmental site inspections in the reporting period.

### 2.6 WASTE MANAGEMENT STATUS

The Contractor has submitted application form for registration as chemical waste producer under the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting.

Wastes generated during this reporting period include mainly construction wastes (inert and non-inert) and recyclable materials. Reference has been made to the waste flow table prepared by the Contractor (*Appendix K*). The quantities of different types of wastes are summarized in *Table 2.16*.

Table 2.16 Quantities of Different Waste Generated in the Reporting Period

Month / Year	Inert Construction	Imported Fill (m³)	Inert Construction	Non-inert Construction	Recyclable Materials (c)	Chemical Wastes		Sediment 1 <sup>3</sup> )
	Waste (a) (m <sup>3</sup> )		Waste Re- used (m³)	Waste (b) (kg)	(kg)	(kg)	Category L	Category M
December 2015	198	0	516	66,000	0	0	0	0
January 2016	1,334	0	606	69,400	105	0	0	0
February 2016	692	0	69	85,890	112	0	0	0
Total	2224	0	1191	221290	217	0	0	0

#### Notes:

- (a) Inert construction wastes include hard rock and large broken concrete, and materials disposed as public fill.
- (b) Non-inert construction wastes include general refuse disposed at landfill.
- (c) Recyclable materials include metals, paper, cardboard, plastics, timber and others.

The Contractor was advised to properly maintain on site C&D materials and waste 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 was also reminded to properly maintain the site tidiness and dispose of the wastes accumulated on site regularly and properly.

For chemical waste containers, the Contractor was reminded to treat properly and store 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*.

### 2.7 ENVIRONMENTAL LICENSES AND PERMITS

The status of environmental licensing and permit is summarized in *Table 2.17* below.

Table 2.17 Summary of Environmental Licensing and Permit Status

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Environmental Permit	EP-354/2009/D	13-Mar-15	N/A	HyD	Tuen Mun- Chek Lap Kok Link
Environmental Permit	EP-353/2009/I	17-Jul-15	N/A	HyD	Hong Kong Boundary Crossing Facilities
Chemical Waste Registration	5213-961-G2380-13	10 Oct 2013	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (Area 1 adjacent to Cheng Tung Road, Siu Ho Wan)
Chemical Waste Registration	5213-961-G2380-14	10 Oct 2013	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (Area 2 adjacent to Cheung Tung Road, Pak Mong Village)
Chemical Waste Registration	5213-951-G2380-17	12-Jun-14	N/A	GCL	Viaducts A, B, C, D & E
Chemical Waste Registration	5213-974-G2588-03	04-Nov-13	N/A	GCL	Chemical waste produced in Contract HY/2012/07 (WA5 adjacent to Cheung Tung Road, Yam O)
Construction Dust Notification	361571	05-Jul-13	N/A	GCL	
Construction Dust Notification	362093	17-Jul-13	N/A	GCL	For Area 23
Construction Noise Permit	Nil	N/A	N/A	GCL	For Piling Works
Construction Noise Permit for night works and works in general holidays	GW-RW0045-16	27 Jan 16	25 Jul 16	GCL	General works at WA5
Construction Noise Permit for night works and works in general holidays	GW-RS0109-16	05-Feb-16	14-Aug-16	GCL	Pre-casted pile cap shell installation at E10-E13
Construction Noise Permit for night works and works in general holidays	GW-KS0809-15	29-Jul-15	29-Jan-16	GCL	For Plant mobilization using tractor with trailer
Construction Noise Permit for night works and works in general holidays	GW-RS0854-15	12-Aug-14	15-Feb-16	GCL	Pre-casted pile cap shell installation at E10-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0855-15	12-Aug-15	11-Feb-16	GCL	Pier construction at C7, D8, D9
Construction Noise Permit for night works and works in general holidays	GW-KS0056-16	1 Feb 2016	31-Mar-16	GCL	Broad Permit for Segmen. Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0911-15	27-Aug-15	26-Feb-16	GCL	Broad Permit for Seg. Launching at Land Portion
Construction Noise Permit for night works and	GW-RS1046-15	04-Jan-16	31-Jan-16	GCL	Erection of GT324, GT326-GT328 sign gantry leg

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
works in general holidays					
Construction Noise Permit for night works and works in general holidays	GW-RS1054-15	30-Sep-15	29-Mar-16	GCL	For Load unload at NLH near Viaduct D
Construction Noise Permit for night works and works in general holidays	GW-RS1086-15	07-Oct-15	15-Dec-15	GCL	TTA Case 009 Ch.2.1E-4.2E
Construction Noise Permit for night works and works in general holidays	GW-RS1144-15	20-Oct-15	19-Feb-16	GCL	For Broad Permit
Construction Noise Permit for night works and works in general holidays	GW-RW0422-15	21-Aug-15	25-Jan-16	GCL	General works at WA5
Construction Waste Disposal Account	7017735	10-Jul-13	N/A	GCL	-
Construction Waste Disposal Account	7019470	03-Mar-14	N/A	GCL	Vessel CHIT Account
Waste Water Discharge License	WT00019017-2014	13-May-14	31-May-19	GCL	Discharge for marine portion
Waste Water Discharge License	WT00019018-2014	13-May-14	31-May-19	GCL	Discharge for land portion
Marine Dumping Permit	EP/MD/16-138	10-Dec-15	13-Jun-16	GCL	For dumping Type I sediment
Marine Dumping Permit	EP/MD/16-147	18-Dec-15	29-Jan-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment
Marine Dumping Permit	EP/MD/16-186	26-Feb-16	31-Mar-16	GCL	For dumping Type I (Dedicated Site) and Type II sediment

### 2.8 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

In response to the site audit findings, the Contractor has carried out corrective actions.

A summary of the Environmental Mitigation and Enhancement Measure Implementation Schedules (EMIS) is presented in *Appendix C*. The necessary mitigation measures were implemented properly for this Contract.

## 2.9 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

Results for 1-hour TSP, 24-hour TSP, construction noise and water quality complied with the Action/ Limit levels in the reporting period.

The construction impact on depth-averaged SS was assessed by comparing the quarterly mean values of depth-averaged SS with the corresponding ambient mean values (Table 2.18). Except SR4a during both mid-ebb and mid-flood tides, all depth-averaged SS results at impact monitoring stations were not higher than their corresponding ambient levels. One-way ANOVA was conducted to examine if there was any significant difference between ambient levels and impact monitoring results of SR4a. By setting  $\alpha$ =0.05, significant difference was neither detected at mid-ebb tide ( $F_{1,48}$ =0.63, p=0.43) nor midflood tide ( $F_{1,48}$ =0.01, p=0.91). The observed insignificant differences were likely due to the highly variable SS results in the reporting period, which is considered as natural fluctuation in the western waters of Hong Kong. The depth-averaged SS results suggest that the Project did not cause unacceptable impact on water quality in the reporting period.

Table 2.18 Comparison between Quarterly Mean and Ambient Mean Values of Depthaveraged Suspended Solids

Station	Baselii	Baseline Mean		t Mean (a)	(Decemb	rly Mean per 2015 to rry 2016)
	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS(Mf)3	9.2	12.8	12.0	16.6	14.3	13.6
CS(Mf)5	9.2	11.5	11.9	14.9	14.0	13.6
SR4	10.3	12.3	13.4	16.0	13.2	12.9
SR4a	9.1	9.8	11.9	12.7	13.3	12.9
IS8	11.3	13.5	14.6	17.6	13.1	12.6
IS(Mf)9	10.9	14.3	14.2	18.5	13.4	12.9
IS(Mf)16	11.4	10.3	14.8	13.4	13.7	13.4

Notes:

(a) Ambient mean value is defined as a 30% increase of the baseline mean value

One (1) Limit Level exceedance was recorded for impact dolphin monitoring in this reporting quarter. Following the review of the monitoring data and marine works details as per the procedure stipulated in the Event and Action Plan of the Updated EM&A Manual, no unacceptable impact was associated with the construction works under this Contract that may have affected the

dolphin usage in the North Lantau region. Investigation findings were detailed in *Appendix L*.

## 2.10 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

The Environmental Complaint Handling Procedure is provided in *Figure 2.5*.

There was no complaint, notification of summons or successful prosecution recorded in the reporting period. Statistics on complaint, notification of summons of successful prosecution are summarized in *Appendix L*.

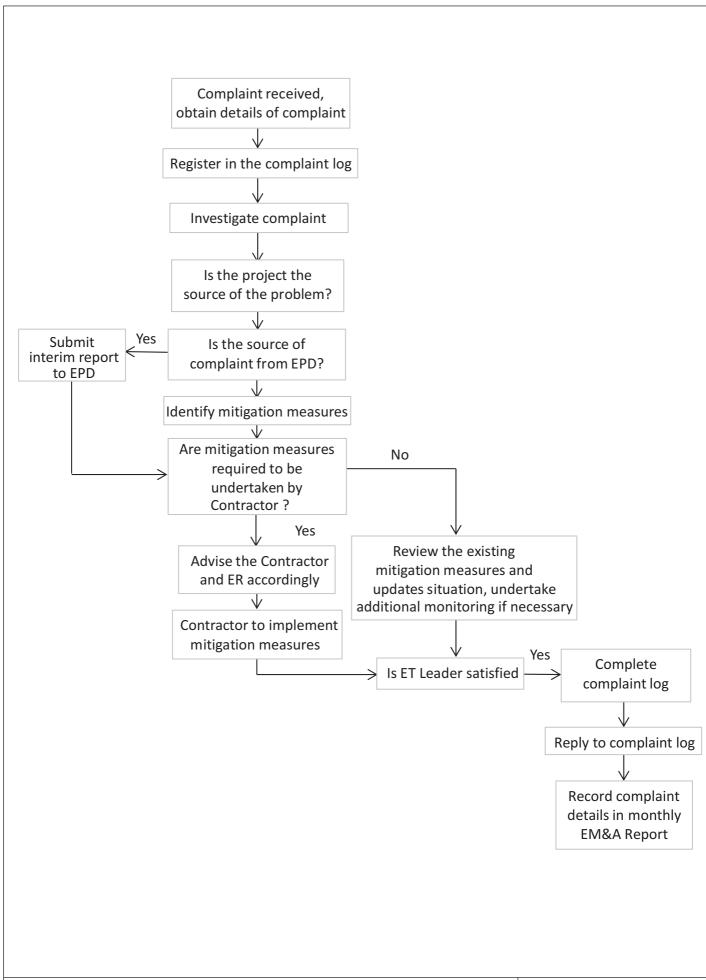


Figure 2.5

**Environmental Complaint Handling Procedure** 

Environmental Resources Management



### 3 FUTURE KEY ISSUES

### 3.1 CONSTRUCTION ACTIVITIES FOR THE COMING QUARTER

As informed by the Contractor, the major works for the Contract in the coming quarter are summarized below:

### March 2016

### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

### April 2016

### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction:
- Construction of marine section of berth at Southern Landfall;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

### May 2016

### Marine Works

- Construction and installation of pile caps;
- Uninstallation of marine piling platform;
- Pier construction;

- Construction of marine section of berth at Southern Landfall;
- Launching gantry operation; and
- Installation of deck segment and pier head segment.

### Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Construction of land section of berth at Southern Landfall;
- Installation of pier head and deck segments; and
- Slope work of Viaducts A, B & C.

### 3.2 KEY ISSUES FOR THE COMING QUARTER

Potential environmental impacts arising from the above upcoming construction activities are mainly associated with air quality, noise, marine water quality, marine ecology and waste management issues.

### 3.3 MONITORING SCHEDULE FOR THE COMING QUARTER

Impact monitoring for air quality, noise, marine water quality and dolphin monitoring are scheduled to continue for the next reporting period.

The monitoring programme has been reviewed and was considered as adequate to cater for the nature of works in progress.

### 4 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 CONCLUSIONS

The Ninth Quarterly EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 December 2015 to 29 February 2016, in accordance with the Updated EM&A Manual and the requirements of the *Environmental Permits* (*EP-354/2009/D* and *EP-353/2009/I*).

Neither Action Level nor Limit Level exceedances were observed for air quality, noise and water quality monitoring in this reporting period.

A total of fourteen (14) groups of fifty-seven (57) Chinese White Dolphins were sighted during the six sets of survey from December 2015 to February 2016. One (1) Limit Level exceedance was recorded for the quarterly dolphin monitoring data between December 2015 and February 2016, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations. It is critical to monitor the dolphin usage in North Lantau region in the upcoming quarters, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

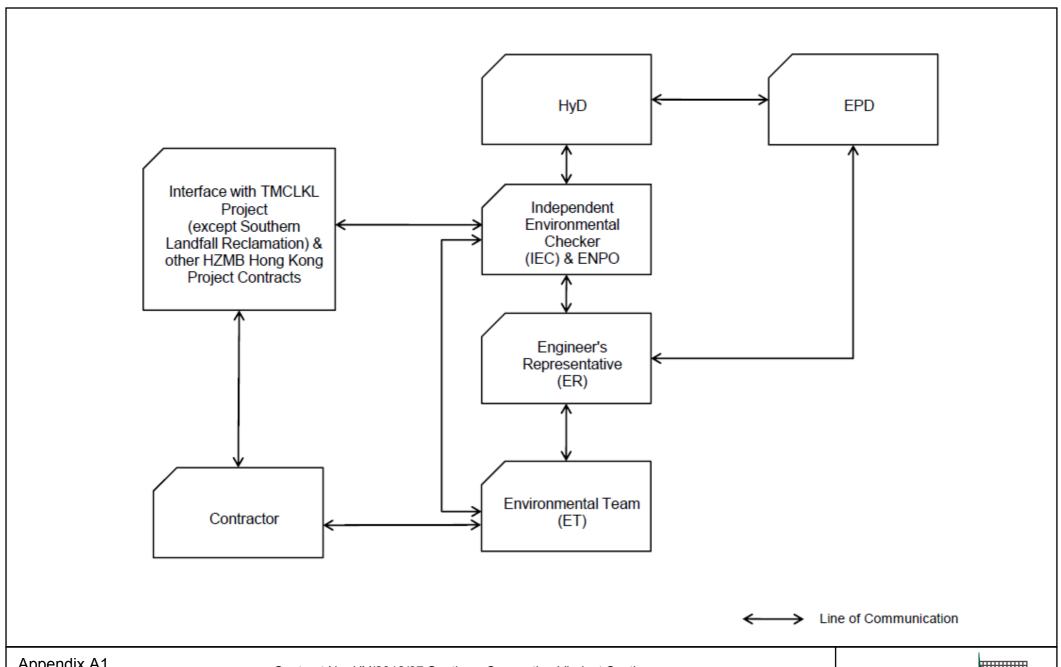
Environmental site inspection was carried out thirteen (13) times in the reporting period. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site audits.

There was no environmental complaint, notification of summon or successful prosecution in the reporting period.

The monitoring programme has been reviewed and was considered as adequate to cater for the nature of works in progress. Change to the monitoring programme was thus not recommended at this stage. The monitoring programme will be evaluated as appropriate in the next reporting period. The ET will keep track on the construction works to confirm compliance of environmental requirements and the proper implementation of all necessary mitigation measures.

### Appendix A

# Project Organization for Environmental Works



Appendix A1

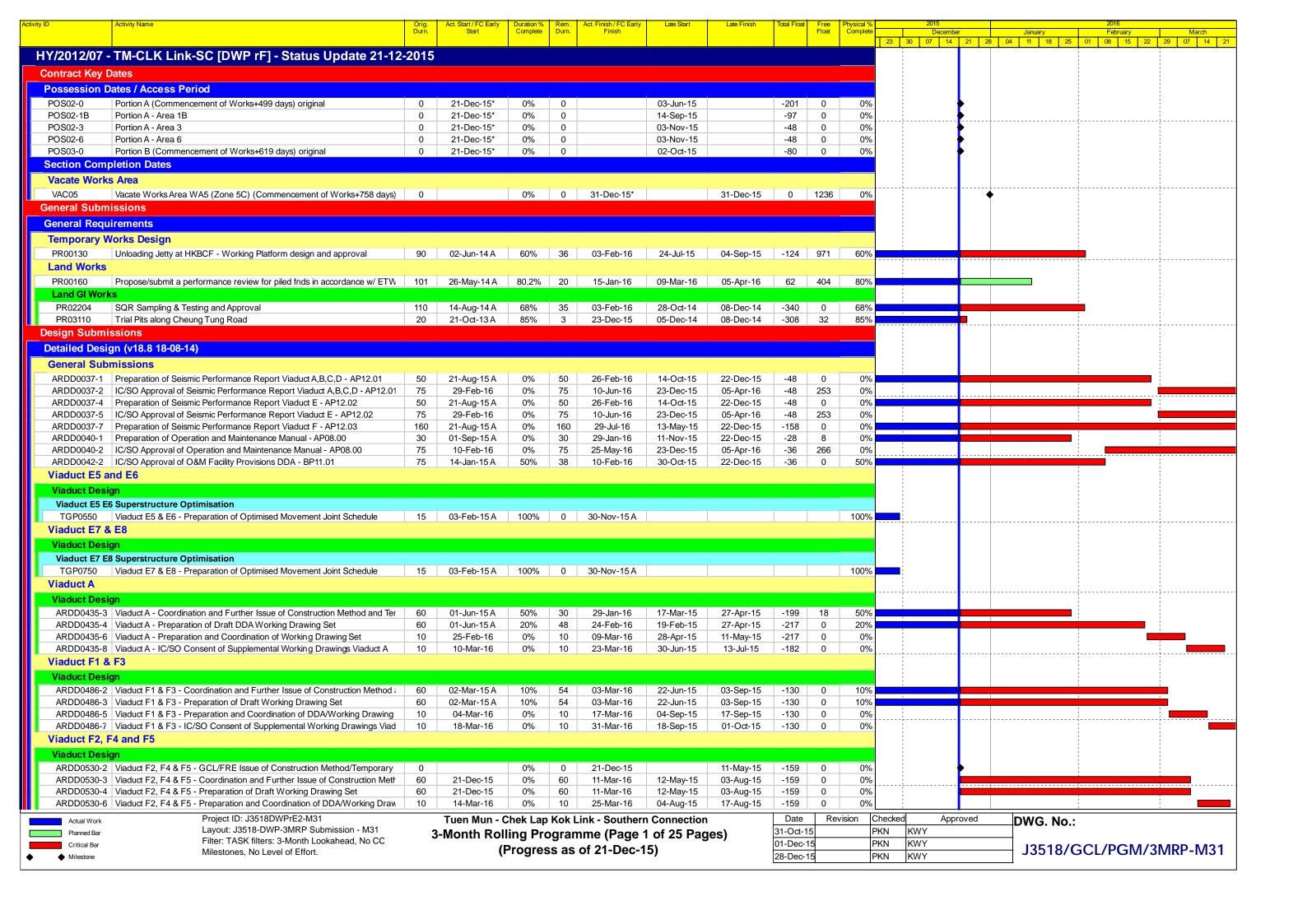
Contract No. HY/2012/07 Southern Connection Viaduct Section **Project Organization** 

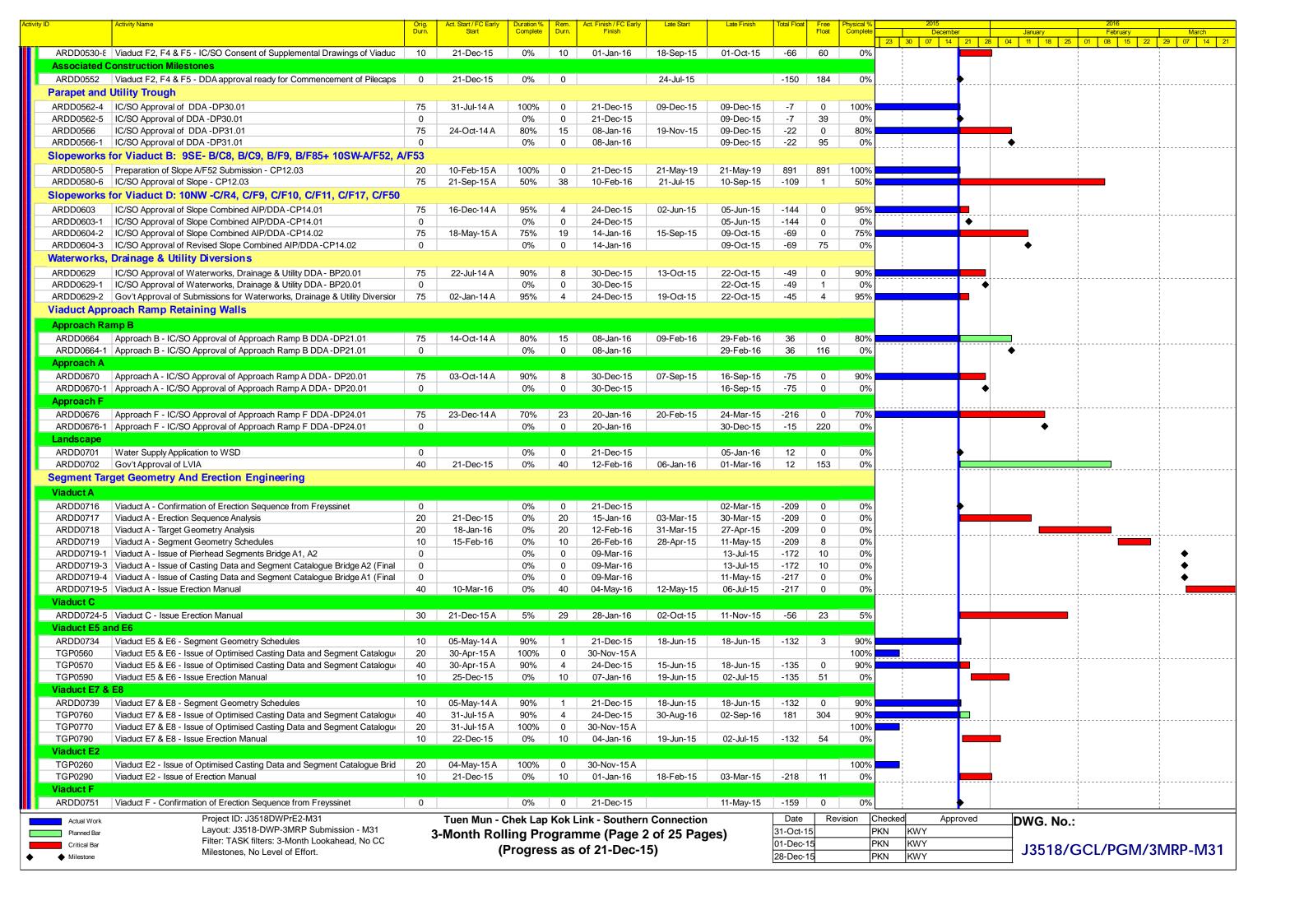
**Environmental** Resources Management

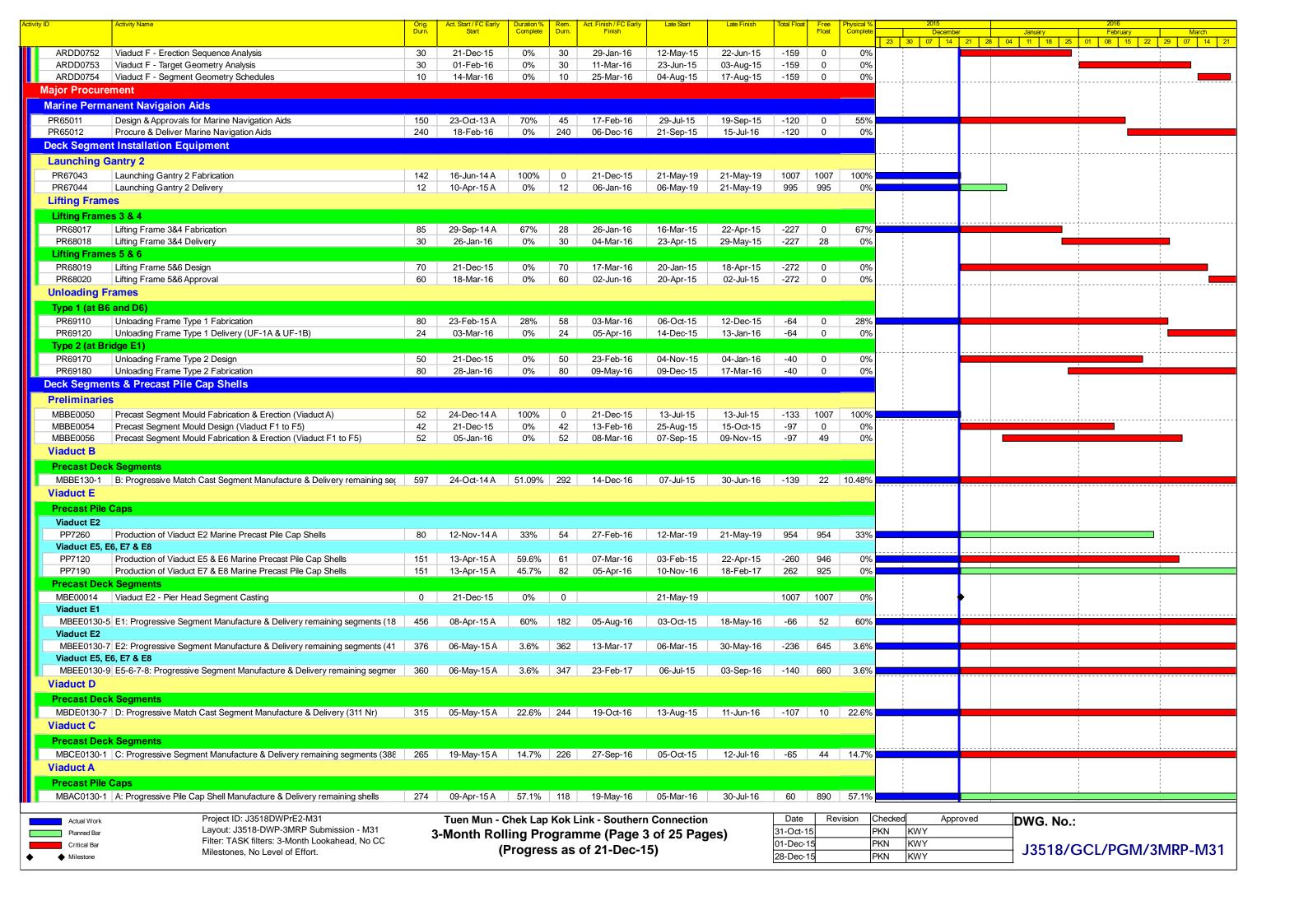


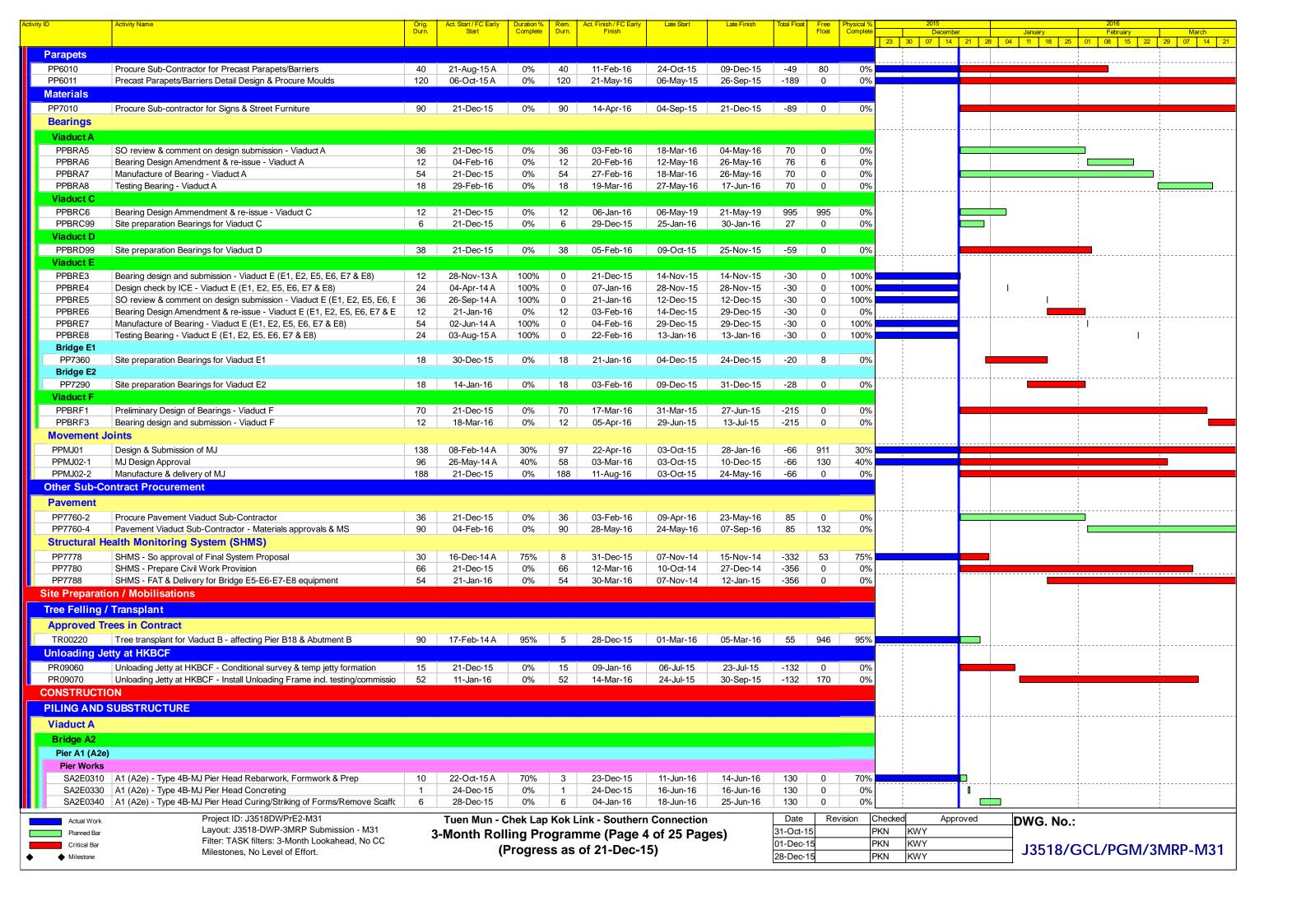
### Appendix B

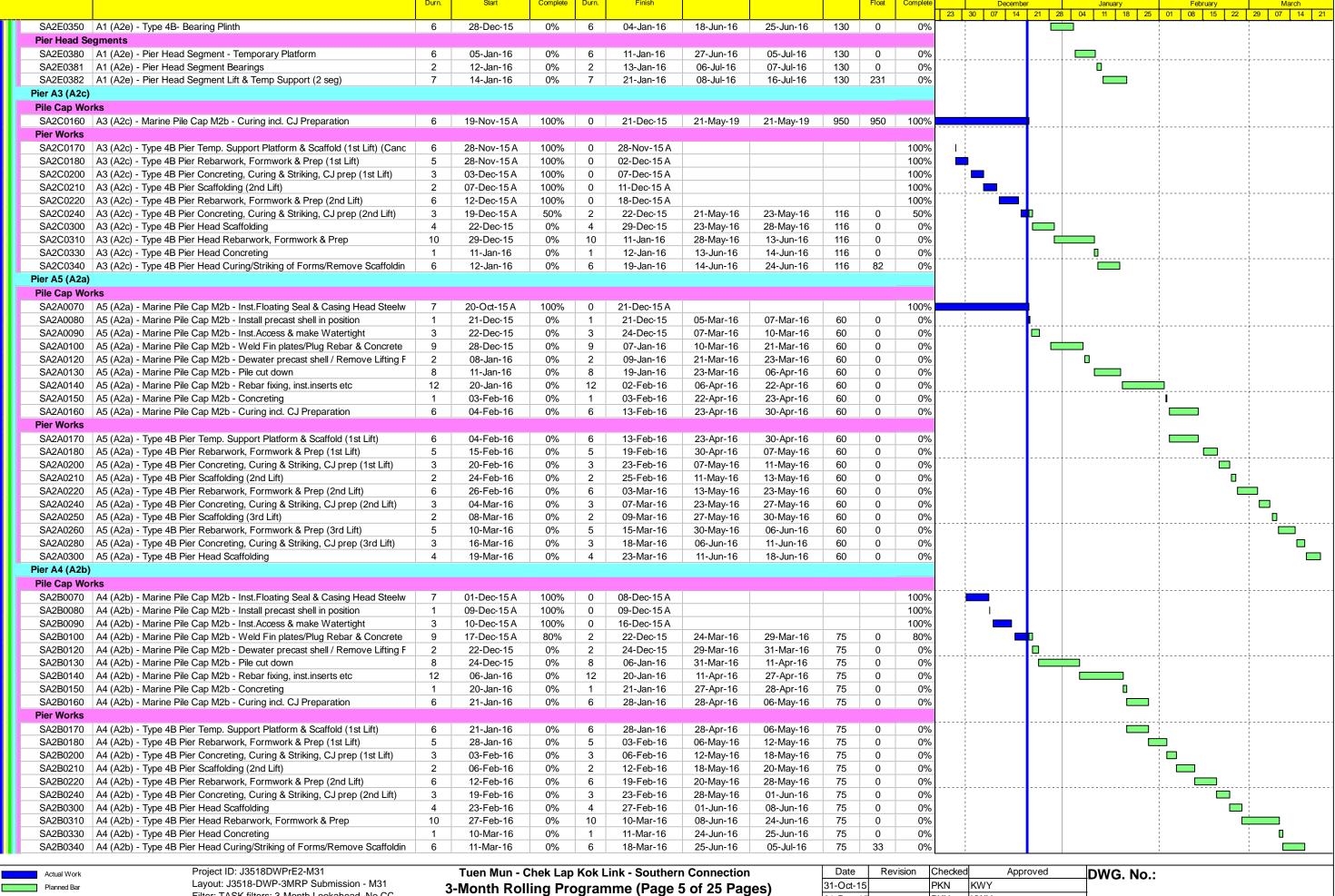
# Construction Programme for the Reporting Quarter











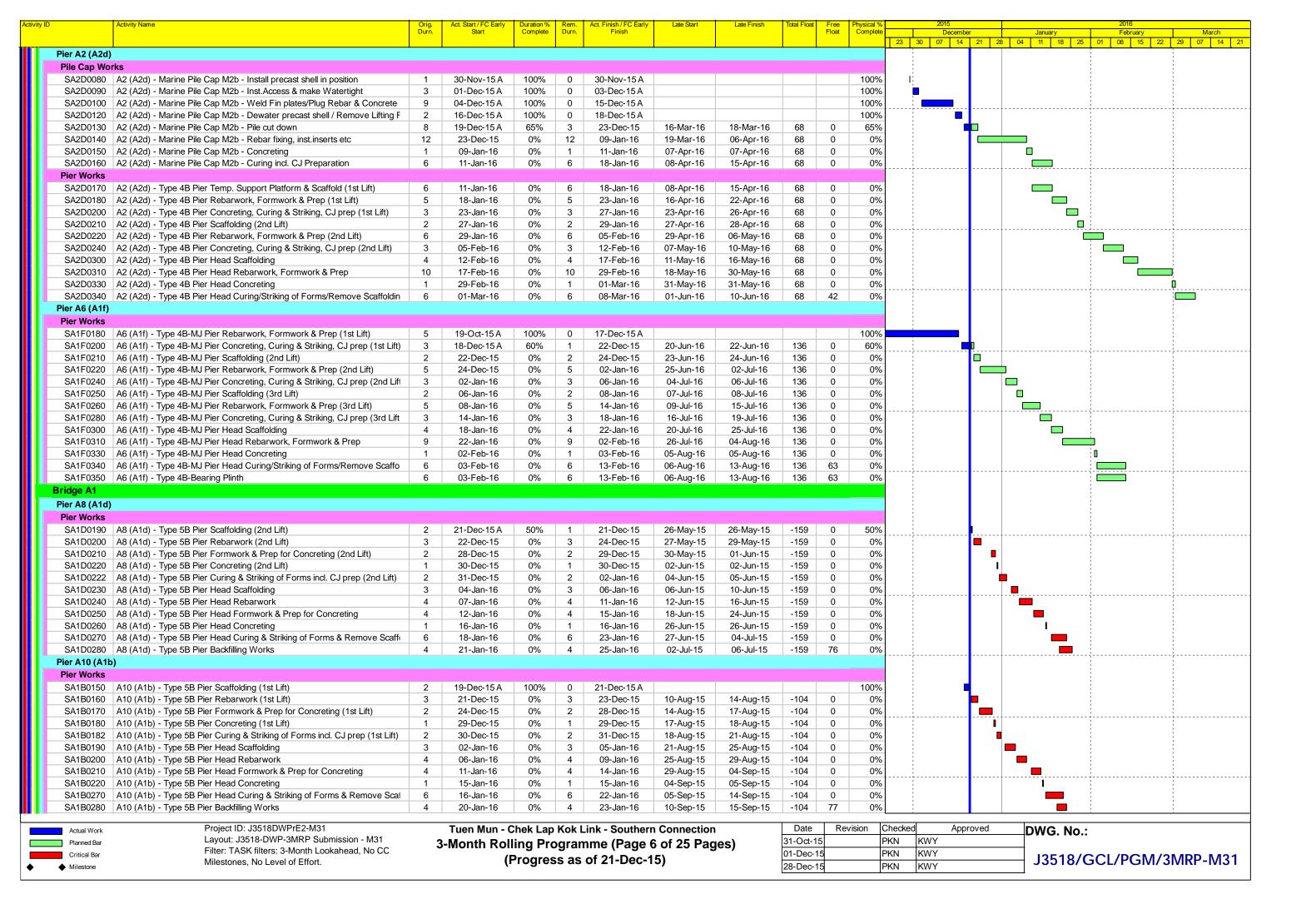
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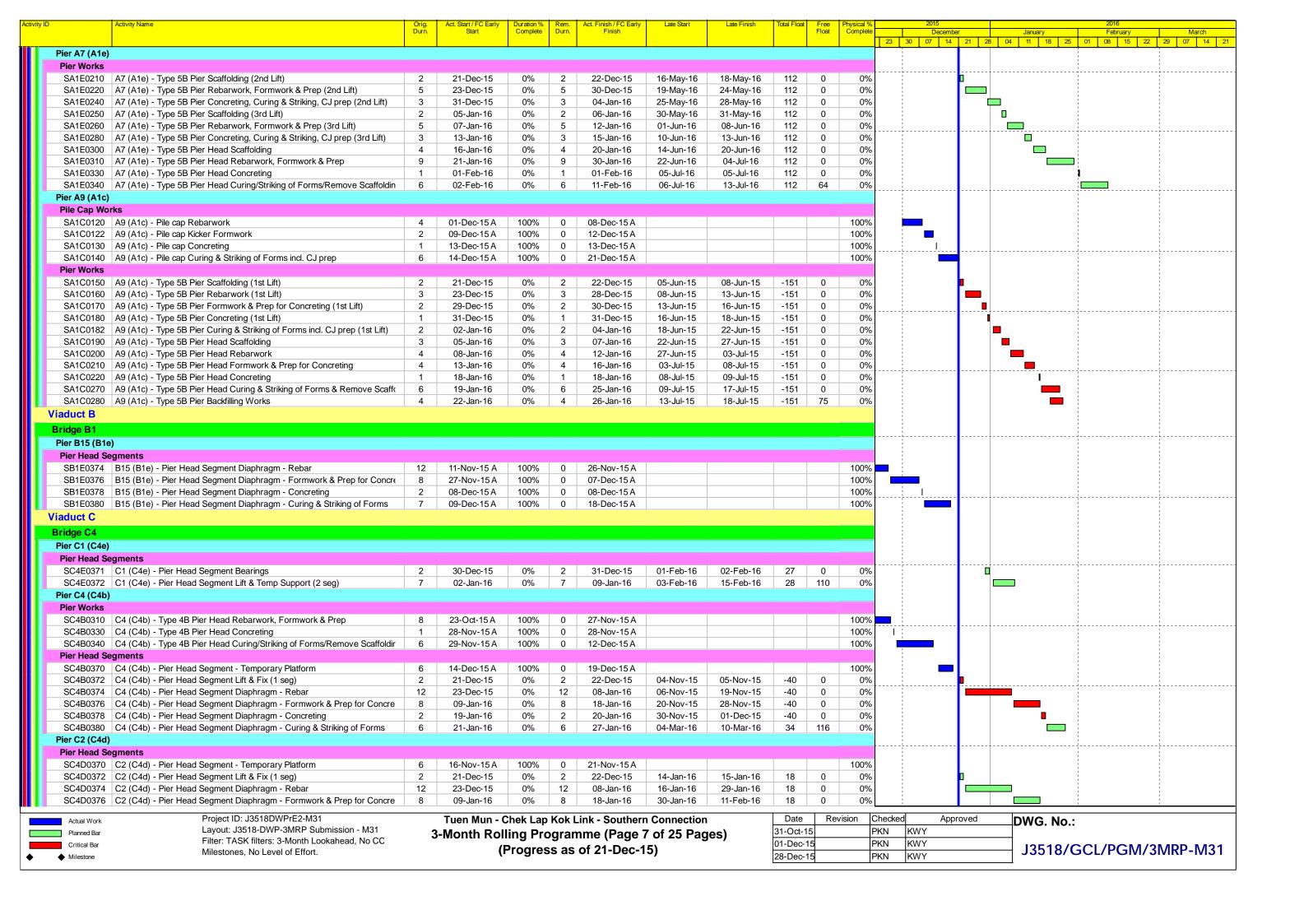
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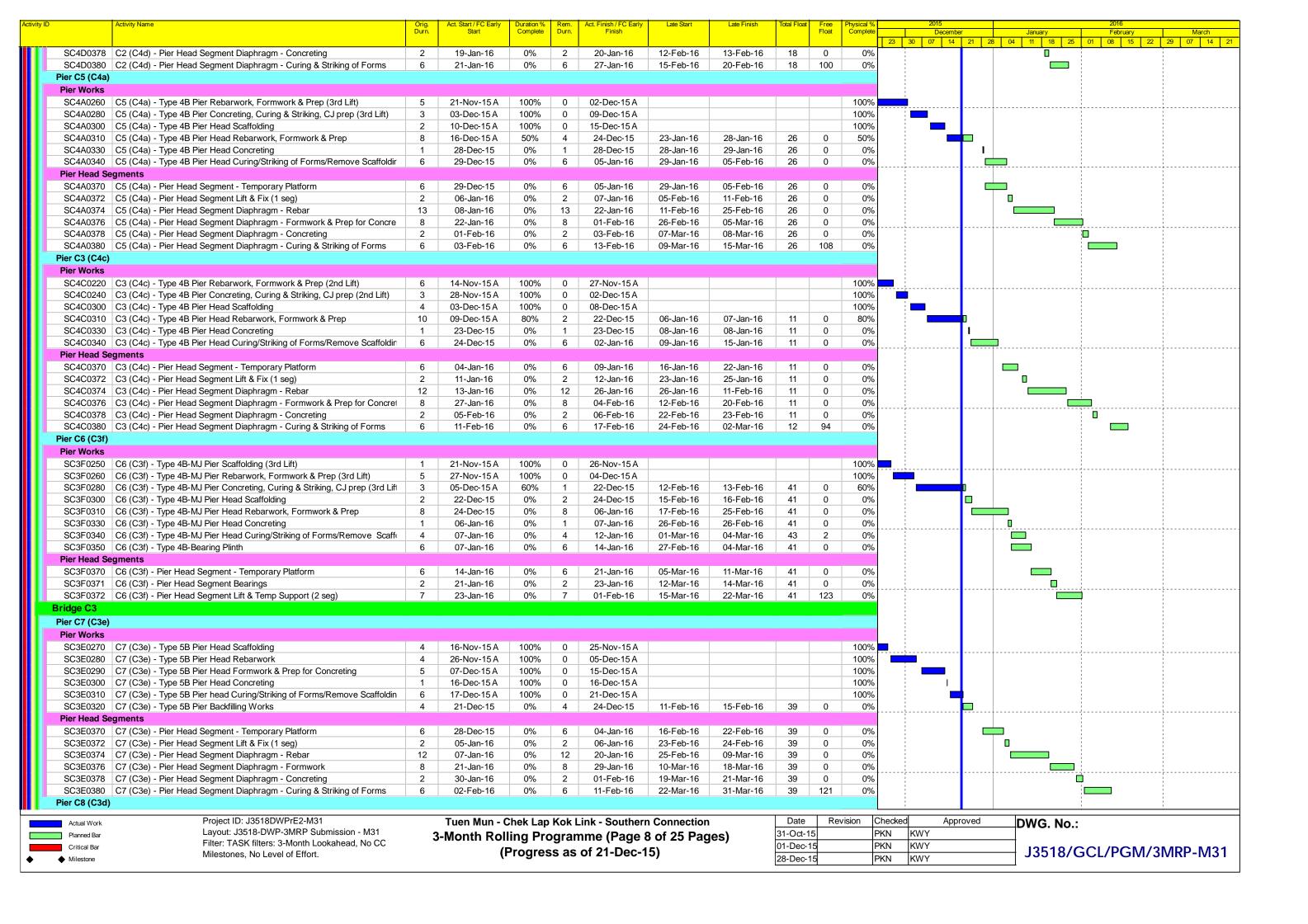
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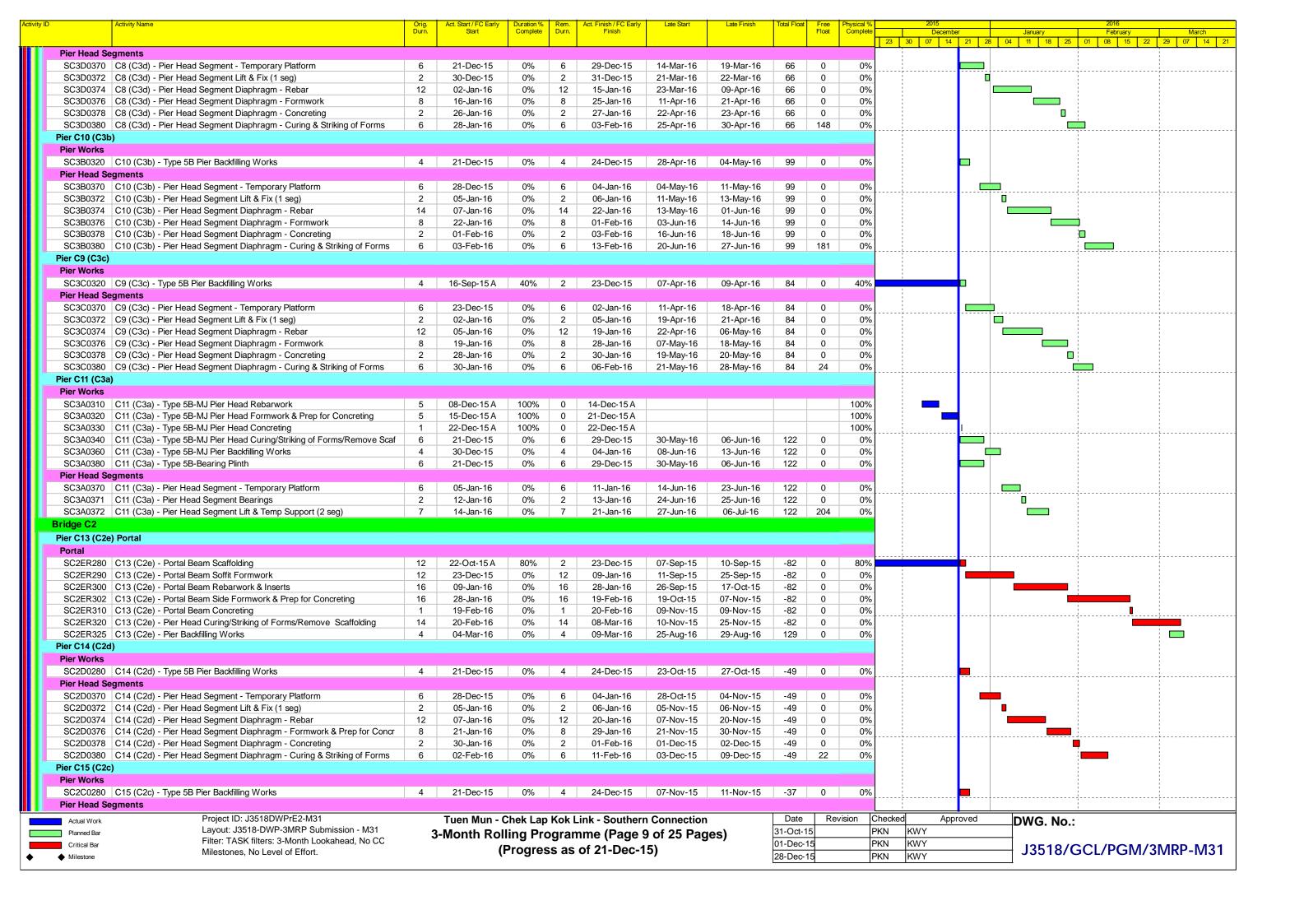
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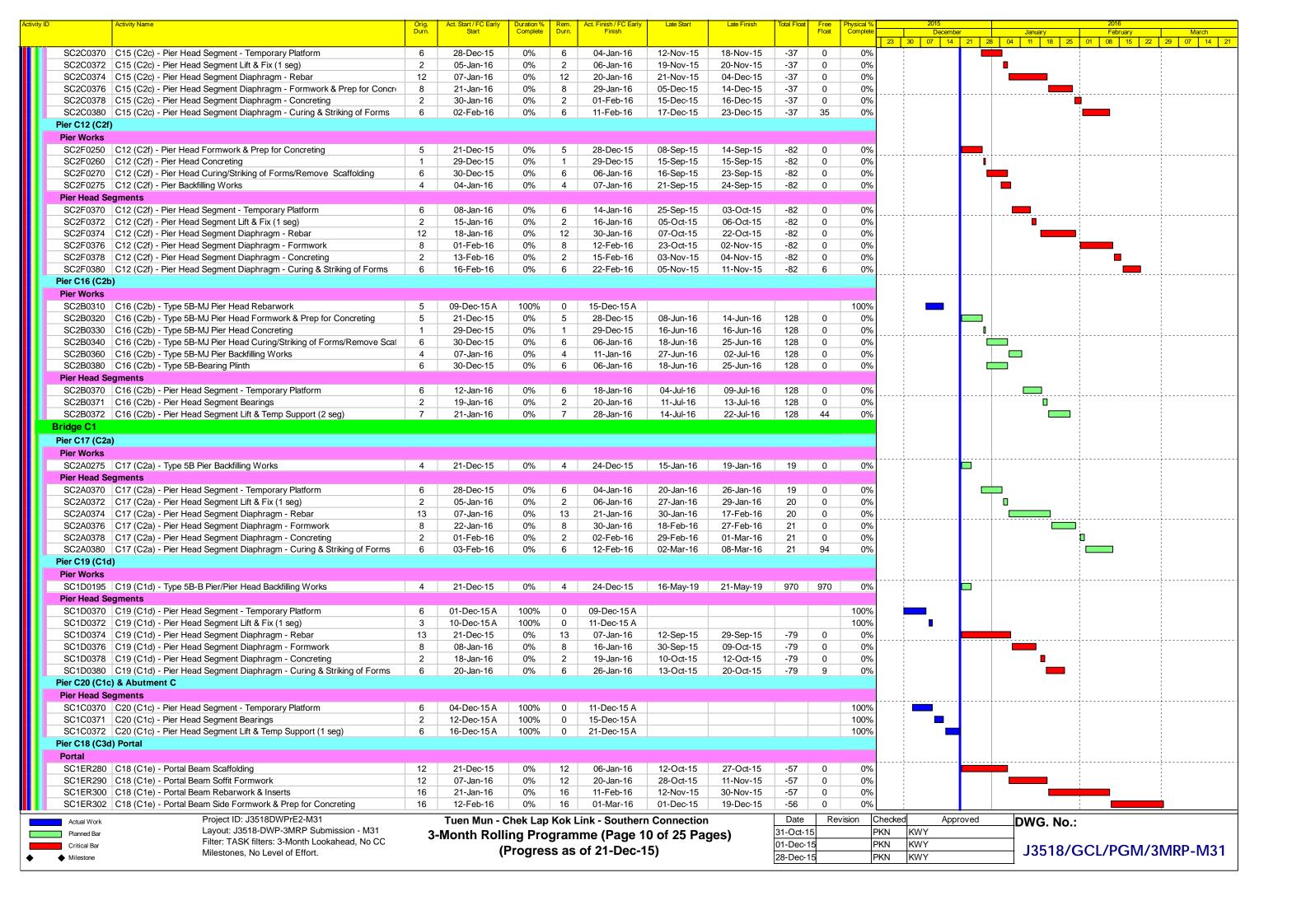
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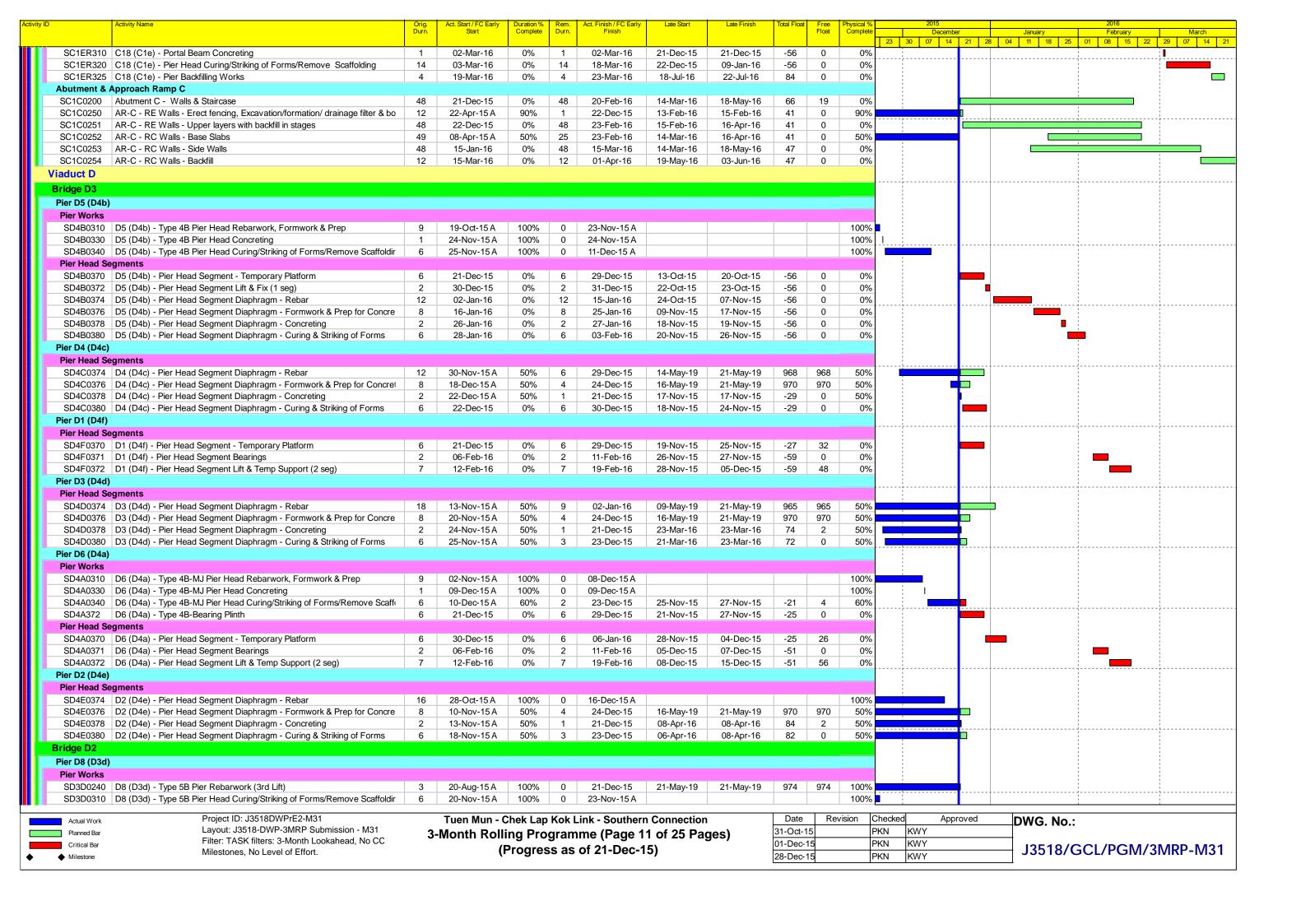


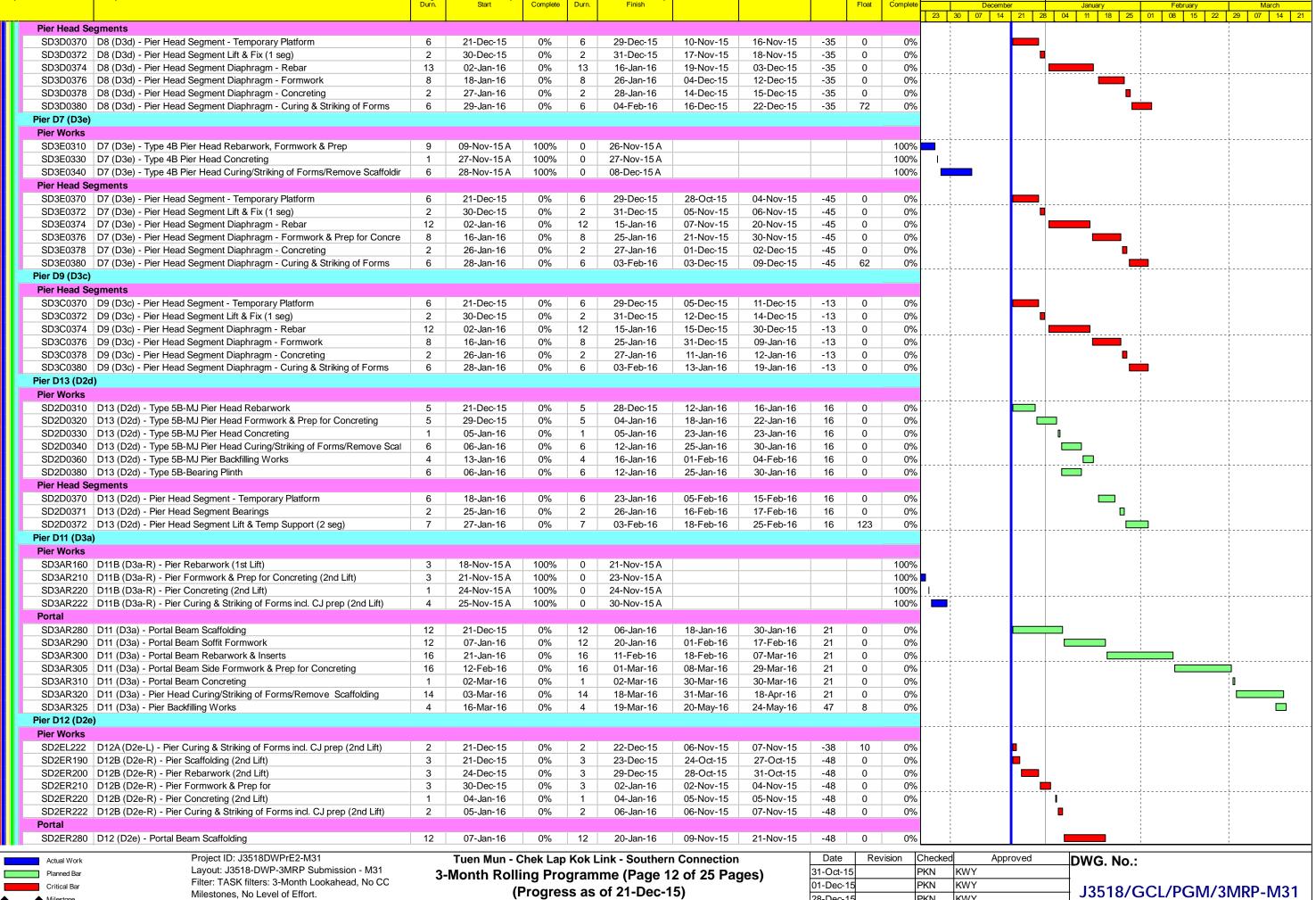




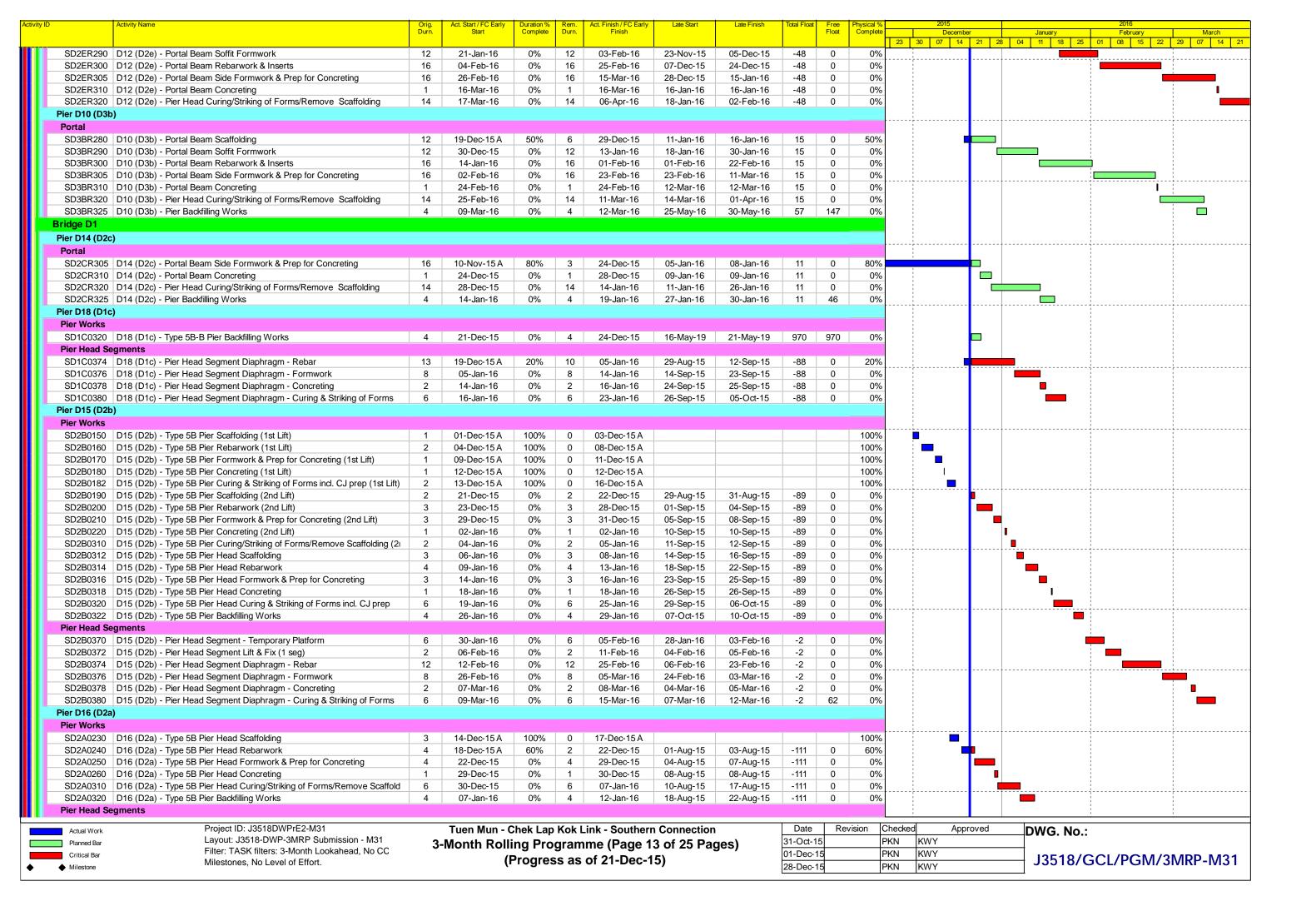


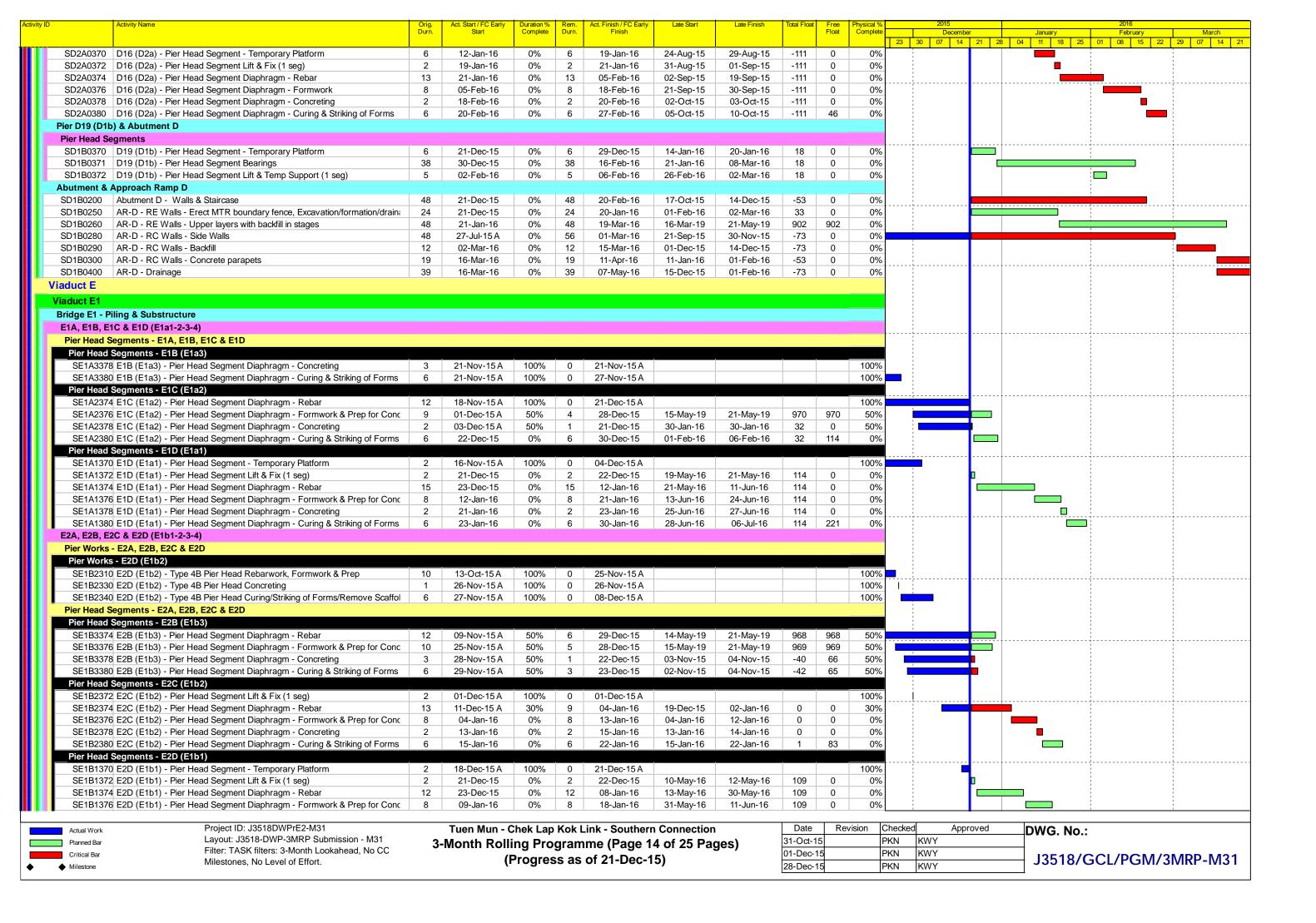


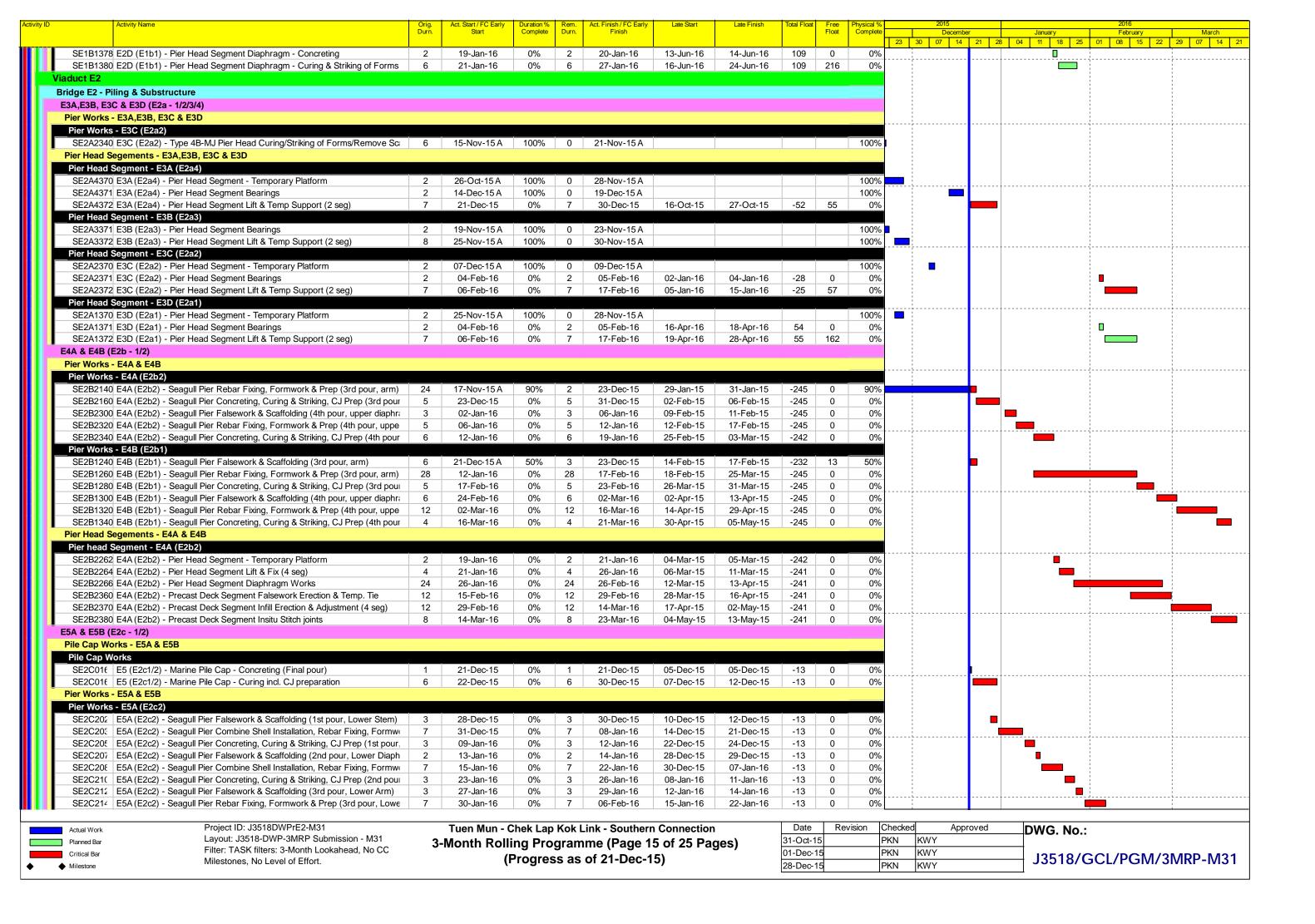


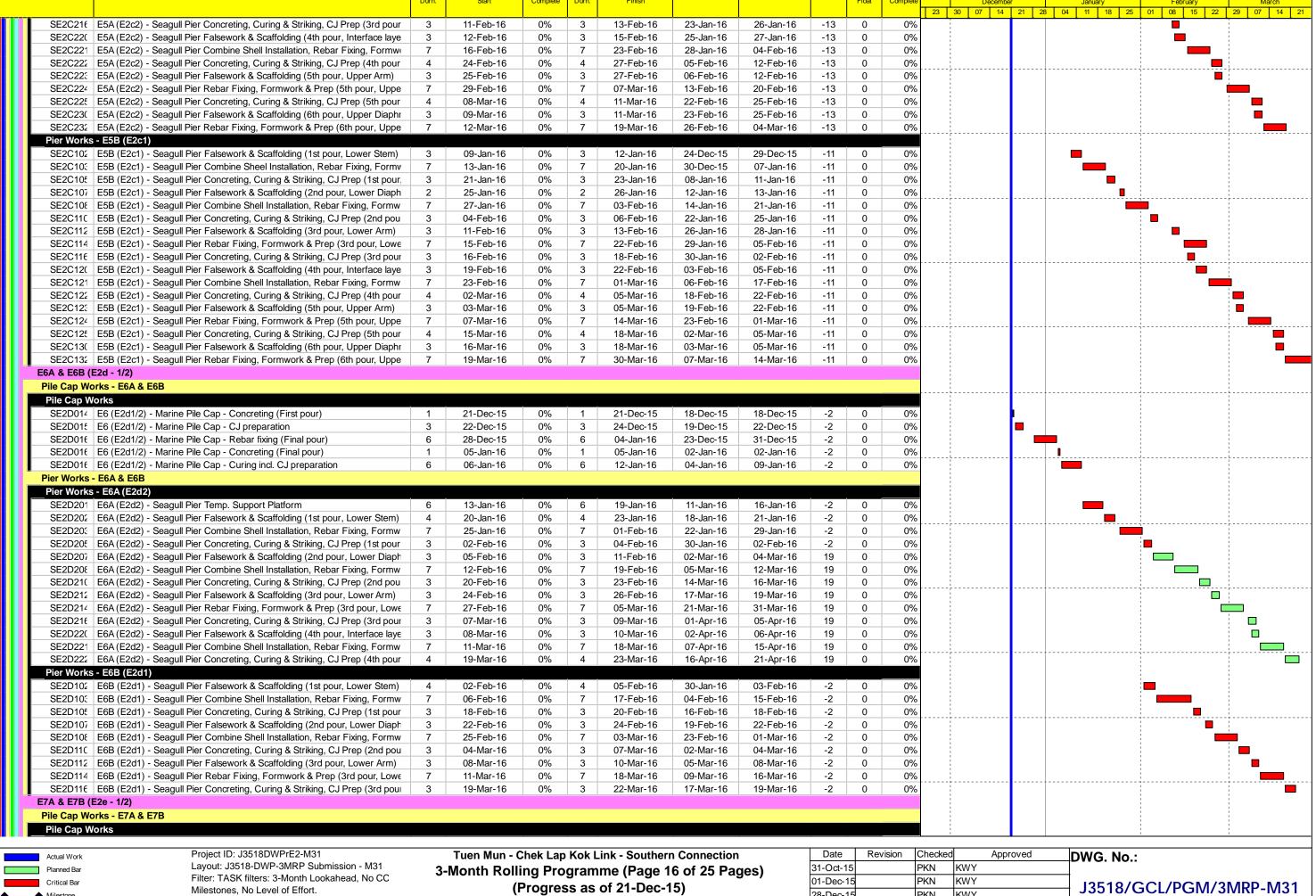


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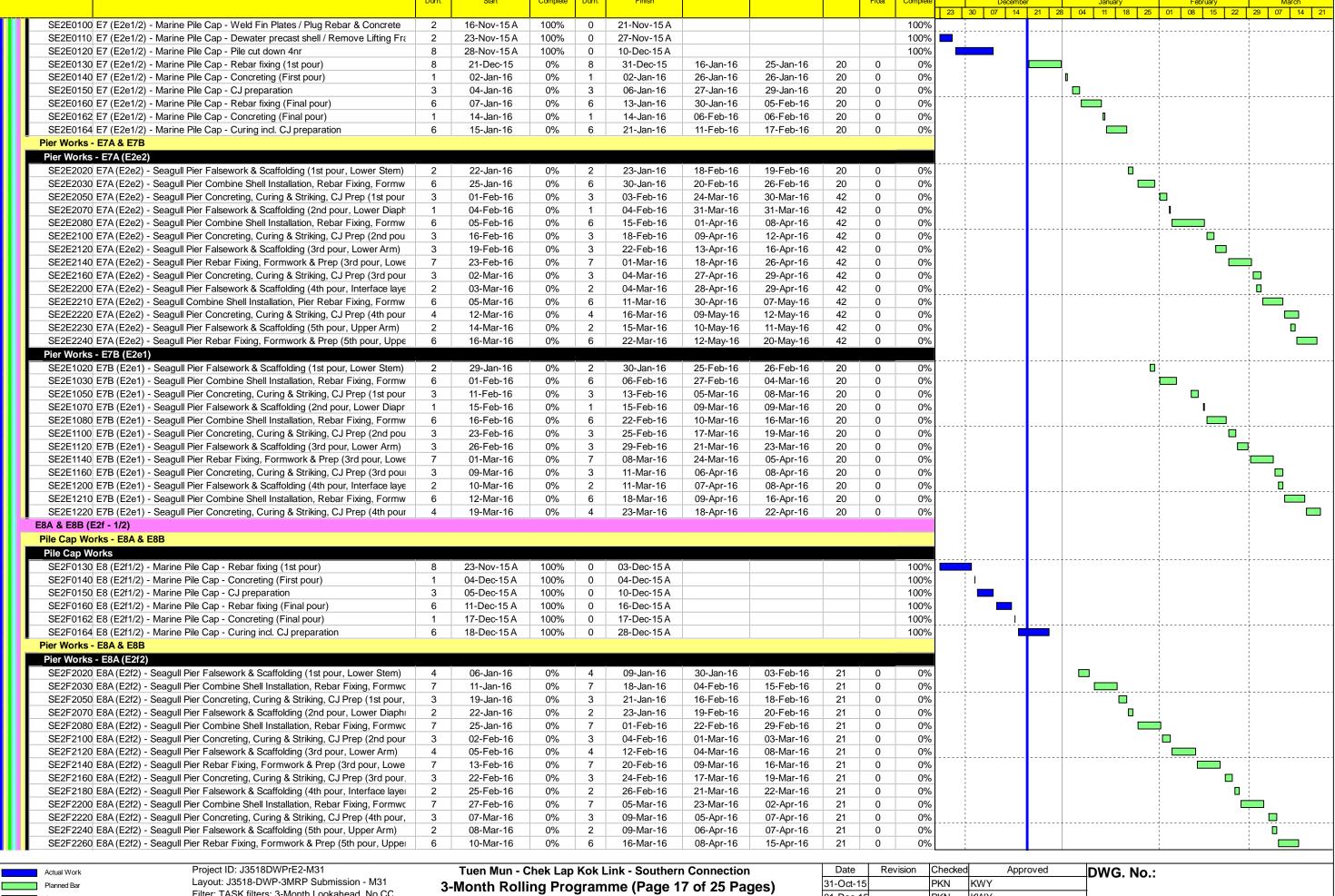








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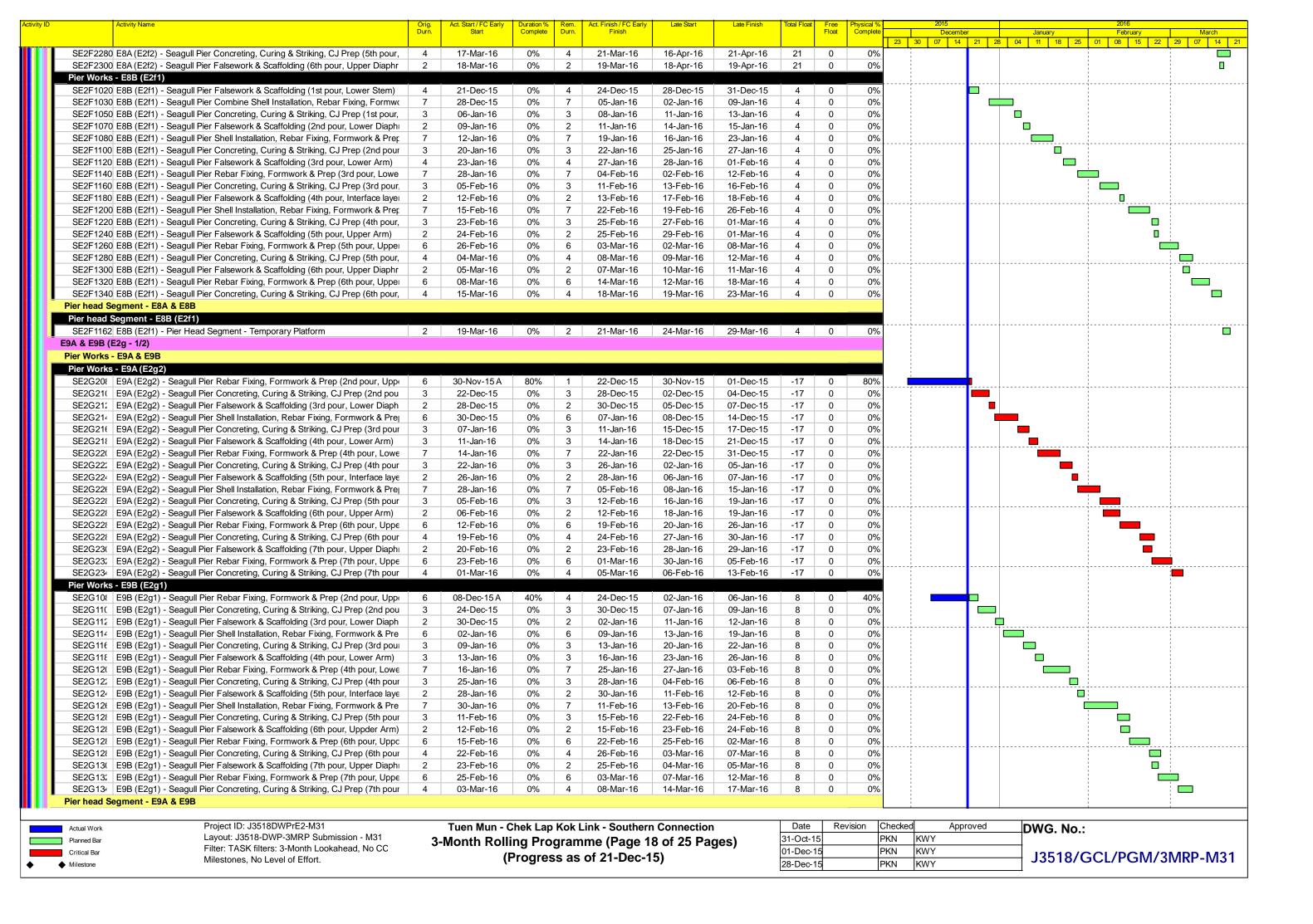
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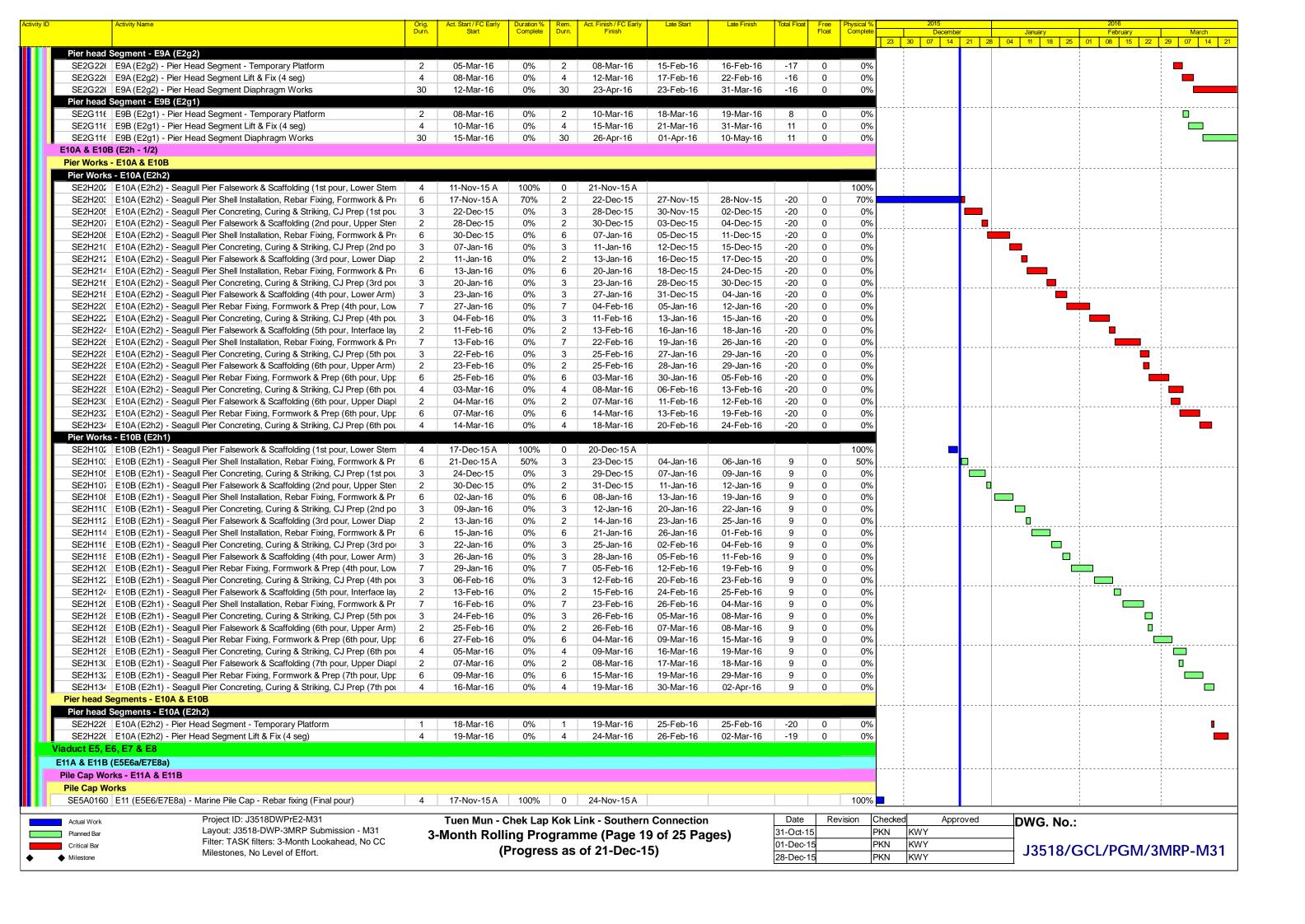
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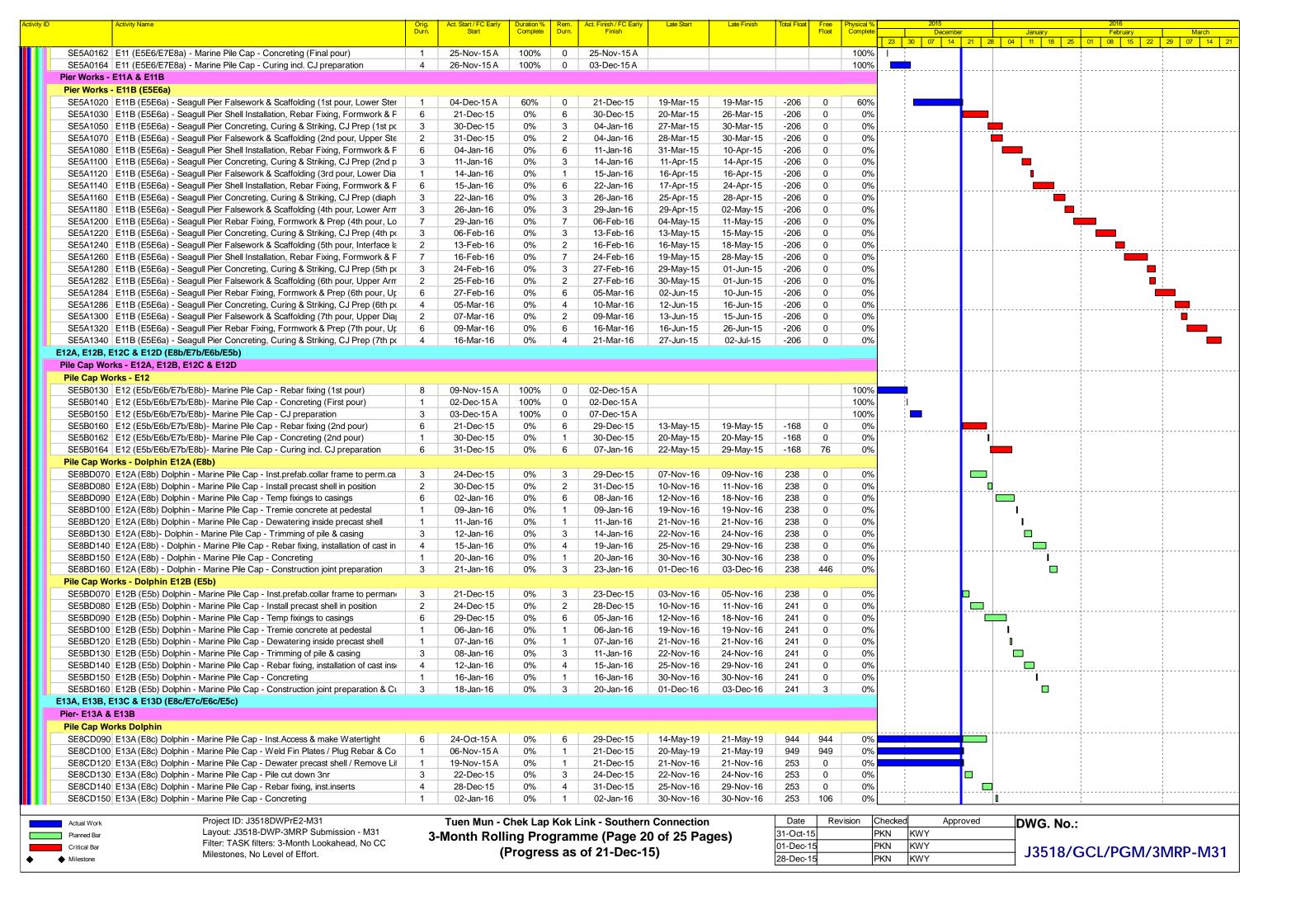
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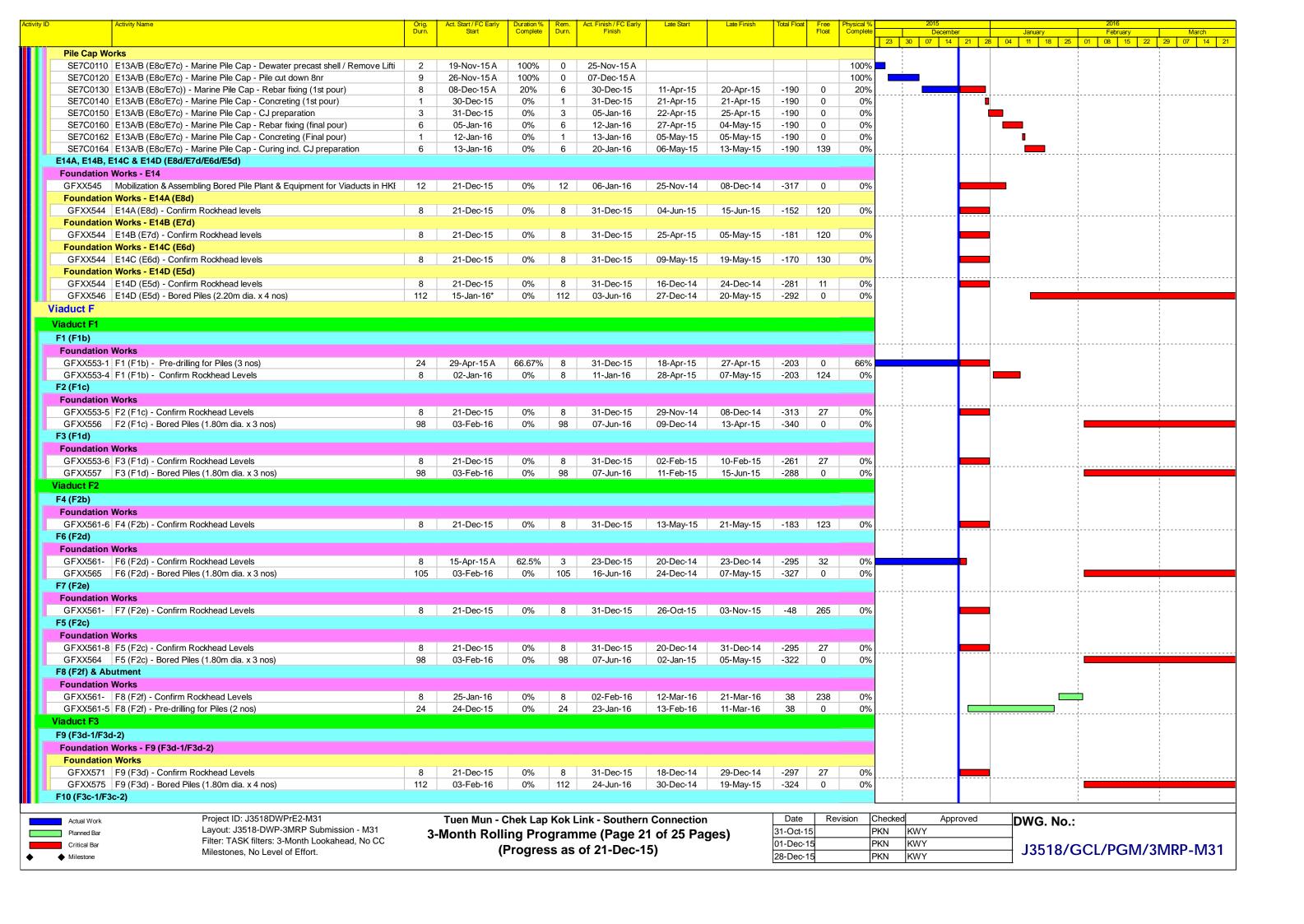
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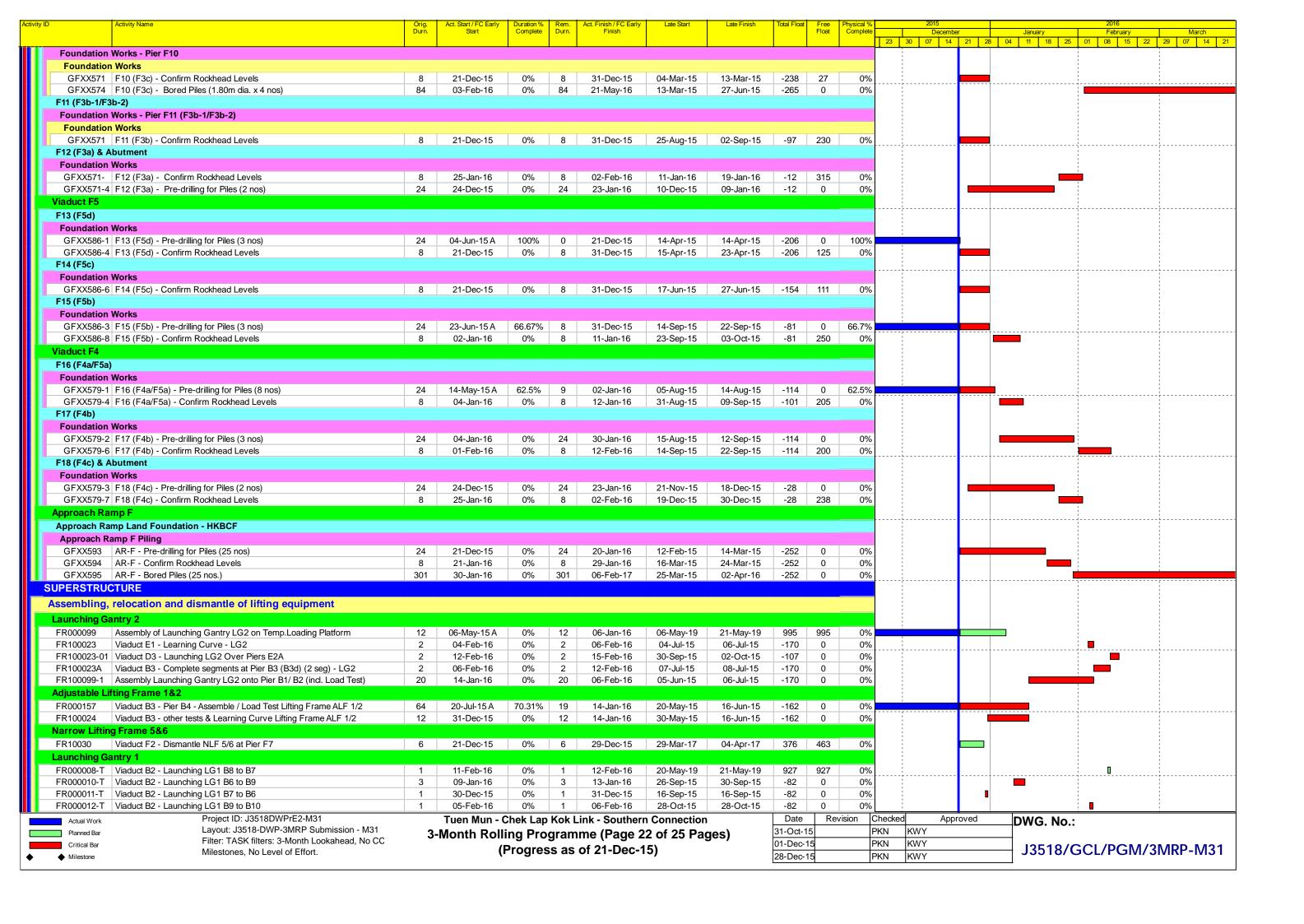
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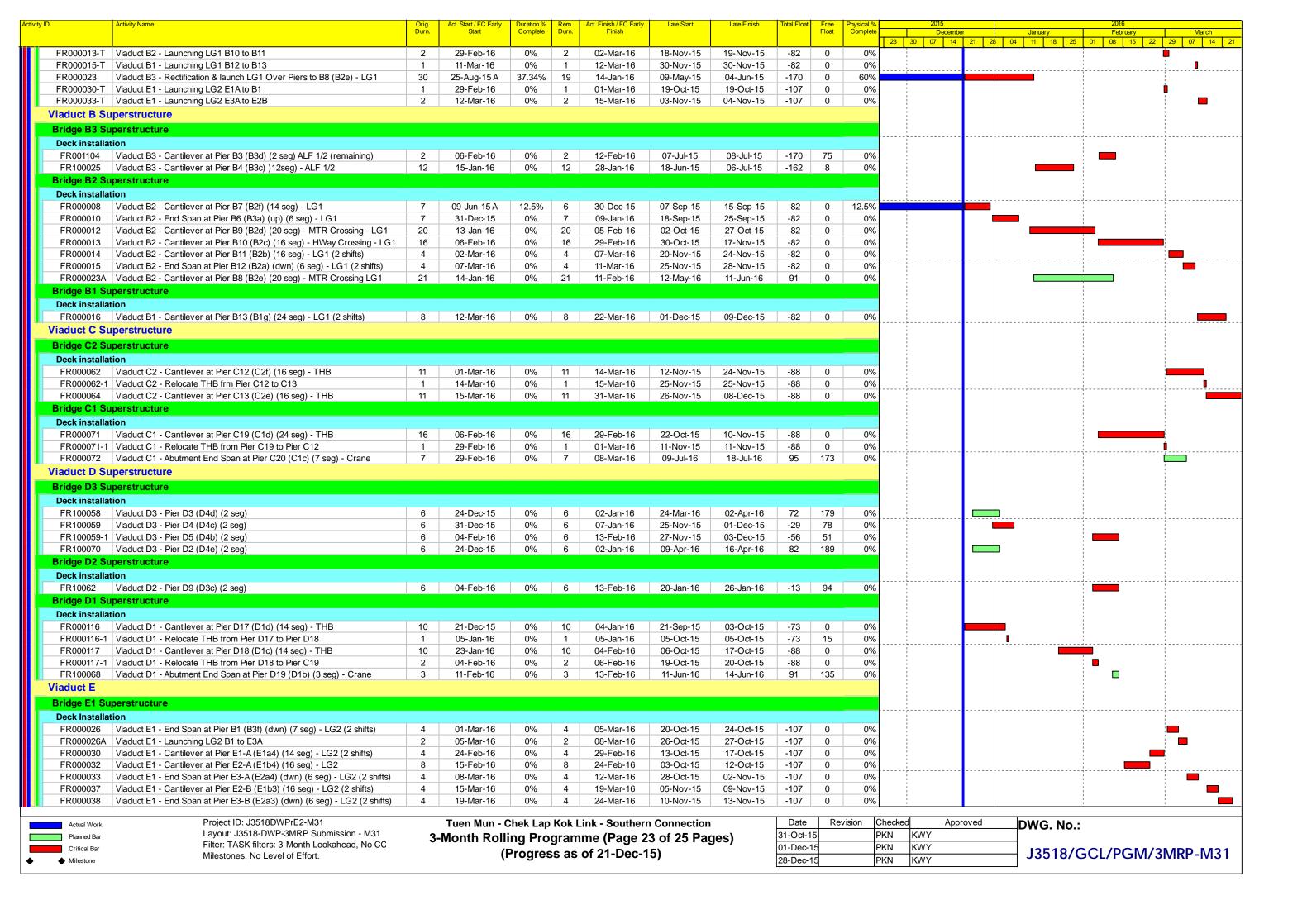


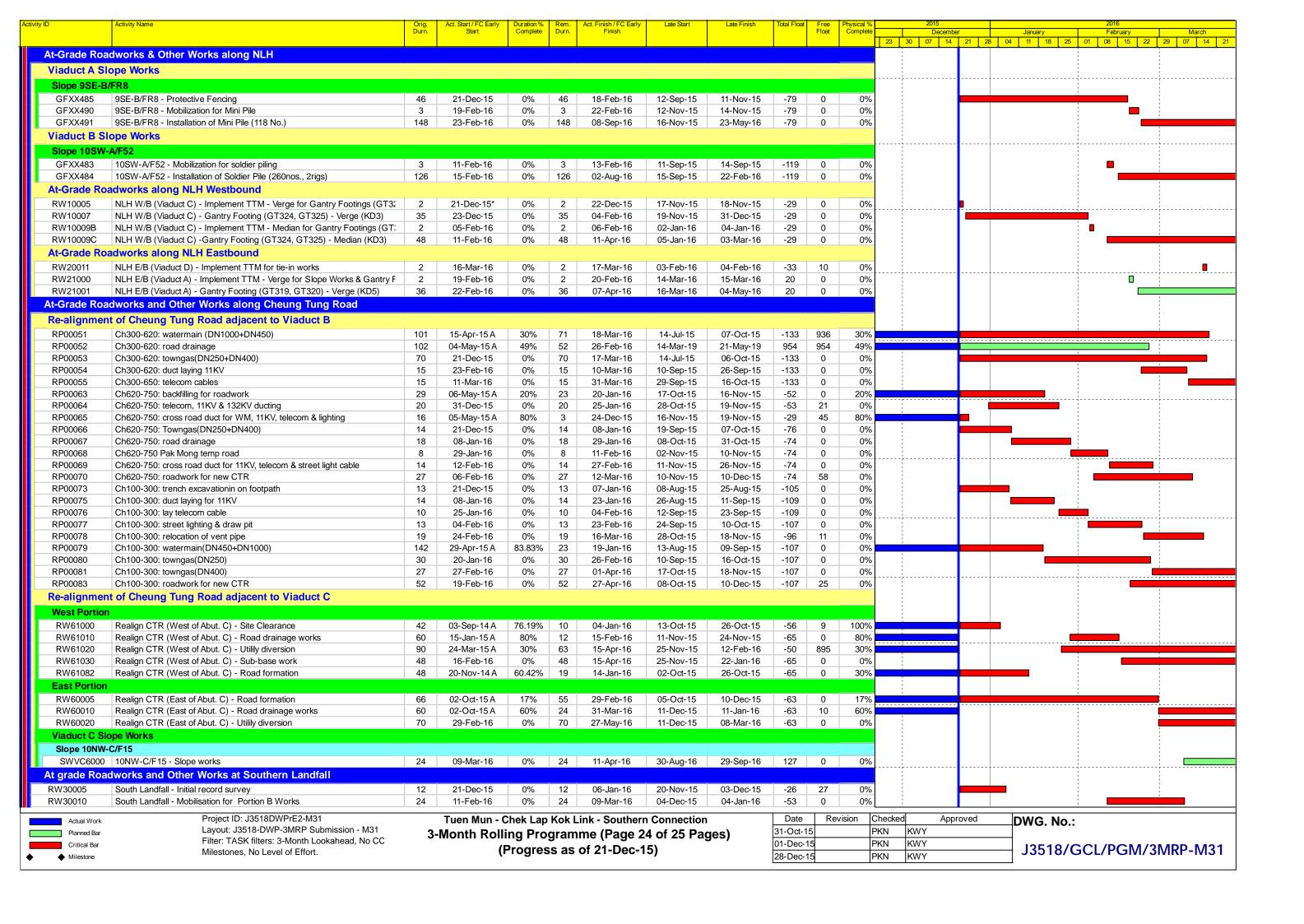




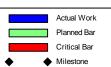








Activ	ty ID	Activity Name	Orig.	Act. Start / FC Early	Duration %	Rem.	Act. Finish / FC Early	Late Start	Late Finish	Total Float	Free	Physical %		2015					2016		
			Durn.	Start	Complete	Durn.	Finish				Float	Complete		Decemb	er		January		February		March
													23 :	30 07 14	21 28	04	11 18 2	5 01 (	08 15 22	29 07	7 14 21
	RW30014	South Landfall - DN300 Fresh water main works installation & connection (	60	10-Mar-16	0%	60	30-May-16	31-Mar-16	23-Jun-16	15	0	0%									
	Watermains 8	All Assoc Works from Tung Chung to Southern Landfall																			
	WM00120	Lay DN450 Fresh Water Main along re-aligned CTR (app. 500 m at 12m/d	48	22-Apr-15 A	80%	10	04-Jan-16	08-May-19	21-May-19	959	959	80%									
	WM00150	Lay DN450 watermain from Tung Chung to realigned CTR (1st 500m - 2 w	50	10-Sep-15 A	80%	10	04-Jan-16	10-Sep-16	22-Sep-16	198	0	80%	-					-			
	WM00160	Lay DN450 watermain from Tung Chung to realigned CTR (2nd 500m - 2	50	05-Jan-16	0%	50	05-Mar-16	23-Sep-16	25-Nov-16	198	0	0%									
	WM00170	Lay DN450 watermain from Tung Chung to realigned CTR (3rd 500m - 2 v	50	07-Mar-16	0%	50	11-May-16	26-Nov-16	26-Jan-17	198	0	0%						-			
	Pressure Tes	sting																			
	TC00010	Pressure Test DN450 Fresh Water Main along re-aligned CTR (app. 520 n	12	18-Sep-15 A	80%	2	23-Dec-15	29-Mar-17	31-Mar-17	358	669	80%						1		-	



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3-Month Rolling Programme (Page 25 of 25 Pages)
(Progress as of 21-Dec-15)

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01-Dec-15		PKN	KWY
28-Dec-15		PKN	KWY

DWG. No.:

J3518/GCL/PGM/3MRP-M31

#### Appendix C

### Environmental Mitigation and Enhancement Measure Implementation Schedules

(In reference to CINOTECH (2011) Agreement No. CE35/2011 EP Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao Bridge Tuen Mun-Chep Lap Kok Link – Investigation. Updated EM&A Manual for Tuen Mun-Chek Lap Kok Link)

#### Contract No. HY/2012/07

#### Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section

#### Environmental Mitigation and Enhancement Measure Implementation Schedule

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	mplementation Stages		Status
	Reference					D	С	О	
Air Qualit	Y								
4.8.1	3.8	An effective watering programme of eight daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;	All areas / throughout construction period	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		<b>&lt;</b>
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<b>*</b>
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<b>✓</b>
4.8. 1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		<b>✓</b>
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<b>✓</b>
4.8. 1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<b>✓</b>
4.8.1	3.8	During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<>

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
4.8.1	3.8	Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		<b>✓</b>
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site.	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		✓
4.8.1	3.8	Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit	All representative existing ASRs / throughout construction period	Contractor	EM&A Manual		Y		✓
Noise	i	i	<u>.i.</u>	<u>i</u>	<u>.i.</u>	i		<u>i</u>	
5.11	Section 4	Noise monitoring	All existing representative sensitive receivers / during North Lantau Viaduct construction	Contractor	EM&A Manual		Y		<b>✓</b>
Water Qua	LITY	i	<u>.i</u>	<u>i.</u>	<u>.i.</u>	I	.1	<u>i</u>	
General Mar	rine Works								
6.10	-	Bored piling to be undertaken within a metal casing.	Marine viaducts of TM-CLKL and HKLR/ bored piling	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Barges and hopper dredgers shall have tight fitting seals to their bottom openings to prevent leakage of material.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementatio Stages			Status
	Reference					D	С	О	
6.10	-	Any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>
6.10	-	Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water. Barges or hoppers shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>
6.10	-	Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>
6.10	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>
6.10	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>~</b>
6.10	-	The works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		<b>✓</b>
Temporary S	Staging work	·	.i.			4			
	5.2	Regular inspection for the accumulation of floating refuse and collection of floating refuse if required	During temporary staging works	Contractor			Y		✓
	5.2	Provision of temporary drainage system on the temporary staging for collection of construction site runoff to allow appropriate treatment before discharge into the sea	During temporary staging works	Contractor			Y		<>
	5.2	Wastewater generated from construction works such as bored / drilling water will be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal	During temporary staging works	Contractor			Y		<b>✓</b>
	5.2	One additional water quality monitoring station is	During temporary	Contractor			Y		✓

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/Timing	Implementation Agent	n Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		proposed at station SR4a In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution will be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration will be arranged at the monitoring station SR4a,	staging works						
Land Works									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Sewage effluent and discharges from on- site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Υ		<b>Y</b>
6.10	-	Storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>Y</b>
6.10	-	Silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>⇔</b>

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	lement Stage:		Status
	Reference					D	С	О	
6.10	-	Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	5.8	Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>~</b>
6.10	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for offsite disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance		Y		<b>✓</b>

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	Implementation Stages		Status
	Reference					D	С	О	
6.10	-	All fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.10	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<b>✓</b>
6.10	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	<b>~</b>
6.10	Section 5	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good working practice.	All areas/ throughout construction period	Contractor	EM&A Manual		Y		<b>✓</b>
Water Qual	ity Monitorin	8		•	•			•	
6.10	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen.  Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period.  One year operation phase water quality monitoring at designated stations	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual		Y	Y	
Ecology									
8.14	6.3	Specification for and implement pre, during and post construction dolphin abundance monitoring.	All Areas/Detailed Design/ during construction works/post construction	Design Consultant/ Contractor	TMEIA	Y	Y	Y	<b>*</b>
8.14	6.3	Specification for bored piling monitoring	Detailed Design	Design Consultant	TMEIA	Y			n/a
8.14	6.3	Implement any recommendations of the bored piling monitoring	Southern marine viaduct/Throughout	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	-
			construction during bored piling						
8.14	6.3,6.5	Avoidance of peak CWD calving season in May and June for driving of metal caissons during bored piling works	Southern marine viaduct/ May and	Contractor	TMEIA		Y		n/a
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All marine bored piling and temporary staging works areas/Detailed Design/during all marine bored piling and temporary staging works	Design Consultant/ Contractor	TMEIA	Y	Y		<b>Y</b>
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600 m <sup>2</sup> in an area where fishing activities are prohibited.	Area of prohibited fishing activities/Detailed Design/towards end of construction period	TM-CLKL/ HKBCF Design Consultant/ TM-CLKL/ HKBCF Contractor	TMEIA	Y		Y	n/a To be enforced by AFCD.
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for marine bored piling and the whole lifespan of temporary staging works.	All areas/ Detailed Design/during marine bored piling and temporary staging works	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Tai Ho Wan (donar site) and Yam Tsui Wan (receptor site) / Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Υ		n/a
8.15	6.5	Audit coral translocation success	Yam Tsui Wan (receptor site)/Post translocation	Contractor	TMEIA		Y		Completed in October 2014
7.13	6.5	Undertaken gabion wall works in Stream NL1 in the dry season	North Lantau slope works/dry	Contractor	TMEIA		Y		n/a

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Imp	olementation Stages		Status
	Reference					D	С	О	
			season/construction phase						
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA	***************************************	Y		n/a. To be approved by AFCD/LCSD
7.13	6.5	Spoil heaps shall be covered at all times.	All areas / Throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
7.13	6.5	Construction activities should be restricted to the proposed works boundary	All areas / Throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
LANDSCAPE	AND VISUAL							-	•
10.9	7.6	Round angle, patterned finishes, and oval shaped pier were considered in the viaduct design, and further details will be developed under ACABAS submission (DM3)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Details of the street furniture will be developed in the detailed design stage (DM4)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Existing trees on boundary of the Project Area shall be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>*</b>

EIA Reference	EM&A Manual		Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. (Tree protection measures will be detailed at Tree Removal Application stage) (CM1)							
10.9	7.6	Trees unavoidably affected by the works shall be transplanted where practical. Trees will be transplanted straight to their final receptor site and not held in a temporary nursery. A detailed Tree Transplanting Specification shall be provided in the Contract Specification. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme (CM2)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		Tree transplanted as Contract Specification
10.9	7.6	Hillside and roadside screen planting to proposed roads, associated structures and slope works (CM3).	All areas/detailed design/ during construction/post construction	Design Consultant/	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Hydroseeding or sheeting of soil stockpiles with visually unobtrusive material (in earth tone) (CM4)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/during construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>

EIA Reference	EM&A Manual		Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
10.9	7.6	Recycle/Reuse all felled trees and vegetation, e.g. mulching (CM9)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a No felled trees or vegetation for recycle
10.9	7.6	Compensatory tree planting shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under ETWBTC 3/2006 (CM10).	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		<b>✓</b>
10.9	7.6	Re-vegetation of affected woodland/shrubland with native species (OM1)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by AFCD/HyD/ L CSD
10.9	7.6	Tall buffer screen tree / shrub / climber planting should be incorporated to soften hard engineering structures and facilities (OM2)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Υ	Y	n/a To be implemented by HyD/LCSD
10.9	7.6	Streetscape elements (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the local context, and minimises potential negative landscape and visual impacts.  Lighting units should be directional and minimise unnecessary light spill (OM3)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Υ	n/a. To be implemented by HyD/LCSD
10.9	7.6	Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Υ	Y	n/a. To be implemented by HyD/LCSD

EIA Reference	EM&A Manual	al	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by HyD
Waste		4	A		·A				
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		<b>✓</b>
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		<b>*</b>
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.		Y		
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures including waste reduction, reuse and recycling.	Contract Mobilisation	Contractor	TMEIA		Y		<b>~</b>
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored	All areas / throughout construction period	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		pile walls should be proposed to minimise the extent of cutting.							
12.6	8.1	Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible	All areas / throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>~</b>
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			n/a
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Υ		<b>✓</b>
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>~</b>
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
12.6	8.1	Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>*</b>

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/Timing Impleme Agent	Implementation Relevant Standard or Requirement	Imp	lement Stage:	Status		
	Reference					D	С	О	
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.	All areas / throughout construction period	Contractor	TMEIA		Y		
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows:  - suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed;  - Having a capacity of <450L unless the specifications have been approved by the EPD; and  - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. Clearly labelled and used solely for the storage of chemical wastes;  - Enclosed with at least 3 sides;  - Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest;  - Adequate ventilation;	All areas / throughout construction period	Contractor	TMEIA		Y		

EIA Reference	EM&A Manual		Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		<ul> <li>Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and</li> <li>Incompatible materials are adequately separated.</li> </ul>							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them.	All areas / throughout construction period	Contractor	TMEIA		Υ		✓
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances Bylaws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		<b>✓</b>
12.6	8.1	All waste containers shall be in a secure area on hard standing;	All areas / throughout construction period	Contractor	TMEIA		Υ		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Office wastes can be reduced by recycling of paper if such volume is sufficiently large to	Site Offices/ throughout	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual	<b>Environmental Protection Measures</b>	Location/ Timing	Implementation Agent	Relevant Standard or Requirement		ement Stages		Status
	Reference					D	С	O	
		warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminium cans, plastic bottles, etc should be provided on-site.	construction period						
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		<b>~</b>
Cultural H	ERITAGE						-		
11.8	Section 9	EM&A in the form of audit of the mitigation measures	All areas / throughout construction period	Highways Department	EIAO-TM		Y		n/a

#### Notes:

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

#### Status:

- ✓ Compliance of Mitigation Measures
- Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by Contractor
- $\Delta$  Deficiency of Mitigation Measures but rectified by Contractor
- n/a Not Applicable in Reporting Period

### Appendix D

### Summary of Action and Limit Levels

#### Table D1 Action and Limit Levels for 1-hour and 24-hour TSP

Parameters	Action	Limit
24 Hour TSP Level in μg/m³	ASR9A/ASR8A = 178 ASR9C/ASR8/ASR9 = 178	260
1 Hour TSP Level in $\mu g / m^3$	ASR9A/ASR8A = 394 ASR9C/ASR8/ASR9 = 393	500

### Table D2 Action and Limit Levels for Construction Noise (0700-1900 hrs of normal weekdays)

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

#### Table D3 Action and Limit Levels for Water Quality

Parameter	Action Level#	Limit Level#
DO in mg/L (a)	Surface and Middle	Surface and Middle
	5.0 mg/L	4.2 mg/L
	<u>Bottom</u>	<u>Bottom</u>
	4.7 mg/L	3.6 mg/L
Turbidity in NTU (Depthaveraged (b), (c))	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e.,	130% of upstream control station at the same tide of the same day and 99%-ile of baseline data, i.e.,
	27.5 NTU	47.0 NTU
SS in mg/L (Depth-averaged (b), (c))	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e.,  23.5 mg/L	130% of upstream control station at the same tide of the same day and 10mg/L for WSD Seawater Intakes at Tuen Mun and 99%-ile of baseline data, i.e.,
		34.4 mg/L

#### Notes:

# Baseline data: data from HKZMB Baseline Water Quality Monitoring between 6 and 31 October 2011.

- (a) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (b) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths
- (c) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- (d) All figures given in the table are used for reference only, and EPD may amend the figures whenever it is considered as necessary

Para	meter	Action Level#	Limit Level#
(e)	The 1%-ile of baseline data	a for surface and middle DO is 4.	2 mg/L, whilst for bottom DO
	is 3.6 mg/L.		

#### Table D4 Action and Limit Levels for Impact Dolphin Monitoring

	North Lant	tau Social Cluster		
	NEL	NWL		
Action Level	STG < 70% of baseline &	STG < 70% of baseline &		
	ANI < 70% of baseline	ANI < 70% of baseline		
Limit Level	[STG < 40% of baseling	ne & ANI < 40% of baseline]		
	and			
	STG < 40% of baseling	ne & ANI < 40% of baseline		

#### Notes:

- 1. STG means quarterly encounter rate of number of dolphin sightings, which is **6.00 in NEL** and **9.85 in NWL** during the baseline monitoring period
- 2. ANI means quarterly encounter rate of total number of dolphins, which is **22.19 in NEL** and **44.66 in NWL** during the baseline monitoring period
- 3. For North Lantau Social Cluster, AL will be trigger if NEL or NWL fall below the criteria; LL will be triggered if both NEL and NWL fall below the criteria.

#### Table D5 Derived Value of Action Level (AL) and Limit Level (LL)

	North Lantau Social Cluster			
	NEL	NWL		
Action Level	STG < 4.2 & ANI< 15.5	STG < 6.9 & ANI < 31.3		
Limit Level	[STG < 2.4 & ANI <8.9]			
		and		
	[STG < 3.9	& ANI <17.9]		

### Appendix E

# EM&A Monitoring Schedules

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Noise Monitoring Schedule (1 to 31 December 2015)

Alternative Noise Monitoring at Pak Mong Village Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		01-Dec				
		Noise Impact				
		Monitoring				
06-Dec		08-Dec	09-Dec		11-Dec	12-De
	Noise Impact			Noise Impact		
	Monitoring			Monitoring		
10 D	44.5	45 D	40 D	47 D	40 D	40.0
13-Dec	14-Dec				18-Dec	19-De
			Noise Impact Monitoring			
20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-De
		Noise Impact				
		Monitoring				
27-Dec		29-Dec				
	Noise Impact			Noise Impact		
	Monitoring			Monitoring		

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 31 December 2015)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		01-Dec	02-Dec	03-Dec	04-Dec	05-Dec
		1-hr TSP Monitoring				
		24-hr TSP Monitoring				
		~				
06-Dec	07-Dec	08-Dec	09-Dec	10-Dec	11-Dec	12-Dec
	1-hr TSP Monitoring			1-hr TSP Monitoring		
	24-hr TSP Monitoring			24-hr TSP Monitoring		
13-Dec	14-Dec	15-Dec	16-Dec	17-Dec	18-Dec	19-Dec
		10 2 00	1-hr TSP Monitoring	.,	10 200	
			24-hr TSP Monitoring			
			211111011110111119			
20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec
20 000	21 000	1-hr TSP Monitoring	20 000	24 800	20 200	20 000
		24-hr TSP Monitoring				
		24-III TOP Worldoning				
27-Dec		29-Dec	30-Dec	31-Dec		
	1-hr TSP Monitoring			1-hr TSP Monitoring		
	24-hr TSP Monitoring			24-hr TSP Monitoring		

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Noise Monitoring Schedule (1 to 31 January 2016)

Alternative Noise Monitoring at Pak Mong Village Entrance

Alternative Noise Monito Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					01-Jan	02-Jan
03-Jan	04-Jan				08-Jan	09-Jan
			Noise Impact Monitoring			
10-Jan	11-Jan		13-Jan	14-Jan	15-Jan	16-Jan
		Noise Impact				
		Monitoring				
17-Jan	18-Jan	19-Jan	20-Jan	21-Jan	22-Jan	23-Jan
	Noise Impact	19-3411	20-3411	Noise Impact	22-Jaii	23-3411
	Monitoring			Monitoring		
	INIOTHIOTHIG			INIOTHOTHIG		
24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan
210011	20 0411		Noise Impact Monitoring	20 0411	20 0411	00 0011
31-Jan						

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 31 January 2016)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					01-Jan	02-Jan
03-Jan	04-Jan	05-Jan	06-Jan	07-Jan	08-Jan	09-Jan
			1-hr TSP Monitoring			
			24-hr TSP Monitoring			
10-Jan	11-Jan	12-Jan	13-Jan	14-Jan	15-Jan	16-Jan
10 0411	11 0011	1-hr TSP Monitoring	10 0411	11 Gail	10 0411	10 0411
		24-hr TSP Monitoring				
		3				
47 1	40 lan	40 1	00 1	04 lan	00 law	00 law
17-Jan		19-Jan	20-Jan		22-Jan	23-Jan
	1-hr TSP Monitoring 24-hr TSP Monitoring			1-hr TSP Monitoring 24-hr TSP Monitoring		
	24-III TOP MONITORING			24-111 TOP Mornitoring		
24-Jan	25-Jan	26-Jan		28-Jan	29-Jan	30-Jan
			1-hr TSP Monitoring			
			24-hr TSP Monitoring			
31-Jan						

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Noise Monitoring Schedule (1 to 29 February 2016)

Alternative Noise Monitoring at Pak Mong Village Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-Feb	02-Feb	03-Feb		05-Feb	06-Feb
		Noise Impact			Noise Impact	
		Monitoring			Monitoring	
07.5.1	00.5.1	00 5.1	40 5.1	44.5.1	40 E.I	40 5.1
07-Feb	08-Feb	09-Feb	10-Feb		12-Feb	13-Feb
				Noise Impact		
				Monitoring		
14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb
			Noise Impact Monitoring			
04 Fab	00 5-4	00 5-4	04 5-4	05 Fab	00 F-h	07 Fab
21-Feb	22-Feb		24-Feb	25-Feb	26-Feb	27-Feb
		Noise Impact				
		Monitoring				
28-Feb	29-Feb					
	Noise Impact					
	Monitoring					

## HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 29 February 2016)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-Feb	02-Feb	03-Feb	04-Feb		06-Feb
		1-hr TSP Monitoring			1-hr TSP Monitoring	
		24-hr TSP Monitoring			24-hr TSP Monitoring	
07-Feb	08-Feb	09-Feb	10-Feb	11-Feb	12-Feb	13-Feb
				1-hr TSP Monitoring		
				24-hr TSP Monitoring		
14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb
			1-hr TSP Monitoring			
			24-hr TSP Monitoring			
21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb
		1-hr TSP Monitoring				
		24-hr TSP Monitoring				
28-Feb	29-Feb					
	1-hr TSP Monitoring					
	24-hr TSP Monitoring					

### HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Marine Water Quality Monitoring (WQM) Schedule (December 15)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
29-Nov			02-Dec		04-Dec		05-Dec
		WQM		WQM		WQM	
		Mid-Flood		Mid-Flood		Mid-Ebb	
		11:44		13:42		7:54	
		(09:59 - 13:29)		(11:57 - 15:27)		(06:09 - 09:39)	
		Mid-Ebb		Mid-Ebb		Mid-Flood	
		16:54		19:33		15:12	
00 Da		(15:09 - 18:39)	20 D	(17:48 - 21:18)	44 D	(13:27 - 16:57)	10 D
06-Dec		WQM 08-Dec	09-Dec	10-Dec WQM	11-Dec	WQM	12-Dec
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		11:04		12:24		13:42	
		(09:19 - 12:49)		(10:39 - 14:09)		(11:57 - 15:27)	
		(09.19 - 12.49) Mid-Flood		(10.59 - 14.09) Mid-Flood		(11.57 - 15.27) Mid-Flood	
		16:46		17:45		18:53	
		(15:01 - 18:31)		(16:00 - 19:30)		(17:08 - 20:38)	
13-Dec		(15.01 - 16.31) 15-Dec	16-Dec		18-Dec		19-Dec
13-Dec		WQM		WQM		WQM	19-Dec
		Mid-Flood		Mid-Flood		Mid-Flood	
		10:23		12:05		13:55	
		(08:38 - 12:08)		(10:20 - 13:50)		(12:10 - 15:40)	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		15:52		17:46		20:20	
		(14:07 - 17:37)		(16:01 - 19:31)		(18:35 - 22:05)	
20-Dec			23-Dec		25-Dec		26-Dec
		WQM		WQM		WQM	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		10:13		12:13		13:42	
		(08:28 - 11:58)		(10:28 - 13:58)		(11:57 - 15:27)	
		Mid-Flood		Mid-Flood		Mid-Flood	
		16:12		17:34		18:53	
		(14:27 - 17:57)		(15:49 - 19:19)		(17:08 - 20:38)	
27-Dec		29-Dec	30-Dec	31-Dec	01-Jan		02-Jan
		WQM		WQM		WQM	
		Mid-Flood		Mid-Flood		Mid-Flood	
		10:22		11:38		13:06	
		(08:37 - 12:07)		(09:53 - 13:23)		(11:21 - 14:51)	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		15:39		17:07		19:26	
		(13:54 - 17:24)		(15:22 - 18:52)		(17:41 - 21:11)	

### HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Marine Water Quality Monitoring (WQM) Schedule (February 2016)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturda	у
31-Jan			03-Feb		05-Feb		06-Feb
		WQM		WQM		WQM	
		Mid-Flood		Mid-Ebb		Mid-Ebb	
		13:08		10:04		11:47	
		(11:23 - 14:53)		(08:30 - 11:40)		(10:02 - 13:32)	
		Mid-Ebb		Mid-Flood		Mid-Flood	
		20:40		15:06		16:55	
07-Feb		(18:55 - 22:25) 09-Feb	10-Feb	(13:21 - 16:51) 11-Feb	12-Feb	(15:10 - 18:40)	13-Feb
07-Feb		WQM is cancelled	TO-Feb	WQM	12-Feb	WQM	13-160
		due to suspension		Mid-Flood		Mid-Flood	
		of marine works.		9:18		10:28	
		of marine works.		(07:33 - 11:03)		(08:43 - 12:13)	
				Mid-Ebb		Mid-Ebb	
				15:08		16:42	
				(13:23 - 16:53)		(14:57 - 18:27)	
14-Feb	15-Feb	16-Feb	17-Feb		19-Feb		20-Feb
		WQM		WQM		WQM	
		Mid-Flood		Mid-Ebb		Mid-Ebb	
		13:02		10:18		12:01	
		(11:17 - 14:47)		(08:45 - 11:45)		(10:16 - 13:46)	
		Mid-Ebb ´		Mid-Flood		Mid-Flood (	
		20:18		15:27		17:18	
		(18:33 - 22:03)		(13:43 - 17:12)		(15:33 - 19:03)	
21-Feb			24-Feb		26-Feb		27-Feb
		WQM		WQM		WQM	
		Mid-Ebb		Mid-Flood		Mid-Flood	
		13:35		8:46		9:34	
		(11:50 - 15:20)		(07:01 - 10:31)		(07:49 - 11:19)	
		Mid-Flood		Mid-Ebb		Mid-Ebb	
		19:19		14:29		15:35	
00.5.1		(17:34 - 21:04)		(12:44 - 16:14)		(13:50 - 17:20)	
28-Feb	29-Feb						

# HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Marine Water Quality Monitoring (WQM) Schedule (January 2016)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturda	y
27-Dec	28-Dec	29-Dec	30-Dec	31-Dec			02-Jan
						WQM	
						Mid-Flood	
						13:06	
						(11:21 - 14:51)	
						Mid-Ebb	
						19:26	
						(17:41 - 21:11)	
03-Jan	04-Jan		06-Jan	07-Jan	08-Jan		09-Jan
		WQM		WQM		WQM	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		9:30		11:20		12:46	
		(07:45 - 11:15)		(09:35 - 13:05)		(11:01 - 14:31)	
		Mid-Flood		Mid-Flood		Mid-Flood	
		15:13		16:34		17:56	
		(13:28 - 16:58)		(14:49 - 18:19)		(16:11 - 19:41)	
10-Jan	11-Jan		13-Jan		15-Jan		16-Jan
		WQM		WQM		WQM	
		Mid-Flood		Mid-Flood		Mid-Flood	
		9:19		10:38		12:09	
		(07:34 - 11:04)		(08:53 - 12:23)		(10:24 - 13:54)	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		14:50		16:23		18:27	
		(13:05 - 16:35)		(14:38 - 18:08)		(16:42 - 20:12)	
17-Jan	18-Jan		20-Jan		22-Jan		23-Jan
		WQM		WQM		WQM	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		8:44		11:18		12:48	
		(06:59 - 10:29)		(09:33 - 13:03)		(11:03 - 14:33)	
		Mid-Flood		Mid-Flood		Mid-Flood	
		14:51		16:35		18:03	
		(13:06 - 16:36)		(14:50 - 18:20)		(16:18 - 19:48)	
24-Jan	25-Jan		27-Jan	28-Jan	29-Jan		30-Jan
		WQM		WQM		WQM	
		Mid-Flood		Mid-Flood		Mid-Flood	
		9:09		10:00		10:58	
		(07:24 - 10:54)		(08:15 - 11:45)		(09:13 - 12:43)	
		Mid-Ebb		Mid-Ebb		Mid-Ebb	
		14:33		15:34		16:57	
		(12:48 - 16:18)		(13:49 - 17:19)		(15:12 - 18:42)	

### HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 31 December 2015)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		01-Dec		03-Dec	04-Dec	05-Dec
			Impact Dolphin			
			Monitoring			
06-Dec	07-Dec	08-Dec	09-Dec	10-Dec	11-Dec	12-Dec
	Impact Dolphin		Impact Dolphin			
	Monitoring		Monitoring			
13-Dec	14-Dec	15-Dec	16-Dec	17-Dec	18-Dec	19-Dec
		Impact Dolphin				
		Monitoring				
		_				
20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec
20 200	21 500	22 300	20 200	21200	20 200	20 200
07.0	00.0	00 D	00.0	04.0		
27-Dec	28-Dec	29-Dec	30-Dec	31-Dec		

### HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 31 January 2016)

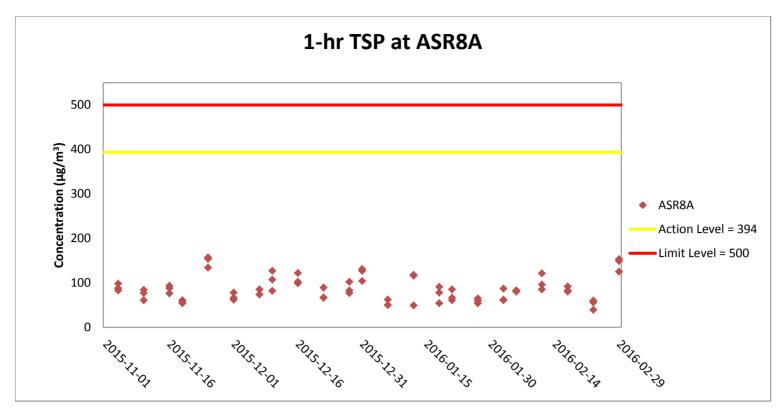
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					01-Jan	02-Jan
03-Jan	04-Jan	05-Jan	06-Jan	07-Jan		09-Jan
					Impact Dolphin	
					Monitoring	
10-Jan		12-Jan		14-Jan	15-Jan	16-Jan
	Impact Dolphin		Impact Dolphin			
	Monitoring		Monitoring			
17-Jan	18-Jan		20-Jan	21-Jan	22-Jan	23-Jan
		Impact Dolphin				
		Monitoring				
24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan
31-Jan						

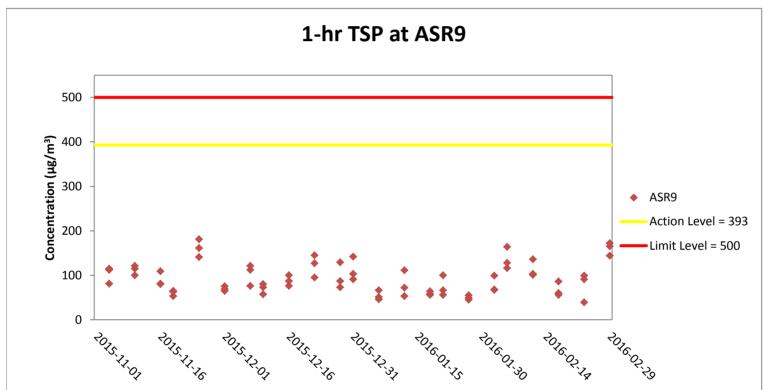
# HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 29 February 2016)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-Feb		03-Feb			
			Impact Dolphin Monitoring			
07-Feb	08-Feb	09-Feb	10-Feb	11-Feb	12-Feb	13-Feb
14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb
		Impact Dolphin Monitoring				
21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb
	Impact Dolphin Monitoring					
28-Feb	29-Feb					

#### Appendix F

Impact Air Quality
Monitoring Graphical
Presentation

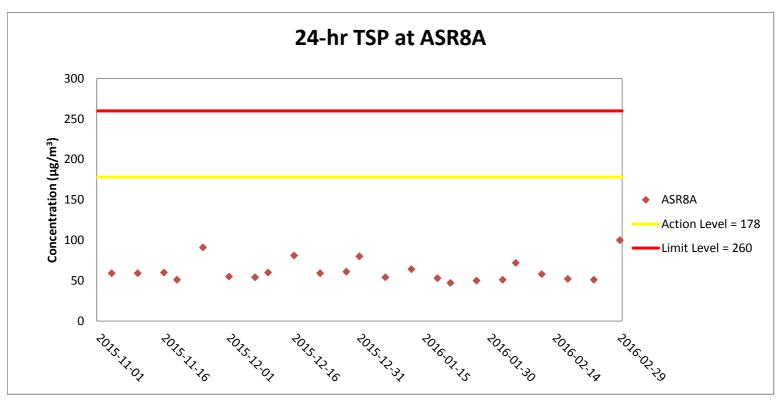


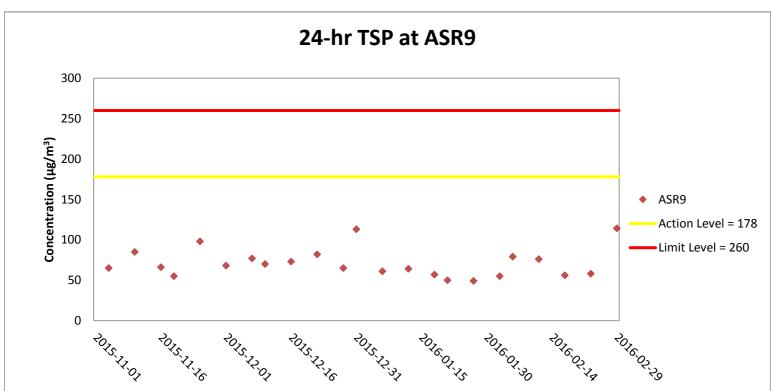


Weather condition within the reporting period varied between sunny to rainy.

Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Predrilling at Viaduct F; Additional land GI, trial pits & lab testing; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

Marine works within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Construction of land section of berth at Southern Landfall; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.





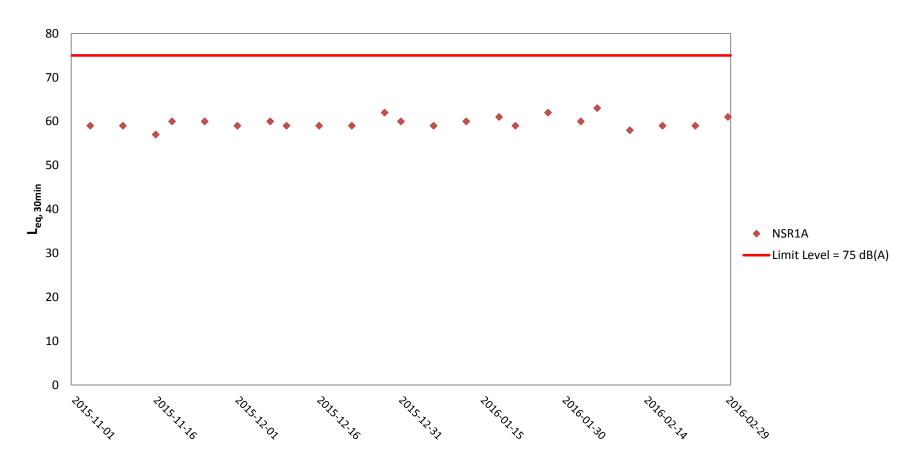
Weather condition within the reporting period varied between sunny to rainy.

Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Predrilling at Viaduct F; Additional land GI, trial pits & lab testing; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C. Marine works within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Construction of land section of berth at Southern Landfall; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

#### Appendix G

### Impact Noise Monitoring Graphical Presentation

### Noise Monitoring Results at NSR 1A ( $L_{eq, 30min}$ )



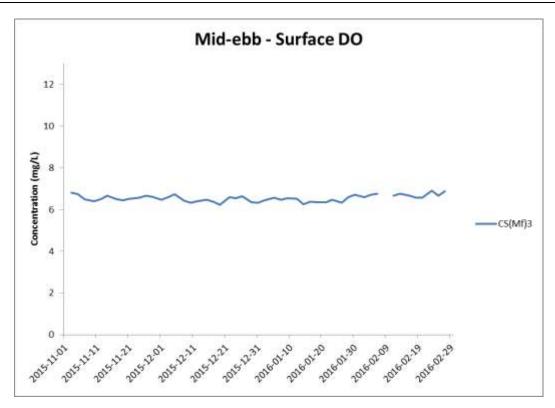
Weather condition within the reporting period varied between sunny to rainy.

Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Predrilling at Viaduct F; Additional land GI, trial pits & lab testing; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

Marine works within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Construction of land section of berth at Southern Landfall; Installation of pier head and deck segments; and Slope work of Viaducts A, B & C.

#### Appendix H

Impact Water Quality Monitoring Graphical Presentation



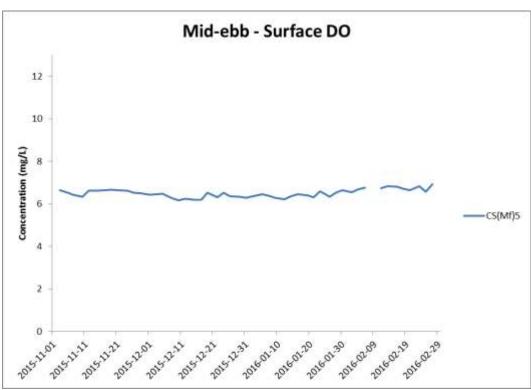
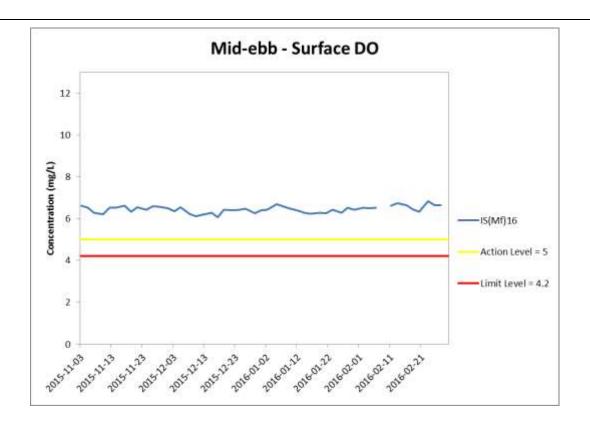


Figure H1 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.





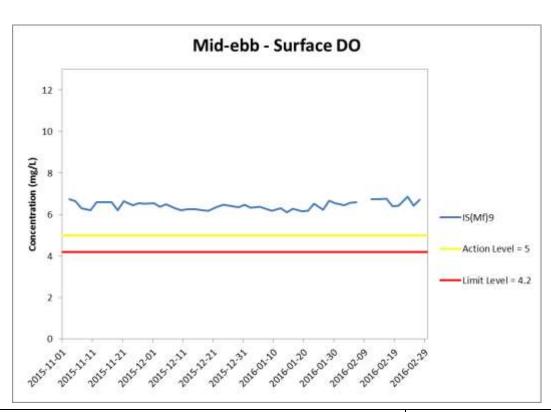
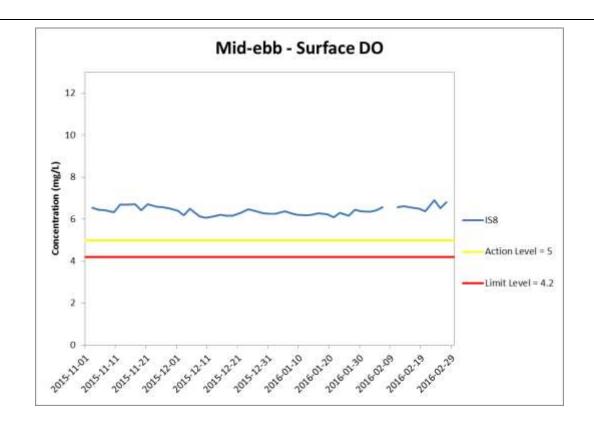


Figure H2 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.





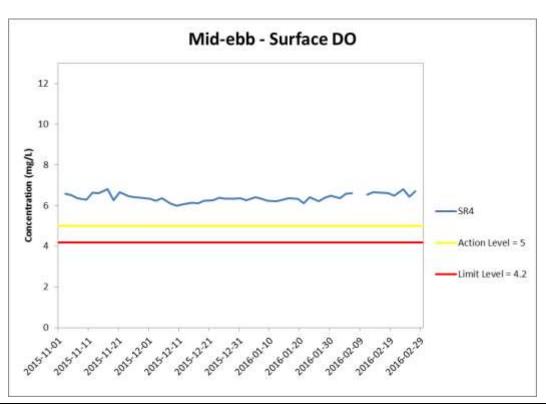


Figure H3 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.



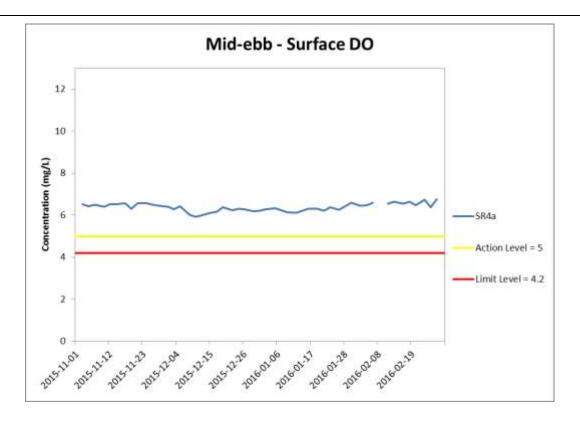
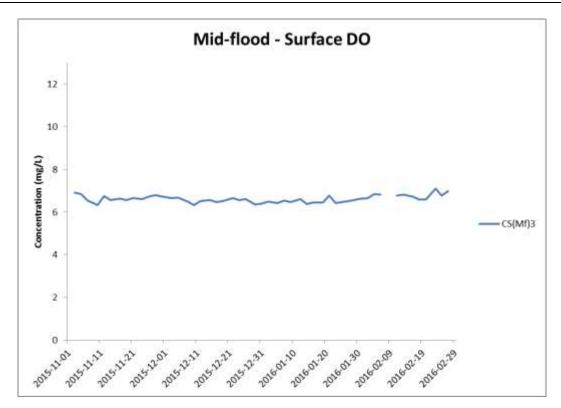


Figure H4 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





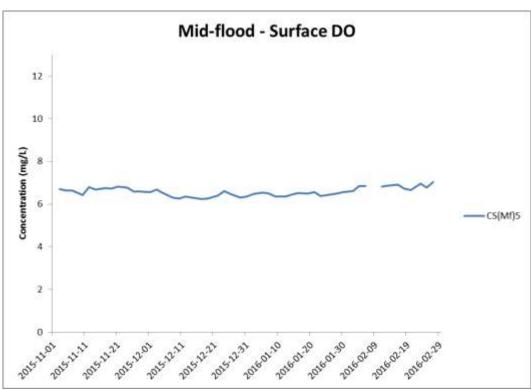
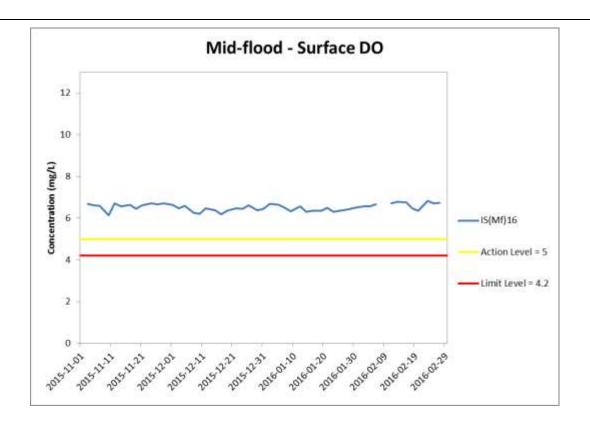


Figure H5 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.





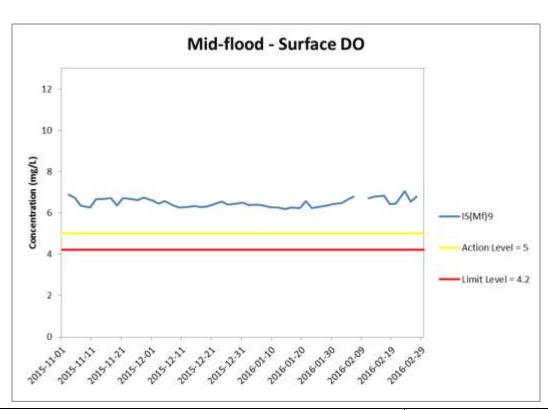
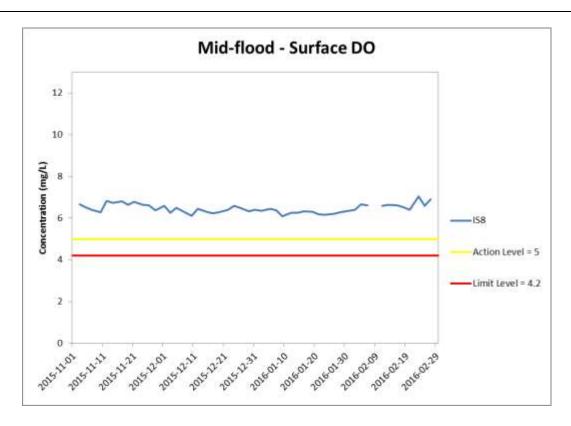


Figure H6 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.





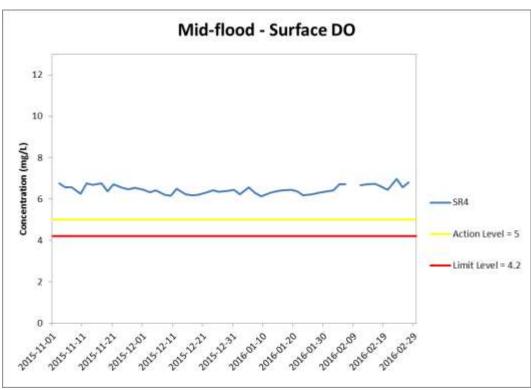


Figure H7 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.



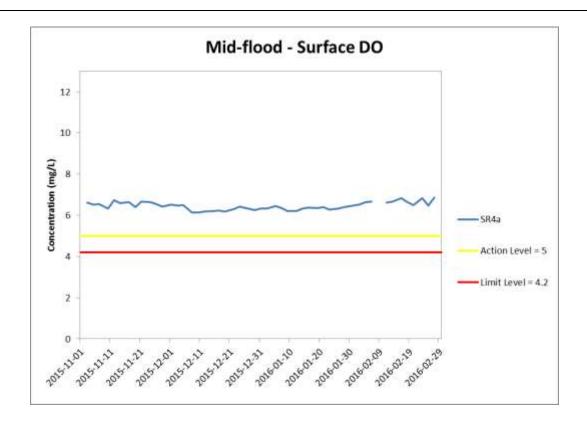
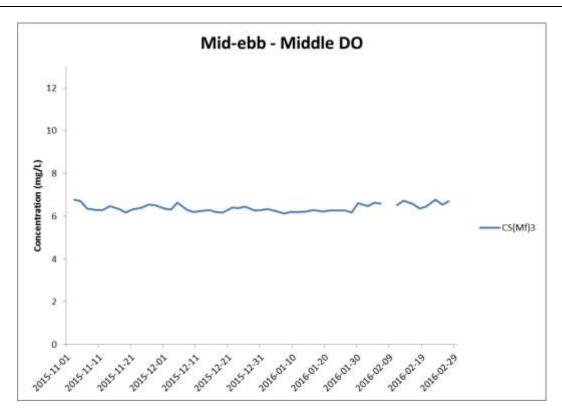


Figure H8 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





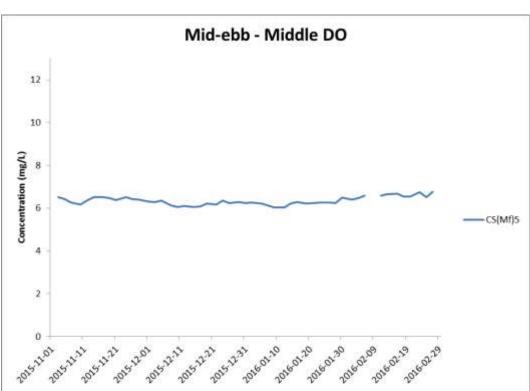


Figure H9 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.



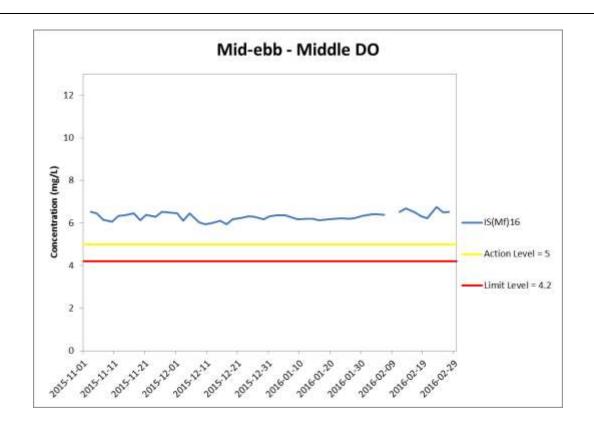
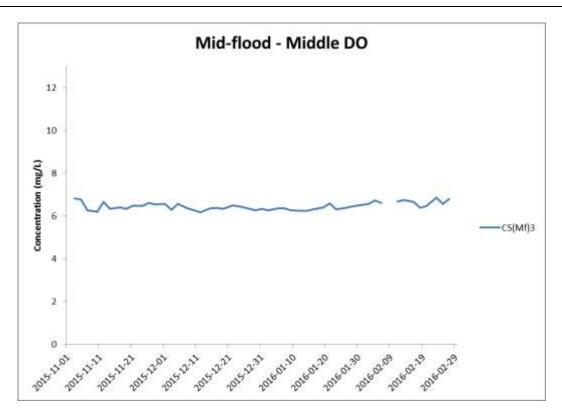


Figure H10 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS(Mf)16.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





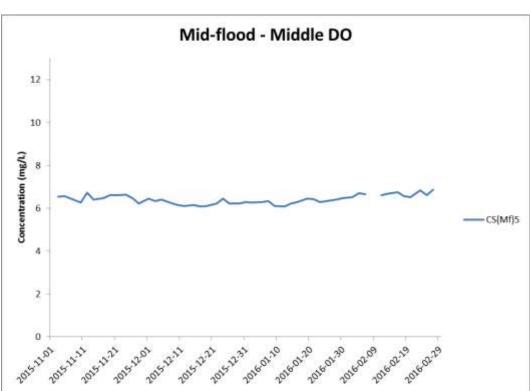


Figure H11 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.



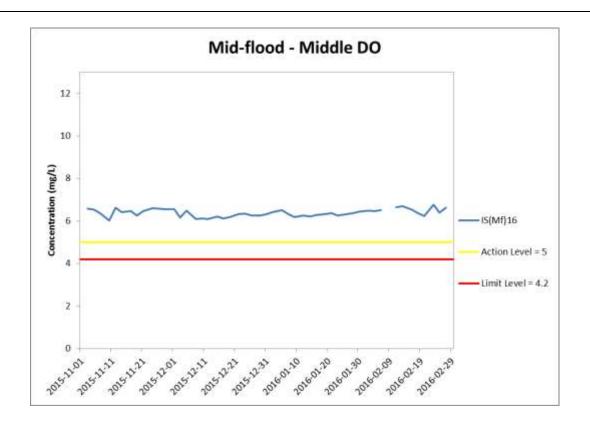
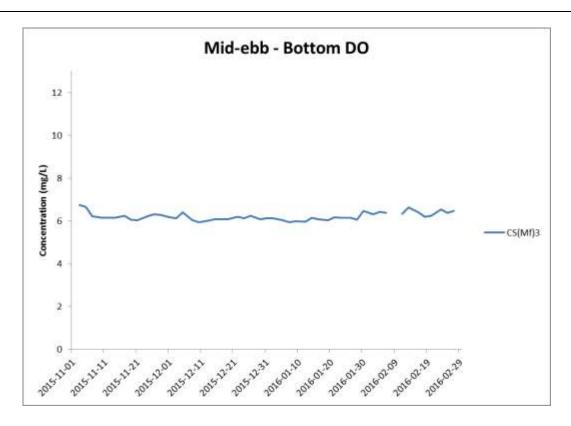


Figure H12 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2015 and 29 February 2016 at IS(Mf)16.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





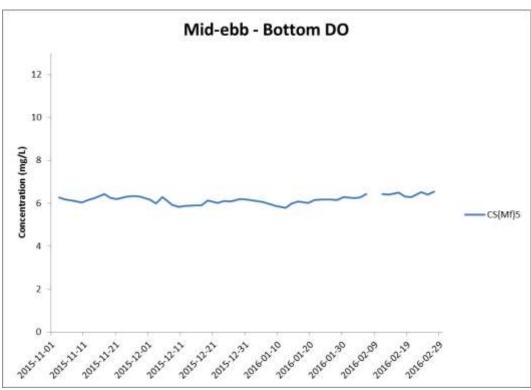
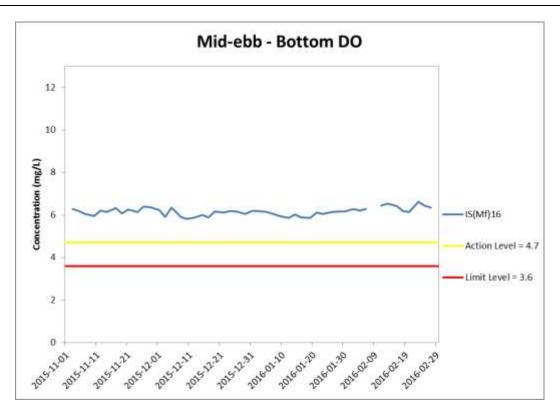


Figure H13 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.





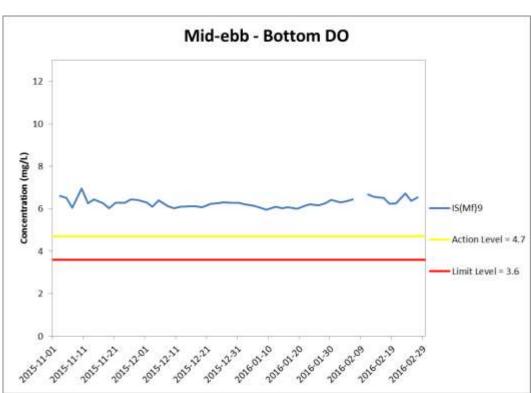
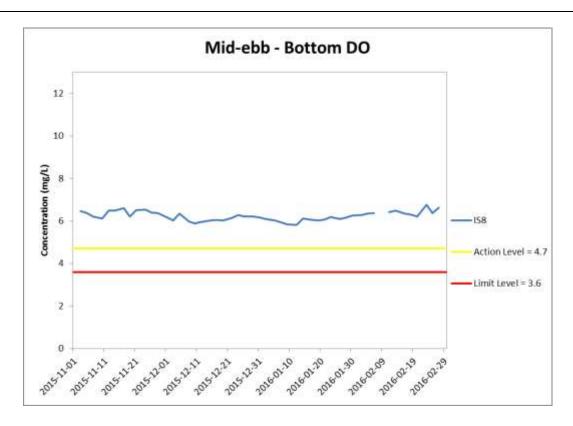


Figure H14 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.





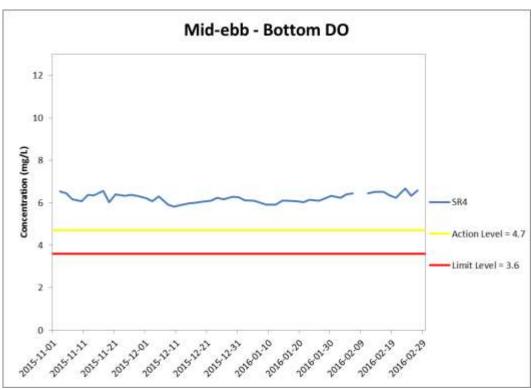


Figure H15 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.



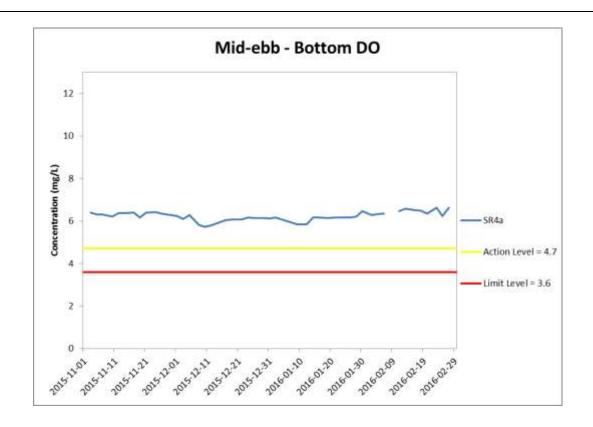
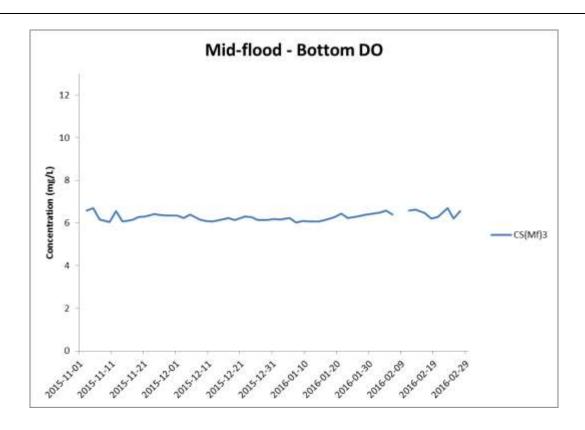


Figure H16 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





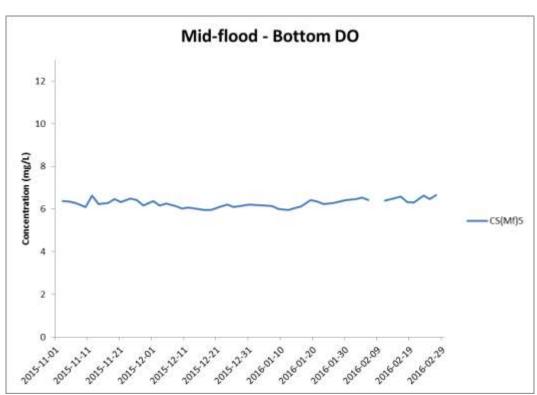
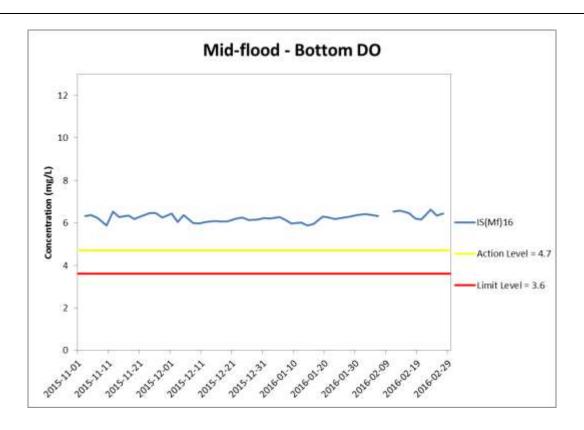


Figure H17 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.





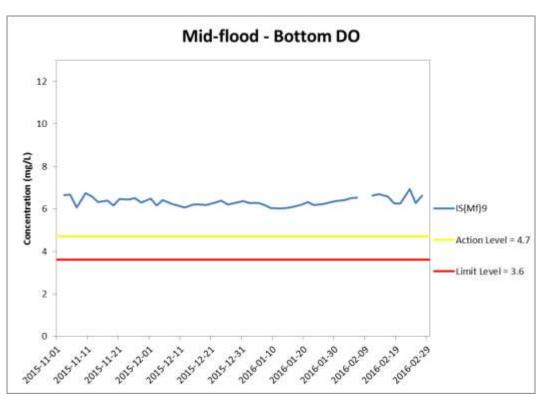
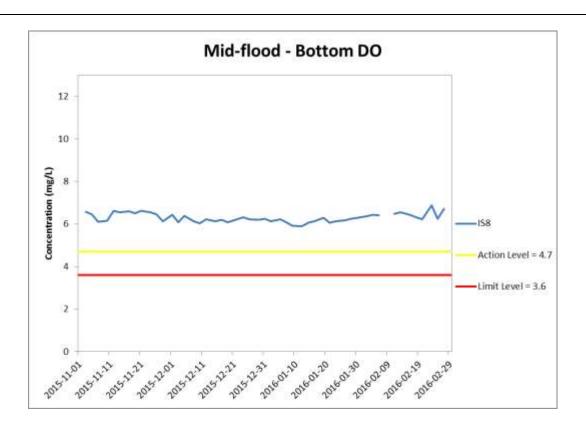


Figure H18 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.





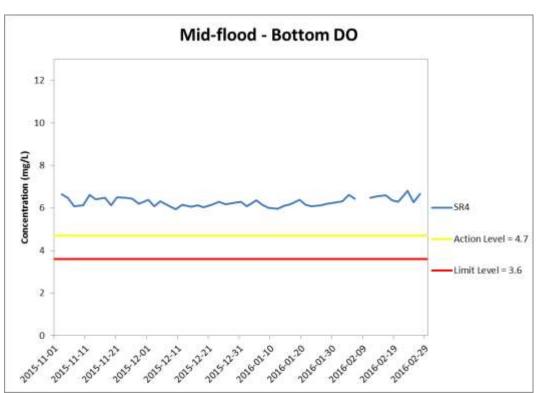


Figure H19 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.



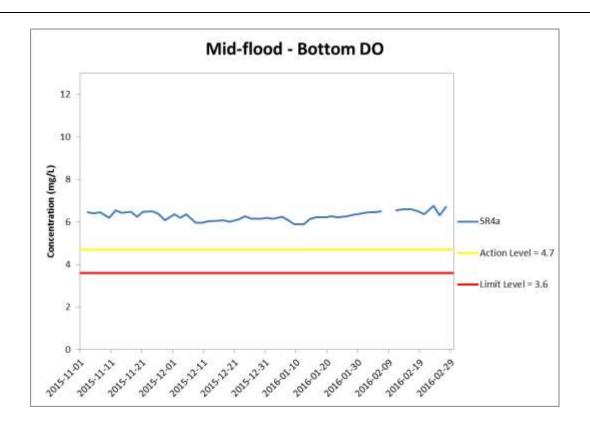
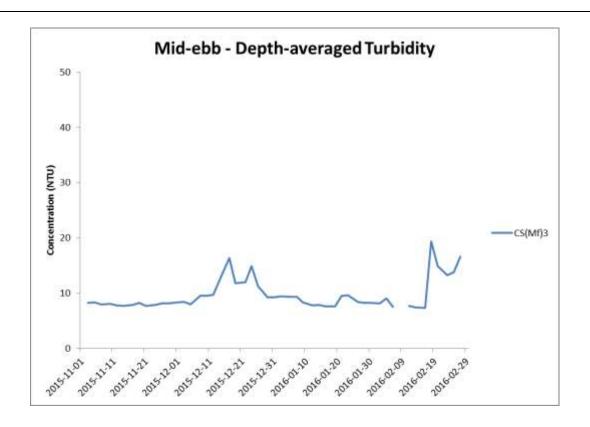


Figure H20 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





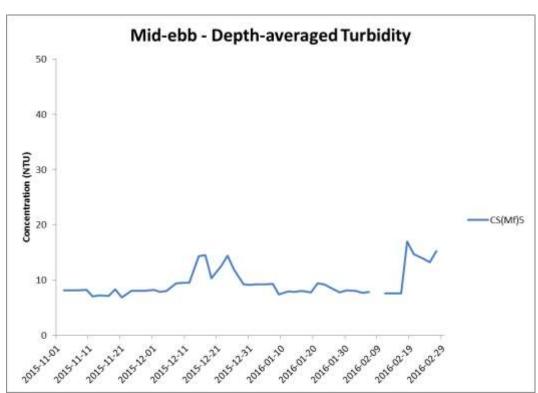
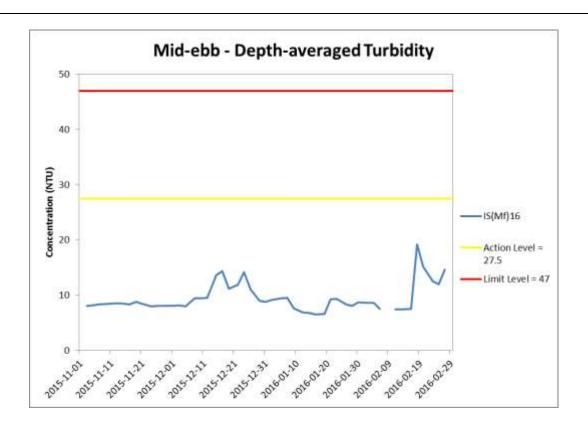


Figure H21 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.





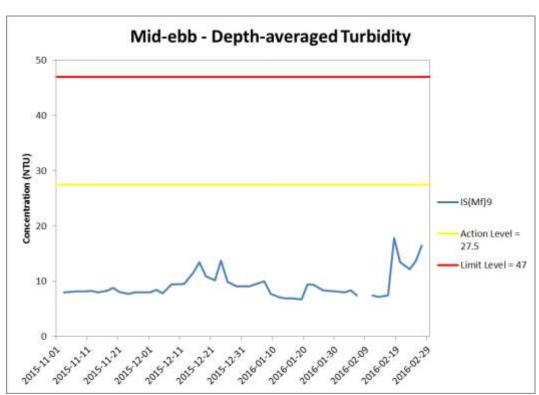
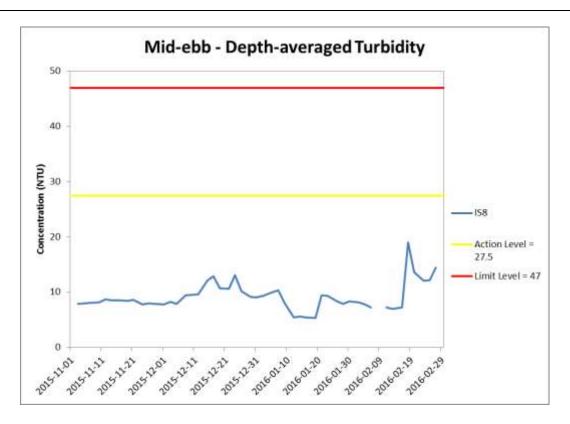


Figure H22 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.





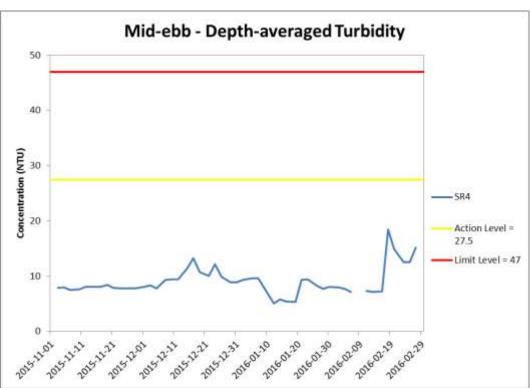


Figure H23 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.



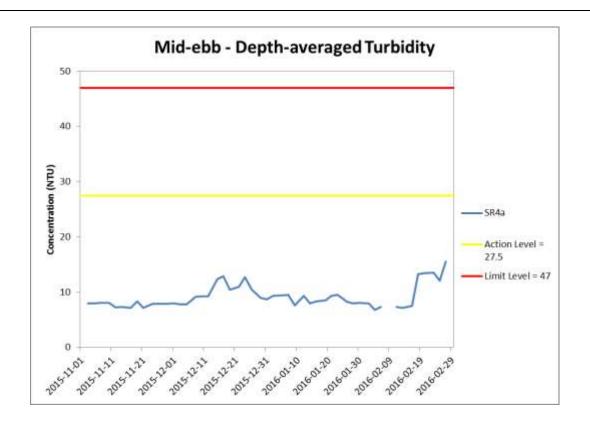
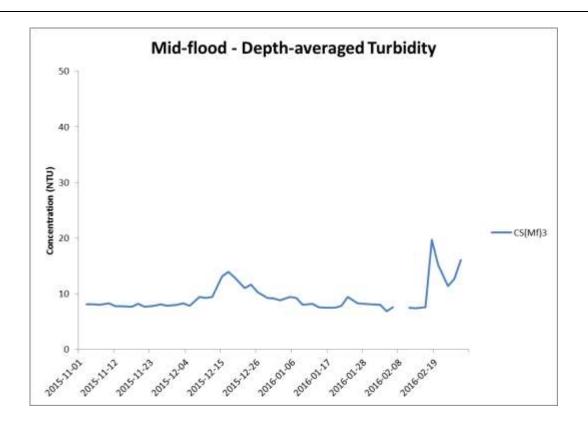


Figure H24 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





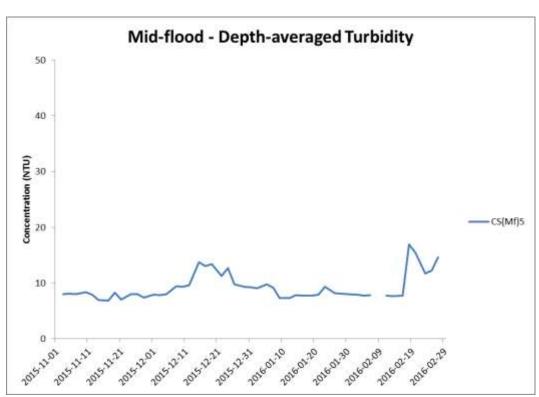
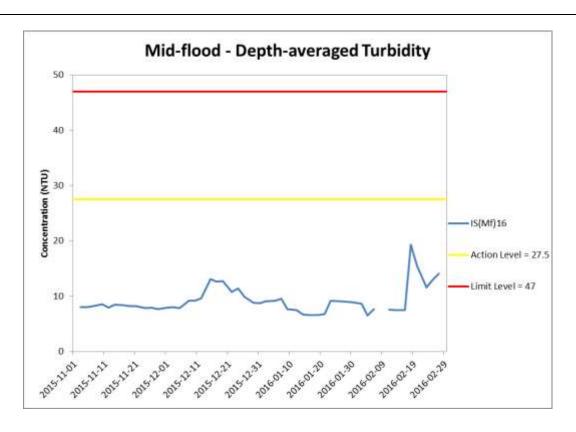


Figure H25 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(MF)5.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





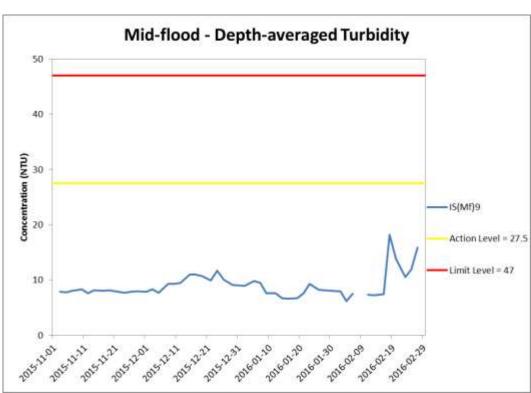
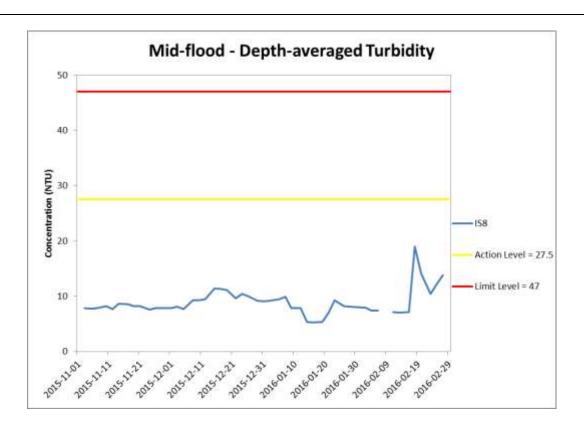


Figure H26 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





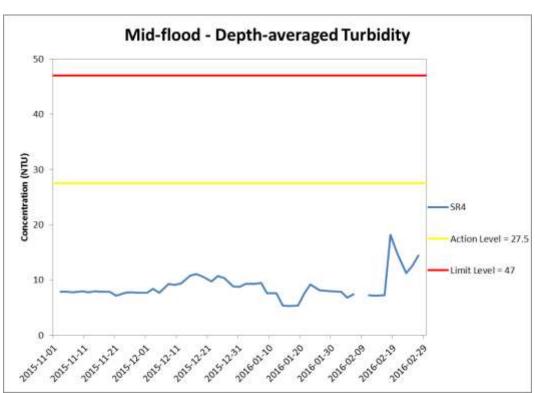


Figure H27 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.



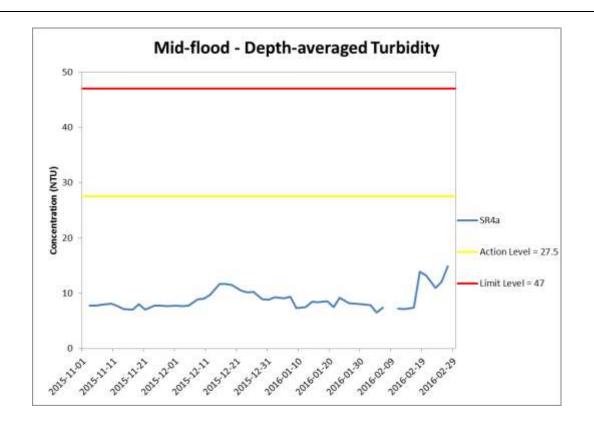
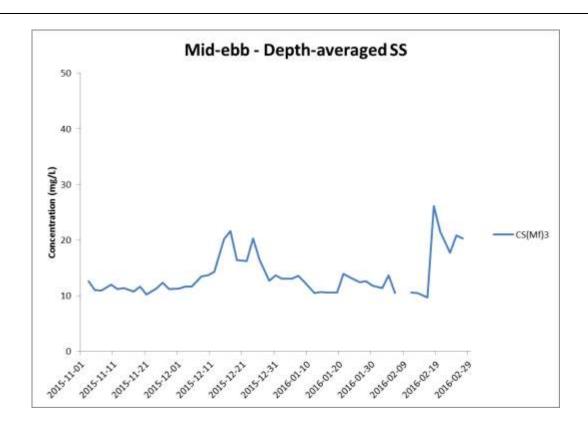


Figure H28 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





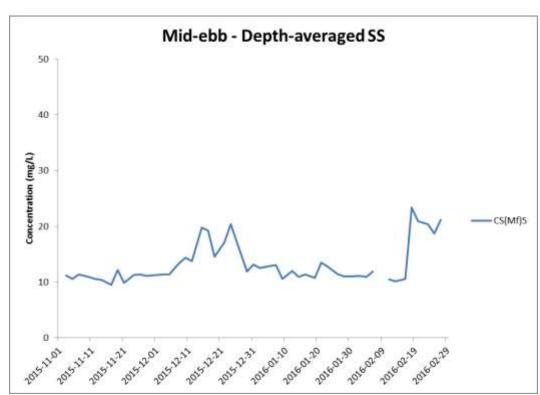
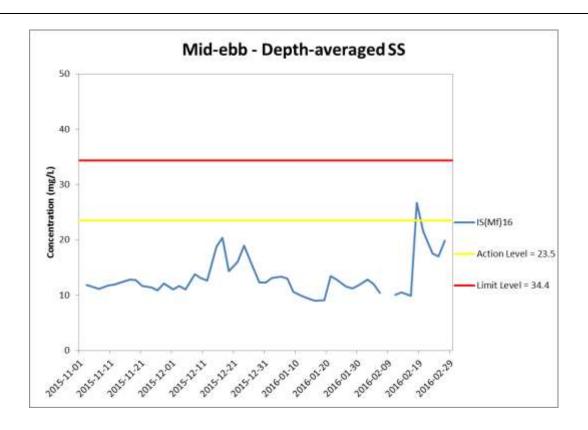


Figure H29 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





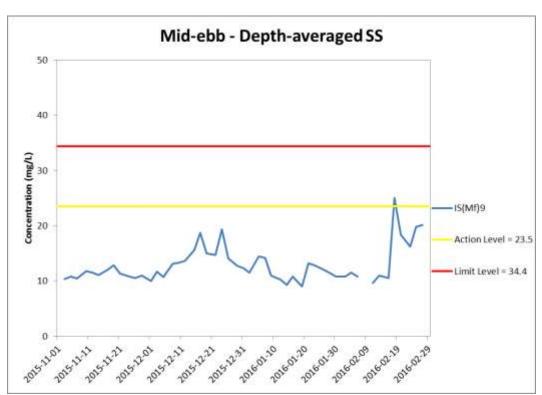
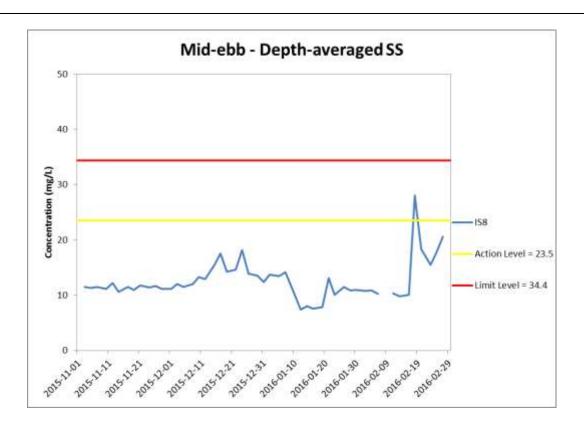


Figure H30 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.

WQM was cancelled on 9 February 2016 due to suspension of marine works. Results higher than Action Level but lower than 120% of upstream control station at the same tide on the same day are not regarded as exceedance. (Weather condition varied between sunny to rainy within the reporting period.)

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





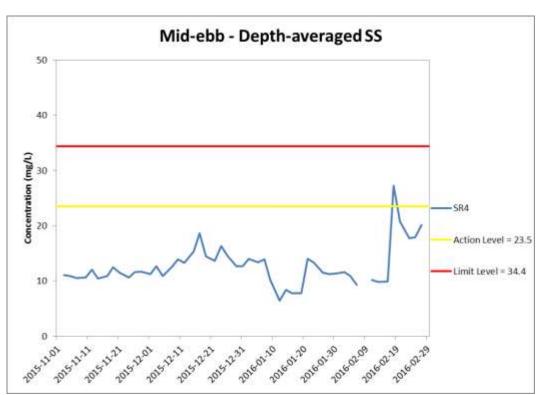


Figure H31 Impact Monitoring - Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.

WQM was cancelled on 9 February 2016 due to suspension of marine works. Results higher than Action Level but lower than 120% of upstream control station at the same tide on the same day are not regarded as exceedance. (Weather condition varied between sunny to rainy within the reporting period.)

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.



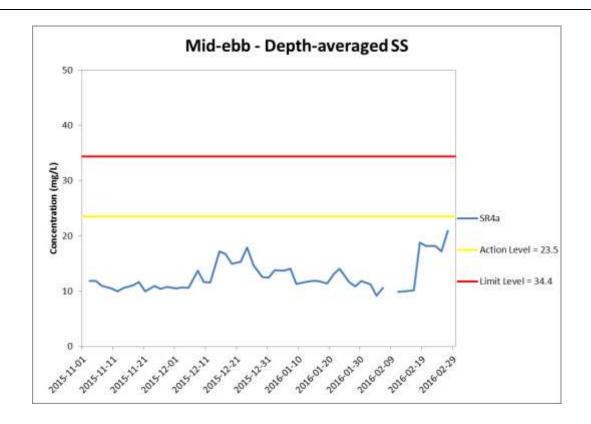
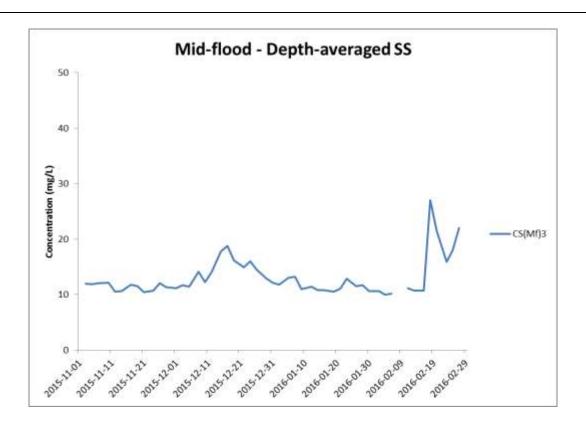


Figure H32 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





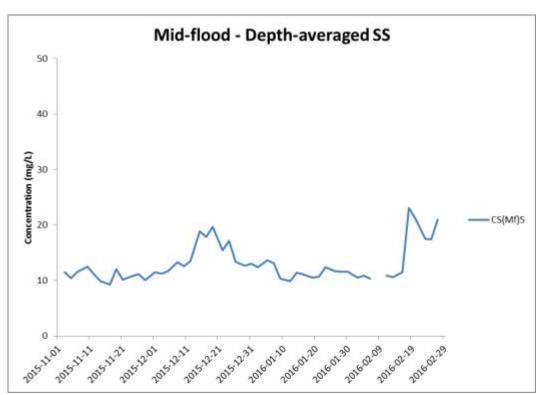
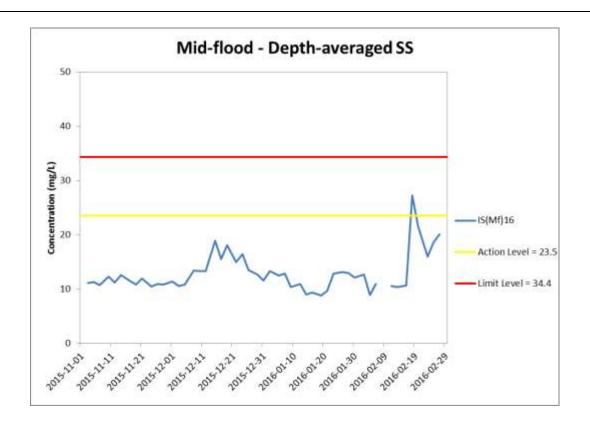


Figure H33 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 29 February 2016 at CS(Mf)3 and CS(Mf)5.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





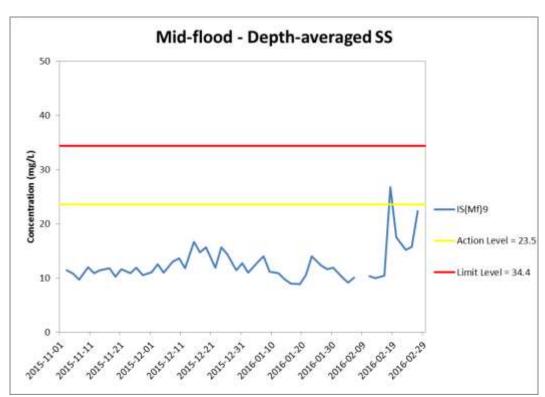
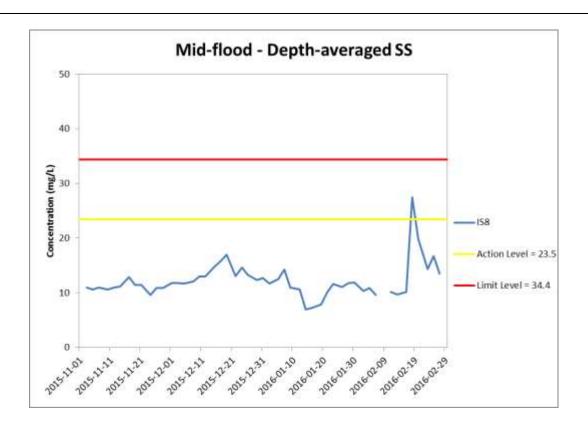


Figure H34 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 29 February 2016 at IS(Mf)16 and IS(Mf)9.

WQM was cancelled on 9 February 2016 due to suspension of marine works. Results higher than Action Level but lower than 120% of upstream control station at the same tide on the same day are not regarded as exceedance. (Weather condition varied between sunny to rainy within the reporting period.)

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.





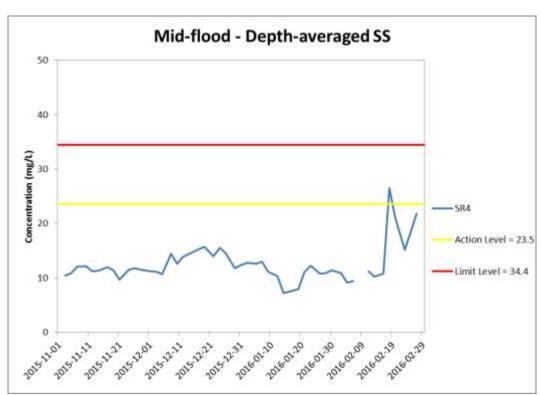


Figure H35 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 29 February 2016 at IS8 and SR4.

WQM was cancelled on 9 February 2016 due to suspension of marine works. Results higher than Action Level but lower than 120% of upstream control station at the same tide on the same day are not regarded as exceedance. (Weather condition varied between sunny to rainy within the reporting period.)

Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.



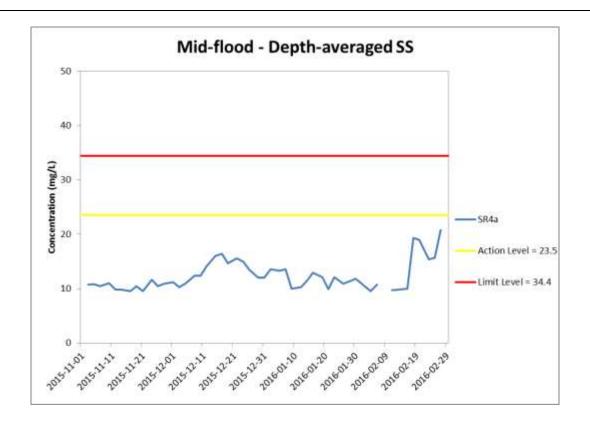


Figure H36 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2015 and 29 February 2016 at SR4a.

WQM was cancelled on 9 February 2016 due to suspension of marine works. (Weather condition varied between sunny to rainy within the reporting period.) Marine works within the reporting period include Construction and installation of pile caps; Uninstallation of marine piling platform; Pier construction; Launching gantry operation; and Installation of deck segment and pier head segment.



## Appendix I

## Impact Dolphin Monitoring Survey Results

### HK j efacean research project 香港鯨豚研究計劃

#### HK CETACEAN RESEARCH PROJECT

## 香港鯨豚研究計劃

#### CONTRACT NO. HY/2012/07

# Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Southern Connection Viaduct Section) Dolphin Quarterly Monitoring

9<sup>th</sup> Quarterly Progress Report (December 2015 – February 2016) submitted to Gammon Construction Limited

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#### 1. Introduction

- 1.1. The Tuen Mun-Chek Lap Kok Link (TM-CLKL) comprises a 1.6 km long dual 2-lane viaduct section between the Hong Kong Boundary Crossing Facilities (HKBCF) and the North Lantau Highway and associated roads at Tai Ho. Gammon Construction Limited (hereinafter called the "Contractor") was awarded as the main contractor of "Contract No. HY/2012/07 Hong Kong-Zhuhai-Macao Bridge Tuen Mun-Chek Lap Kok Link Southern Connection Viaduct Section".
- 1.2. According to the updated Environmental Monitoring and Audit (EM&A) Manual (for TM-CLKL), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas as in AFCD annual marine mammal monitoring programme. However, as such surveys have been undertaken by the HKLR03 and HKBCF projects in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommended by the Highways Department, that the TM-CLKL EM&A project can utilize the monitoring data collected by HKLR03 or HKBCF project to avoid any redundancy in monitoring effort. Such exemption for the dolphin monitoring will end upon the completion of the dolphin monitoring carried out by HKLR03 contract as well as the TM-CLKL Northern Connection Sub-Sea Tunnel Section (HY/2012/08)
- 1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by Gammon Construction Limited as the dolphin specialist for the TM-CLKL Southern Viaduct Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese White Dolphins during the construction phase (i.e. impact period) of the TM-CLKL project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas.
- 1.4. During the construction period of HKLR, the dolphin specialist would be in charge of



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reviewing and collating information collected by the HKLR03 dolphin monitoring programme to examine any potential impacts of TM-CLKL construction works on the dolphins.

- 1.5. From the monitoring results, any changes in dolphin occurrence within the study area will be examined for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.
- 1.6. This report is the ninth quarterly progress report under the TM-CLKL construction phase dolphin monitoring programme submitted to the Gammon Construction Limited, summarizing the results of the surveys findings during the period of December 2015 to February 2016, utilizing the survey data collected by HKLR03 project.

#### 2. Monitoring Methodology

- 2.1. Vessel-based Line-transect Survey
- 2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines are shown in Table 1. The coordinates of several starting points have been revised due to the obstruction of the permanent structures in association to the construction works of HKLR and the southern viaduct of TM-CLKL, as well as provision of adequate buffer distance from the Airport Restricted Areas. The EPD issued a memo and confirmed that they had no objection on the revised transect lines on 19 August 2015, and the revised coordinates are in red and marked with an asterisk in Table 1.

Table 1 Co-ordinates of transect lines conducted by HKLR03 project

	Line No.	Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	815456*		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805475	815913*		14	Start Point	817537	820220
2	End Point	805477	826654		14	End Point	817537	824613
3	Start Point	806464	819435		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	819771		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	820220		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	820466		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761



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7	Start Point	810499	820880*	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	821123*	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	821303*	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	820872	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818853*	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807				
12	End Point	815542	824882				

Note: Co-ordinates in red and marked with asterisk are revised co-ordinates of transect line.

- 2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 16 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2013, 2014). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.
- 2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.
- 2.1.4. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).
- 2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was



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diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

#### 2.2. Photo-identification Work

- 2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.
- 2.2.2. A professional digital camera (*Canon* EOS 7D or 60D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.
- 2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.
- 2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).
- 2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

#### 2.3. Data Analysis

2.3.1. Distribution Analysis – The line-transect survey data was integrated with the Geographic Information System (GIS) in order to visualize and interpret different spatial and temporal



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patterns of dolphin distribution using sighting positions. Location data of dolphin groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView<sup>©</sup> 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, young calves and activities.

2.3.2. Encounter rate analysis – Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort, and total number of dolphins sighted on-effort per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collect under Beaufort 3 or below condition would be used for the encounter rate analyses. Dolphin encounter rates were calculated in two ways for comparisons with the HZMB baseline monitoring results as well as to AFCD long-term marine mammal monitoring results.

Firstly, for the comparison with the HZMB baseline monitoring results, the encounter rates were calculated using primary survey effort alone. The average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) were deduced based on the encounter rates from six events during the present quarter (i.e. six sets of line-transect surveys in North Lantau), which was also compared with the one deduced from the six events during the baseline period (i.e. six sets of line-transect surveys in North Lantau).

Secondly, the encounter rates were calculated using both primary and secondary survey effort collected under Beaufort 3 or below condition as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by dividing the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the present quarterly period.

2.3.3. Quantitative grid analysis on habitat use – To conduct quantitative grid analysis of habitat use, positions of on-effort sightings of Chinese White Dolphins collected during the quarterly impact phase monitoring period were plotted onto 1-km<sup>2</sup> grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km<sup>2</sup>) and dolphin densities (total number of dolphins from on-effort sightings per km<sup>2</sup>) were then calculated for each 1 km by 1 km grid with the aid of GIS. Sighting density grids and dolphin density grids were then further normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid was calculated by examining the survey coverage on each line-transect survey to determine how many times the grid was surveyed during the study period. For example, when the survey boat traversed through a specific grid 50 times, 50 units of survey effort were counted for that grid. With the amount of survey effort calculated for each grid, the sighting density and dolphin density of each grid were then normalized (i.e. divided by the unit of survey effort).

The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort <u>sightings</u> <u>per</u> 100 units of <u>survey</u> <u>effort</u>. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of <u>d</u>olphins <u>per</u> 100 units of <u>survey</u> <u>effort</u>. Among the 1-km<sup>2</sup> grids that were partially covered by land, the



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percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae were used to estimate SPSE and DPSE in each 1-km<sup>2</sup> grid within the study area:

SPSE = ((S / E) x 100) / SA% DPSE = ((D / E) x 100) / SA%

where S = total number of on-effort sightings

D = total number of dolphins from on-effort sightings

E = total number of units of survey effort

SA% = percentage of sea area

2.3.4. Behavioural analysis – When dolphins were sighted during vessel surveys, their behaviour was observed. Different activities were categorized (i.e. feeding, socializing, traveling, and milling/resting) and recorded on sighting datasheets. This data was then input into a separate database with sighting information, which can be used to determine the distribution of behavioural data with a desktop GIS. Distribution of sightings of dolphins engaged in different activities and behaviours would then be plotted on GIS and carefully examined to identify important areas for different activities of the dolphins.

2.3.5. Ranging pattern analysis – Location data of individual dolphins that occurred during the 3-month impact phase monitoring period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home ranges for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, was loaded as an extension with ArcView 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD level.

#### 3. Monitoring Results

- 3.1. Summary of survey effort and dolphin sightings
- 3.1.1. During the period of December 2015 to February 2016, six sets of systematic line-transect vessel surveys were conducted under the HKLR03 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these HKLR03 surveys, a total of 907.45 km of survey effort was collected, with 95.1% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility). Among the two areas, 347.07 km and 560.38 km of survey effort were conducted in NEL and NWL survey areas respectively.
- 3.1.3. The total survey effort conducted on primary lines was 655.90 km, while the effort on secondary lines was 251.55 km. Survey effort conducted on both primary and secondary lines were considered as on-effort survey data. A summary table of the survey effort is



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shown in Appendix I.

- 3.1.4. During the six sets of HKLR03 monitoring surveys in December 2015 to February 2016, a total of 14 groups of 57 Chinese White Dolphins were sighted. All except one dolphin sightings were made during on-effort search, and ten of the thirteen on-effort dolphin sightings were made on primary lines. In this quarterly period, all dolphin groups were sighted in NWL, while none was sighted at all in NEL. A summary table of the dolphin sightings is shown in Appendix II.
- 3.2. Distribution
- 3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys in December 2015 to February 2016 is shown in Figure 1. Dolphin sightings made in the present quarter were mostly located to the north of Lung Kwu Chau, while a few other sightings were also made near Pillar Point and Sha Chau (Figure 1).
- 3.2.2. Notably, no dolphin sighting was made near the southern viaduct of TM-CLKL or the HKLR03/HKBCF reclamation sites. On the other hand, two dolphin groups were sighted near the northern landfall of TM-CLKL as well as near Shum Wat near the HKLR alignment respectively (Figure 1).
- 3.2.3. Sighting distribution of the present impact phase monitoring period (December 2015 to February 2016) was compared to the one during the baseline monitoring period (September to November 2011). In the present quarter, dolphins have disappeared from the NEL region, which was in stark contrast to their frequent occurrence around the Brothers Islands, near Shum Shui Kok and in the vicinity of HKBCF reclamation site during the baseline period (Figure 1).
- 3.2.4. In NWL survey area, dolphin occurrence was also drastically different between the baseline and impact phase periods. During the present impact monitoring period, much fewer dolphins occurred in this survey area than during the baseline period, when many dolphin groups were frequently sighted between Lung Kwu Chau and Black Point, around Sha Chau, near Pillar Point and to the west of the Chek Lap Kok Airport (Figure 1).
- 3.2.5. Another comparison in dolphin distribution was made between the four quarterly periods of winter months in 2012-13, 2013-14, 2014-15 and 2015-16 (Figure 2). Among the four winter periods, dolphins were regularly sighted in NEL in 2012-13, but their usage there was dramatically reduced in 2013-14, and the dolphins have completely avoided this area during the winter of 2014-15 and 2015-16 (Figure 2).
- 3.2.6. On the other hand, dramatic changes in dolphin distribution in NWL waters were also observed in the winter months during the four quarterly periods (Figure 2). In 2012-13 and 2013-14, dolphins still regularly occurred throughout the NWL survey area, with higher concentrations of sightings within Sha Chau and Lung Kwu Chau Marine Park, but they appeared to avoid the waters to the north of the airport in 2013-14 where they normally occurred in the previous winter. In 2014-15 and 2015-16, dolphin usage in NWL was then dramatically reduced, with most sightings clustered around and to the north of Lung Kwu Chau but rarely sighted elsewhere. Such temporal trend indicated



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that dolphin usage in the NWL region has progressively diminished in recent years.

#### 3.3. Encounter rate

- 3.3.1. During the present quarterly period, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data from the primary transect lines under favourable conditions (Beaufort 3 or below) for each set of the HKLR03 surveys in NEL and NWL are shown in Table 2. The average encounter rates deduced from the six sets of HKLR03 surveys were also compared with the ones deduced from the baseline monitoring period (September November 2011) (Table 3).
- 3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present quarter using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 2.32 sightings and 9.11 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil for this quarter.

Table 2. Dolphin encounter rates (sightings per 100 km of survey effort) during December 2015 to February 2016

SURVEY AREA	DOLPHIN MONITORING DATES	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)		
		Primary Lines Only	Primary Lines Only		
	Set 1 (2 & 7 Dec 2015)	0.00	0.00		
	Set 2 (9 & 15 Dec 2015)	0.00	0.00		
Northeast	Set 3 (8 & 11 Jan 2016)	0.00	0.00		
Lantau	Set 4 (13 & 19 Jan 2016)	0.00	0.00		
	Set 5 (2 & 3 Feb 2016)	0.00	0.00		
	Set 6 (16 & 22 Feb 2016)	0.00	0.00		
	Set 1 (2 & 7 Dec 2015)	4.12	17.84		
	Set 2 (9 & 15 Dec 2015)	4.78	11.94		
Northwest	Set 3 (8 & 11 Jan 2016)	2.79	9.78		
Lantau	Set 4 (13 & 19 Jan 2016)	1.36	10.90		
	Set 5 (2 & 3 Feb 2016)	1.35	6.75		
	Set 6 (16 & 22 Feb 2016)	1.44	8.66		



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Table 3. Comparison of average dolphin encounter rates from impact monitoring period (December 2015 – February 2016) and baseline monitoring period (September – November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions; ± denotes the standard deviation of the average encounter rates)

	Encounter i	ate (STG)	Encounter rate (ANI)		
	(no. of on-effort dolph	in sightings per 100	(no. of dolphins from all on-effort sightings		
	km of surve	ey effort)	per 100 km of survey effort)		
	December 2015 - February 2016	September - November 2011	December 2015 - February 2016	September - November 2011	
Northeast Lantau	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81	
Northwest Lantau	2.64 ± 1.52	9.85 ± 5.85	10.98 ± 3.81	44.66 ± 29.85	

Table 4. Comparison of average dolphin encounter rates in Northeast Lantau survey area from all quarters of HKLR03 impact monitoring period and baseline monitoring period (September-November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions; the encounter rates in winter months were highlighted in blue; ± denotes the standard deviation of the average encounter rates)

	Encounter rate (STG)	Encounter rate (ANI)
	(no. of on-effort dolphin	(no. of dolphins from all
	sightings per 100 km of	on-effort sightings per 100
	survey effort)	km of survey effort)
September-November 2011 (Baseline)	6.00 ± 5.05	22.19 ± 26.81
December 2012-February 2013 (Impact)	3.14 ± 3.21	6.33 ± 8.64
March-May 2013 (Impact)	0.42 ± 1.03	0.42 ± 1.03
June-August 2013 (Impact)	0.88 ± 1.36	3.91 ± 8.36
September-November 2013 (Impact)	1.01 ± 1.59	3.77 ± 6.49
December 2013-February 2014 (Impact)	0.45 ± 1.10	1.34 ± 3.29
March-May 2014 (Impact)	0.00	0.00
June-August 2014 (Impact)	0.42 ± 1.04	1.69 ± 4.15
September-November 2014 (Impact)	0.00	0.00
December 2014-February 2015 (Impact)	0.00	0.00
March-May 2015 (Impact)	0.00	0.00
June-August 2015 (Impact)	0.44 ± 1.08	0.44 ± 1.08
September-November 2015 (Impact)	0.00	0.00
December 2015-February 2016 (Impact)	0.00	0.00

3.3.3. In NEL, the average dolphin encounter rates (both STG and ANI) in the present three-month impact monitoring period were both zero with no sighting made, and such extremely low occurrence of dolphins in NEL have been consistently recorded in the past



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twelve quarters of HKLR03 monitoring (Table 4). This is a serious concern as the dolphin occurrence in NEL in the last eleven quarters (0.0-1.0 for ER(STG) and 0.0-3.9 for ER(ANI)) have been exceptionally low when compared to the baseline period (Table 4). Dolphins have almost vacated from NEL waters since January 2014, with only two groups of five dolphins sighted there since then despite consistent and intensive survey effort being conducted in this survey area

- 3.3.4. Moreover, the average dolphin encounter rates (STG and ANI) in NWL during the present impact phase monitoring period were also much lower (reductions of 73.2% and 75.4% respectively) than the ones recorded in the 3-month baseline period, indicating a dramatic decline in dolphin usage of this survey area as well during the present impact phase period (Table 5).
- 3.3.5. Even for the same winter quarters, the dolphin encounter rates in NWL during the winters of 2014-2015 and 2015-16 were much lower than the ones recorded in winters of 2012-13 and 2013-14 (Table 5).

Table 5. Comparison of average dolphin encounter rates in Northwest Lantau survey area from all quarters of HKLR03 impact monitoring period and baseline monitoring period (September-November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions; the encounter rates in winter months were highlighted in blue; ± denotes the standard deviation of the average encounter rates)

	Encounter rate (STG)	Encounter rate (ANI)
	(no. of on-effort dolphin	(no. of dolphins from all
	sightings per 100 km of	on-effort sightings per 100
	survey effort)	km of survey effort)
September-November 2011 (Baseline)	9.85 ± 5.85	44.66 ± 29.85
December 2012-February 2013 (Impact)	8.36 ± 5.03	35.90 ± 23.10
March-May 2013 (Impact)	7.75 ± 3.96	24.23 ± 18.05
June-August 2013 (Impact)	6.56 ± 3.68	27.00 ± 18.71
September-November 2013 (Impact)	8.04 ± 1.10	32.48 ± 26.51
December 2013-February 2014 (Impact)	8.21 ± 2.21	32.58 ± 11.21
March-May 2014 (Impact)	6.51 ± 3.34	19.14 ± 7.19
June-August 2014 (Impact)	4.74 ± 3.84	17.52 ± 15.12
September-November 2014 (Impact)	5.10 ± 4.40	20.52 ± 15.10
December 2014-February 2015 (Impact)	2.91 ± 2.69	11.27 ± 15.19
March-May 2015 (Impact)	0.47 ± 0.73	2.36 ± 4.07
June-August 2015 (Impact)	2.53 ± 3.20	9.21 ± 11.57
September-November 2015 (Impact)	3.94 ± 1.57	21.05 ± 17.19
December 2015-February 2016 (Impact)	2.64 ± 1.52	10.98 ± 3.81



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- 3.3.6. After a slight rebound in encounter rates in NWL in the previous quarter, dolphin occurrence has dropped noticeably once again in the present quarter back to a low level (especially for ER(ANI)) (Table 5). Such temporal trend should be closely monitored in the upcoming monitoring quarters.
- 3.3.7. As discussed recently in Hung (2015), the dramatic decline in dolphin usage of NEL waters in the past few years (including the declines in abundance, encounter rate and habitat use in NEL, as well as shifts of individual core areas and ranges away from NEL waters) was possibly related to the HZMB construction works that were commenced since 2012. It appeared that such noticeable decline has already extended to NWL waters progressively in the past two years.
- 3.3.8. A two-way ANOVA with repeated measures and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline and impact monitoring periods. The two variables that were examined included the two periods (baseline and impact phases) and two locations (NEL and NWL).
- 3.3.9. For the comparison between the baseline period and the present quarter (thirteenth quarter of the HKLR03 impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.0043 and 0.0275 respectively. If the alpha value is set at 0.05, significant differences were detected between the baseline and present quarters in both the average dolphin encounter rates of STG and ANI.
- 3.3.10. For the comparison between the baseline period and the cumulative quarters in impact phase (i.e. first thirteen quarters of the HKLR03 impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.00004 and 0.00001 respectively. Even if the alpha value is set at 0.00005, significant differences were still detected in both the average dolphin encounter rates of STG and ANI (i.e. between the two periods and the locations).
- 3.3.11. As indicated in both dolphin distribution patterns and encounter rates, dolphin usage has been significantly reduced in both NEL and NWL survey areas during the present quarterly period, and such low occurrence of dolphins has also been consistently documented in previous quarters. This raises serious concern, as the timing of the decline in dolphin usage in North Lantau waters coincided well with the construction schedule of the HZMB-related projects (Hung 2015).
- 3.3.12. To ensure the continuous usage of North Lantau waters by the dolphins, every possible measure should be implemented by the contractors and relevant authorities of HZMB-related works to minimize all disturbances to the dolphins.
- 3.4. Group size
- 3.4.1. Group size of Chinese White Dolphins ranged from one to ten individuals per group in North Lantau region during December 2015 to February 2016. The average dolphin group sizes from these three months were compared with the ones deduced from the



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baseline period in September to November 2011, as shown in Table 6.

Table 6. Comparison of average dolphin group sizes from impact monitoring period (December 2015 – February 2016) and baseline monitoring period (September – November 2011) (Note: ± denotes the standard deviation of the average group size)

	Average Dolph	in Group Size
	December 2015 – February 2016	September – November 2011
Overall	4.07 ± 3.22 (n = 14)	3.72 ± 3.13 (n = 66)
Northeast Lantau	N/A	3.18 ± 2.16 (n = 17)
Northwest Lantau	4.07 ± 3.22 (n = 14)	3.92 ± 3.40 (n = 49)

- 3.4.2. The average dolphin group size in NWL waters during December 2015 to February 2016 was slightly higher than the ones recorded during the three-month baseline period (Table 6). Eight of the 14 groups were composed of 1-3 individuals only, while three other groups were moderate in sizes with 5-6 individuals per group. Moreover, three large dolphin groups with 8-10 individuals each were sighted during the present quarterly period.
- 3.4.3. Distribution of dolphins with larger group sizes (five individuals or more per group and ten individuals per group) during the present quarter is shown in Figure 3, with comparison to the one in baseline period. During the winter months of 2015-16, distribution of these moderately large groups of dolphins were located to the north of Lung Kwu Chau, near Pillar Point and near the northern landfall of TM-CLKL (Figure 3). This distribution pattern was very different from the baseline period, when the larger dolphin groups were more evenly distributed in NWL waters with a few more sighted in NEL waters (Figure 3).

#### 3.5. Habitat use

- 3.5.1. From December 2015 to February 2016, the areas being heavily utilized by Chinese White Dolphins was to the north of Lung Kwu Chau, near Pillar Point and near the northern landfall of TM-CLKL in the North Lantau region (Figures 4a and 4b). All grids near southern viaduct of TM-CLKL, HKLR03/HKBCF reclamation sites as well as HKLR09 alignment did not record any presence of dolphins during on-effort search in the present quarterly period, but one grid (N12) overlapped with the northern landfall of TM-CLKL recorded moderately high dolphin densities (Figure 4b).
- 3.5.2. It should be emphasized though that the amount of survey effort collected in each grid during the three-month period was fairly low (6-12 units of survey effort for most grids), and therefore the habitat use pattern derived from the three-month dataset should be treated with caution. A more complete picture of dolphin habitat use pattern should be examined when more survey effort for each grid will be collected throughout the impact phase monitoring programme.
- 3.5.3. When compared with the habitat use patterns during the baseline period, dolphin usage in



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NEL and NWL has dramatically diminished in both areas during the present impact monitoring period (Figure 5). During the baseline period, many grids between Siu Mo To and Shum Shui Kok in NEL recorded moderately high to high dolphin densities, which was in stark contrast to the complete absence of dolphins there during the present impact phase period (Figure 5).

- 3.5.4. The density patterns were also very different in NWL between the baseline and impact phase monitoring periods, with higher dolphin usage throughout the area, especially around Sha Chau, near Black Point, to the west of the airport, as well as between Pillar Point and airport platform during the baseline period. In contrast, mainly the waters to the north of Lung Kwu Chau recorded high densities of dolphins during the present impact phase period (Figure 5).
- 3.6. Mother-calf pairs
- 3.6.1. During the present quarterly period, neither unspotted calf nor unspotted juvenile was sighted with any female in the North Lantau region.
- 3.6.2. The absence of young calves in the present quarter was in stark contrast to their regular occurrence in North Lantau waters during the baseline period. This should be of a serious concern, and the occurrence of young calves in North Lantau waters should be closely monitored in the upcoming quarters.
- 3.7. Activities and associations with fishing boats
- 3.7.1. One of the 14 dolphin groups were engaged in feeding activity, while two other dolphin groups were engaged in socializing activities. None of the dolphin groups were engaged in traveling or milling/resting activity during the three-month study period.
- 3.7.2. The percentage of sightings associated with feeding activities (7.1%) was much lower than the one recorded during the baseline period (11.6%), while the one associated with socializing activities (14.2%) during the present impact phase period was much higher than the one from the baseline period (5.4%). However, it should be noted the sample sizes on total numbers of dolphin sightings during the present quarter (14 dolphin groups) was much lower than the baseline period (66 dolphin groups).
- 3.7.3. Distribution of dolphins engaged in various activities during the present three-month period is shown in Figure 6. The only dolphin group engaged in feeding activity was sighted near Sha Chau, while the two groups engaged in socializing activities were located to the north of Lung Kwu Chau and near the northern landfall of TMCLKL.
- 3.7.4. When compared to the baseline period, distribution of various dolphin activities during the present impact phase monitoring period was drastically different with a much more restricted area of occurrences of these activities (Figure 6).
- 3.7.5. As consistently recorded in the past monitoring quarters, none of the 14 dolphin groups was found to be associated with any operating fishing vessel in North Lantau waters during the present impact phase period.



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- 3.8. Summary of photo-identification works
- 3.8.1. From December 2015 to February 2016, over 1,500 digital photographs of Chinese White Dolphins were taken during the HKLR03 impact phase monitoring surveys for the photo-identification work.
- 3.8.2. In total, 21 individuals sighted 48 times altogether were identified (see summary table in Appendix III and photographs of identified individuals in Appendix IV). All of these re-sightings were made in NWL.
- 3.8.3. The majority of identified individuals were sighted only once or twice during the three-month period, with the exception of six individuals (NL182, NL210, NL220, NL284, NL286 and NL320) being 3-4 times and another two individuals (NL48 and NL285) being sighted 5 times in the present quarter.
- 3.8.4. For the first time since such comparison has been made, none of the 21 individuals sighted during HKLR03 monitoring surveys was sighted in West Lantau waters during the HKLR09 monitoring surveys in the same quarter. The restricted movements of individuals between North and West Lantau waters should be continuously monitored to determine whether the presence of HKLR09 alignments has affected such movements.
- 3.9. Individual range use
- 3.9.1. Ranging patterns of the 21 individuals identified during the three-month study period were determined by fixed kernel method, and are shown in Appendix V.
- 3.9.2. All identified dolphins sighted in the present quarter were utilizing NWL waters only, but have completely avoided NEL waters where many of them have utilized as their core areas in the past (Appendix V). This is in contrary to the extensive movements between NEL and NWL survey areas observed in the earlier impact monitoring quarters as well as the baseline period.
- 3.9.3. Moreover, none of the 21 individuals have extended their range use to WL or SWL waters during the present quarter, which was very different from the previous quarters when frequent individual movements between the North and West Lantau waters were observed. In the upcoming quarters, individual range use and movements should be continuously monitored to examine whether there has been any significant change in individual range use, which could possibly be related to the HZMB-related construction works or the physical presence of the bridge structures (see Hung 2015).

#### 4. Conclusion

- 4.1. During this quarter of dolphin monitoring, no adverse impact from the activities of the TMCLKL construction project on Chinese White Dolphins was noticeable from general observations.
- 4.2. Although the dolphins infrequently occurred along the alignment of TMCLKL southern connection viaduct in the past and during the baseline monitoring period, it is apparent



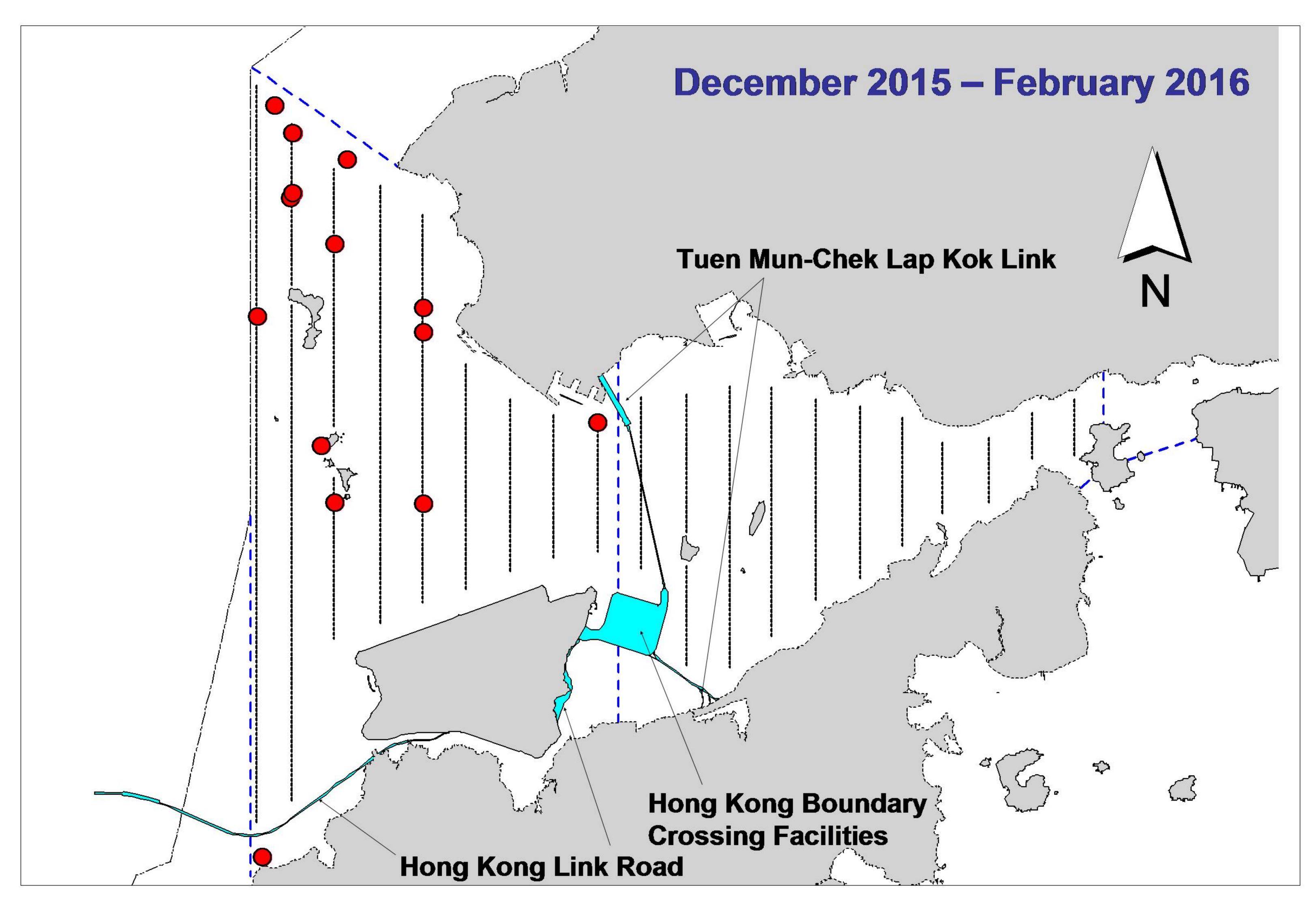
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that dolphin usage has been significantly reduced in NEL, and many individuals have shifted away from the important habitat around the Brothers Islands.

4.3. It is critical to monitor the dolphin usage in North Lantau region in the upcoming quarters, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

#### 5. References

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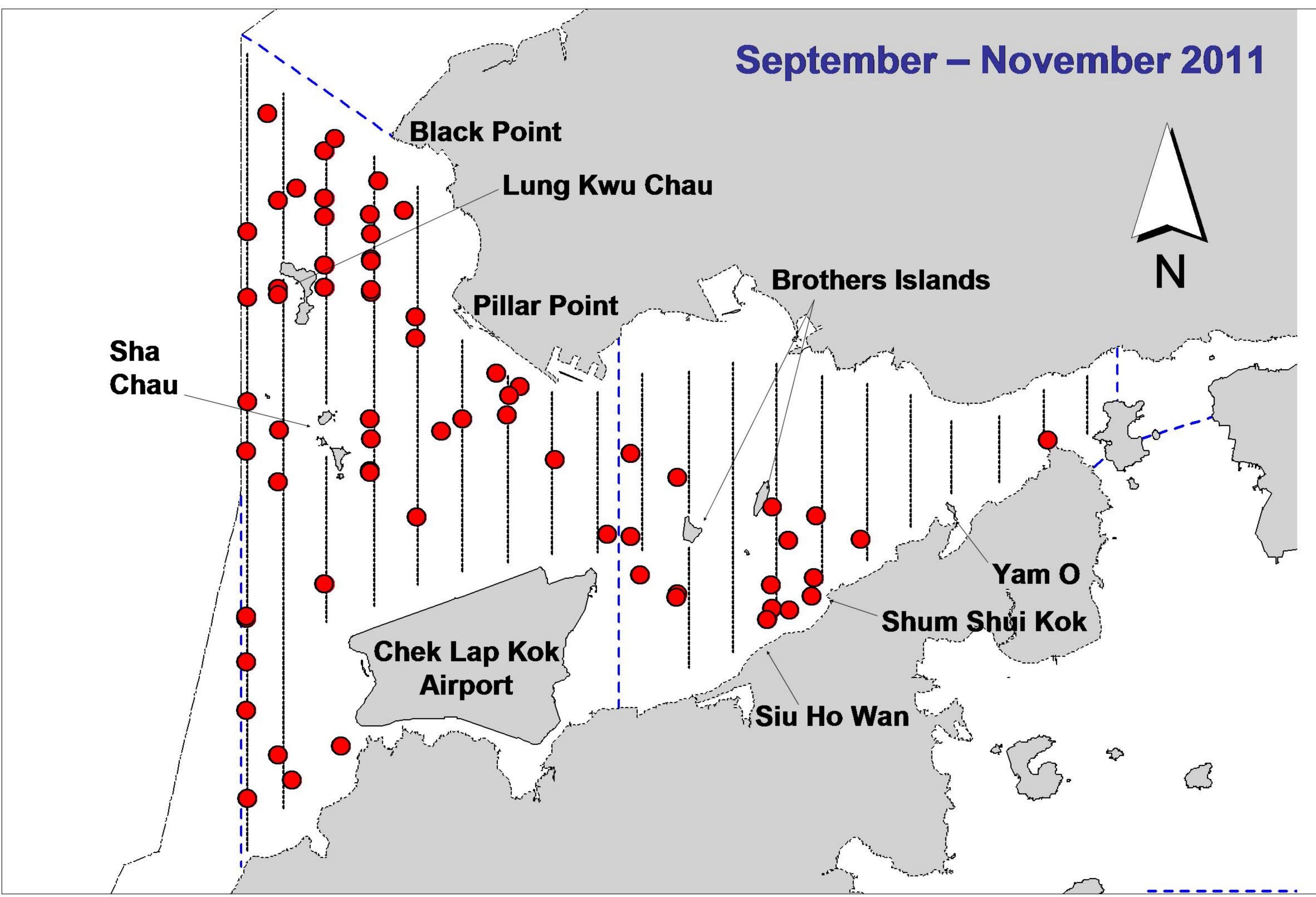


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

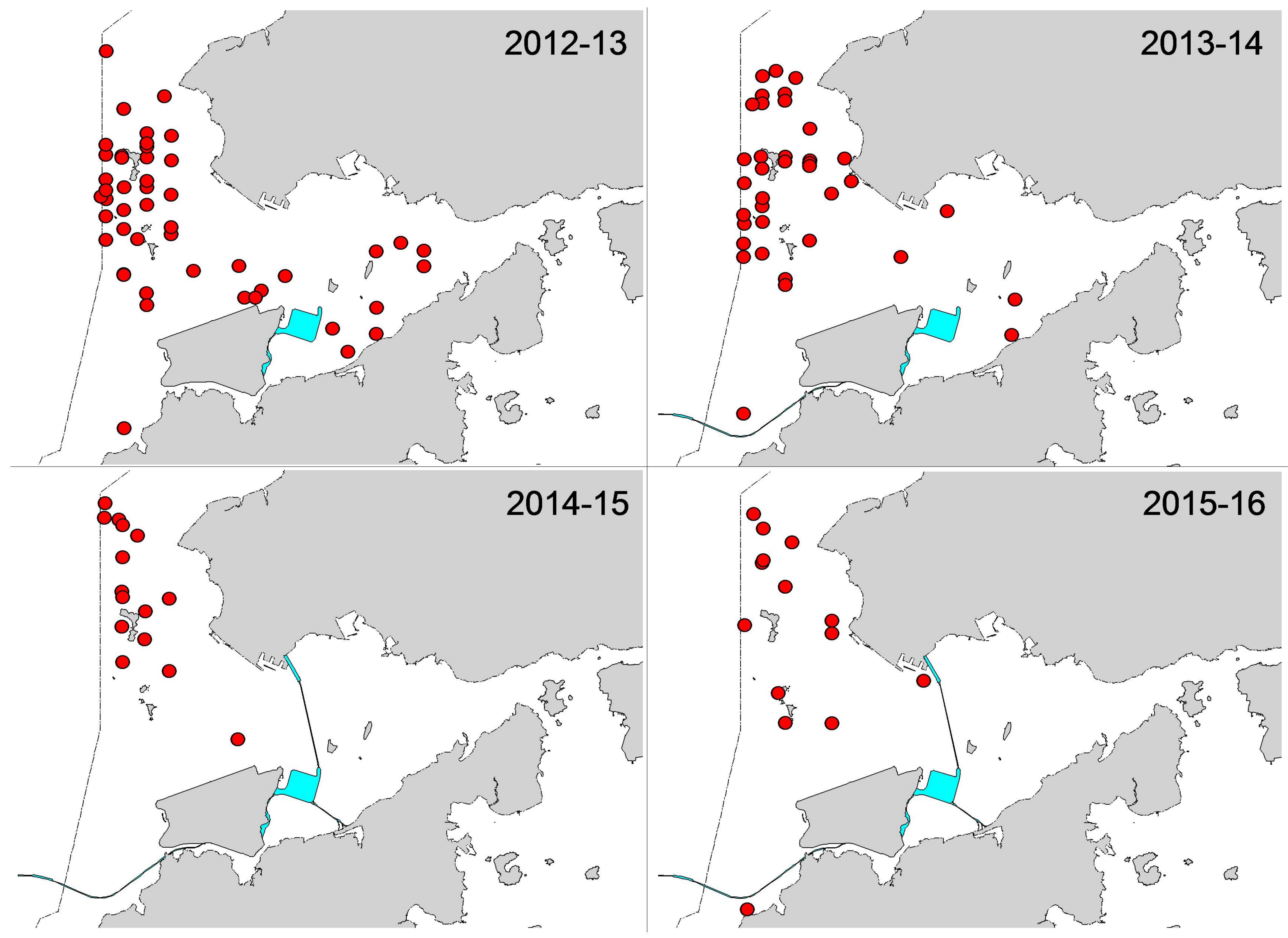


Figure 2. Distribution of Chinese white dolphin sightings in Northwest and Northeast Lantau during the same winter quarters (December - February) of HKLR03 impact phase in 2013-16

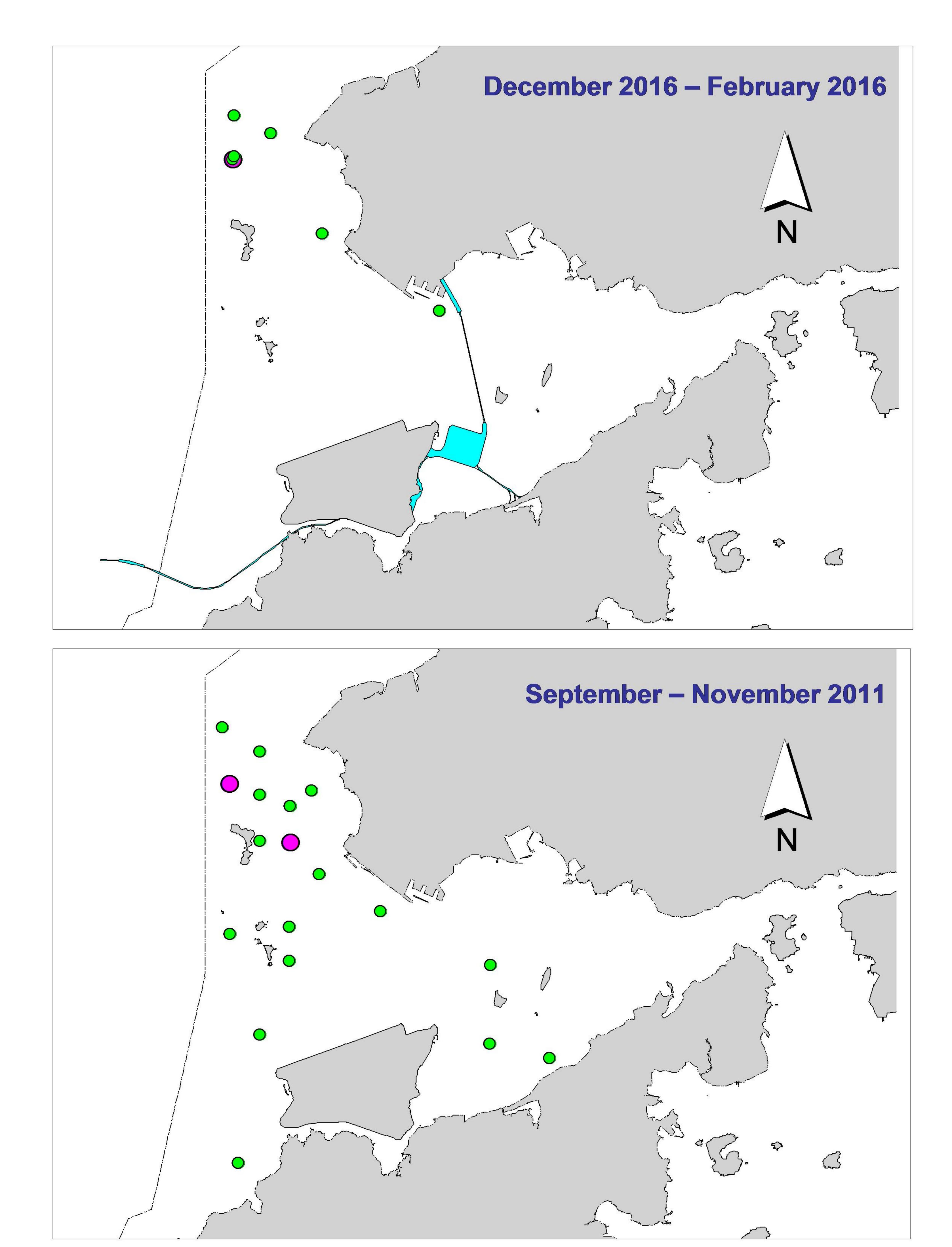


Figure 3. Distribution of Chinese white dolphins with larger group sizes during HKLR03 impact phase (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

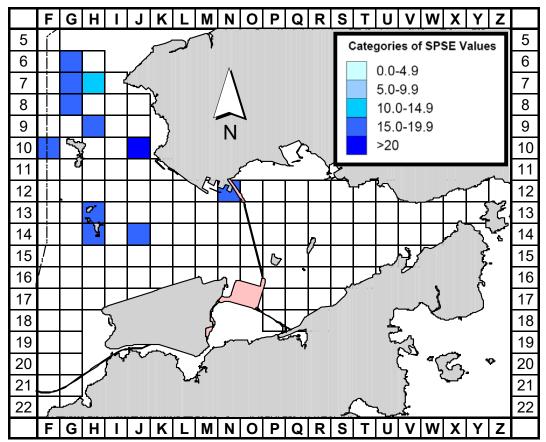


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Dec15-Feb16) (SPSE = no. of on-effort sightings per 100 units of survey effort)

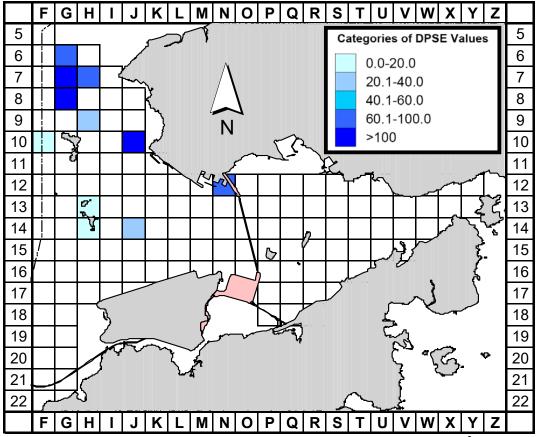


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Dec15-Feb16) (DPSE = no. of dolphins per 100 units of survey effort)

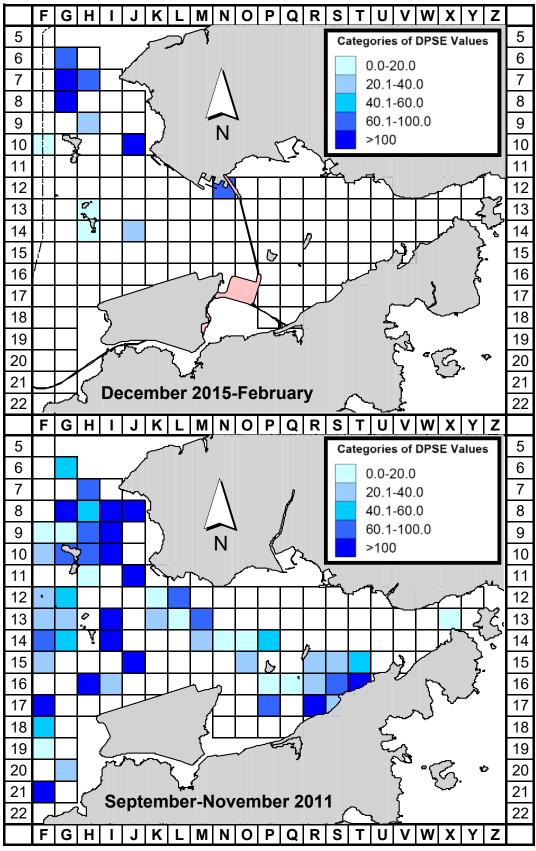


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northwest and Northeast Lantau survey area between the impact monitoring period December 2015-February 2016) and baseline monitoring period (September-November 2011) (DPSE = no. of dolphins per 100 units of survey effort)

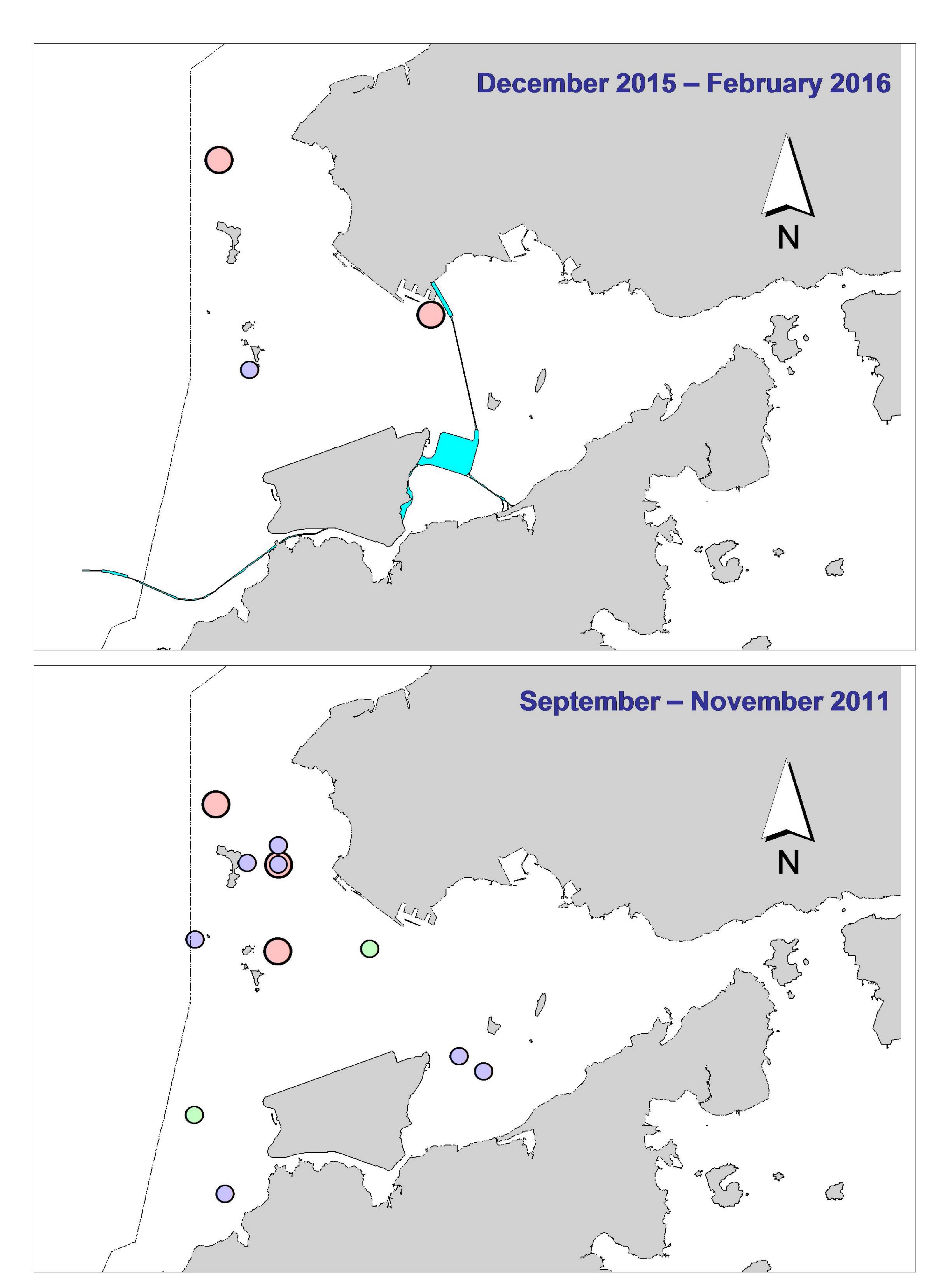


Figure 6. Distribution of Chinese white dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

## Appendix I. HKLR03 Survey Effort Database (Dec. 2015 - Feb. 2016)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

2-Dec-15   NW LANTAU   2   34.36   WINTER   STANDARD31516   HKLR   P	DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-Dec-15   NW LANTAU   2   12.06   WINTER   STANDARD31516   HKLR   S   2-Dec-15   NW LANTAU   3   0.90   WINTER   STANDARD31516   HKLR   P   2-Dec-15   NE LANTAU   2   15.53   WINTER   STANDARD31516   HKLR   P   2-Dec-15   NE LANTAU   2   15.53   WINTER   STANDARD31516   HKLR   P   2-Dec-15   NE LANTAU   2   18.39   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NE LANTAU   3   1.75   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NE LANTAU   3   1.75   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NE LANTAU   3   1.35   WINTER   STANDARD31516   HKLR   S   7-Dec-15   NE LANTAU   2   3.22   WINTER   STANDARD31516   HKLR   S   7-Dec-15   NE LANTAU   2   3.22   WINTER   STANDARD31516   HKLR   S   7-Dec-15   NW LANTAU   2   3.22   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NW LANTAU   2   3.22   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NW LANTAU   2   0.27   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NW LANTAU   2   0.27   WINTER   STANDARD31516   HKLR   P   7-Dec-15   NW LANTAU   3   7.53   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   13.30   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   13.30   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   4   14.71   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.10   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.10   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.10   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.10   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.20   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   2   1.10   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   1.364   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   1.34   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   1.34   WINTER   STANDARD31516   HKLR   P   9-Dec-15   NW LANTAU   3   1.34   WINTER   STANDARD31516   HKLR   P   1-Dec-15   NW LANTAU   3   1.34   WINTER   STANDARD31516   HKLR   P   1-Dec-	2-Dec-15	NW LANTAU	2	34.36	WINTER	STANDARD31516	HKLR	Р
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2-Dec-15	2-Dec-15	NW LANTAU	3	0.90	WINTER	STANDARD31516	HKLR	S
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15-Dec-15         NE LANTAU         2         15.04         WINTER         STANDARD31516         HKLR         P           15-Dec-15         NE LANTAU         3         1.60         WINTER         STANDARD31516         HKLR         P           15-Dec-15         NE LANTAU         2         10.16         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         2         25.03         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         3         15.46         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         2         10.60         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NW LANTAU         3         2.21         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         2         16.39         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         3         2.10         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         1         1.97         WINTER         STANDARD31516<								
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15-Dec-15         NE LANTAU         2         10.16         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NW LANTAU         2         25.03         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         3         15.46         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         2         10.60         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         3         2.21         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         2         16.39         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NE LANTAU         2         8.31         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         3         2.10         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         1         1.97         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NE LANTAU         2         11.00         WINTER         STANDARD31516 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
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8-Jan-16         NW LANTAU         3         15.46         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NW LANTAU         2         10.60         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NW LANTAU         3         2.21         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         2         8.31         WINTER         STANDARD31516         HKLR         P           8-Jan-16         NE LANTAU         2         8.31         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         3         2.10         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         1         1.97         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NE LANTAU         2         11.00         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NE LANTAU         2         11.76         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         2         11.76         WINTER         STANDARD31516 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
8-Jan-16         NW LANTAU         2         10.60         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NW LANTAU         3         2.21         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         2         8.31         WINTER         STANDARD31516         HKLR         S           8-Jan-16         NE LANTAU         2         8.31         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         3         2.10         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         1         1.97         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NE LANTAU         2         15.21         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NE LANTAU         3         2.72         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         3         1.30         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         19.32         WINTER         STANDARD31516 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
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11-Jan-16         NE LANTAU         2         11.00         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NE LANTAU         3         1.30         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         2         11.76         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         3         19.32         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         2         4.82         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         1.00         WINTER         STANDARD31516         HKLR         S								
11-Jan-16         NE LANTAU         3         1.30         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         2         11.76         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         3         19.32         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         2         4.82         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         1.00         WINTER         STANDARD31516         HKLR         S			2					
11-Jan-16         NW LANTAU         2         11.76         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         3         19.32         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         2         4.82         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         1.00         WINTER         STANDARD31516         HKLR         S								
11-Jan-16         NW LANTAU         3         19.32         WINTER         STANDARD31516         HKLR         P           11-Jan-16         NW LANTAU         2         4.82         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         1.00         WINTER         STANDARD31516         HKLR         S			2					
11-Jan-16         NW LANTAU         2         4.82         WINTER         STANDARD31516         HKLR         S           11-Jan-16         NW LANTAU         3         1.00         WINTER         STANDARD31516         HKLR         S			3					
	11-Jan-16	NW LANTAU		4.82	WINTER	STANDARD31516	HKLR	S
	11-Jan-16	NW LANTAU	3	1.00	WINTER	STANDARD31516	HKLR	S
11-Jan-16 NW LANTAU 4 2.10 WINTER STANDARD31516 HKLR S	11-Jan-16	NW LANTAU	4	2.10	WINTER	STANDARD31516	HKLR	S

## Appendix I. (cont'd)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
13-Jan-16	NE LANTAU	1	1.00	WINTER	STANDARD31516	HKLR	Р
13-Jan-16	NE LANTAU	2	15.93	WINTER	STANDARD31516	HKLR	Р
13-Jan-16	NE LANTAU	2	9.63	WINTER	STANDARD31516	HKLR	S
13-Jan-16	NE LANTAU	3	0.64	WINTER	STANDARD31516	HKLR	S
13-Jan-16	<b>NW LANTAU</b>	2	26.61	WINTER	STANDARD31516	HKLR	Р
13-Jan-16	<b>NW LANTAU</b>	3	15.03	WINTER	STANDARD31516	HKLR	Р
13-Jan-16	<b>NW LANTAU</b>	2	5.05	WINTER	STANDARD31516	HKLR	S
13-Jan-16	<b>NW LANTAU</b>	3	6.87	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NW LANTAU	2	22.73	WINTER	STANDARD31516	HKLR	Р
19-Jan-16	NW LANTAU	3	9.01	WINTER	STANDARD31516	HKLR	Р
19-Jan-16	NW LANTAU	2	6.16	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NW LANTAU	3	1.50	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NE LANTAU	1	0.90	WINTER	STANDARD31516	HKLR	Р
19-Jan-16	NE LANTAU	2	16.70	WINTER	STANDARD31516	HKLR	Р
19-Jan-16	NE LANTAU	3	2.29	WINTER	STANDARD31516	HKLR	Р
19-Jan-16	NE LANTAU	1	2.30	WINTER	STANDARD31516	HKLR	S
19-Jan-16	NE LANTAU	2	8.41	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NE LANTAU	2	20.46	WINTER	STANDARD31516	HKLR	Р
2-Feb-16	NE LANTAU	2	6.05	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NE LANTAU	3	4.59	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NW LANTAU	2	6.80	WINTER	STANDARD31516	HKLR	P
2-Feb-16	NW LANTAU	3	26.28	WINTER	STANDARD31516	HKLR	P
2-Feb-16	NW LANTAU	2	2.32	WINTER	STANDARD31516	HKLR	S
2-Feb-16	NW LANTAU	3	4.50	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NW LANTAU	2	21.30	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NW LANTAU	3	19.74	WINTER	STANDARD31516	HKLR	Р
3-Feb-16	NW LANTAU	2	10.82	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NW LANTAU	3	2.24	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NE LANTAU	1	1.82	WINTER	STANDARD31516	HKLR	P
3-Feb-16	NE LANTAU	2	14.48	WINTER	STANDARD31516	HKLR	Р
3-Feb-16	NE LANTAU	1	2.49	WINTER	STANDARD31516	HKLR	S
3-Feb-16	NE LANTAU	2	8.08	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	2	6.05	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NW LANTAU	3	31.35	WINTER	STANDARD31516	HKLR	Р
16-Feb-16	NW LANTAU	4	3.00	WINTER	STANDARD31516	HKLR	Р
16-Feb-16	NW LANTAU	2	5.70	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	3	4.80	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NW LANTAU	4	3.10	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	1	1.10	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NE LANTAU	2	15.25	WINTER	STANDARD31516	HKLR	P
16-Feb-16	NE LANTAU	1	1.40	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	2	8.16	WINTER	STANDARD31516	HKLR	S
16-Feb-16	NE LANTAU	3	1.09	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NE LANTAU	2	20.26	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NE LANTAU	2	9.08	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NE LANTAU	3	1.86	WINTER	STANDARD31516	HKLR	S
22-Feb-16	NW LANTAU	2	14.88	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NW LANTAU	3	16.99	WINTER	STANDARD31516	HKLR	P
22-Feb-16	NW LANTAU	2	2.43	WINTER	STANDARD31516 STANDARD31516	HKLR	S
22-Feb-16 22-Feb-16	NW LANTAU	3	5.10	WINTER	STANDARD31516 STANDARD31516	HKLR	S
22-Feb-16	NW LANTAU	4	0.30	WINTER	STANDARD31516 STANDARD31516	HKLR	S
ZZ-1 GD-10	INV LAINIAU	<b>–</b>	0.50	VVIINILIX		HINLIN	

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (December 2015-February 2016) (Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association P/S: Sighting Made on Primary/Secondary Lines

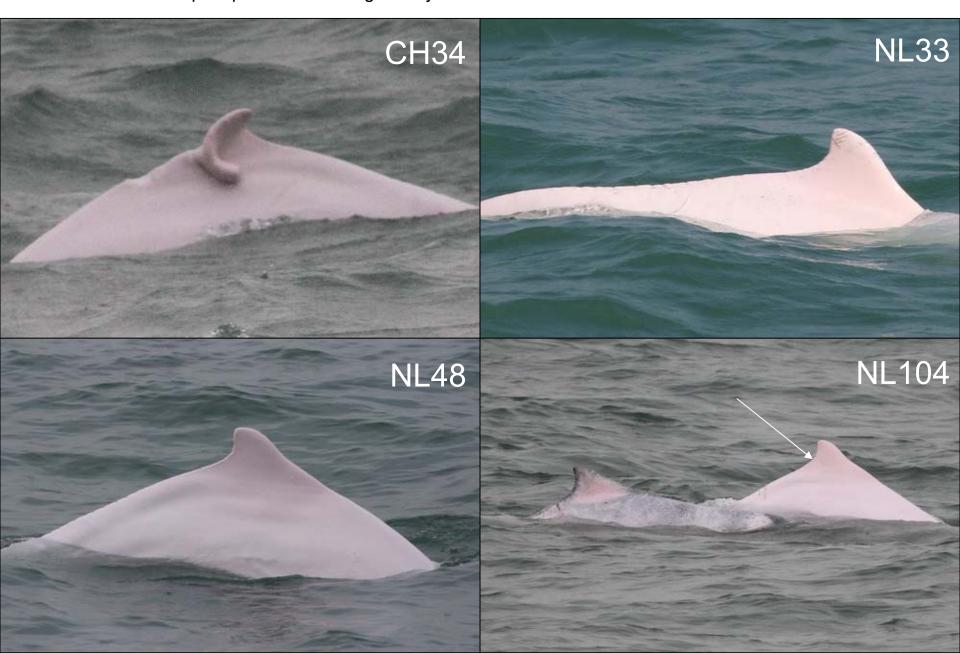
DATE	STG#	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
2-Dec-15	1	1058	1	NW LANTAU	2	477	ON	HKLR	826399	804684	WINTER	NONE	Р
2-Dec-15	2	1149	2	NW LANTAU	2	257	ON	HKLR	827946	806459	WINTER	NONE	Р
7-Dec-15	1	1449	10	NW LANTAU	3	553	ON	HKLR	828945	805462	WINTER	NONE	Р
9-Dec-15	1	1209	9	NW LANTAU	4	126	ON	HKLR	829795	806761	WINTER	NONE	S
15-Dec-15	1	1015	1	NW LANTAU	2	ND	OFF	HKLR	814683	804794	WINTER	NONE	
15-Dec-15	2	1303	2	NW LANTAU	2	169	ON	HKLR	822328	808518	WINTER	NONE	Р
15-Dec-15	3	1329	3	NW LANTAU	3	236	ON	HKLR	826060	808504	WINTER	NONE	Р
8-Jan-16	1	1209	1	NW LANTAU	2	591	ON	HKLR	822365	806458	WINTER	NONE	Р
11-Jan-16	1	1303	6	NW LANTAU	3	140	ON	HKLR	830351	805495	WINTER	NONE	Р
13-Jan-16	1	1355	1	NW LANTAU	3	54	ON	HKLR	823584	806162	WINTER	NONE	S
13-Jan-16	2	1458	2	NW LANTAU	2	83	ON	HKLR	830961	805085	WINTER	NONE	S
19-Jan-16	1	1112	8	NW LANTAU	3	332	ON	HKLR	829044	805503	WINTER	NONE	Р
3-Feb-16	1	1318	5	NW LANTAU	3	28	ON	HKLR	826580	808505	WINTER	NONE	Р
16-Feb-16	1	1414	6	NW LANTAU	3	145	ON	HKLR	824082	812518	WINTER	NONE	Р

# Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in December 2015 - February 2016

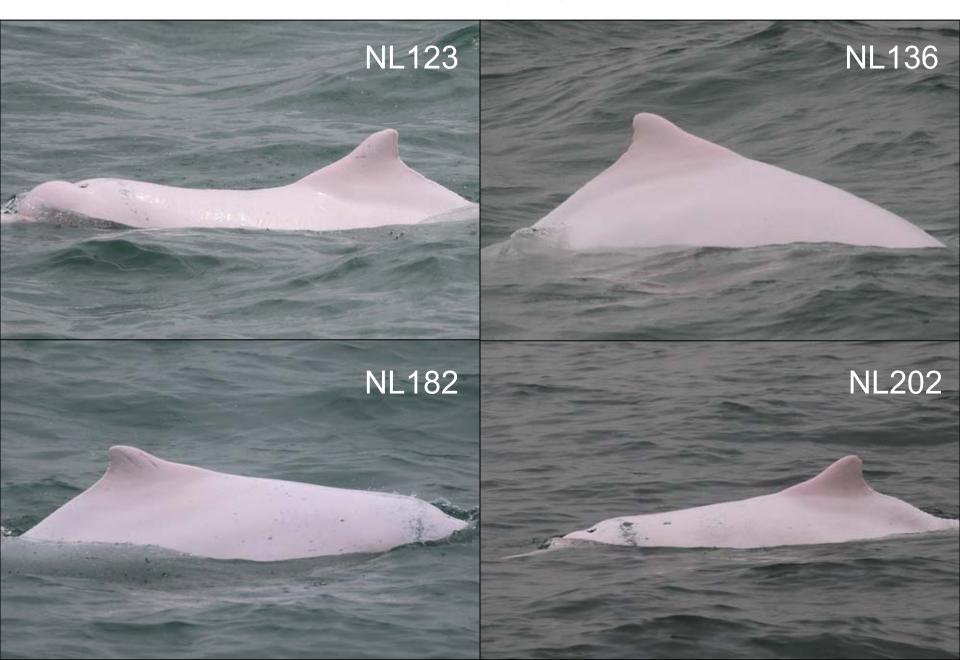
ID#	DATE	STG#	AREA
CH34	09/12/15	1	NW LANTAU
NL33	07/12/15	1	NW LANTAU
	09/12/15	1	NW LANTAU
NL48	09/12/15	1	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL104	09/12/15	1	NW LANTAU
	15/12/15	3	NW LANTAU
NL123	11/01/16	1	NW LANTAU
NL136	09/12/15	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL182	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL202	07/12/15	1	NW LANTAU
	19/01/16	1	NW LANTAU
NL210	07/12/15	1	NW LANTAU
	13/01/16	2	NW LANTAU
	03/02/16	1	NW LANTAU
NL220	09/12/15	1	NW LANTAU
	15/12/15	3	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU

ID#	DATE	STG#	AREA
NL233	07/12/15	1	NW LANTAU
NL261	15/12/15	2	NW LANTAU
	03/02/16	1	NW LANTAU
NL269	09/12/15	1	NW LANTAU
NL272	07/12/15	1	NW LANTAU
	15/12/15	2	NW LANTAU
NL280	07/12/15	1	NW LANTAU
NL284	07/12/15	1	NW LANTAU
	19/01/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL285	08/01/16	1	NW LANTAU
	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
	16/02/16	1	NW LANTAU
NL286	02/12/15	1	NW LANTAU
	02/12/15	2	NW LANTAU
	07/12/15	1	NW LANTAU
NL302	13/01/16	2	NW LANTAU
NL320	11/01/16	1	NW LANTAU
	19/01/16	1	NW LANTAU
	03/02/16	1	NW LANTAU
WL17	16/02/16	1	NW LANTAU

Appendix IV. Twenty-one individual dolphins that were identified during December 2015 – February 2016 under HKLR03 impact phase monitoring surveys



Appendix IV. (cont'd)



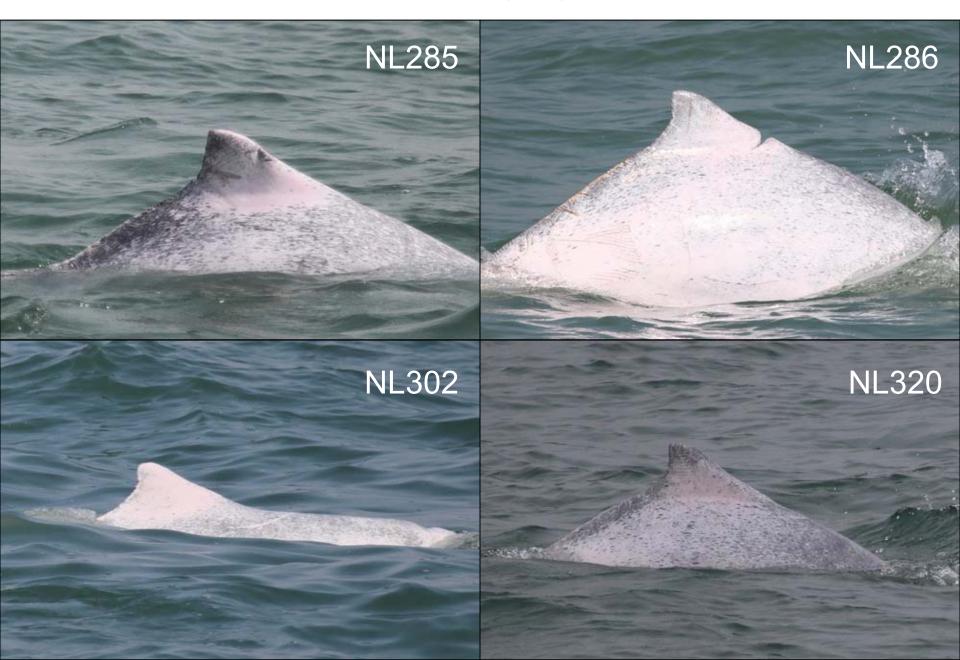
Appendix IV. (cont'd)



Appendix IV. (cont'd)



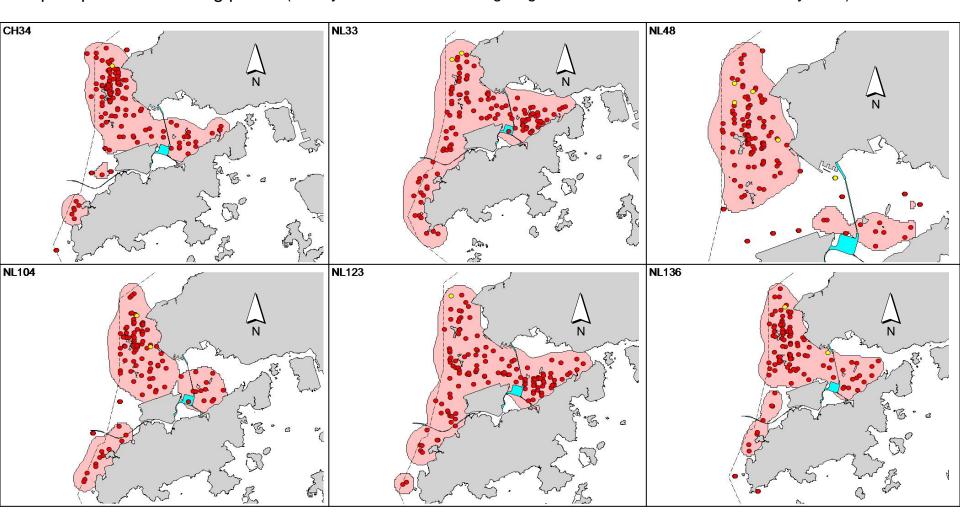
Appendix IV. (cont'd)



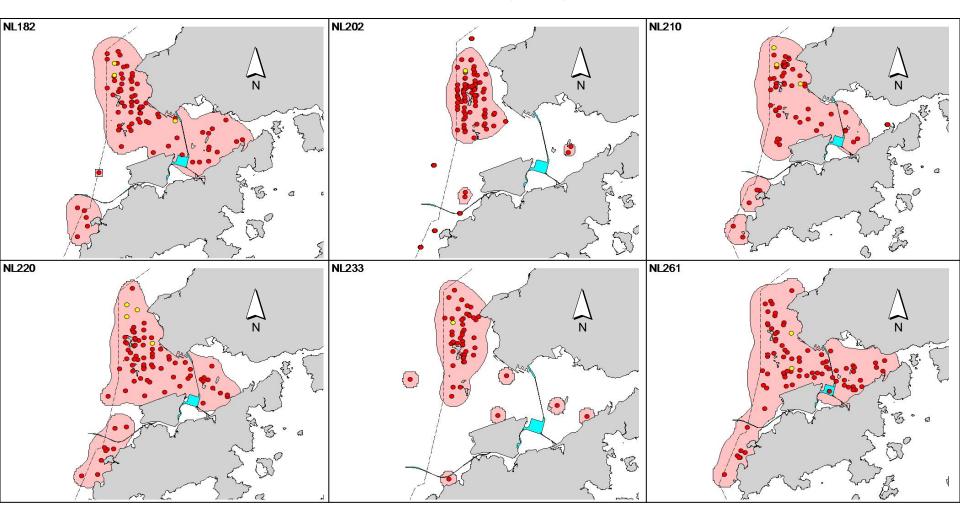
## Appendix IV. (cont'd)



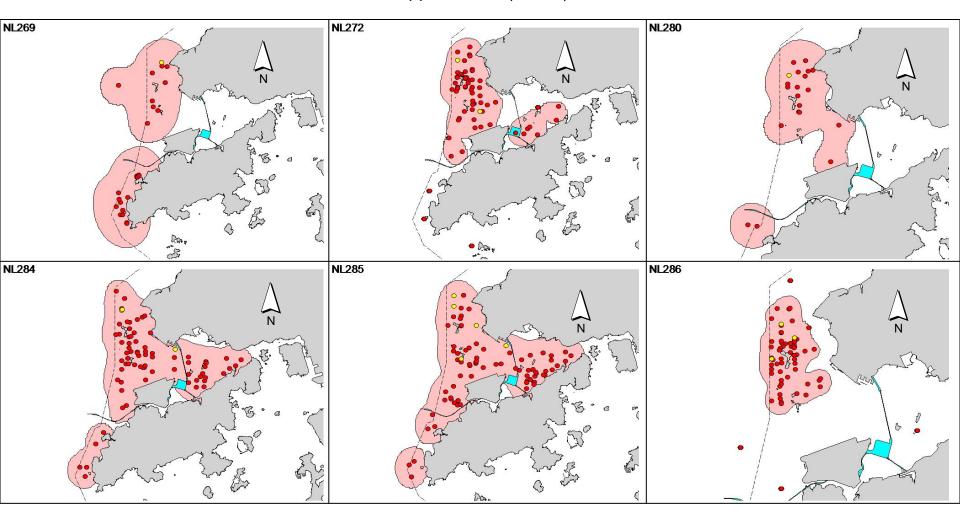
Appendix V. Ranging patterns (95% kernel ranges) of 21 individual dolphins that were sighted during HKLR03 impact phase monitoring period (note: yellow dots indicates sightings made in December 2015 – February 2016)



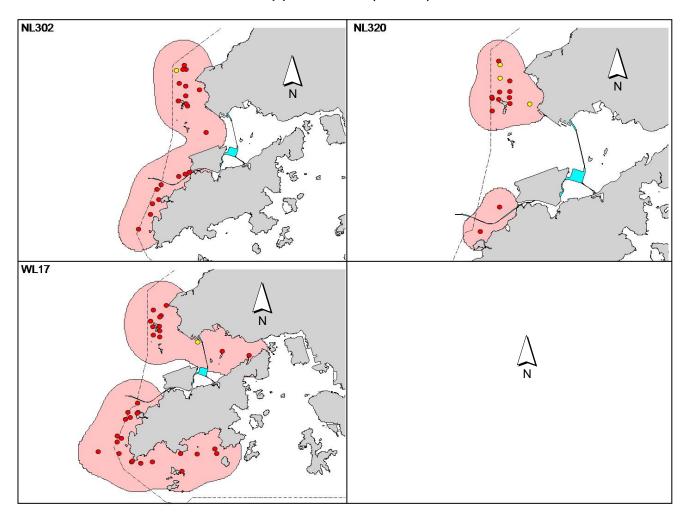
Appendix V. (cont'd)



Appendix V. (cont'd)



## Appendix V. (cont'd)



Appendix J

Event Action Plan

Appendix J1 Event/Action Plan for Air Quality

		AC	TION	
EVENT	ET (1)	IEC (1)	SOR <sup>(1)</sup>	Contractor
Action Level				
1. Exceedance for one sample	<ol> <li>Identify the source.</li> <li>Inform the IEC and the SOR.</li> <li>Repeat measurement to confirm finding.</li> <li>Increase monitoring frequency to daily.</li> </ol>	<ol> <li>Check monitoring data submitted by the ET.</li> <li>Check Contractor's working method.</li> </ol>	1. Notify Contractor.	<ol> <li>Rectify any unacceptable practice</li> <li>Amend working methods if appropriate</li> </ol>
2. Exceedance for two or more consecutive samples	<ol> <li>Identify the source.</li> <li>Inform the IEC and the SOR.</li> <li>Repeat measurements to confirm findings.</li> <li>Increase monitoring frequency to daily.</li> <li>Discuss with the IEC and the Contractor on remedial actions required.</li> <li>If exceedance continues, arrange meeting with the IEC and the SOR.</li> <li>If exceedance stops, cease additional monitoring.</li> </ol>	<ol> <li>Check monitoring data submitted by the ET.</li> <li>Check the Contractor's working method.</li> <li>Discuss with the ET and the Contractor on possible remedial measures.</li> <li>Advise the SOR on the effectiveness of the proposed remedial measures.</li> <li>Supervisor implementation of remedial measures.</li> </ol>	<ol> <li>Confirm receipt of notification of failure in writing.</li> <li>Notify the Contractor.</li> <li>Ensure remedial measures properly implemented.</li> </ol>	<ol> <li>Submit proposals for remedial actions to IEC within 3 working days of notification</li> <li>Implement the agreed proposals</li> <li>Amend proposal if appropriate</li> </ol>

	ACTION									
EVENT	ET (1)	IEC (1)	SOR <sup>(1)</sup>	Contractor						
Limit Level										
1. Exceedance for one sample	<ol> <li>Identify the source.</li> <li>Inform the SOR and the DEP.</li> </ol>	1. Check monitoring data submitted by the ET.	<ol> <li>Confirm receipt of notification of failure in writing.</li> </ol>	Take immediate action to avoid further exceedance						
	<ol> <li>Repeat measurement to confirm finding.</li> <li>Increase monitoring frequency to daily.</li> <li>Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results.</li> </ol>	<ol> <li>Check Contractor's working method.</li> <li>Discuss with the ET and the Contractor on possible remedial measures.</li> <li>Advise the SOR on the effectiveness of the proposed remedial measures.</li> <li>Supervisor implementation of remedial measures.</li> </ol>	<ul><li>2. Notify the Contractor.</li><li>3. Ensure remedial measures are properly implemented.</li></ul>	<ul><li>2. Submit proposals for remedial actions to IEC within 3 working days of notification</li><li>3. Implement the agreed proposals</li><li>4. Amend proposal if appropriate</li></ul>						
2. Exceedance for two or more consecutive samples	<ol> <li>Notify the IEC, the SOR, the DEP and the Contractor.</li> <li>Identify the source.</li> <li>Repeat measurements to confirm findings.</li> <li>Increase monitoring frequency to daily.</li> <li>Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented.</li> <li>Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken.</li> <li>Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and</li> </ol>	<ol> <li>Discuss amongst the SOR, ET and the Contractor on the potential remedial actions.</li> <li>Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly.</li> <li>Supervise the implementation of remedial measures.</li> </ol>	<ol> <li>Confirm receipt of notification of failure in writing.</li> <li>Notify the Contractor.</li> <li>In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented.</li> <li>Ensure remedial measures are properly implemented.</li> <li>If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.</li> </ol>	<ol> <li>Take immediate action to avoid further exceedance.</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification.</li> <li>Implement the agreed proposals.</li> <li>Resubmit proposals if problem still not under control.</li> <li>Stop the relevant activity of works as determined by the SOR until the exceedance is abated.</li> </ol>						

the SOR informed of the results.

8. If exceedance stops cease additional monitoring.

Appendix J2 Event/Action Plan for Construction Noise

		ACTION							
EVENT	ET	IEC	SOR	Contractor					
Action Level	<ol> <li>Notify the IEC and the Contractor.</li> <li>Carry out investigation.</li> </ol>	Review the analysed results submitted by the ET.	Confirm receipt of notification of failure in writing.	Submit noise mitigation proposals to IEC					
	<ol> <li>Report the results of investigation to the IEC and the Contractor.</li> <li>Discuss with the Contractor and formulate remedial measures.</li> <li>Increase monitoring frequency to</li> </ol>	<ol> <li>Review the proposed remedial measures by the Contractor and advise the SOR accordingly.</li> <li>Supervise the implementation of remedial measures.</li> </ol>	<ol> <li>Notify the Contractor.</li> <li>Require the Contractor to propose remedial measures for the analysed noise problem.</li> <li>Ensure remedial measures are</li> </ol>	Implement noise mitigation proposals					
Limit Level	check mitigation effectiveness.  1. Notify the IEC, the SOR, the DEP	Discuss amongst the SOR, the ET	properly implemented.  1. Confirm receipt of notification of	Take immediate action to avoid					
	<ul><li>and the Contractor.</li><li>Identify the source.</li></ul>	and the Contractor on the potential remedial actions.	<ul><li>failure in writing.</li><li>Notify the Contractor.</li></ul>	further exceedance  2. Submit proposals for remedial					
	3. Repeat measurement to confirm findings.	2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise	3. Require the Contractor to propose remedial measures for the analysed noise problem.	<ul><li>actions to IEC within 3 working days of notification</li><li>3. Implement the agreed proposals</li></ul>					
	<ul><li>4. Increase monitoring frequency.</li><li>5. Carry out analysis of Contractor's working procedures to determine</li></ul>	the SOR accordingly.  3. Supervise the implementation of	Ensure remedial measures are properly implemented.	Resubmit proposals if problem still not under control					
	possible mitigation to be implemented.	remedial measures.	5. If exceedance continues, consider what activity of the work is	5. Stop the relevant activity of works as determined by the SOR until the					
	<ol><li>Inform the IEC, the SOR and the DEP the causes &amp; actions taken for the exceedances.</li></ol>		responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	exceedance is abated.					
	7. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results.								
	<ol><li>If exceedance stops, cease additional monitoring.</li></ol>								

Appendix J3 Event/Action Plan for Water Quality

Event	ET	Leader		IEC	S	OR		Contractor
Action level being exceeded by one sampling day	1.	Repeat in situ measurement on next day of exceedance to confirm	1.	Check monitoring data submitted by ET and	1.	Confirm receipt of notification of non-compliance in	1.	Inform the SOR and confirm notification of the non-
by one sumpling day		findings;		Contractor's working methods.		writing;		compliance in writing;
	2.	Identify source(s) of impact;			2.	Notify Contractor.	2.	Rectify unacceptable practice;
	3.	Inform IEC, contractor and SOR;					3.	Amend working methods if appropriate.
	4.	Check monitoring data, all plant, equipment and Contractor's working methods.						
Action level being exceeded by two or more consecutive sampling days	1.	Repeat measurement on next day of exceedance to confirm findings;	1.	Check monitoring data submitted by ET and Contractor's working method;	1.	Discuss with IEC on the proposed mitigation measures;	1.	Inform the Supervising Officer and confirm notification of the non-
consecutive sumpring unjo	2.	Identify source(s) of impact;		Ç		·		compliance in writing;
	3.	Inform IEC, contractor, SOR and EPD;	2.	Discuss with ET and Contractor on possible remedial actions;	2.	Ensure mitigation measures are properly implemented;	2.	Rectify unacceptable practice;
	4.	Check monitoring data, all plant, equipment and Contractor's working methods;	3.	Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly;	3.	Assess the effectiveness of the implemented mitigation measures.	3.	Check all plant and equipment and consider changes of working methods;
	5.	Discuss mitigation measures with IEC, SOR and Contractor;	4.	Supervise the implementation of mitigation measures.			4.	Submit proposal of additional mitigation measures to SOR within 3 working days of
	6.	Ensure mitigation measures are implemented;						notification and discuss with ET, IEC and SOR;
	7.	Increase the monitoring frequency to daily until no exceedance of Action level;					5.	Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	1.	Repeat measurement on next day of exceedance to confirm findings;	1.	Check monitoring data submitted by ET and Contractor's working method;	1.	Confirm receipt of notification of failure in writing;	1.	Inform the SOR and confirm notification of the non-compliance in writing;
	2.	Identify source(s) of impact;	2	-	2.	Discuss with IEC, ET and	2	-
			2.	Discuss with ET and Contractor		Contractor on the proposed	2.	Rectify unacceptable practice;

Event	ET	Leader		IEC	SC	OR		Contractor
	3.	Inform IEC, contractor, SOR and EPD;		on possible remedial actions;		mitigation measures;	3.	Check all plant and
	4.	Check monitoring data, all plant, equipment and Contractor's working methods;	3.	Review the proposed mitigation measures submitted by Contractor and advise the SOR	3.	Request Contractor to review the working methods.	0.	equipment and consider changes of working methods;
	5.	Discuss mitigation measures with IEC, SOR and Contractor;		accordingly.			4.	Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR.
Limit level being exceeded by two or more consecutive	1.	Repeat measurement on next day of exceedance to confirm findings;	1.	Check monitoring data submitted by ET and Contractor's working method;		Discuss with IEC, ET and     Contractor on the     proposed mitigation	1.	Take immediate action to avoid further exceedance;
sampling days	2.	Identify source(s) of impact;		-		measures;	2.	Submit proposal of mitigation
	3.	Inform IEC, contractor, SOR and EPD;	2.	Discuss with ET and Contractor on possible remedial actions;		<ol><li>Request Contractor to critically review the working methods;</li></ol>		measures to SOR within 3 working days of notification and discuss with ET, IEC and
	4.	Check monitoring data, all plant, equipment and Contractor's working methods;	3.	Review the Contractor's mitigation measures whenever necessary to assure their		3. Make agreement on the mitigation measures to be implemented;	3.	SOR; Implement the agreed
				effectiveness and advise the		4.	٠.	mitigation measures;
	5.	Discuss mitigation measures with IEC, SOR and Contractor;	4	SOR accordingly;		5. Ensure mitigation measures are properly implemented;	4.	Resubmit proposals of
	6.	Ensure mitigation measures are implemented;	4.	Supervise the implementation of mitigation measures.		<ul><li>6.</li><li>7. Consider and instruct, if necessary, the Contractor to slow down or to stop all</li></ul>		mitigation measures if problem still not under control;
	7.	Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days;				or part of the construction activities until no exceedance of Limit level.		As directed by the Supervising Officer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

Appendix J4 Implementation of Event-Action Plan for Dolphin Monitoring

Event	ET Leader	IEC	SC	OR .	Contractor
Action Level	1. Repeat statistical data analysis to confirm findings;	Check monitoring data submitted by ET and Contractor;	l 1.	Discuss monitoring with the IEC and any other measures	1. Inform the SOR and confirm notification of the non-
	2. Review all available and relevant data, including raw data and statistical analysis results of other	2. Discuss monitoring results and		proposed by the ET;	compliance in writing;
	parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;	findings with the ET and the Contractor.	2.	If SOR is satisfied with the proposal of any other measures, SOR to signify the agreement in writing on the measures to be	2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR;
	3. Identify source(s) of impact;			implemented.	3. Implement the agreed measures.
	4. Inform the IEC, SOR and Contractor;				
	5. Check monitoring data.				
	<ol><li>Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li></ol>				

Event ET Leader IEC	SOR Contractor
Limit Level  1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, ER/SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary; 7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to monitoring mitigation or monit	necessity of additional dolphin monitoring and any other potential mitigation measures; with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other groposals for additional and any other mitigation measures; and advise eversults and one and any other measures and advise eversults and findings  necessity of additional dolphin monitoring and any other poposals for additional dolphin monitoring and/or any other mitigation measures; and advise eversults and findings  necessity of additional dolphin monitoring and any other poposals for additional dolphin monitoring and any other monitoring and/or any other monitoring and/or any other mitigation measures; and advise eversults and findings  non-compliance in writing; and non-compliance in writing; and any other measures; with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures; and any other mitigation measures; and any other mitigation measures; and any other mitigation measures.

Appendix J5 Event and Action Plan on Dolphin Acoustic Behaviour

EVENT		ACTION		
	ET Leader	IEC	SO	Contractor
Action Level				
With the numerical values presented in <i>Table 5.7</i> of <i>Baseline Monitoring Report</i> , when any of the response variable for dolphin acoustic behaviour recorded in the construction phase monitoring is 20% lower or higher than that recorded in the baseline monitoring (see <i>Table 5.8</i> of <i>Baseline Monitoring Report</i> ), or when there is a difference of 20% in dolphin acoustic signal detection at nighttime period at Site C1 only, the action level should be triggered	<ol> <li>Repeat statistical data analysis to confirm findings;</li> <li>Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences;</li> <li>Identify source(s) of impact;</li> <li>Inform the IEC, SO and Contractor;</li> <li>Check monitoring data;</li> <li>Carry out audit to ensure all dolphin protective measures are implemented fully and additional</li> </ol>	<ol> <li>Check monitoring data submitted by ET and Contractor;</li> <li>Discuss monitoring with the ET and the Contractor;</li> </ol>	<ol> <li>Discuss with the IEC the repeat monitoring and any other measures proposed by the ET;</li> <li>Make agreement on measures to be implemented.</li> </ol>	<ol> <li>Inform the SO and confirm notification of the non- compliance in writing;</li> <li>Discuss with the ET and the IEC and propose measures to the IEC and the SO;</li> <li>Implement the agreed measures.</li> </ol>
	measures are implemented fully and additional measures be proposed if necessary			

EVENT		ACTION		
	ET Leader	IEC	SO	Contractor
<u>Limit Level</u>				
With the numerical values presented in <i>Table 5.7</i> of <i>Baseline Monitoring Report</i> , when any of the response variable for dolphin acoustic behaviour recorded in the construction phase monitoring is 40% lower or higher than that recorded in the baseline monitoring (see <i>Table 5.8</i> of <i>Baseline Monitoring Report</i> ), or when there is a difference of 40% in dolphin acoustic signal detection at nighttime at Site C1 only, the limit level should be triggered	<ol> <li>Repeat statistical data analysis to confirm findings;</li> <li>Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences;</li> <li>Identify source(s) of impact;</li> <li>Inform the IEC, SO and Contractor;</li> <li>Check monitoring data;</li> <li>Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary</li> <li>Discuss additional dolphin monitoring and any other potential mitigation measures (eg consider to temporarily stop relevant portion of construction activity) with the IEC and Contractor.</li> </ol>	<ol> <li>Check monitoring data submitted by ET and Contractor;</li> <li>Discuss monitoring with the ET and the Contractor;</li> <li>Review proposals for additional monitoring and any other measures submitted by the Contractor and advise ER accordingly.</li> </ol>	<ol> <li>Discuss with the IEC the repeat monitoring and any other measures proposed by the ET;</li> <li>Make agreement on measures to be implemented.</li> </ol>	<ol> <li>Inform the SO and confirm notification of the non- compliance in writing;</li> <li>Discuss with the ET and the IEC and propose measures to the IEC and the SO;</li> <li>Implement the agreed measures.</li> </ol>

Abbreviations: ET - Environmental Team, IEC - Independent Environmental Checker, SO - Supervising Office, DEP - Director of Environmental Protection

Appendix K

Quarterly Summary of Waste Flow Table Contract No.: HY/2012/07

# Tuen Mun Chek Lap Kok Link – Southern Connection Viaduct Section Monthly Summary Waste Flow Table for 2015 (Year)

	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation					Actual Quantities of Recyclables Generation				
Month\Material	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Marine Sediment, Cat. L	Marine Sediment, Cat. Mp	Marine Sediment, Cat. Mf	Marine Sediment, Cat. H	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	13.578	0.081	0.990	-	12.474	0.115	0.178	0.229	0.258	-	-	132.170	-	61.380	0.091	
Feb	6.233	0.148	0.461	-	5.759	0.014	0.801	0.110	0.223	-	0.400	141.020	-	73.690	0.112	
Mar	10.149	0.220	0.473	-	9.600	0.077	0.618	0.073	0.149	-	-	120.940	-	9.140	0.203	
Apr	9.986	0.410	2.261	-	7.694	0.032	-	-	-	-	-	133.630	-	2.740	0.105	-
May	8.870	0.177	0.779	-	8.091	-	0.550	-	-	-	-	107.920	-	13.070	0.042	
Jun	8.627	0.132	1.462	-	7.166	-	0.324	0.118	0.169	-	0.017	89.930	-	2.000	0.119	-
SUB-TOTAL	57.444	1.168	6.424	-	50.782	0.238	2.471	0.530	0.799	-	0.417	725.610	-	162.020	0.672	
Jul	4.520	0.137	2.121	-	2.322	0.078	-	-	-	-	1.400	111.570	-	-	0.105	
Aug	1.992	0.203	0.352	-	1.265	0.375	-	-	-	-	1.200	87.760	-	-	0.133	-
Sep	4.148	0.160	0.623	-	3.525	-	-	-	-	-	0.600	66.680	-	-	0.105	-
Oct	2.286	0.317	0.651	-	1.635	-	-	-	-	-	-	102.080	-	-	0.084	-
Nov	1.571	0.273	0.725	-	0.204	0.642	-	-	-	-	2.000	64.740	-	-	0.098	-
Dec	0.714	0.216	0.516	-	0.198	-	-	-	-	-	-	66.000	-	-	-	_
TOTAL	72.675	2.476	11.412	-	59.930	1.333	2.471	0.530	0.799	-	5.617	1,224.440	-	162.020	1.197	-

#### Notes:

- 1 The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
- 2 Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
- 3 Broken concrete for recycling into aggregates.
- 4 Assumed 5 kg per damaged water-filled barrier.
- 5 'Reused in the Contract' and 'Disposed as Public Fills' include 'Hard Rock and Large Broken Concrete'.

Contract No.: HY/2012/07

# Tuen Mun Chek Lap Kok Link – Southern Connection Viaduct Section Monthly Summary Waste Flow Table for 2016 (Year)

	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation					Actual Quantities of Recyclables Generation				
Month\Material	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Marine Sediment, Cat. L	Marine Sediment, Cat. Mp	Marine Sediment, Cat. Mf	Marine Sediment, Cat. H	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000m <sup>3</sup> )	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	1.941	0.263	0.606	-	1.334	-	-	-	-	-	-	69.400	-	-	0.105	-
Feb	0.760	0.162	0.069	-	0.692	-	-	-	-	-	-	85.890	-	-	0.112	-
Mar																
Apr																
May																
Jun																
SUB-TOTAL	2.701	0.425	0.675	-	2.026	0.000	-	-	-	-	-	155.290	-	0.000	0.217	-
Jul																
Aug																
Sep																
Oct																
Nov																
Dec																
TOTAL	2.701	0.425	0.675	-	2.026	-	-	-	-	-	-	155.290	-	-	0.217	-

#### Notes:

- 1 The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
- 2 Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
- 3 Broken concrete for recycling into aggregates.
- 4 Assumed 5 kg per damaged water-filled barrier.
- 5 Disposed as Public Fills and Reused in the Contract include Hard Rock and Large Broken Concrete.

## Appendix L

Cumulative Statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions

Appendix L1 Cumulative Statistics on Exceedances

		Total No. recorded in this quarter	Total No. recorded since project commencement
1-Hr TSP	Action	0	0
	Limit	0	0
24-Hr TSP	Action	0	2
	Limit	0	0
Noise	Action	0	0
	Limit	0	0
Water Quality	Action	0	2
	Limit	0	0
Impact Dolphin	Action	0	9
Monitoring	Limit	1	4

Appendix L2 Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	Cumulative Statistics						
_	Complaints	Notifications of	Successful				
		Summons	Prosecutions				
This quarter	0	0	0				
Total No. received since project commencement	4	0	0				

Email message

From

Environmental Resources Management

To Ramboll Environ - Hong Kong, Limited (ENPO)

ERM- Hong Kong, Limited

16/F Berkshire House, 25 Westlands Road Quarry Bay, Hong Kong Telephone: (852) 2271 3113 Facsimile: (852) 2723 5660 E-mail: jovy.tam@erm.com

Ref/Project number Contract No. HY/2012/07 Tuen Mun-Chek Lap

Kok Link-Southern Connection Viaduct Section

Subject Notification of Exceedance for Impact Dolphin

Monitoring

*Date* 22 April 2016



Dear Sir or Madam,

Please find attached the Notification of Exceedance (NOE) of the following Log no.:

0215660\_Dec2015/Feb2016\_dolphin\_STG&ANI\_NEL&NWL

A total of one limit level exceedance was recorded in the quarterly impact dolphin monitoring data between December 2015 and February 2016.

Regards,

Mr Jovy Tam

Environmental Team Leader

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## **ERM-Hong Kong, Limited**

# CONTRACT NO. HY/2012/07 TUEN MUN - CHEK LAP KOK LINK SOUTHERN CONNECTION VIADUCT SECTION

## Impact Dolphin Monitoring Notification of Exceedance

Log No.	0215660_Dec2015/Feb2016_dolphin_STG&ANI_NEL&NWL [Total No. of Exceedance = 1]							
Date	December 2015 to February 2016 (monitored)							
	18 April 2016 (results received by ERM)							
Monitoring Area	Northeast Lantau (NEL) and Northwest Lantau (NWL)							
Parameter(s) with	Quarterly encounter rate of dolphin sightings (STG)							
Exceedance(s)	Quarterly encounter rate of total number of dolphins (ANI)							
Action Levels		NEL: STG < 4.2 & ANI < 15.5						
		Or						
Limit Levels	North Lantau Social cluster	NWL: STG < 6.9 & ANI < 31.3						
Limit Levels		NEL: STG < 2.4 & ANI < 8.9 and NWL: STG< 3.9 & ANI < 17.9						
Recorded Levels	NEL	STG = 0 & ANI = 0						
	NWL	STG = 2.64 & ANI = 10.98						
	One Limit Level Exceedance was	s recorded in the quarterly impact dolphin monitoring at NEL and						
	NWL between December 2015 and February 2016. The exceedance was reported in the approved							
	Twenty Eighth Monthly EM&A Report dated 11 March 2016.							
Statistical Analyses	Further to the review of the available and relevant dolphin monitoring data in the EM&A under this							
· ·	Contract, statistical analyses were conducted as follows:							
	A two-way ANOVA with repeated measures and unequal sample size was conducted using							
	Period (2 levels: baseline vs impact – present impact quarter, December 2015 to February 2016)							
	and Location (2 levels: NEL and NWL) as fixed factors to examine whether there were any							
	significant differences in the average encounter rates between the baseline and present impact							
	monitoring quarter. By setting $\alpha = 0.05$ as the significance level in the statistical tests,							
	significant differences in STG ( $p = 0.0043$ ) and in ANI ( $p = 0.0275$ ) between Periods were							
	detected.							
	A two-way ANOVA with repeated measures and unequal sample size was conducted using  Cumulative Period (2 levels; baseline vs. impact — cumulative quarters. December 2012 to							
	Cumulative Period (2 levels: baseline vs impact – cumulative quarters, December 2012 to February 2016) and Location (2 levels: NEL and NWL) as fixed factors to examine whether							
	there were any significant differences in the average encounter rates between the baseline and							
	cumulative impact monitoring quarter. By setting $\alpha = 0.00005$ as the significance level in the							
	statistical tests, significant difference in STG ( $p = 0.00004$ ) and in ANI ( $p = 0.00001$ ) between							
	Cumulative Period and Location were detected.							
	* Note: The commencement date under <i>Contract No. HY/2012/07</i> is 31 October 2013.							
Works Undertaken (in	In the quarter between Decembe	r 2015 and February 2016, the major marine works under Contract						
the monitoring	No. HY/2012/07 included:							
quarter)	Construction and installation of pile caps;							
	Uninstallation of marine piling platform;							
	Pier construction;							
	Launching gantry operation							
	Installation of deck segment	at and pier nead segment.						

## Possible Reason for Action or Limit Level Exceedance(s)

The potential factors that may have contributed to the observed exceedance are reviewed below:

- Blocking of CWD travelling corridor:

  The *Monitoring of Marine Mammals in Hong Kong Waters* (2014 15) <sup>(1)</sup> reported that dolphin usage and traveling activities to the northern side of the airport (dolphin traveling corridor) are affected by frequent high-speed ferry traffic from Sky Pier (not related to this Contract), which is likely a major factor resulting in the decrease in dolphin abundances in North Lantau.
- Marine works of the Contract:
  As per the findings from the EIA report (*Section 8.11.9*), the major influences on the Chinese White Dolphin (CWD) *Sousa chinensis* under this Contract are marine traffics and bored piling works. The Contractor implemented the marine traffic control in the reporting period as per the requirements in the *EP-354/2009/D* and the updated *EM&A Manual*. The bored piling works of this Contract was completed in September 2015. Thus, underwater noise emission from this Contract had been relatively low in the reporting period when comparing to the previous quarters. During dolphin monitoring in this quarter, no unacceptable impact on CWD due to the activities under this Contract was observed.
- Impact on water quality:
  According to the findings in the water quality monitoring results at the impact monitoring stations between December 2015 and February 2016, there was no exceedance on WQM.
  Although impact mean levels of depth-averaged SS at SR4a during both mid-ebb and mid-flood tides (Mid-ebb: 13.3 mg/L; Mid-flood: 12.9 mg/L) were higher than the corresponding ambient levels (Mid-ebb: 11.9 mg/L; Mid-flood: 12.7 mg/L), the statistical analyses suggest there were no significant difference. Overall, the WQM results imply that no unacceptable impact on water quality was associated with the marine works under this Contract, and thus no indirect impacts on marine habitat quality due to change in water quality is observed in this Contract.

In view of the above, marine ecological mitigation measures were considered properly implemented, and thus no unacceptable impact on CWD or its habitat was associated with this Contract in this quarter from December 2015 to February 2016.

### Actions Taken / To Be Taken

With reference to the site inspection records in this quarter, the respective marine ecological mitigation measures have been implemented properly by the Contractor throughout the marine works period, including:

- 1. 250m dolphin exclusion zone;
- 2. Acoustic decoupling plan;
- 3. Training to workers;
- 4. Offsite vessel routing control in accordance with Regular Marine Travel Routes Plan, including routing control within existing and proposed marine park boundaries;
- 5. Vessels speed limited at 5 knots and 10 knots within existing and proposed marine park boundary and site boundary respectively;
- 6. Idling and mooring of working vessels within site boundary;

The existing mitigation measures are recommended to be continuously implemented. Furthermore, it is also recommended to reduce the vessels for marine works as much as possible. The ET will monitor for future trends in exceedance(s).

A joint team meeting was held on 20 April 2016 for discussion on CWD trend, with attendance of ENPO, HyD, Representatives of Resident Site Staff (RSS), for Contract No. HY/2010/02, HY2011/03 and HY/2012/08, Representatives of Environmental Team (ET) for Contract No. HY/2010/02, HY2011/03, HY/2012/07 and HY/2012/08, and Representatives of Main Contractor for Contract No. HY/2012/08. The discussion/recommendation as recorded in the minutes of the meeting, which might be relevant to this Contract are summarized below. It was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine contracts) cannot be quantified or separate from the other stress factors. ENPO presented the CWD sighting and photo-identification survey results in mainland waters obtained from Hong Kong-Zhuhai-Macao Bridge Authority that some CWDs that were previously more often sighted in Hong Kong waters have expanded their ranges into mainland waters, and some with reduced usage in Hong Kong waters, while they are partially accounted for the local decline. Monitoring of Chinese White Dolphins in Southwest Lantau Waters - Fourth Quarterly Report (December 2015 - February 2016) (2) also reported some dolphins have extended their range to West and Southwest Lantau waters. It was reminded that the ETs shall keep reviewing the implementation status of the dolphin related mitigation measures and remind the contractor to ensure the relevant measures are fully implemented. The participants were requested by ENPO to collect and report the marine traffic statistics. It was recommended that the marine works of HZMB projects should be completed as soon as possible to reduce the overall duration of impacts and allow the dolphins population to recover as early as

### Remarks

The results of impact water quality and impact dolphin monitoring, the status of implemented marine ecological mitigation measures are documented in the approved *Twenty Sixth* to *Twenty Eighth Monthly EM&A Reports*. Comparison on water quality between impact and baseline periods is elaborated in the 9<sup>th</sup> *Quarterly EM&A Report*.

<sup>(2)</sup> Hung SKY (2016). Prepared for the Environmental Project Office for the HZMB, HKLR, HZMB HKBCF and TM-CLKL – Investigation. Available at: http://www.enpo.com.hk/EMnA\_Report/ENPO\_R7C/quarterly/pdf/SWL\_201512-201602.pdf