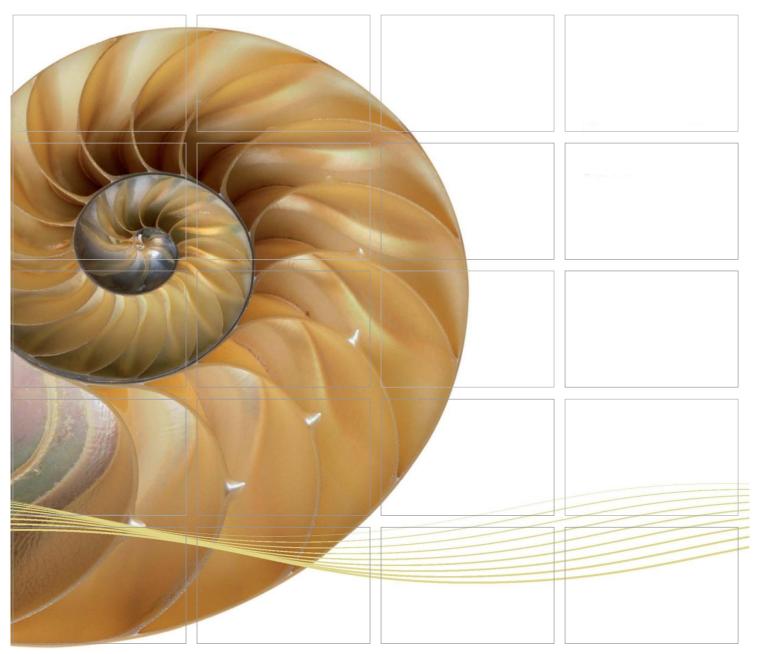
Report



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

Twenty-first Quarterly Environmental Monitoring & Audit (EM&A) Report

28 May 2019

Environmental Resources Management 2507, 25/F, One Harbourfront 18 Tak Fung Street Hunghom, Kowloon, 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

Twenty-first Quarterly Environmental Monitoring & Audit (EM&A) Report

Document Code: 0215660_21st Qtr EM&A_20190528.doc

Environmental Resources Management

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Client:		Project N	0:			
Gammo	n	021566	0			
Summary	:	Date:				
·		28 May	2019			
		Approved				
This document presents the Twenty-first Quarterly EM&A Report for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.						
		Mr Craig	a Reid			
		Partner	y			
		Certified b	oy:			
		Jami	W			
		Dr Jasn	nine Ng			
		ET Leade	er			
	21st Quarterly EM&A Report	VAR	JN	CAR	28/05/19	
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.			Internal OHSAS 18001: 20 Certificate No. OHS So 9001: 20		No. OHS 515956	





Ref.: HYDHZMBEEM00_0_7427L.19

5 June 2019

By Fax (3691 2899) and By Post

AECOM Asia Company Limited Supervising Officer's Representative Office 780 Cheung Tung Road Lantau, Hong Kong

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
21st Ouarterly EM&A Report for December 2018 - February 2019

Reference is made to the Environmental Team's submission of the quarterly EM&A report for December 2018 to February 2019 (ET's ref.: "0215660_21st Qtr EM&A_20190528.doc" dated 28 May 2019) certified by the ET Leader and provided to us via e-mail on 3 June 2019.

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

Thank you for very much your attention. Please feel free to contact the undersigned or the ENPO Leader, Mr. Y H Hui, should you require further information.

Yours sincerely, For and on behalf of Ramboll Hong Kong Limited

Farfa Roy

F. C. Tsang

Independent Environmental Checker Tuen Mun-Chek Lap Kok Link

C.C.

 HyD
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 (By Fax: 3188 6614)

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Internal: DY, YH, RY, DF, HW, 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 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.

The southern landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where a reclamation area is constructed by *Contract No. HY/2010/02* under *Environmental Permit No. EP-353/2009/K* and *EP-354/2009/D*. 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 under *EP-353/2009/K* and *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07*. Another part of the southern landfall area under *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07* after completion of reclamation works by *Contract No. HY/2010/02* in June 2016.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively completed by 2019. 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 Twenty-first Quarterly EM&A Report presenting the EM&A works carried out during the period from 1 December 2018 to 28 February 2019 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 2019

Land-based Works

- Reinstatement works along Cheung Tung Road;
- Abutment construction;
- Road works along North Lantau Highway;

- Asphalt paving;
- Construction of sign gantries, light poles and street furniture;
- Parapets and barriers installation; and
- Slope work of Viaducts A, B, C & D.

January 2019

Marine-based Works

• Reinstatement of Seawall at Seafront;

Land-based Works

- Reinstatement works along Cheung Tung Road;
- Drainage works;
- Construction of sign gantries, light poles and street furniture;
- Barriers installation; and
- Slope work of Viaducts A, B, C & D.

February 2019

Marine-based Works

• Reinstatement of Seawall at Seafront;

Land-based Works

- Drainage works;
- Construction of sign gantries, light poles and street furniture;
- Road marking at Portion A; and
- Slope work of Viaducts A, B, C & D.

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

24-hour TSP monitoring 18 sessions

1-hour TSP monitoring 18 sessions

Noise monitoring 18 sessions

Water quality monitoring 34 sessions

Dolphin monitoring 6 sessions

Breaches of Action and Limit Levels for Air Quality

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

Impact Dolphin Monitoring

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between December 2018 to February 2019. No unacceptable impact from the construction activities of the TM-CLKL Southern Connection Viaduct Section on Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphins) was noticeable from general observations during the dolphin monitoring in this reporting quarter.

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 Chinese White Dolphin was recorded in the monitoring period during the exclusion zone monitoring.

Environmental Complaints, Non-compliance & Summons

There was no environmental complaint, notification of summons or successful prosecution recorded 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 2019

Marine-based Works

• Reinstatement of Seawall at Seafront

Land-based Works

- Slope work of Viaduct A;
- Landscaping works at NLH/CTR; and
- Landscaping works at HKBCF.

April 2019

Marine-based Works

Reinstatement of Seawall at Seafront;

Land-based Works

- Slope work of Viaduct D;
- Landscaping works at NLH/CTR; and
- Landscaping works at HKBCF.

May 2019

Marine-based Works

• Reinstatement of Seawall at Seafront

Land-based Works

- Slope work of Viaduct D; and
- Landscaping works at HKBCF.

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.

1.1 BACKGROUND

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 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*.

The southern landfall of TM-CLK Link lies alongside the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) where a reclamation area is constructed by *Contract No. HY/2010/02* under *Environmental Permit No. EP-353/2009/K* and *EP-354/2009/D*. 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 under *EP-353/2009/K* and *EP-*

354/2009/D was handed-over to *Contract No. HY/2012/07*. Another part of the southern landfall area under *EP-354/2009/D* was handed-over to *Contract No. HY/2012/07* after completion of reclamation works by *Contract No. HY/2010/02* in June 2016.

The construction phase of the Contract commenced on 31 October 2013 and will be tentatively be completed by 2019. 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

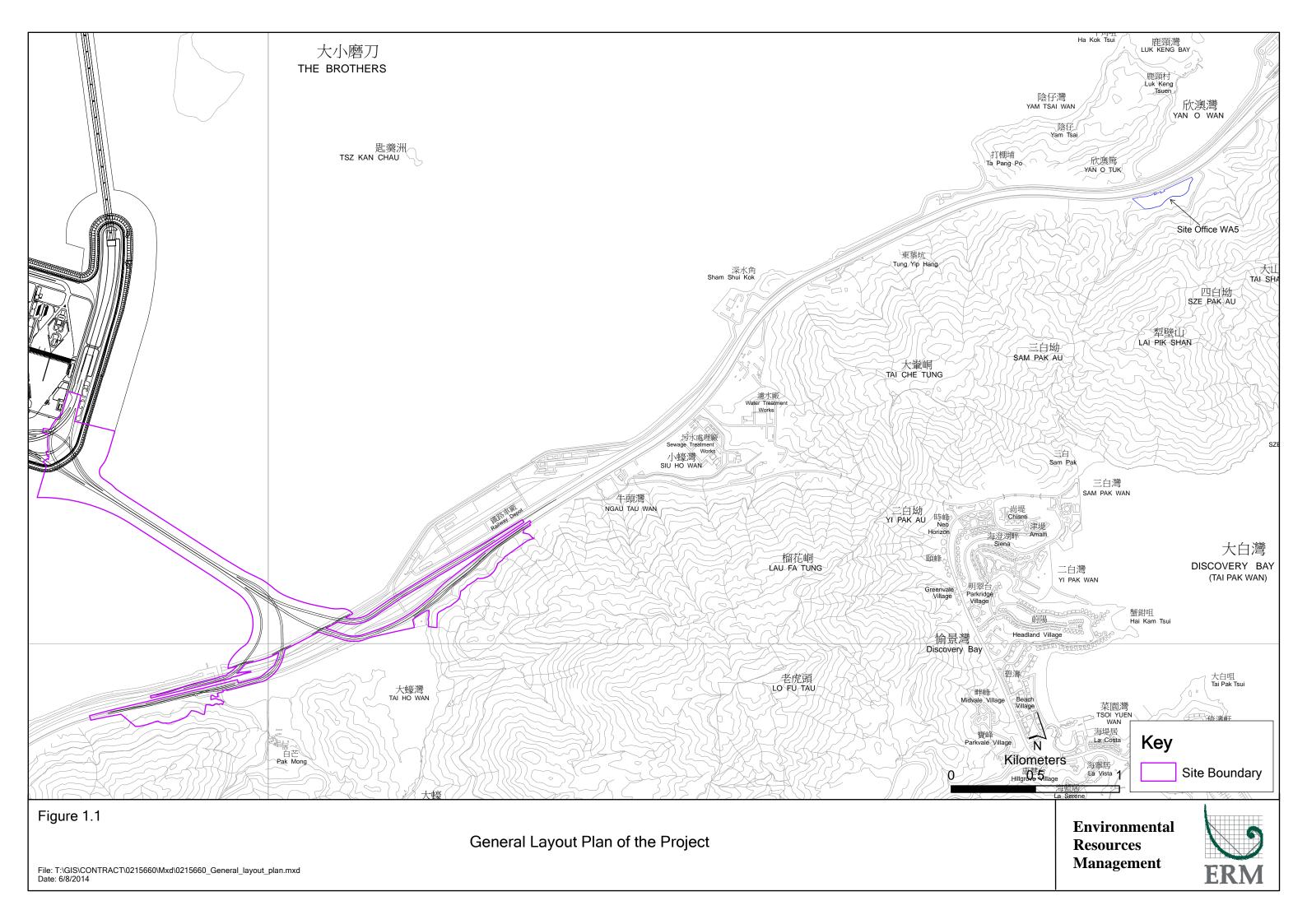
This is the Twenty-first Quarterly EM&A Report under the *Contract No. HY/2012/07 Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section.* This report presents a summary of the environmental monitoring and audit works from 1 December 2018 to 28 February 2019.

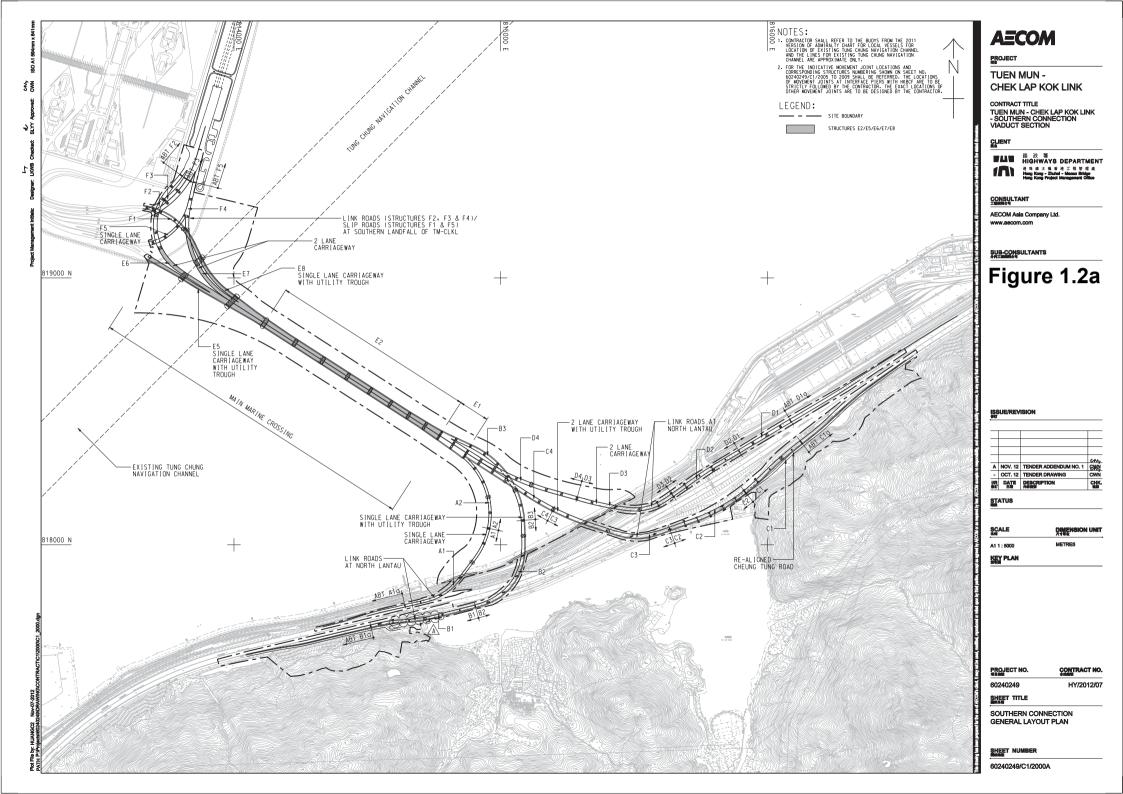
1.3 ORGANIZATION STRUCTURE

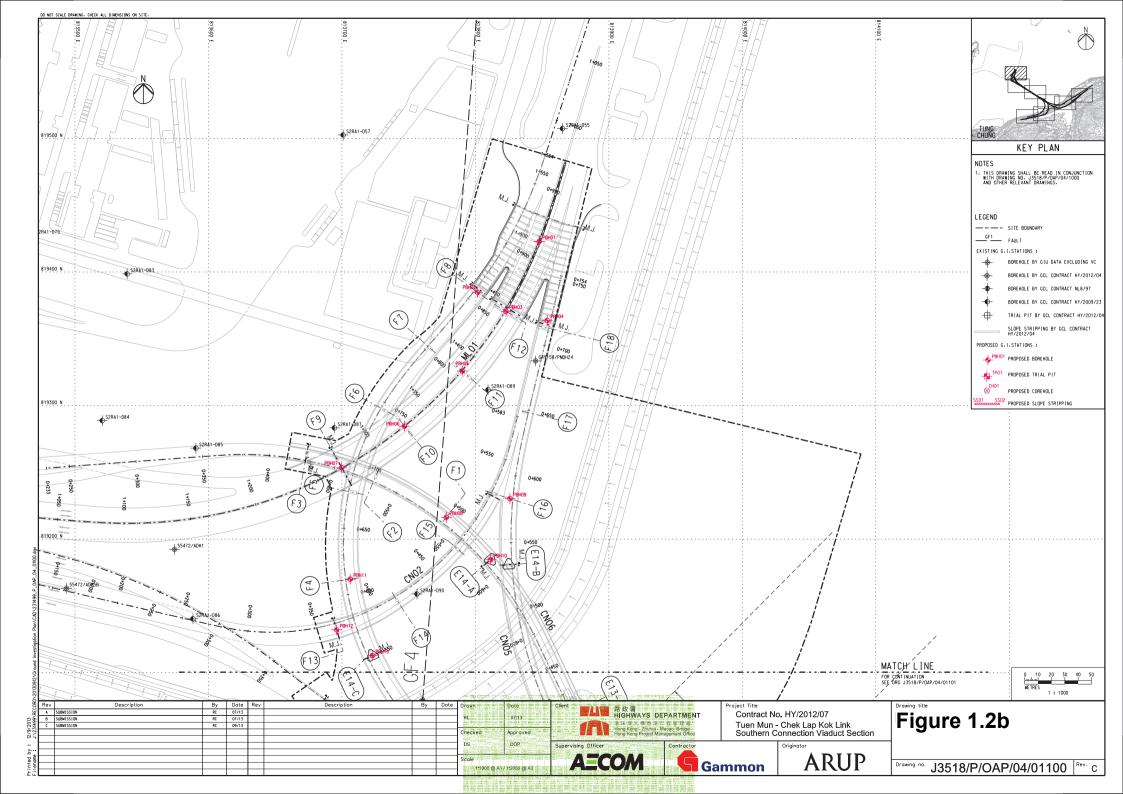
The organization structure of the Contract is shown in *Appendix A*. The key personnel contact names and contact details are summarized in *Table 1.1* below.

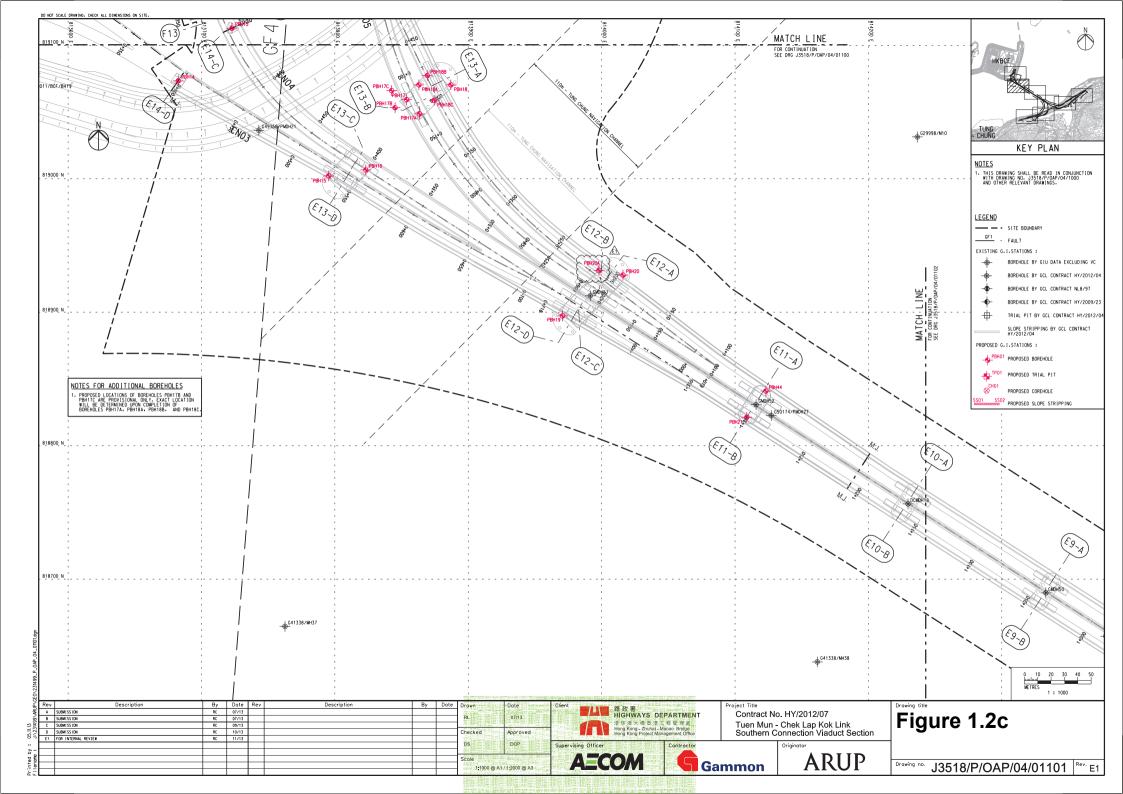
Table 1.1 Contact Information of Key Personnel

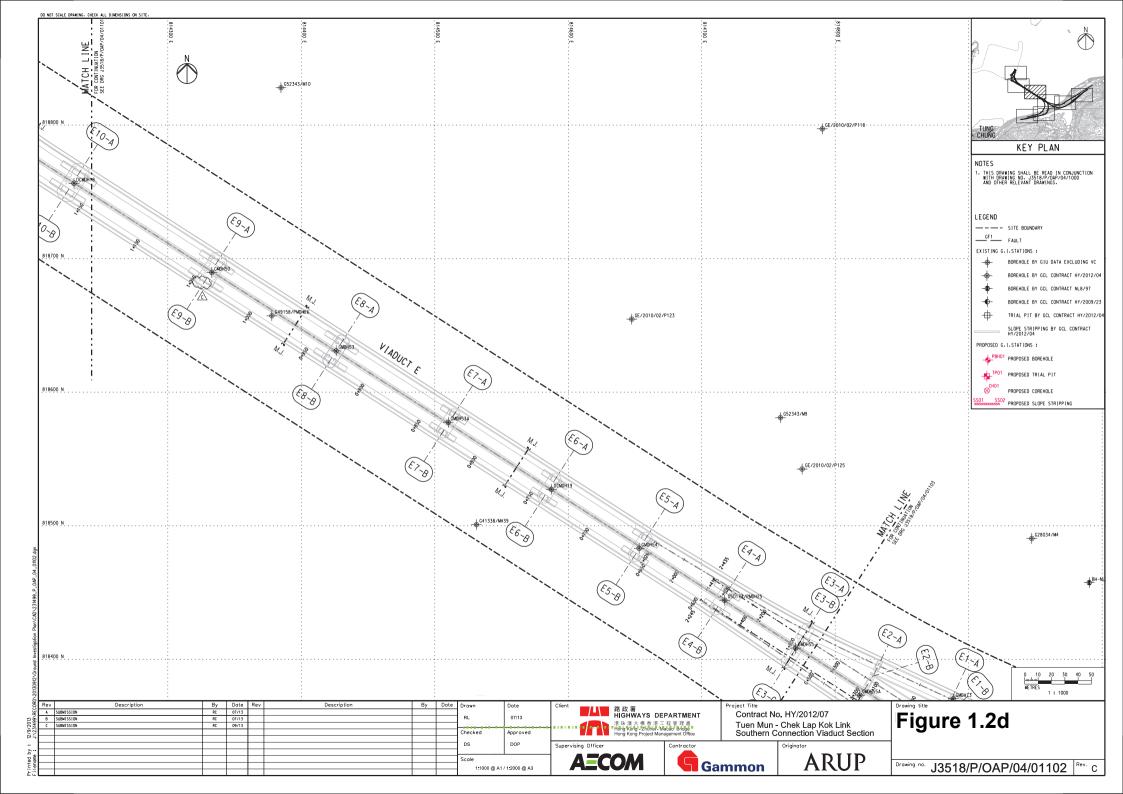
Party	Position	Name	Telephone	Fax
HyD (Highways Department)	Senior Engineer	Kenneth Lee	2762 3413	3188 6614
	Engineer	Alex Wong	2762 3471	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Daniel Ip	3553 3800	2492 2057
	Resident Engineer	Ivan Yim	3691 2967	3691 2899
ENPO / IEC (Ramboll Hong Kong	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
Ltd.)	IEC	Dr. F.C. Tsang	3465 2851	3465 2899
Contractor (Gammon Construction Limited)	Environmental Officer	Roy Leung	3520 0387	3520 0486
,	24-hour Complaint Hotline		9738 4332	
ET (ERM-HK)	ET Leader	Dr. Jasmine Ng	2271 3311	2723 5660

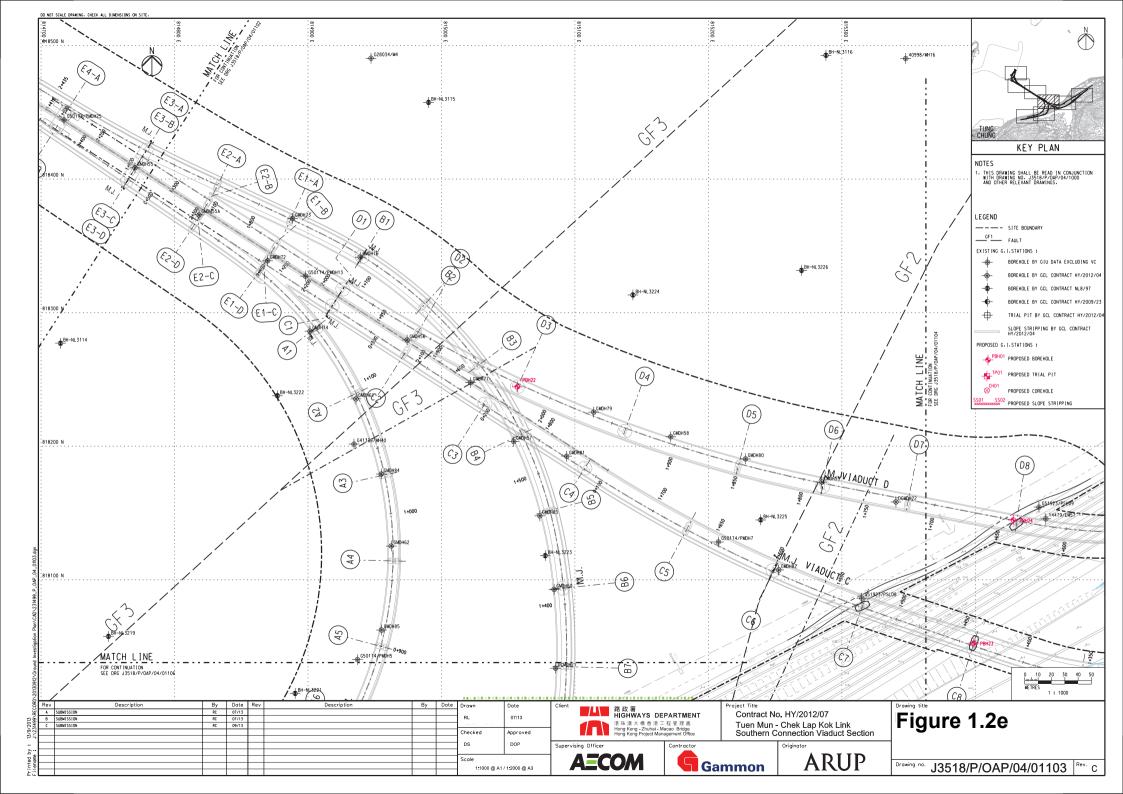


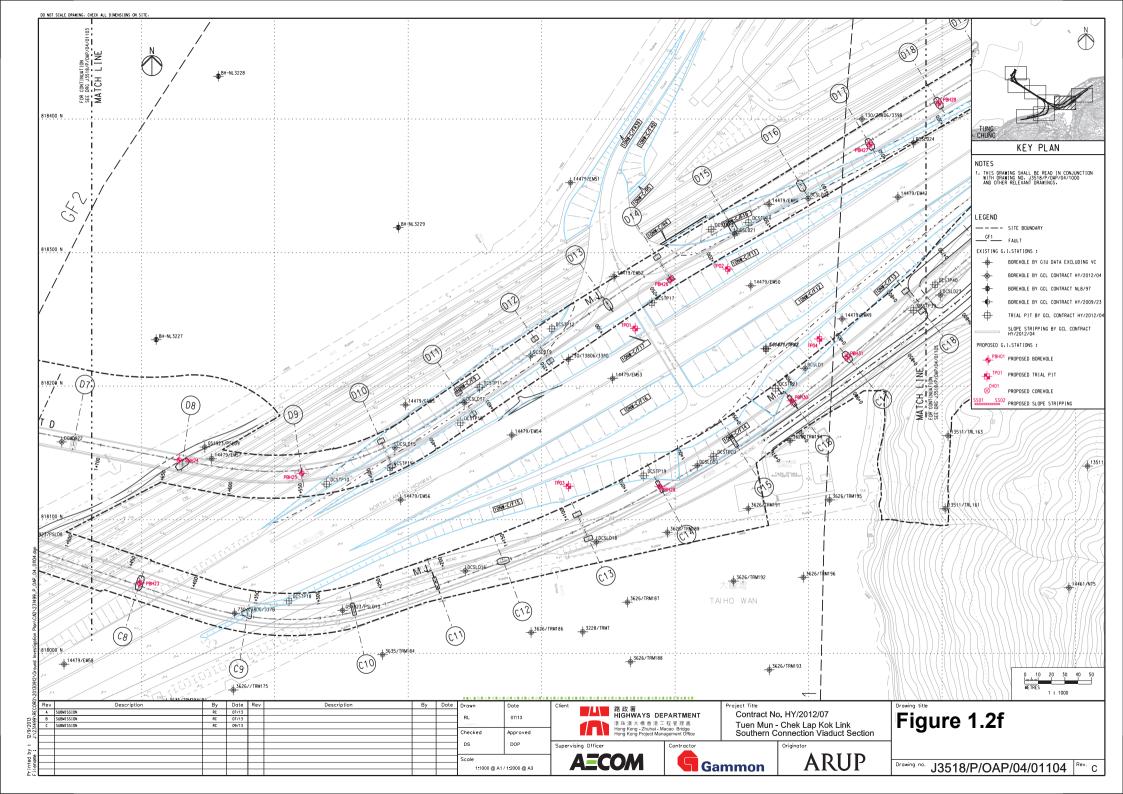


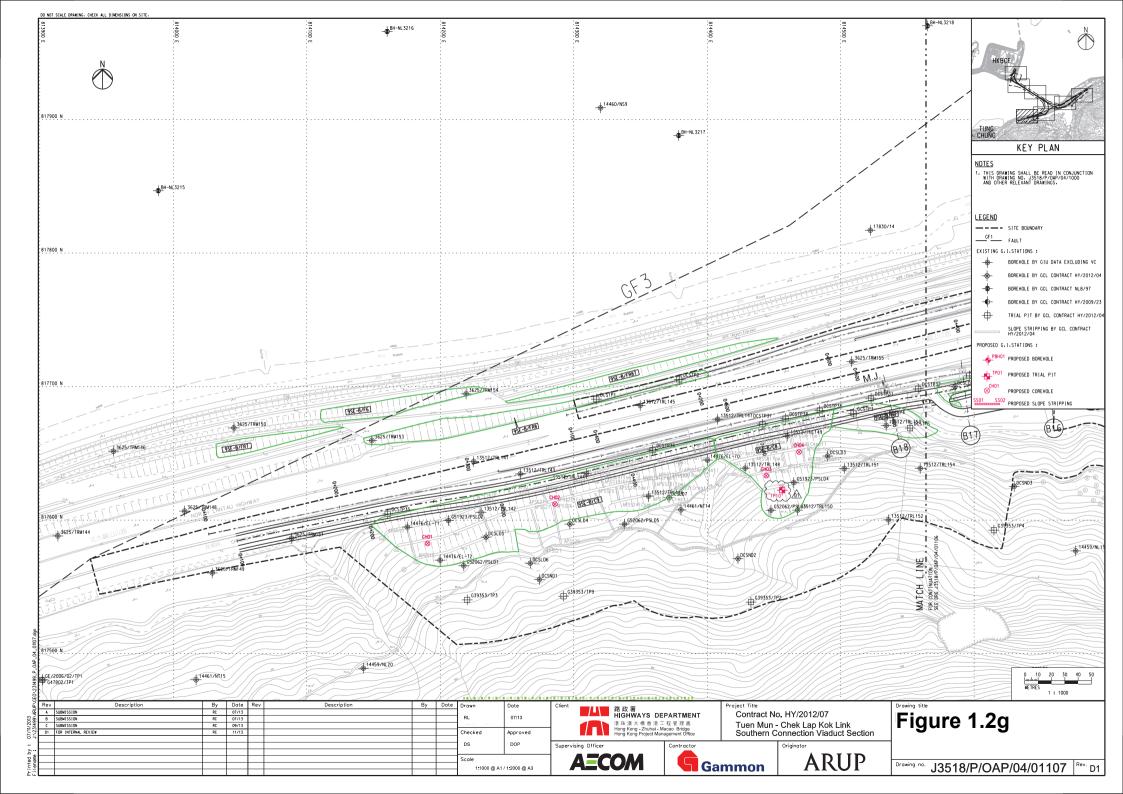


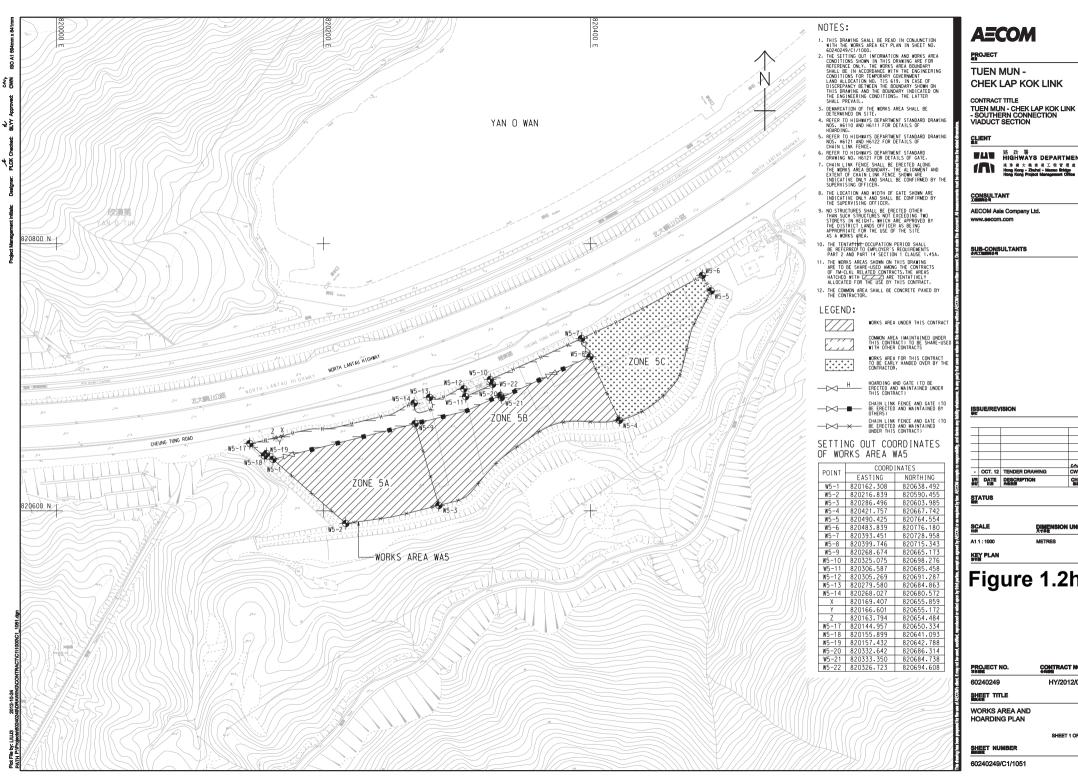












AECOM

TUEN MUN -CHEK LAP KOK LINK

CONTRACT TITLE

■ B 政 署 HIGHWAYS DEPARTMENT

CONSULTANT

AECOM Asia Company Ltd.

SUB-CONSULTANTS

ISSUE/REVISION

CWN - OCT. 12 TENDER DRAWING VR DATE DESCRIPTION œK.

Figure 1.2h

PROJECT NO.

CONTRACT NO. HY/2012/07

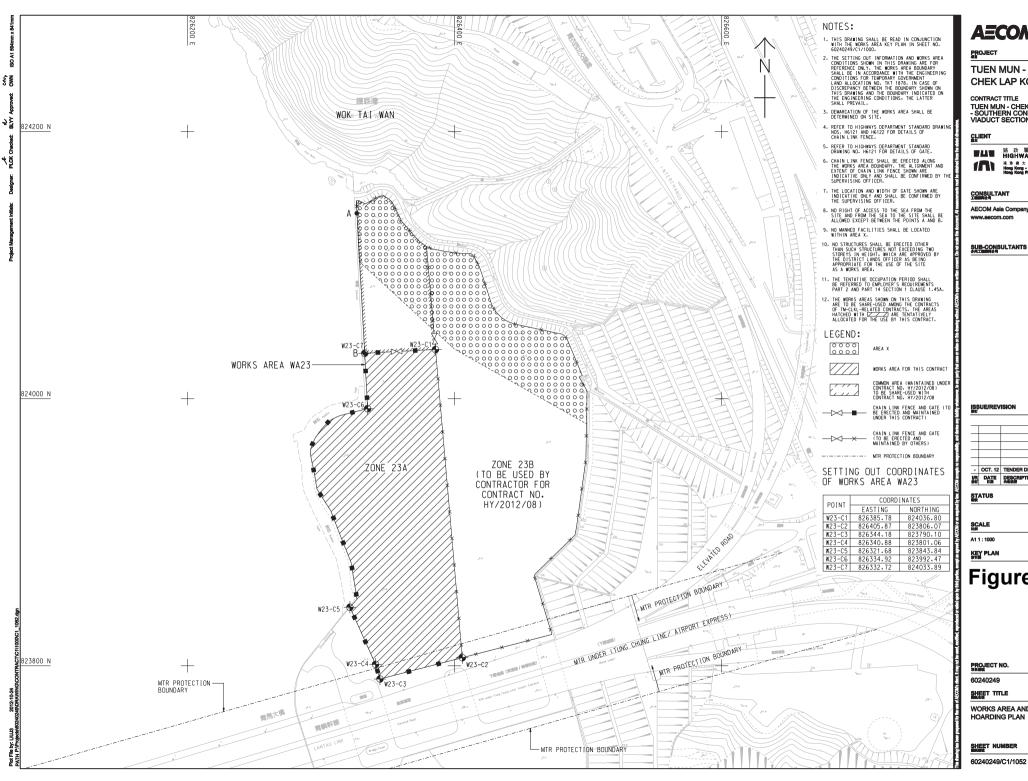
SHEET TITLE

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.

SUB-CONSULTANTS

SSUE/REVISION

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CONTRACT NO. HY/2012/07

SHEET TITLE

WORKS AREA AND HOARDING PLAN

SHEET 2 OF 2

SHEET NUMBER

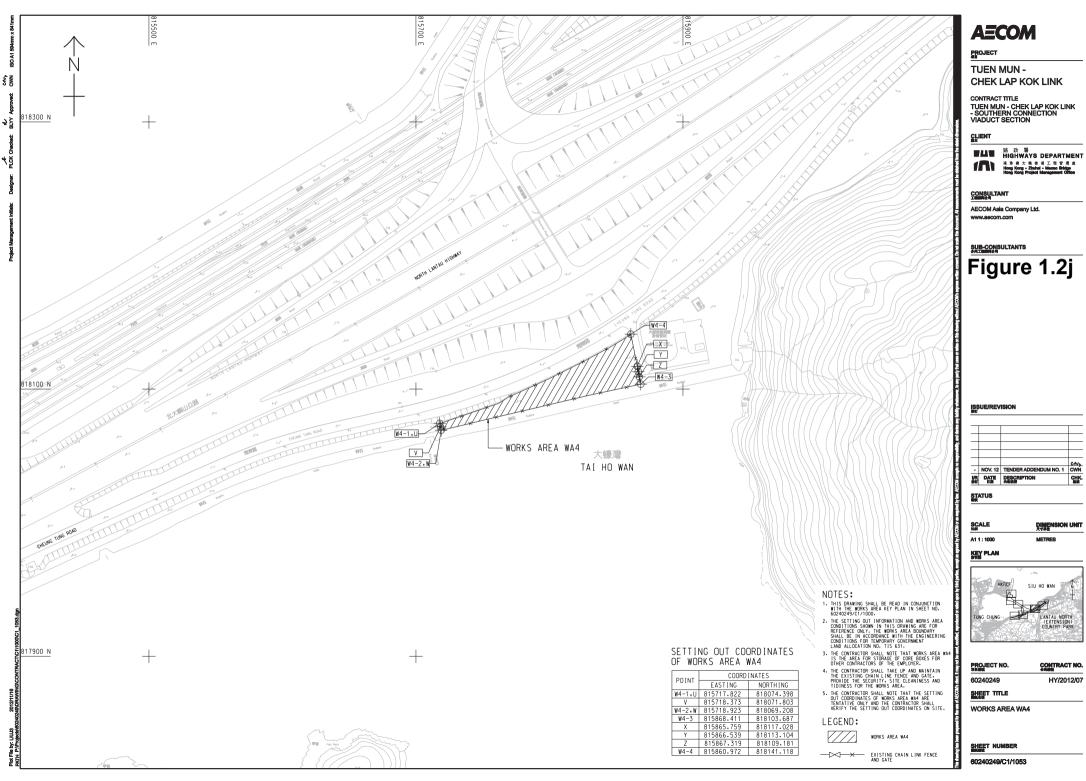
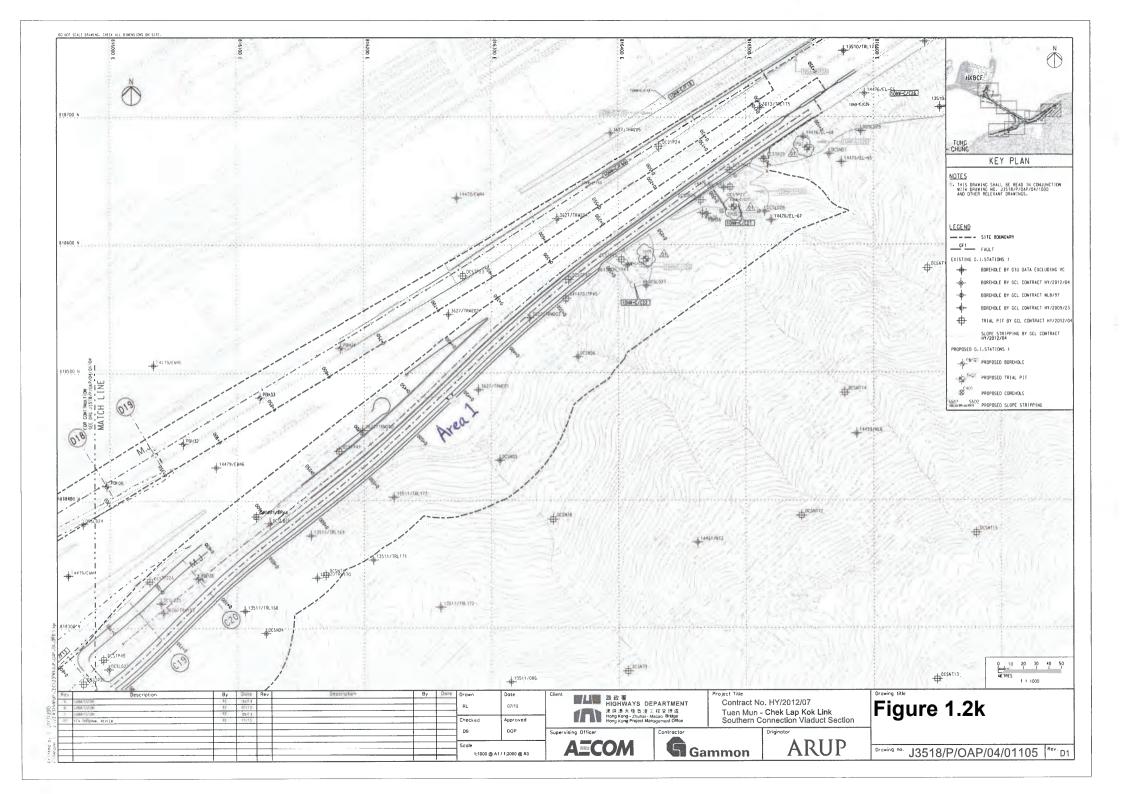


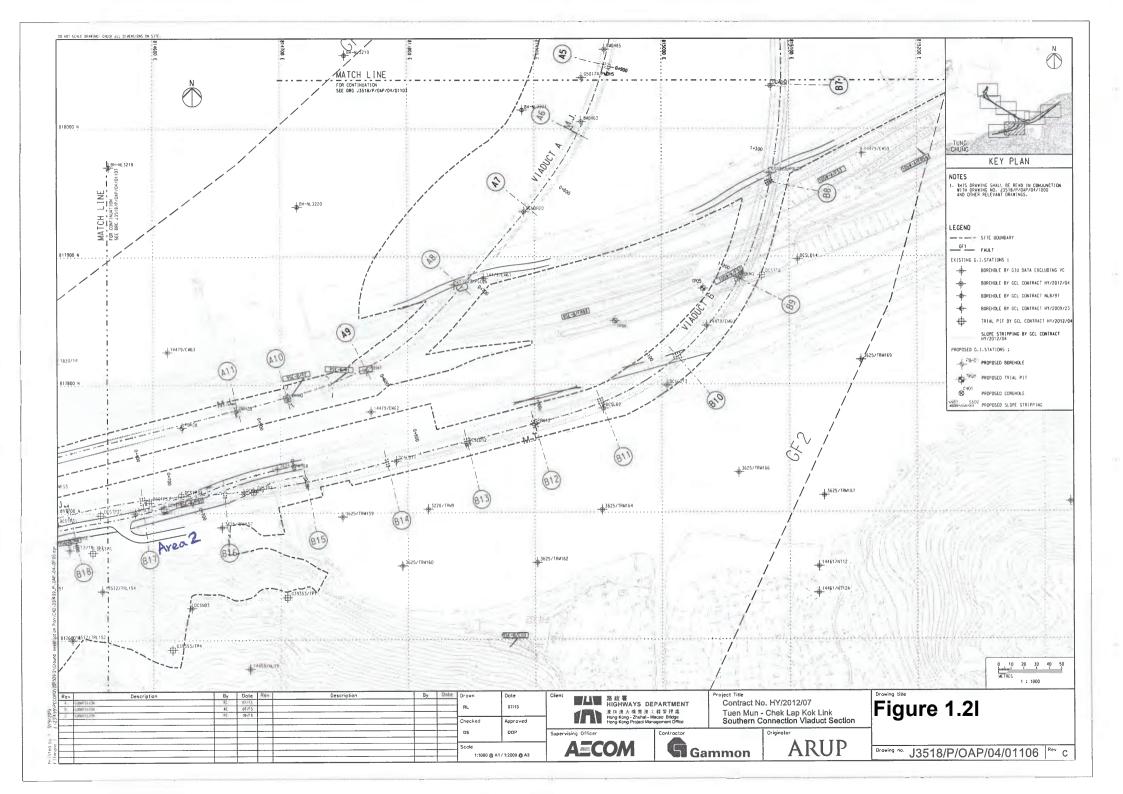
Figure 1.2j

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			CNy



HY/2012/07





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 2018 to February 2019 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 2019

Land-based Works

- Reinstatement works along Cheung Tung Road;
- Abutment construction;
- Road works along North Lantau Highway;
- Asphalt paving;
- Construction of sign gantries, light poles and street furniture;
- Parapets and barriers installation; and
- Slope work of Viaducts A, B, C & D.

January 2019

Marine-based Works

• Reinstatement of Seawall at Seafront;

Land-based Works

- Reinstatement works along Cheung Tung Road;
- Drainage works;
- Construction of sign gantries, light poles and street furniture;
- Barriers installation; and
- Slope work of Viaducts A, B, C & D.

February 2019

Marine-based Works

Reinstatement of Seawall at Seafront;

Land-based Works

- Drainage works;
- Construction of sign gantries, light poles and street furniture;
- Road marking at Portion A; and
- Slope work of Viaducts A, B, C & D.

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*.

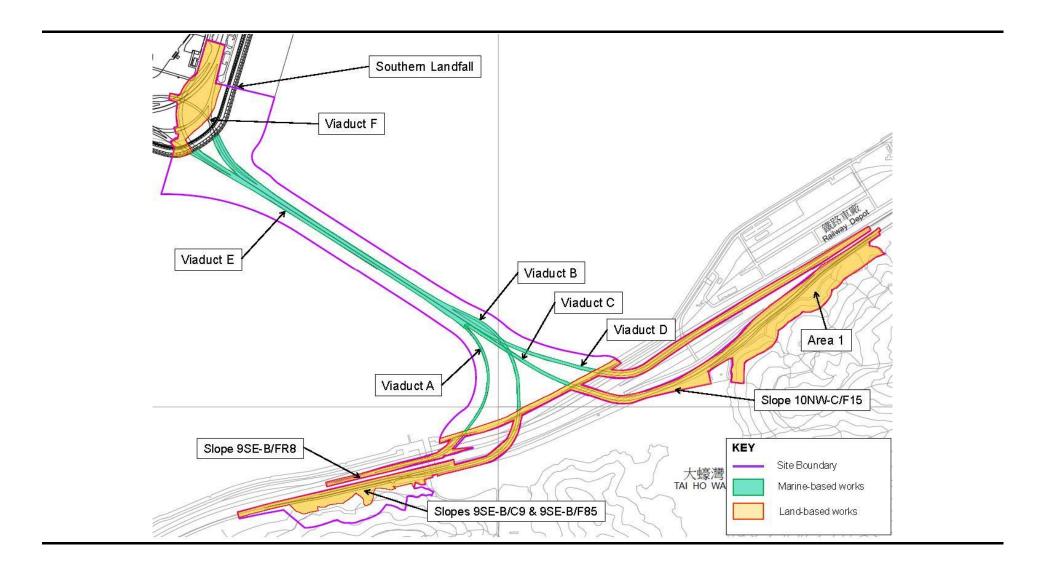
The environmental mitigation measures implementation schedule is presented in *Appendix C*.

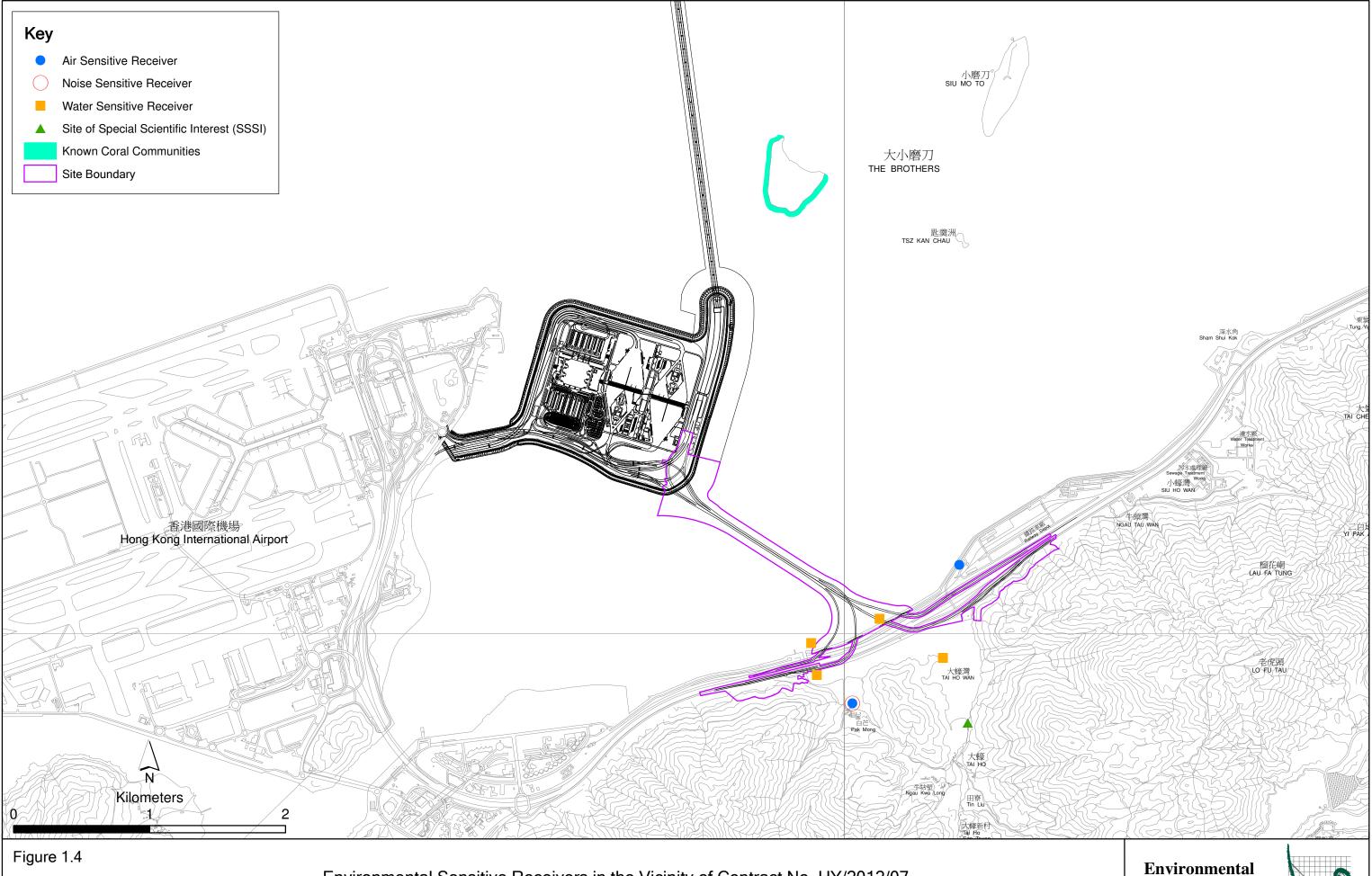
1.5 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

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.

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



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 HZMB Projects during October 2011 included the two monitoring stations ASR9A and ASR9C for this Project. Thus, the baseline monitoring results and Action/Limit Level presented in HZMB 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.

⁽¹⁾ 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.

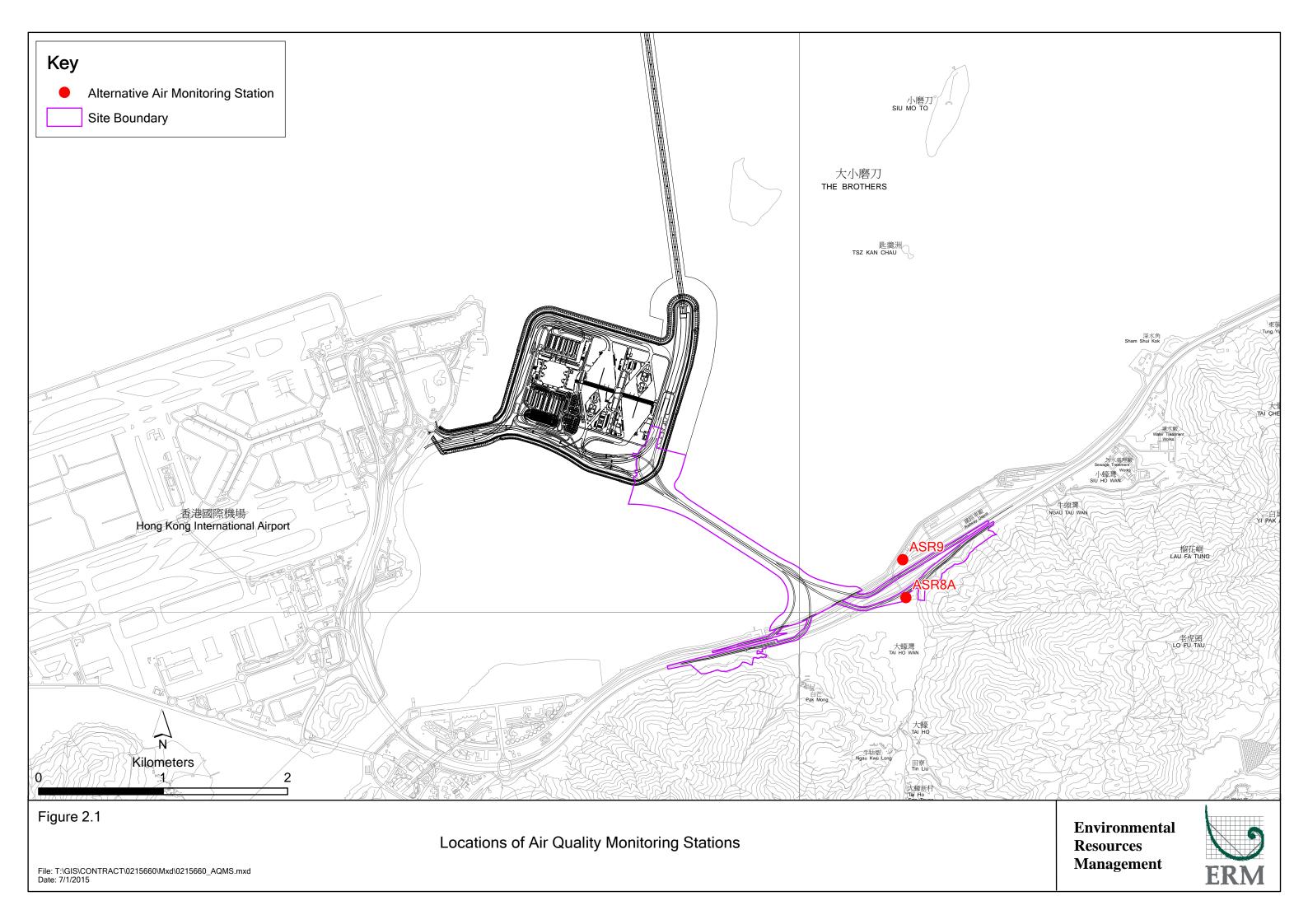


Table 2.1 Locations of Impact Air Quality Monitoring Stations and Monitoring Dates in this Reporting Period

Monitoring Station (1)	Monitoring Period	Location	Description	Parameters & Frequency
ASR8A	3, 6, 12, 18, 21 and 27 December	Area 4	On ground at the works area, Area 4	• 1-hour Total Suspended Particulates (1-hour TSP,
ASR9	2018 2, 8, 14, 17, 23 and 29 January 2019 4, 9, 13, 19, 25, 26 and 28 February 2019	MTR Depot	On the ground nearby MTR Depot entrance	 μg/m³), 3 times per day every 6 days 24-hour Total Suspended Particulates (24-hour TSP, μg/m³), daily for 24-hour every 6 days

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*. The 24-hour TSP monitoring at ASR9 on 25 February 2019 failed due to power shortage and a make-up 24-hour TSP monitoring at ASR9 was conducted 26 February 2019. In addition, 24-hour TSP monitoring at ASR8A also failed due to power shortage on 28 February 2019.

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 *Sixty-second* to *Sixty-fourth Monthly EM&A Reports*.

⁽¹⁾ 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 2018	ASR 8A	97	46-300	394	500
	ASR 9	87	53-164	393	500
January 2019	ASR 8A	110	46-229	394	500
	ASR 9	110	43-271	393	500
February 2019	ASR 8A	95	29-242	394	500
	ASR 9	77	26-193	393	500

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

Month	Station	Average	Range (μg/m³)	Action Level	Limit Level
		(μg/m³)		(μg/m³)	(μg/m³)
December 2018	ASR 8A	56	39-68	178	260
	ASR 9	62	48-87	178	260
January 2019	ASR 8A	73	45-101	178	260
	ASR 9	79	51-114	178	260
February 2019	ASR 8A	55	30-91	178	260
	ASR 9	58	42-82	178	260

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

All 1-hour and 24-hour TSP results were below the Action and Limit Levels at all monitoring locations in this reporting period. No action is thus required to be undertaken in accordance with the Event Action Plan presented in Appendix J.

2.2 Noise Monitoring

The baseline noise monitoring undertaken by the HZMB Projects during the period of 18 October to 1 November 2011 included the monitoring station NSR1 for this Project. Thus, the baseline monitoring results and Action/Limit Level presented in HZMB 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*.

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.

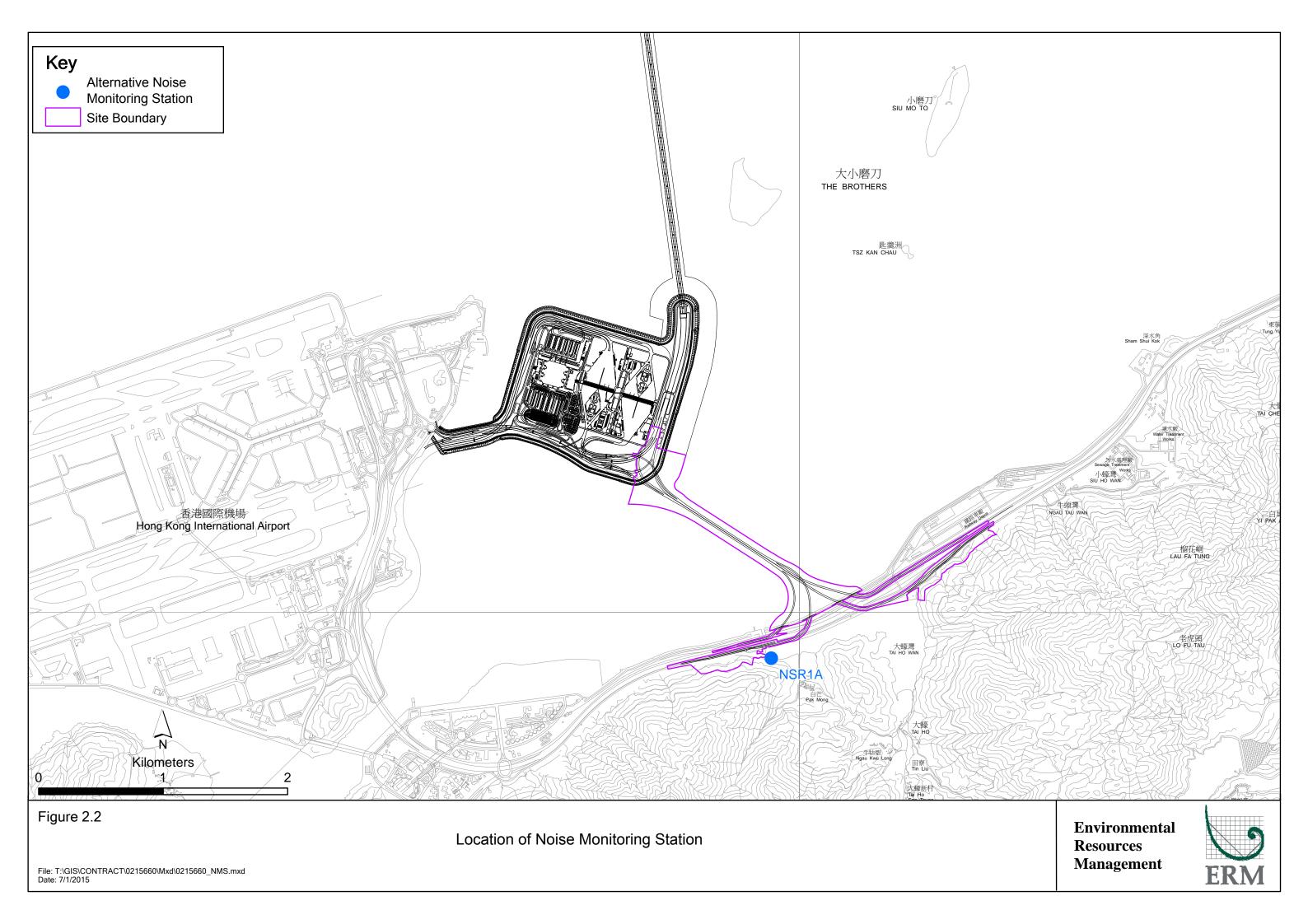


Table 2.5 Location of Impact Noise Monitoring Station and Monitoring Dates in this Reporting Period

Monitoring Station	Monitoring Period	Location	Parameters & Frequency
NSR1A	3, 6, 12, 18, 21 and 27 December 2018 2, 8, 14, 17, 23 and 29 January 2019 4, 9, 13, 19, 25, and 28 February 2019	Pak Mong Village Pavilion	 30-mins measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). L_{eq}, L₁₀ and L₉₀ would be recorded. At least once a week

Note:

Table 2.6 Noise Monitoring Equipment

Equipment	Brand and Model
Integrated Sound Level Meter	Rion NL-52
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 schedule for construction noise monitoring in the reporting period is 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 *sixty-second* to *Sixty-fourth Monthly EM&A Reports*.

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

Month	Average , dB(A), L _{eq}	Range, dB(A), L _{eq}	Limit Level, dB(A), L _{eq}
	(30mins)	(30mins)	(30mins)
December 2018	64	63-65	75
January 2019	64	64-65	75
February 2019	63	62-65	75

A total of 18 monitoring events were undertaken in the reporting period with no Action Level and Limit Level exceedance recorded at the monitoring

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

station in the reporting period. No action is thus required to be undertaken in accordance with the Event Action Plan presented in *Appendix J*.

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

2.3 WATER QUALITY MONITORING

The baseline water quality monitoring undertaken by the HZMB Projects between 6 and 31 October 2011 included all monitoring stations except SR4a for the Project. Thus, the baseline monitoring results except for station SR4a and Action/Limit Level presented in HZMB Baseline Monitoring Report ⁽¹⁾ 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.

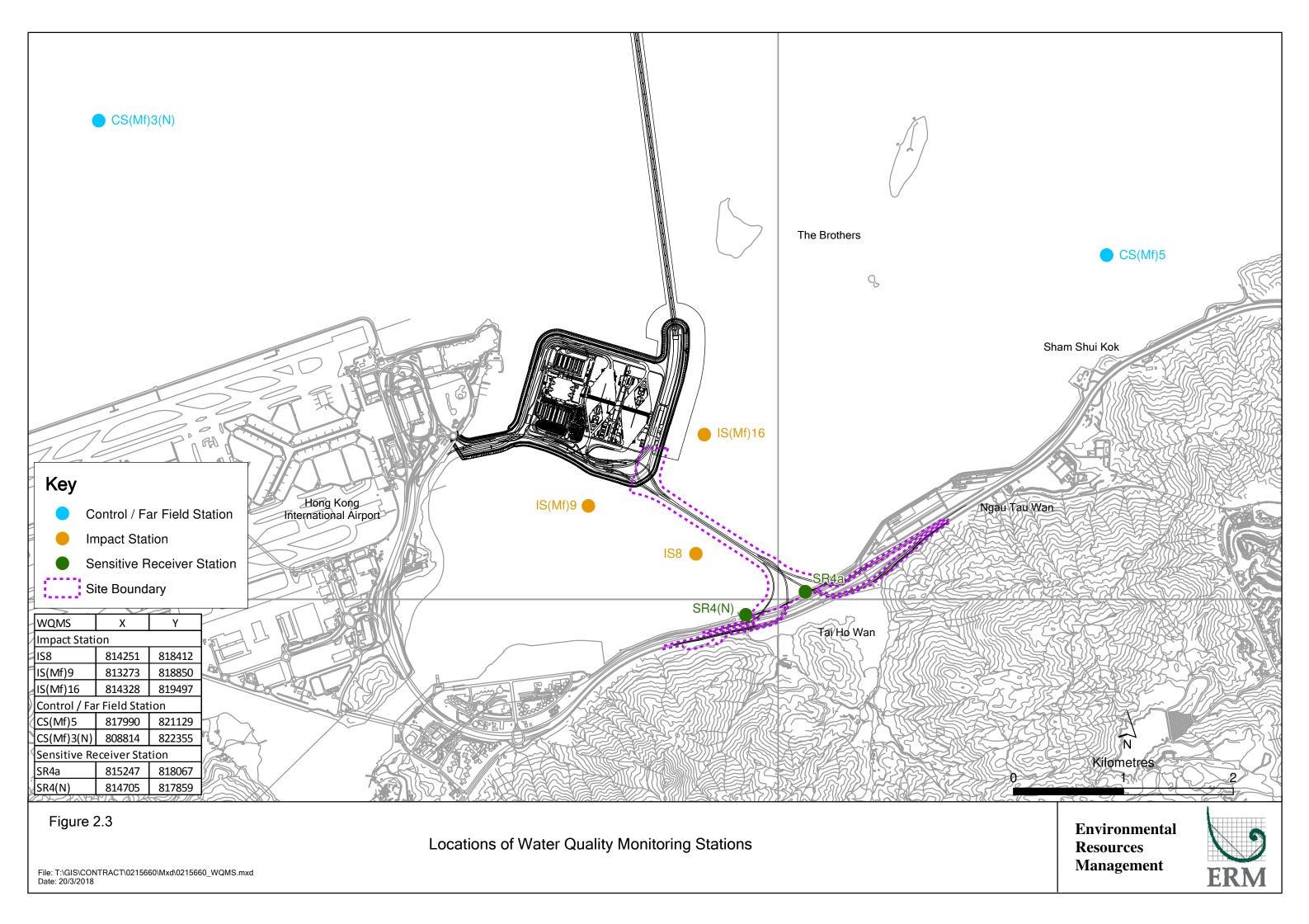
Due to Three-Runway System (3RS) marine construction works, an alternative water quality control station CS(Mf)3(N) was proposed to replace control station CS(Mf)3. The *Proposal of Alternative Water Quality Monitoring Station* ⁽²⁾ was submitted to EPD on 31 March 2017 and granted on 6 April 2017. Water quality monitoring at CS(Mf)3(N) is undertaken since 2 May 2017. The locations of the monitoring stations under the Contract are shown in *Figure 2.3* and *Table 2.8*.

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

Station ID	Type	Coor	dinates	*Parameters, unit	Depth	Frequency
		Easting	Northing	•		
IS(Mf)9	Impact	813273	818850	• Temperature(°C)	3 water	Impact
	Station			 pH(pH unit) 	depths:	monitoring: 3
	(Close to			• Turbidity (NTU)	1m	days per
	HKBCF			• Water depth (m)	below sea	week, at mid-
	construction			 Salinity (ppt) 	surface,	flood and
	site)			 Dissolved 	mid-depth	mid-ebb tides
IS(Mf)16	Impact	814328	819497	Oxygen (DO)	and 1m	during the
	Station			(mg/L and % of	above sea	construction
	(Close to			saturation)	bed. If	period of the
	HKBCF			• Suspended Solid	the water	Contract.
	construction			(SS) (mg/L)	depth is	
	site)				less than	

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.

⁽²⁾ The Proposal of Alternative Water Quality Monitoring Station with the verification letter from IEC was submitted to EPD on 31 March 2017, and subsequently replied with no objection on.6 April 2017.



Station ID	Type	Coor	dinates	*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS8	Impact	814251	818412		3m, mid-	
	Station(Close				depth	
	to HKBCF				sampling	
	construction				only. If	
	site)				water	
SR4(N)	Sensitive	814705	817859		depth less	
	receiver (Tai				than 6m,	
	Ho Inlet)				mid-depth	
SR4a	Sensitive	815247	818067		may be	
	receiver				omitted.	
CS(Mf)3(N)	Control	808814	822355			
	Station					
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.

Water Quality Monitoring Station CS(Mf)3 was relocated to CS(Mf)3(N) since 2 May 2017. Water Quality Monitoring Station SR4 was relocated to SR4(N) since 2 March 2018.

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
Multi-parameters	YSI ProDSS
(Dissolved Oxygen, Salinity,	
Turbidity, Temperature, pH)	
Positioning Equipment	Furuno GP-170
Water Depth Detector	Lowrance Mark 5x / Garmin Striker 4
Water Sampler	WildCo Vertical Alpha Bottles 1120-2.2L /1120-3.2L Aquatic Research Instrument Vertical/Horizontal Point Water Sampler 2.2L / 3.0L

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*. Water quality monitoring on 26 December 2018, 4, 6 and 8 February 2019 were cancelled due to suspension of marine works during site closure.

2.3.4 Results and Observations

In this reporting period, a total of 34 monitoring events for impact water quality monitoring were conducted at 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 *Sixty-second* to *Sixty-fourth Monthly EM&A Reports*.

No exceedance was recorded for water quality impact monitoring in the reporting period. No actions was required to be undertaken in accordance with the Event Action Plan as 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 Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) from the Contract. 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

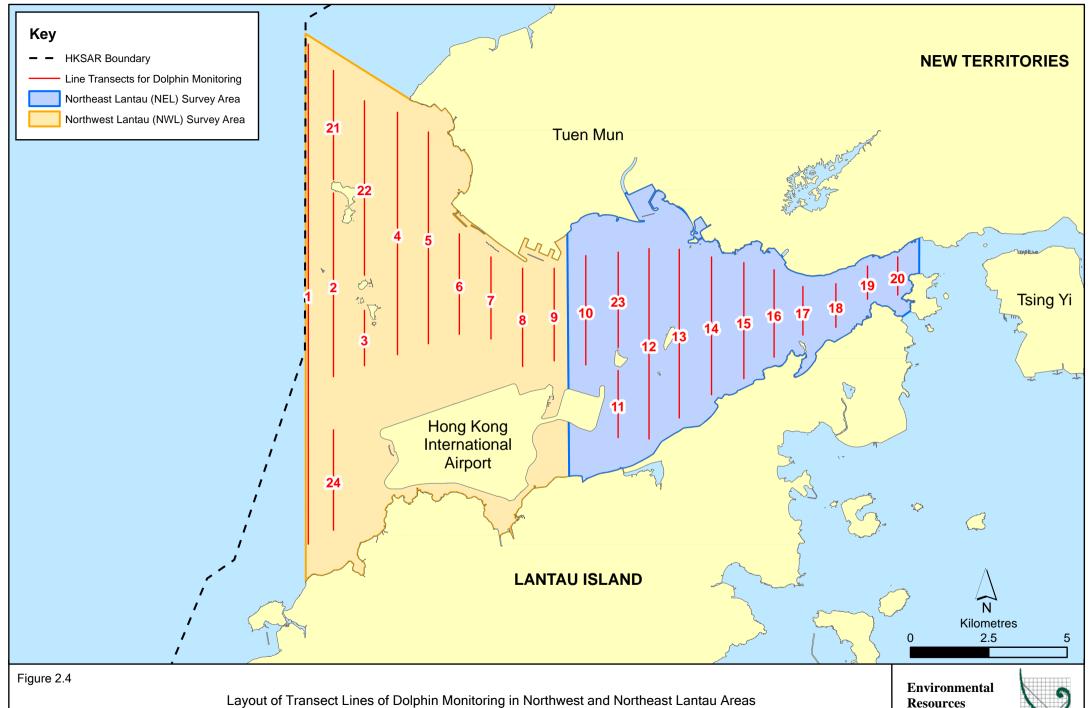
2.4.3 Monitoring Parameter, Frequencies & Duration

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 ⁽¹⁾.

(1) Proposal on the changes of transect lines for dolphin monitoring was approved by EPD on 28 July 2017 (Reference number: (19) in EP2/G/A/129 Pt. 8).



File: T:\GIS\CONTRACT\0212330\Mxd\0212330_Transect_of_Dolphin_Monitoring.mxd Date: 21/9/2017

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	815456	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805476	820800	14	Start Point	817537	820220
2	End Point	805476	826654	14	End Point	817537	824613
3	Start Point	806464	821150	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	821500	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	821850	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	822150	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	822000*	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	821176	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	24	Start Point	805476	815900
12	End Point	815542	824882	24	End Point	805476	819100

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 801.74 km of survey effort was collected, with 94.7% 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, 302.10 km and 499.64 km of survey effort were conducted in NEL and NWL survey areas respectively. The total survey effort conducted on primary lines was 579.99 km, while the effort on secondary lines was 221.75 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 2018 to February 2019, a total of twelve (12) groups of 38 Chinese White Dolphins were sighted. Ten (10) of the twelve (12) dolphin sightings were made during on-effort, while eight (8) of the ten (10) on-effort dolphin sightings were made on primary lines. In this quarterly period, all dolphin groups were sighted in NWL, no sighting of dolphin was sighted in NEL. Summary table of the dolphin sightings is shown in *Appendix II of 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	Survey period	Encounter rate (STG)	Encounter rate (ANI)	
Area		(no. of on-effort	(no. of dolphins from all	
		dolphin sightings per	on-effort sightings per	
		100 km of survey	100 km of survey effort)	
		effort)		
		Primary Lines Only	Primary Lines Only	
	Set 1: 3 rd / 5 th Dec 2018	0.0	0.0	
	Set 2: 10 th / 12 th Dec 2018	0.0	0.0	
	Set 3: 2 nd /3 rd Jan 2019	0.0	0.0	
NEL	Set 4: 7th / 14th Jan 2019	0.0	0.0	
	Set 5: 1st / 14th Feb 2109	0.0	0.0	
	Set 6: 20th / 25th / 26th Feb	0.0	0.0	
	2019			
	Set 1: 3 rd / 5 th Dec 2018	3.95	11.86	
	Set 2: 10th / 12th Dec2018	0.00	0.00	
	Set 3: 2 nd /3 rd Jan 2019	3.32	14.94	
NWL	Set 4: 7th / 14th Jan 2019	0.00	0.00	
	Set 5: 1st / 14th Feb 2109	3.86	7.72	
	Set 6: 20th / 25th / 26th Feb	3.29	13.16	
	2019			

Note: Dolphin Encounter Rates are deduced from the six sets of surveys (two surveys in each set and three surveys in the last set in February 2019) 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 2018 – February 2019	September - November 2011	December September 2018 - February November 2019 2011		
Northeast Lantau	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81	
Northwest Lantau	2.40 ± 1.88	9.85 ± 5.85	7.95 ± 6.60	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

Group size of Chinese White Dolphins ranged from one (1) to seven (7) individuals per group in North Lantau region during December 2018 to February 2019. 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 Group Sizes

	Average Dolph	Average Dolphin Group Size						
	December 2018 - February 2019 September - November 2011							
Overall	3.17 ± 1.80 (n = 12)	3.72 ± 3.13 (n = 66)						
Northeast Lantau		3.18 ± 2.16 (n = 17)						
Northwest Lantau	3.17 ± 1.80 (n = 12)	3.92 ± 3.40 (n = 49)						

One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between December 2018 to February 2019.

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 both NEL and NWL, 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 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. Twelve (12) site inspections were carried out in the reporting quarter on 6, 11, 18 and 27 December 2018, 2, 9, 16, 22 and 31 January 2019 and 13, 20 and 28 February 2019.

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
6 December 2018	 WA2, WA4 Chemical containers should be placed in drip tray. Accumulated refuse should be removed. 	 WA2, WA4 The Contractor was reminded to place chemical containers in drip tray. The Contractor was reminded to remove accumulated refuse.
11 December 2018	 Viaduct E Chemical drums and containers should be placed in drip tray. Stagnant water in drip tray should be discharged. Suggest to spray water during concrete breaking to reduce dust generation 	 Viaduct E The Contractor was reminded to place chemical drums and containers in drip tray. The Contractor was reminded to discharge stagnant water in drip tray. The Contractor was suggested to spray water during concrete breaking.
18 December 2018	 Portion A Accumulated construction waste was observed. Oil was observed in the drip tray of the generator. Chemical container should be placed in drip tray. 	 Portion A The Contractor was reminded to clear accumulated construction waste. The Contractor was reminded to clear oil in drip tray. The Contractor was reminded to place chemical container in drip tray.

Inspection Date	Location & Environmental Observations	Recommendations/ Remarks
27 December 2018	 Viaduct F & Ramp F Chemical drums and containers should be placed in drip tray. Ramp F Accumulated waste should be cleared. Stagnant water was observed in the drip tray of the generator. 	 Viaduct F & Ramp F The Contractor was reminded to place chemical containers and drums in drip tray. Ramp F The Contractor was reminded to clear accumulated waste. The Contractor was reminded to discharge stagnant water.
2 January 2019	 WA4A -4B Chemical drums and containers should be placed in drip tray. Accumulated refuse was observed Gate 4A Soil should not be taken out by tyres of vehicles leaving site. 	 WA4A -4B The Contractor was reminded to place chemical drums and containers in drip tray. The Contractor was reminded to clear accumulated refuse. Gate 4A The Contractor was reminded to wash tyres before leaving site.
9 January 2019	 Ramp F Chemical drums and containers should be placed in drip tray. Accumulated waste should be disposed in waste bin. 	 Ramp F The Contractor was reminded to place chemical drums and containers in drip tray. The Contractor was reminded to clear accumulated waste in the waste bin.
16 January 2019	 Viaduct D General refuse was observed on the ground. Chemical containers should be placed in drip tray. NRMM label should be displayed on the excavator. Tyre marks were observed at the exit of the works area. 	 Viaduct D The Contractor was reminded to dispose general refuse in the waste bin. The Contractor was reminded to place chemical containers in drip tray. The Contractor was reminded to display NRMM label on the excavator. The Contractor was reminded to wash the car tyres thoroughly before leaving the works area.
22 January 2019	 Southern Landfall (Portion A) Soil stockpile was observed. Chemical containers should be placed in drip tray. Accumulated waste was observed. 	 Southern Landfall (Portion A) The Contractor was reminded to apply waters on the soil stockpile to avoid dust generation. The Contractor was reminded to place chemical containers in drip tray. The Contractor was reminded to remove accumulated waste.
31 January 2019	 Southern Landfall (Portion A) Drip tray with chemical containers placed was observed to be damaged. Chemical containers should be placed in drip tray. 	 Southern Landfall (Portion A) The Contractor was reminded to replace the drip tray. The Contractor was reminded to place chemical containers in drip tray.
13 February 2019	 Gate 4A General refuse was observed on the ground. Drainage should be cleared to avoid washing soil into the drainage system during rainstorm Tyre marks was observed on the road. 	 Gate 4A The Contractor was reminded to place general refuse in capped rubbish bin. The Contractor was reminded to clear the drains The Contractor was reminded to wash the tyres of vehicles before leaving the works area.

Inspection Date	Location & Environmental Observations	Recommendations/ Remarks
20 February 2019	Seafront Chemicals without drip tray. General refuse not clear. Viaduct D Accumulated general refuse inside U-	 Seafront The Contractor was reminded to place chemicals in drip tray. The Contractor was reminded to clear general refuse
	channel.	Viaduct DThe Contractor was reminded to clear refuse in U-channel.
28 February 2019	Southern Landfall (Portion A) Stagnant water was observed in drip tray.	 Southern Landfall (Portion A) The Contractor was reminded to discharge stagnant water in drip tray.

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), recyclable materials, chemical waste and marine sediment. 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/	Inert C&D	Imported	Inert	Non-inert	Recyclable	Chemical	Marii	ne Sedimen	ıt (m³)
Year	Materials ^(a) (m ³)	Fill (m³)	Constructio n Waste Re- used (m³)	Constructio n Waste (b) (kg)	Materials (c) (kg)	Wastes (kg)	Category L	Category M (M _p & M _f)	Category H
December 2018	8,079	0	0	346,730	77	0	0	0	0
January 2019	3,687	0	0	251,110	0	800	0	0	0
February 2019	1,254	0	637	84,990	0	0	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, felled trees 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-353/2009/K	11-Apr-16	N/A	HyD	Hong Kong Boundary Crossing Facilities
Environmental Permit	EP-354/2009/D	13-Mar-15	N/A	HyD	Tuen Mun- Chek Lap Kok Link
Construction Dust Notification	361571	05-Jul-13	N/A	GCL	
Construction Dust Notification	362093	17-Jul-13	N/A	GCL	For Area 23
Chemical Waste Registration	5213-951-G2380-17	12-Jun-14	N/A	GCL	Viaducts A, B, C, D & E
Chemical Waste Registration	5213-961-G2380-13	10-Oct-13	N/A	GCL	Chemical waste produced in Contract No. HY/2012/07 (Area 1 adjacent to Cheng Tung Road, Siu Ho Wan)
Chemical Waste Registration	5213-961-G2380-14	10-Oct-13	N/A	GCL	Chemical waste produced in Contract No. HY/2012/07 (Area 2 adjacent to Cheung Tung Road, Pak Mong Village)
Chemical Waste Registration	5213-974-G2588-03	04-Nov-13	N/A	GCL	Chemical waste produced in Contract No. HY/2012/07 (WA5 adjacent to Cheung Tung Road, Yam O)
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
Construction Noise Permit for night works and works in general holidays	GW-RW0235-18	21 Jun 2018	18 Dec 2018	GCL	General works at WA5
Construction Noise Permit for night works and works in general holidays	GW-RS0235-18	23 Jan 2019	13 Jun 2019	GCL	General works at WA5
Construction Noise Permit for night works and works in general holidays	GW-RS0740-18	20 Aug 2018	16 Feb 2019	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-RW012-19	23 Jan 2019	13 Jun 2019	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays		19 February 2019	15 July 2019	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-KS1085-18	28 Nov 2018	31 Dec 2018	GCL	Maintenance of Traffic Sign in Tung Chung
Construction Noise Permit for night works and	GW-RS1118-18	6 Dec 2018	31 Dec 2018	GCL	Fencing Removal at Seafront

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

No Action or Limit Level exceedance for 1-hour TSP and 24-hour TSP for air quality and construction noise monitoring was recorded during the reporting period.

No exceedance was recorded for water quality impact monitoring 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 relevant ambient mean values (*Table 2.18*). The monitoring results showed that the quarterly means of depth-averaged SS at all sampling stations during both mid-ebb and mid-flood tides were well below the corresponding ambient means. 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	Baselir	ne Mean	Ambien	t Mean (a)	(Decemb	rly Mean per 2018 to rry 2019)
	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS(Mf)3(N)	9.2	12.8	12.0	16.6	7.2	8.6
CS(Mf)5	9.2	11.5	11.9	14.9	5.0	6.0
SR4(N)	10.3	12.3	13.4	16.0	6.0	6.4
SR4a	9.1	9.8	11.9	12.7	5.5	5.9
IS8	11.3	13.5	14.6	17.6	5.9	6.8
IS(Mf)9	10.9	14.3	14.2 18.5		6.3	7.0
IS(Mf)16	11.4	10.3	14.8	13.4	5.8	6.7

Notes:

- (a) Ambient mean value is defined as a 30% increase of the baseline mean value
- b) Water Quality Monitoring Station CS(Mf)3 was relocated to CS(Mf)3(N) since 2 May 2017.
- (c) Water Quality Monitoring Station SR4 was relocated to SR4(N) since 2 March 2018.

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*.

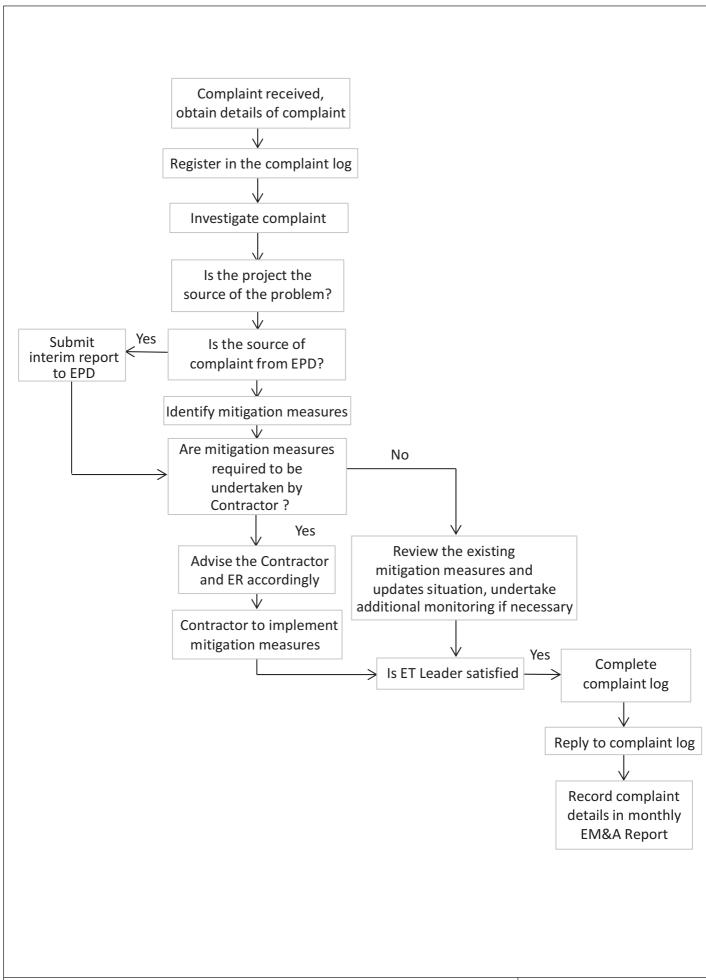


Figure 2.5

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 2019

Marine-based Works

• Reinstatement of Seawall at Seafront

Land-based Works

- Slope work of Viaduct A;
- Landscaping works at NLH/CTR; and
- Landscaping works at HKBCF.

April 2019

Marine-based Works

• Reinstatement of Seawall at Seafront;

Land-based Works

- Slope work of Viaduct D;
- Landscaping works at NLH/CTR; and
- Landscaping works at HKBCF.

May 2019

Marine-based Works

• Reinstatement of Seawall at Seafront

Land-based Works

- Slope work of Viaduct D; and
- Landscaping works at HKBCF.

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 Twenty-first Quarterly EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 December 2018 to 28 February 2019, in accordance with the Updated EM&A Manual and the requirements of the *Environmental Permits* (*EP-354/2009/D* and *EP-353/2009/K*).

Neither Action Level nor Limit Level exceedances were observed for 1-hour and 24-hour TSP level, noise impact monitoring and water quality impact monitoring in this reporting period.

A total of twelve (12) groups of thirty-eight (38) Chinese White Dolphins were sighted during the six sets of survey from December 2018 to February 2019. One (1) Limit Level exceedance was recorded for the quarterly dolphin monitoring data between December 2018 to February 2019, 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.

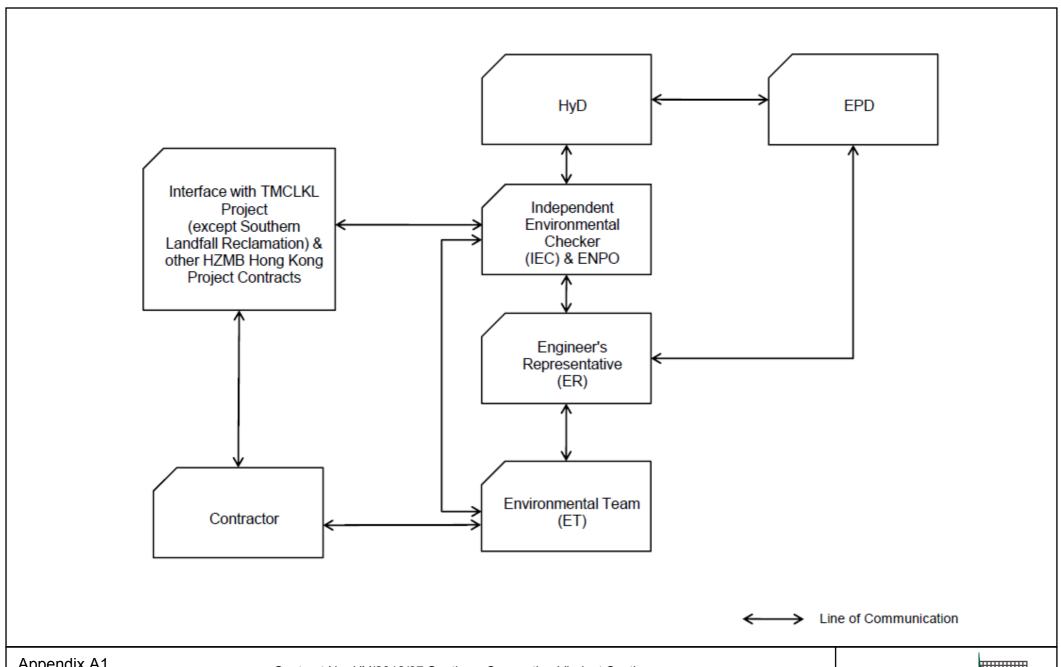
Environmental site inspection was carried out 12 times in the reporting period. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site audits.

There was no complaint, notification of summons or successful prosecution recorded 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**

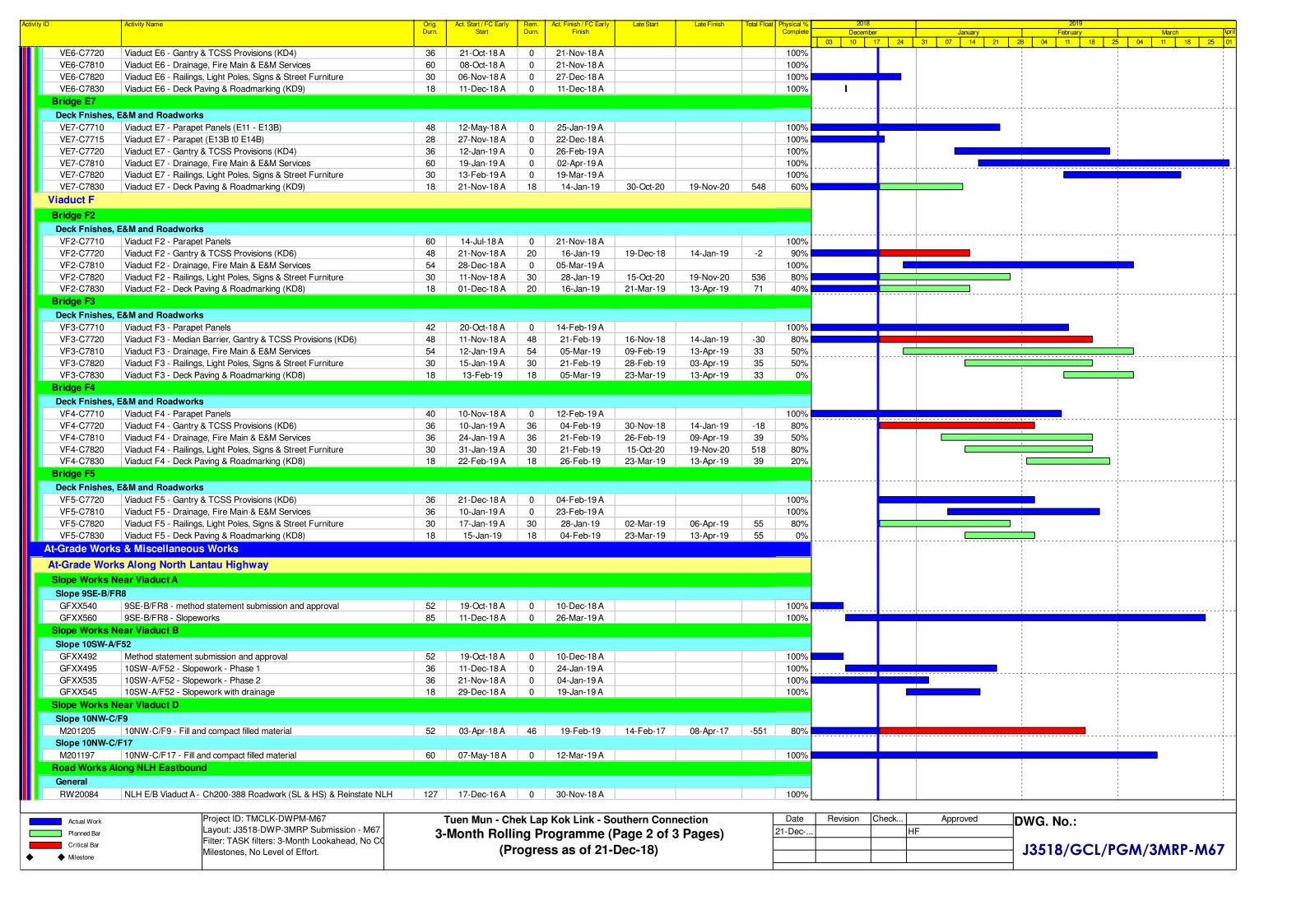
Environmental Resources Management

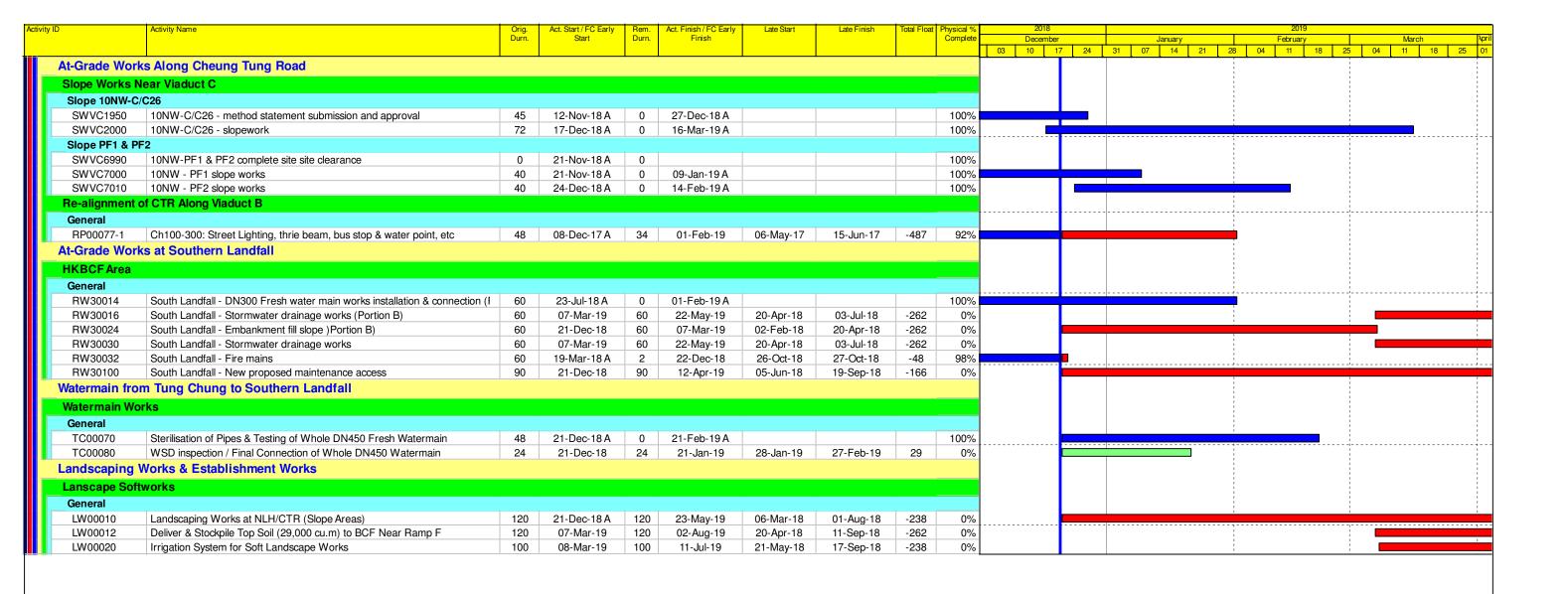


Appendix B

Construction Programme for the Reporting Quarter

[,] ID	Activity Name		Orig.	Act. Start / FC Early		Act. Finish / FC Early	Late Start	Late Finish	Total Float	Physical %	2018	3		2019	
			Durn.	Start	Durn.	Finish				Complete	Decem 03 10	17 24	January 31 07 14 21	February 28 04 11 18	25 04 11 18 25
/2012/07	Tuen Mun-Chel	k Lap Kok Link - Southern Connec	tion												
ontract Miles	stones													; ; ;	
Key Dates for	r Completion													1 1 1	
Stage of the														 	
Completion I	Date								_						
General KD06	KD6 - Stage 6: TO	CSS at Viaduct F2, F3, F4, F5 (EoT 14-Jan-19)	0		0	21-Feb-19*		14-Jan-19	-38	0%				•	
Section of the		500 at viadua 12, 13, 14, 13 (201 14 bail 13)	U		0	2110010		14 0411 13	30	0 78				•	
Completion I														i 	
General															
KD09 KD15		Il Works at Viaduct E2, E5-E8 (EoT 12-Aug-18) Watermains Tung Chung-HKBCF (EoT 27-Feb-19)	0		0	11-Mar-19 A 21-Jan-19*		27-Feb-19	37	100% 0%			_	1	•
KD17		: Works Not in Section 1-10 & 12-14 (EoT 8-Apr-17)	0		0	19-Feb-19*		08-Apr-17	-682	0%			•	•	
KD20		: Preserve & Protect Existing Trees (EoT 7-Apr-17)	0		0	21-Dec-18*		07-Apr-17	-622	0%		•			
Portion Hand														 	
Vacate Work Vacate Dates															
General	3														
VAC05	Vacate Works Area	a WA5 (Zone 5C) (Extension Requested)	0		0	19-Mar-19*		18-Mar-19	0	0%					•
Design															
Detailed Desi	<u> </u>								_						
_	s Near Viaduct A								_					i 	
	E-B/FR8, B/R1, B/R2													1 1 1	
Slope Works		Slope Combined AIP/DDA - CP11.01	60	13-Jun-17 A	0	15-Dec-18 A				100%				 	
Procurement	10/00 Αρριοναι οι	Giope Combined Air /DDA Of 11.01	00	10 0dil 17 A	0	10 DCC 10 A				10078					
Precast Parag	pets & Barriers													1	
Viaduct A to	F														
Precast Para	apet Manufacture													i ! !	
General	VC 1		400	05.14 40.4		04.14.40.4				4000/					
PP6011-06 Construction	Viaduct F - Precas	st Parapets/Barriers Production	198	05-Mar-18 A	0	21-Nov-18 A				100%				1	
	& Substructure Wo	orks													
Ramp C									<u> </u>						
	Approach Ramp C													i 	
	nes, E&M & Roadwork														
ARC-C7850	Ramp C- maintena	ance period completion	0		0	09-Feb-19*		09-Feb-19	0	0%				•	
Ramp F	Approach Ramp F													1	
Ramp Struct															
ARF-C6160		leck	71	25-Jun-18 A	0	13-Dec-18 A				100%					
	nes, E&M & Roadwork			00.0 : : : : : :		04.1.45.1				400=1					
ARF-C7710 ARF-C7720		Panels Barrier, Gantry & TCSS Provisions (KD6)	60 48	29-Oct-18 A 15-Nov-18 A	48	24-Jan-19 A 21-Feb-19	26-Jul-18	19-Sep-18	-124	100% 70%					
ARF-C7810	Ramp F - Drainage	e, Fire Main & E&M Services	60	21-Jan-19 A	60	04-Apr-19	16-Jan-19	29-Mar-19	-5	50%					
ARF-C7820		Light Poles, Signs & Street Furniture	30	22-Feb-19	30	28-Mar-19	16-Feb-19	22-Mar-19	-5	0%					
	re & Associated W	vorks													
Viaduct C Bridge C4															
<u> </u>	es, E&M and Roadwor	rks													
VC4-C7850		enance period completion	0		0	09-Feb-19*		09-Feb-19	0	0%				•	
Viaduct E															
Bridge E6															
	es, E&M and Roadwor		40	01 May 10 A	0	01 Dec 10 4				1000/					
VE6-C7710	Viaduct E6 - Parap	Project ID: TMCLK-DWPM-M67	48 T	21-May-18 A Fuen Mun - C h			outhern Con	nection	<u> </u>	100% Date	Revision	Check	Approved	DWG. No.:	
Actual Work Planned Bar		Layout: J3518-DWP-3MRP Submission - M67		Month Roll					2	21-Dec	. 10 7 10 10 11		IF	DWG. NO.:	
Critical Bar		Filter: TASK filters: 3-Month Lookahead, No CC	J -1			s as of 21-		o i agos)						13518/60	/PGM/3MRP-M6
Milestone		Milestones, No Level of Effort.		ζ,	. 09.03	5 45 51 £1-	_00 10)		1		İ	1 1		300 10/ GCL	1410





Actual Work
Planned Bar
Critical Bar

Milestone

Project ID: TMCLK-DWPM-M67 Layout: J3518-DWP-3MRP Submission - M67 Filter: TASK filters: 3-Month Lookahead, No CC Milestones, No Level of Effort. Tuen Mun - Chek Lap Kok Link - Southern Connection
3-Month Rolling Programme (Page 3 of 3 Pages)
(Progress as of 21-Dec-18)

Date	Revision	Check	Approved	D
21-Dec			HF	Γ
				1
]

DWG. No.:

J3518/GCL/PGM/3MRP-M67

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		Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Sta			Status
	Reference					D	С	О	
Air Quality	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		<>
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		✓
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		✓
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		<>
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		✓
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		✓
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		Location/ Timing	Implementation Agent	Relevant Standard or Requirement	-	lement 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		<>
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	.1	<u>i</u>	<u>i</u>	<u>.i.</u>	.i	i	i	<u> </u>
5.11	Section 4	Noise monitoring	All existing representative sensitive receivers / during North Lantau Viaduct construction	Contractor	EM&A Manual		Y		✓
Water Qua	LITY	i.	i.	.1.	.i				<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		n/a
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		n/a

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		✓
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		n/a
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		n/a
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		n/a
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.		Υ		n/a
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		✓
Temporary S	Staging work							•	•
	5.2	Regular inspection for the accumulation of floating refuse and collection of floating refuse if required	During temporary staging works	Contractor			Y		n/a
	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		n/a
	5.2	One additional water quality monitoring station is	During temporary	Contractor			Y		✓

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	plementation 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		Υ		✓
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		✓
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		✓
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		✓
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
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		✓
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		✓

EIA Reference	EM&A Manual			Implementation Agent	Relevant Standard or Requirement	Stages			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		✓
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		✓
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		✓
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		Υ		⇔
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		✓
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		✓
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		✓

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	olementation Stages		Status
	Reference					D	C	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		✓
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		Υ	✓
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		✓
Water Quali	ity Monitoring				····			-	-
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	Υ	✓
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	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	lemen Stage		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 June during bored piling	Contractor	TMEIA		Υ		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	Υ		*
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600 m ² 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		✓
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		n/a
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	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	lemen Stage		Status
	Reference					D	C	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		✓
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		<>
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		<>
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Construction activities should be restricted to the proposed works boundary	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
LANDSCAPE	AND VISUAL		.i.		.i.				·
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		~

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						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		✓
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		⇔
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		✓
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		✓
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		✓
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		✓

EIA Reference	EM&A Manual	nual	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 suitable 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	Υ		✓
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	Υ	Υ	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	Y	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	Y	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	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by

EIA Reference	EM&A Manual	ıal	Location/ Timing	Implementation Agent	ation Relevant Standard or Requirement		Implementation Stages		Status
	Reference					D	С	О	
		(OM4)							HyD/LCSD
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			•					•	
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓
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		
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		✓
12.6	8.1	The extent of cutting operation should be optimised	All areas / throughout	Contractor	TMEIA		Y		✓
		.i	.i		.4	.A		4	

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Imp	lement Stages		Status
	Reference					D	С	О	
		where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	construction period						
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		✓
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
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		Y		✓
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		<>
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		~
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		✓
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	All areas / throughout construction period	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
12.6	8.1	materials should avoid over-ordering and wastage. 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;	All areas / throughout construction period	Contractor	TMEIA		Y		

EIA Reference	EM&A Manual	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		 Adequate ventilation; Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and Incompatible materials are adequately separated. 							
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		Υ		
12.6	8.1	All waste containers shall be in a secure area on hard standing;	All areas / throughout construction period	Contractor	TMEIA		Y		✓
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	Site Offices/	Contractor	TMEIA		Υ		✓

EIA Reference	EM&A Manual	Environmental Protection Measures	, 0		Relevant Standard or Requirement	Implementation Stages			Status
	Reference					D	С	О	
		paper if such volume is sufficiently large to 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.	throughout 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		Υ		✓
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
- Δ 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 Lantau 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:

- 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	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 2018)

Alternative Noise Monitoring at Pak Mong Village Entrance

Sunday	toring at Pak Mong Village Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-Dec
2-Dec		4-Dec			7-Dec	8-Dec
	Noise Impact Monitoring			Noise Impact		
				Monitoring		
9-Dec	10-Dec	11-Dec		13-Dec	14-Dec	15-Dec
			Noise Impact Monitoring			
10.5		40.5	10.5	00.5	0.4.5	20.5
16-Dec	17-Dec		19-Dec	20-Dec		22-Dec
		Noise Impact Monitoring			Noise Impact	
					Monitoring	
23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	28-Dec	29-Dec
23-Dec	24-060	25-Dec		Noise Impact	20-Dec	29-Dec
				Monitoring		
				Worldoning		
30-Dec	31-Dec					
30-Dec	312060					

HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 31 December 2018)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-Dec
2-Dec	3-Dec	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec
	1-hr TSP Monitoring			1-hr TSP Monitoring		
	24-hr TSP Monitoring			24-hr TSP Monitoring		
9-Dec	10-Dec	11-Dec	12-Dec	13-Dec	14-Dec	15-Dec
0 000	10 000		1-hr TSP Monitoring	10 000	14 000	10 000
			24-hr TSP Monitoring			
10.5	45.0	10.5	10.0	00.5	0.4.15	00.0
16-Dec	17-Dec	18-Dec	19-Dec	20-Dec		22-Dec
		1-hr TSP Monitoring			1-hr TSP Monitoring	
		24-hr TSP Monitoring			24-hr TSP Monitoring	
23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	28-Dec	29-Dec
				1-hr TSP Monitoring		
				24-hr TSP Monitoring		
30-Dec	31-Dec					
00 000						

HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Noise Monitoring Schedule (1 to 31 January 2019)

Alternative Noise Monitoring at Pak Mong Village Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
-		1-Jan	2-Jan	3-Jan	4-Jan	5-Jar
			Noise Impact Monitoring			
6-Jan			9-Jan	10-Jan	11-Jan	12-Jar
		Noise Impact Monitoring				
13-Jan		15-Jan			18-Jan	19-Jan
	Noise Impact Monitoring			Noise Impact		
				Monitoring		
20-Jan	21-Jan				25-Jan	26-Jan
			Noise Impact Monitoring			
27-Jan			30-Jan	31-Jan		
		Noise Impact Monitoring				

HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 31 January 2019)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1-Jan	2-Jan	3-Jan	4-Jan	5-Jan
			1-hr TSP Monitoring			
			24-hr TSP Monitoring			
6-Jan	7-Jan		9-Jan	10-Jan	11-Jan	12-Jan
		1-hr TSP Monitoring				
		24-hr TSP Monitoring				
13-Jan	14-Jan	15-Jan	16-Jan	17-Jan	18-Jan	19-Jan
	1-hr TSP Monitoring			1-hr TSP Monitoring		
	24-hr TSP Monitoring			24-hr TSP Monitoring		
20-Jan	21-Jan	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan
20 0411	21 0011	22 0011	1-hr TSP Monitoring	210011	20 0411	20 0411
			24-hr TSP Monitoring			
			2 m ror wormoning			
27-Jan	28-Jan		30-Jan	31-Jan		
		1-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 28 February 2019)

Alternative Noise Monitoring at Pak Mong Village Entrance

			1-Feb	2-Feb
1				
5-Feb	6-Feb	7-Feb	8-Feb	9-Fe
				Noise Impact
				Monitoring
12-Feb	13-Feb	14-Feb	15-Feb	16-Fe
19-Feb	20-Feb	21-Feb	22-Feb	23-Fe
26-Feb	27-Feb	28-Feb		
		Noise Impact		
	2b 12-Feb 2b 19-Feb Noise Impact Monitoring	26 12-Feb 13-Feb Noise Impact Monitoring About 19-Feb 20-Feb Noise Impact Monitoring	Beb 12-Feb 13-Feb 14-Feb Noise Impact Monitoring Deb 12-Feb 13-Feb 14-Feb 15-Feb Noise Impact Monitoring Noise Impact Noise Impact Noise Impact	

HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Air Quality Monitoring Schedule (1 to 28 February 2019)

Alternative Air Quality Monitoring at WA4 and MTRC Depot Entrance

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1-Feb	2-Feb
3-Feb	4-Feb	5-Feb	6-Feb	7-Feb	8-Feb	9-Feb
	1-hr TSP Monitoring					1-hr TSP Monitoring
	24-hr TSP Monitoring					24-hr TSP Monitoring
10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb
			1-hr TSP Monitoring			
			24-hr TSP Monitoring			
17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb
17 1 00	10 1 05	1-hr TSP Monitoring	20100	21100	22 1 00	20100
		24-hr TSP Monitoring				
24-Feb			27-Feb			
	1-hr TSP Monitoring	24-hr TSP Monitoring		1-hr TSP Monitoring		
	24-hr TSP Monitoring	(ASR9)		24-hr TSP Monitoring		
	(ASR8A)			(ASR9)		
				l la la la Co Calara an acc	40. The 04 he TOD Me	

The 24-hr TSP Monitoring for ASR9 failed on 25 February 2019 due to power shortage and was reschedule to 26 February 2019. The 24-hr TSP Monitoring for ASR8A also failed due to power shortage.

HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Marine Water Quality Monitoring (WQM) Schedule (December 2018)

Sunday	Monday	Tuesday		Thursday	Friday	Saturday
						1/Dec
2/Dec	3/Dec	4/Dec	5/Dec	6/Dec	7/Dec	8/Dec
2/200		1/200		0/200		0/200
	ebb tide 8:14 - 11:44 flood tide 2:13 - 5:43		ebb tide 10:02 - 13:32 flood tide 4:20 - 7:50		ebb tide 11:27 - 14:57	
	1100d tide 2:13 - 5:43		1100d tide 4:20 - 7:50		flood tide 5:59 - 9:29	
9/Dec	10/Dec	11/Dec	12/Dec	13/Dec	14/Dec	15/Dec
	ebb tide 13:15 - 16:45		ebb tide 14:43 - 16:43		ebb tide 4:43 - 6:35	
	flood tide 8:03 - 11:33		flood tide 9:27 - 12:57		flood tide 11:32 - 15:02	
16/Dec	17/Dec	18/Dec	19/Dec	20/Dec	21/Dec	22/Dec
10,210						
	ebb tide 5:57 - 9:27 flood tide 13:24 - 16:54		ebb tide 8:12 - 11:42 flood tide 14:23 - 17:53		ebb tide 10:00 - 13:30 flood tide 15:33 - 19:03	
	11000 tiue 15.24 - 10.54		1100d tide 14.23 - 17.33		1100d tide 13.33 - 19.03	
23/Dec	24/Dec	25/Dec	26/Dec	27/Dec	28/Dec	29/Dec
	ebb tide 12:28 - 15:58		WQM was cancelled due		ebb tide 4:21 - 6:36	
	flood tide 7:10 - 10:40		to suspension of marine		flood tide 10:34 - 14:04	
			works.			
30/Dec	31/Dec					
33,233						
	ebb tide 6:37 - 10:07 flood tide 13:13 - 16:43					
	1100d ddc 15.15 - 10.45					

HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Marine Water Quality Monitoring (WQM) Schedule (January 2019)

Sunday	Monday .	Tuesday	•	Thursday		Saturday
		1/Jan				
			ebb tide 9:00 - 12:30 flood tide 14:31 - 18:01		ebb tide 10:34 - 14:04 flood tide 6:01 - 8:48	
6/Jan	7/Jan	8/Jan	9/Jan	10/Jan	11/Jan	12/Jan
	ebb tide 12:19 - 15:49 flood tide 7:09 - 10:39		ebb tide 13:28 - 16:58 flood tide 8:14 - 11:44		ebb tide 14:41 - 18:11 flood tide 9:14 - 12:44	
13/Jan	14/Jan	15/Jan	16/Jan	17/Jan	18/Jan	19/Jan
	ebb tide 3:52 - 7:22 flood tide 11:12 - 14:42		ebb tide 6:12 - 9:42 flood tide 12:40 - 16:10		ebb tide 8:48 - 12:18 flood tide 14:14 - 17:44	
20/Jan	21/Jan	22/Jan	23/Jan	24/Jan	25/Jan	26/Jan
	ebb tide 11:31 - 15:01 flood tide 6:12 - 9:42		ebb tide 13:03 - 16:33 flood tide 7:40 - 11:10		ebb tide 14:39 - 18:09 flood tide 9:05 - 12:35	
27/Jan	28/Jan	29/Jan	30/Jan	31/Jan		
	ebb tide 4:37 - 8:07 flood tide 11:22 - 14:52		ebb tide 7:35 - 11:05 flood tide 13:02 - 16:32			

HY/2012/07 - Tuen Mun - Chek Lap Kok Link - Southern Landfall Impact Marine Water Quality Monitoring (WQM) Schedule (February 2019)

Sunday	Monday		Wednesday	Thursday		Saturday
					1/Feb	
					ebb tide 9:48 - 13:11 flood tide 14:38 - 18:08	
3/Feb	4/Feb	5/Feb	6/Feb	7/Feb	8/Feb	9/Feb
	WQM will be canceled due to site closure		WQM will be canceled due to site closure		WQM will be canceled due to site closure	
10/Feb	11/Feb	12/Feb	13/Feb	14/Feb	15/Feb	16/Feb
	ebb tide 15:25 - 18:55 flood tide 9:07 - 12:37		ebb tide 17:35 - 19:50 flood tide 10:26 - 13:56		ebb tide 7:50 - 10:38 flood tide 12:28 - 15:58	
17/Feb	18/Feb	19/Feb	20/Feb	21/Feb	22/Feb	23/Feb
	ebb tide 10:34 - 14:04 flood tide 15:48 - 19:18		ebb tide 12:02 - 15:32 flood tide 7:18 - 10:01		ebb tide 13:24 - 16:54 flood tide 7:42 - 11:12	
24/Feb	25/Feb	26/Feb	27/Feb	28/Feb		
	ebb tide 15:45 - 18:15 flood tide 9:18 - 12:48		ebb tide 6:15 - 8:47 flood tide 10:38 - 14:08			

HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 31 December 2018)

I	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
							1-Dec
ı							
ı							
I	2-Dec		4-Dec		6-Dec	7-Dec	8-Dec
ı		Impact Dolphin		Impact Dolphin			
ı		Monitoring		Monitoring			
ı							
ı							
	9-Dec		11-Dec		13-Dec	14-Dec	15-Dec
ı		Impact Dolphin		Impact Dolphin			
ı		Monitoring		Monitoring			
ı							
ı							
I	16-Dec	17-Dec	18-Dec	19-Dec	20-Dec	21-Dec	22-Dec
ı							
ı							
ı							
ı							
	23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	28-Dec	29-Dec
ı							
ı							
ı							
ı							
İ	30-Dec	31-Dec					
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HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 31 January 2019)

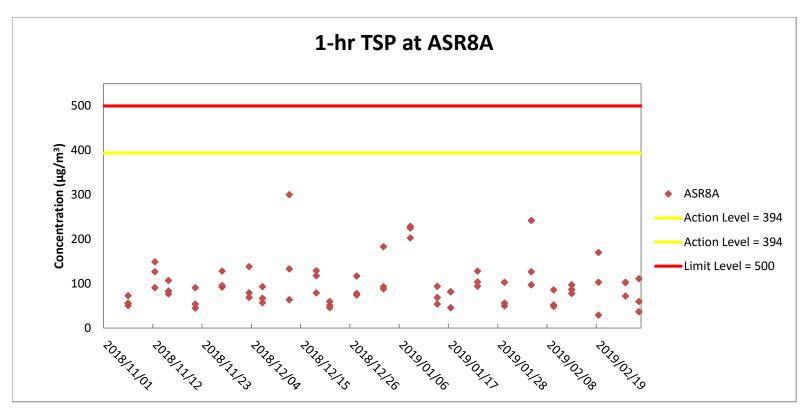
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1-Jan			4-Jan	5-Jan
			Impact Dolphin	Impact Dolphin		
			Monitoring	Monitoring		
6-Jan	7-Jan	8-Jan	9-Jan	10-Jan	11-Jan	12-Jan
	Impact Dolphin Monitoring					
42 lon	14 los	15 lon	16 lon	17 lon	40 los	10 los
13-Jan		15-Jan	16-Jan	17-Jan	18-Jan	19-Jan
	Impact Dolphin Monitoring					
20-Jan	21-Jan	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan
27-Jan	28-Jan	29-Jan	30-Jan	31-Jan		
	20 0011	25 5411	30 Jan	or oan		

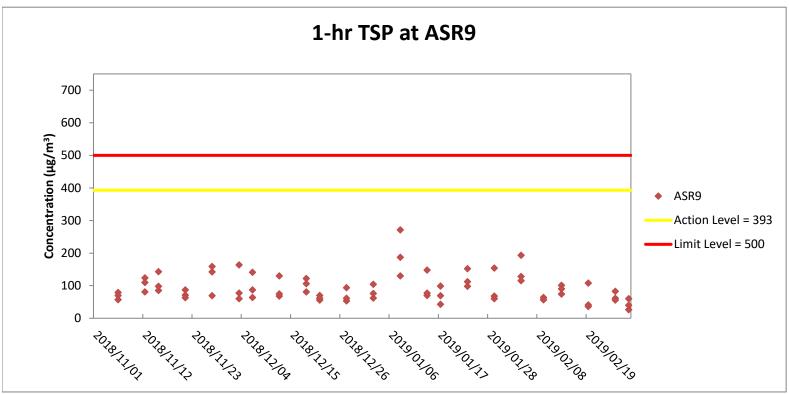
HY/2012/07 Tuen Mun - Chek Lap Kok Link - Southern Connection Viaduct Section Impact Dolphin Monitoring Survey Schedule (1 to 28 February 2019)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1-Feb	2-Feb
					Impact Dolphin	
					Monitoring	
3-Feb	4-Feb	5-Feb	6-Feb	7-Feb	8-Feb	9-Feb
10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb
				Impact Dolphin		
				Monitoring		
17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb
			Impact Dolphin			
			Monitoring			
24-Feb	25-Feb	26-Feb	27-Feb	28-Feb		
		Impact Dolphin	21100	20 1 00		
		Monitoring				

Appendix F

Impact Air Quality
Monitoring Graphical
Presentation

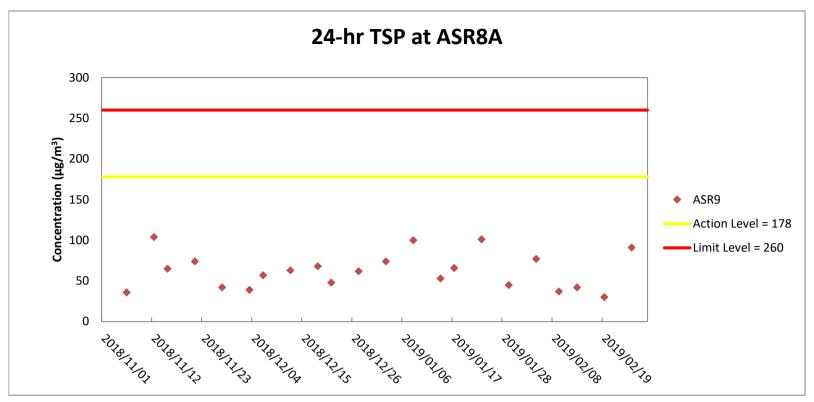


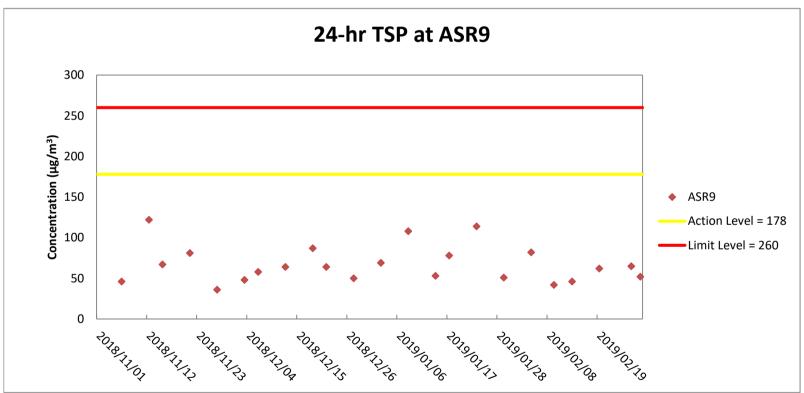


Weather condition within the reporting period varied between sunny to cloudy.

Major construction works undertaken within the reporting period include drainage works; construction of sign gantries, light poles and street furniture; road marking at Portion A and slope work of Viaducts A, B,C & D.

Marine works within the reporting period include reinstatement of seawall at seafront





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

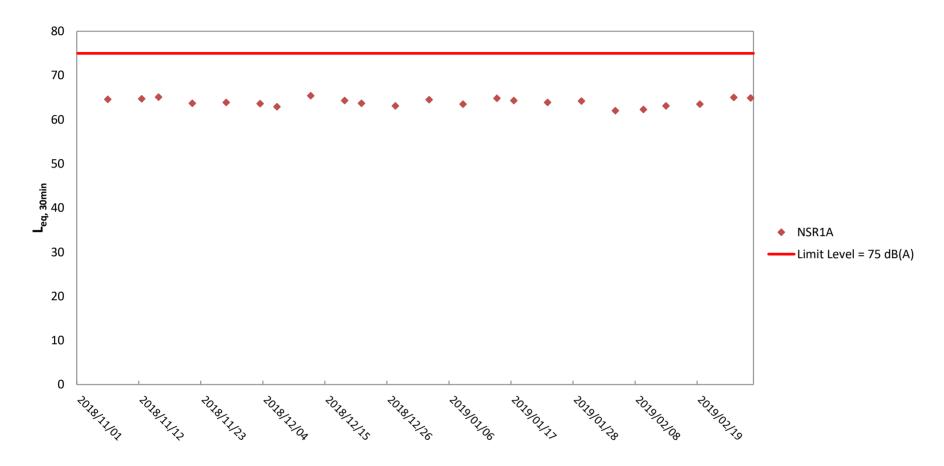
Major construction works undertaken within the reporting period include drainage works; construction of sign gantries, light poles and street furniture; road marking at Portion A and slope work of Viaducts A, B,C & D.

Marine works within the reporting period include reinstatement of seawall at seafront

Appendix G

Impact Noise Monitoring Graphical Presentation

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



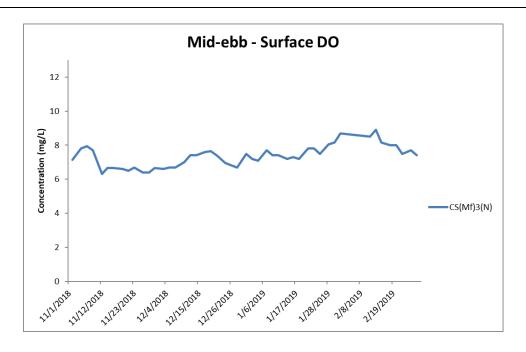
Weather condition within the reporting period varied between sunny to cloudy.

Major construction works undertaken within the reporting period include drainage works; construction of sign gantries, light poles and street furniture; road marking at Portion A and slope work of Viaducts A, B,C & D.

Marine works within the reporting period include reinstatement of seawall at seafront.

Appendix H

Impact Water Quality Monitoring Graphical Presentation



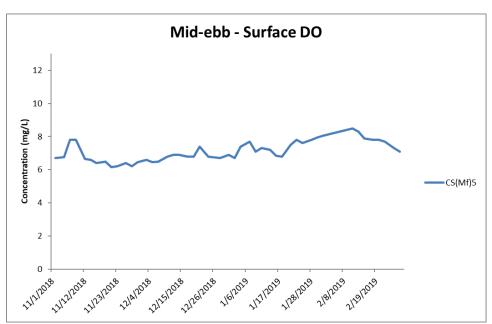
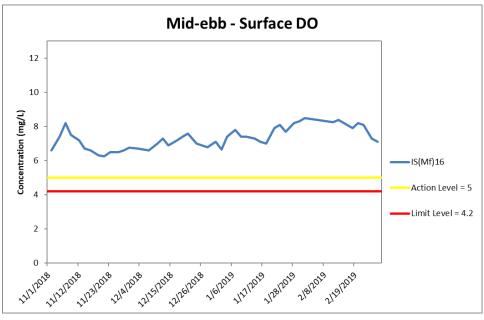


Figure H1 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





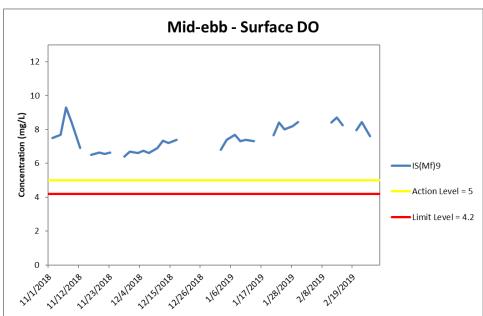
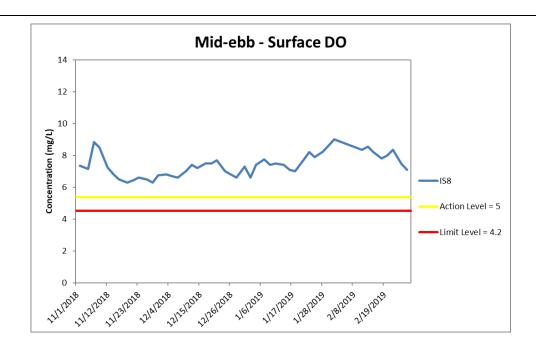


Figure H2 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





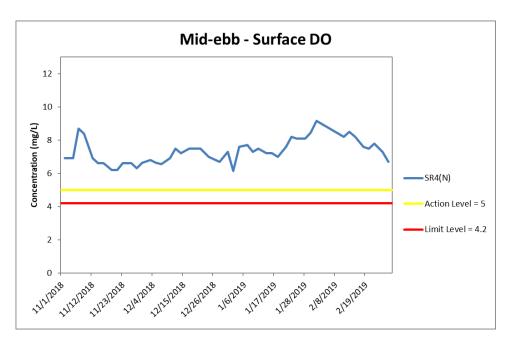


Figure H3 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



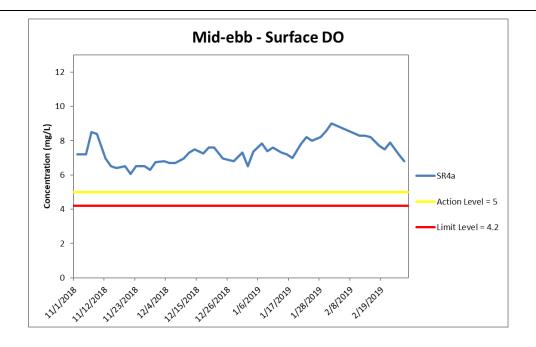
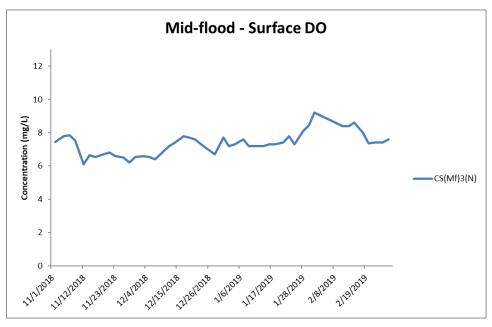


Figure H4 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





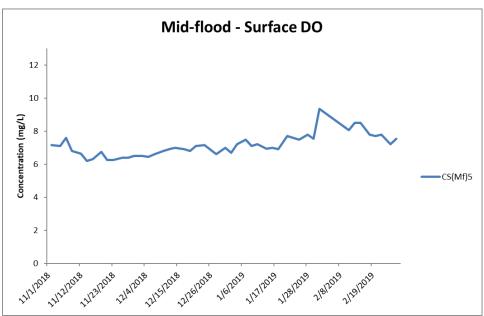
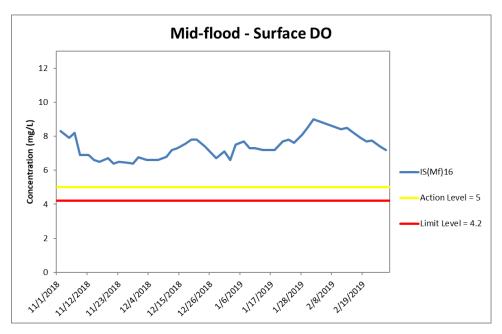


Figure H5 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





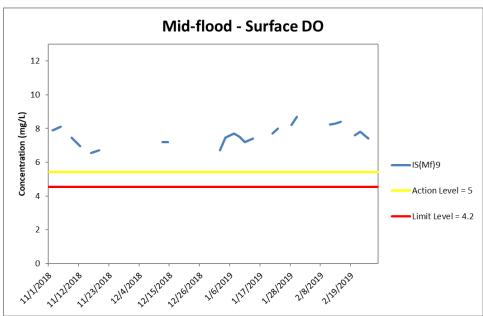
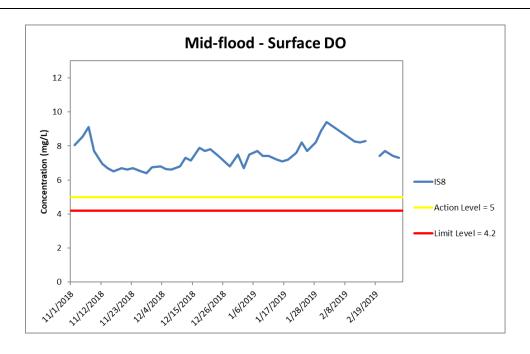


Figure H6 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





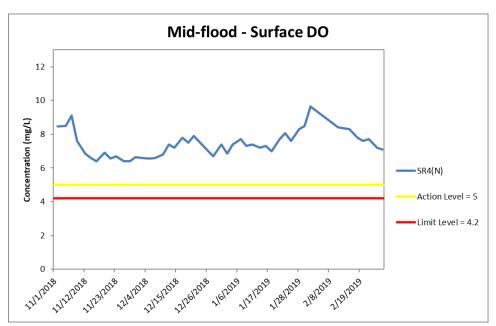


Figure H7 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



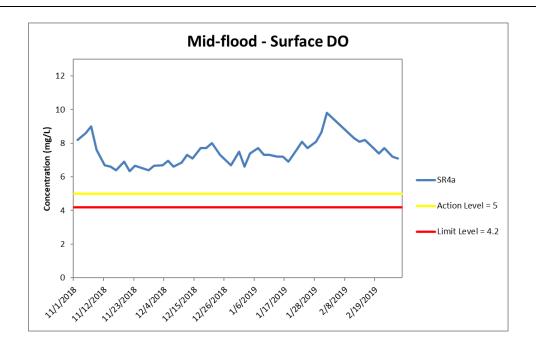
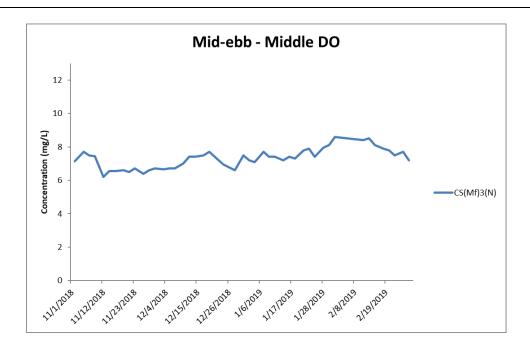


Figure H8 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





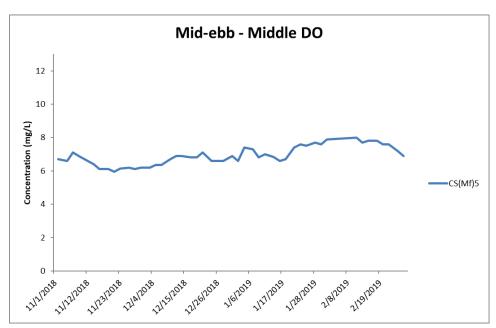


Figure H9 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.



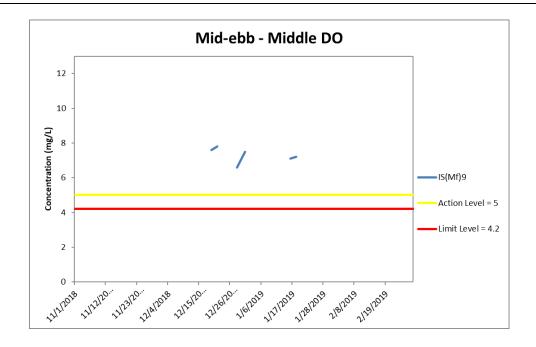
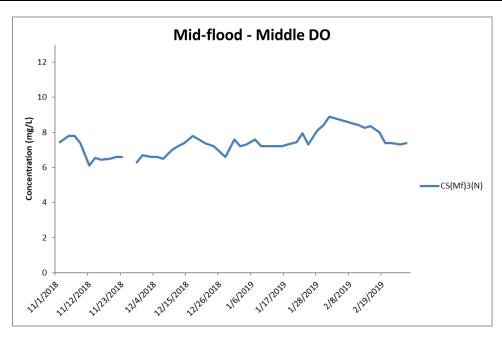


Figure H10 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





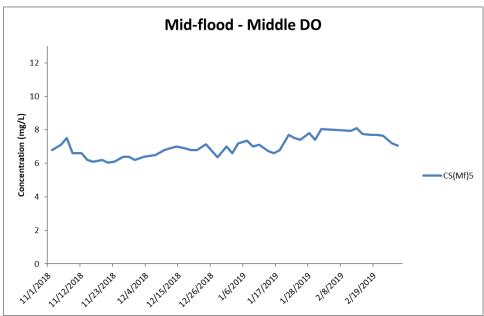


Figure H11 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Environmental Resources Management



Marine works within the reporting period include Reinstatement of seawall at

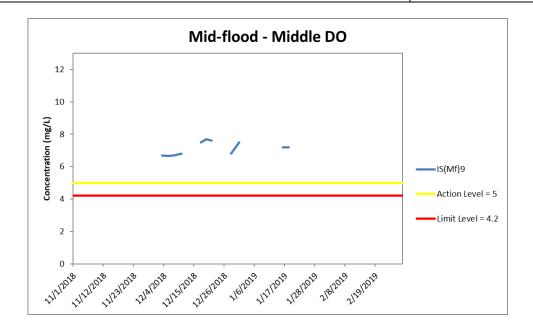
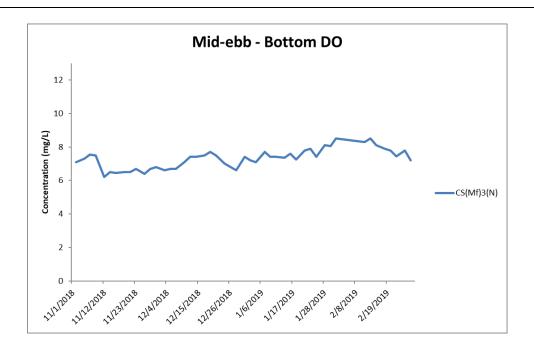


Figure H12 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2018 and 28 February 2019 at IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





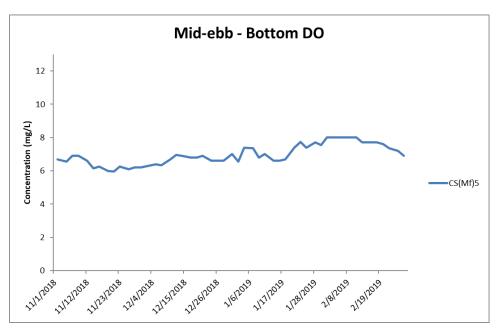
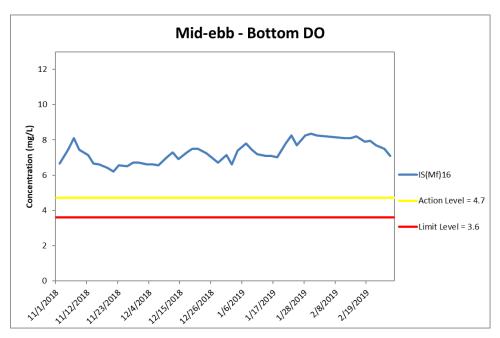


Figure H13 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





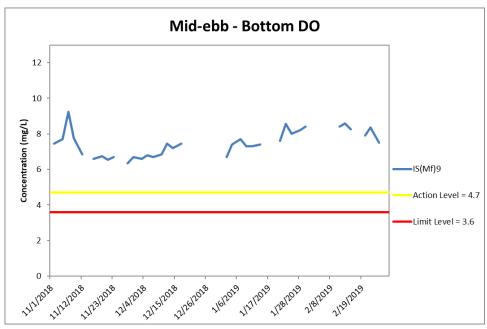
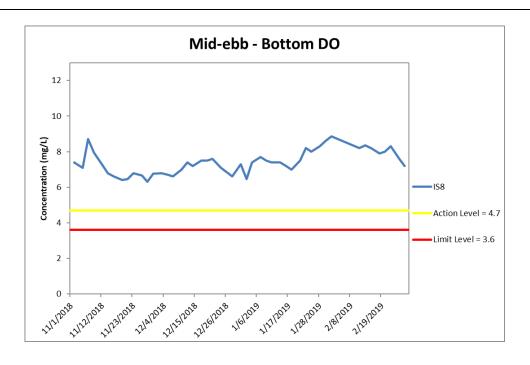


Figure H14 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





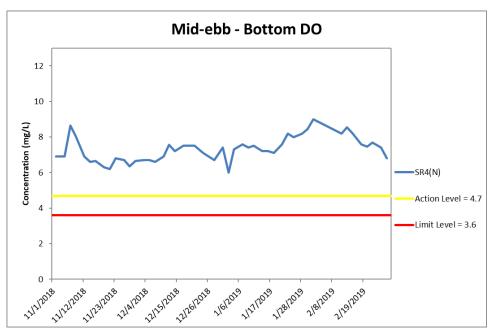


Figure H15 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



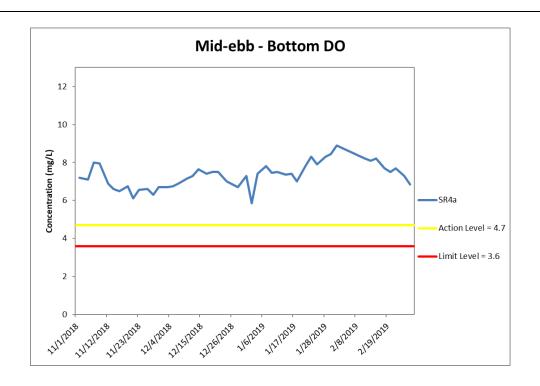
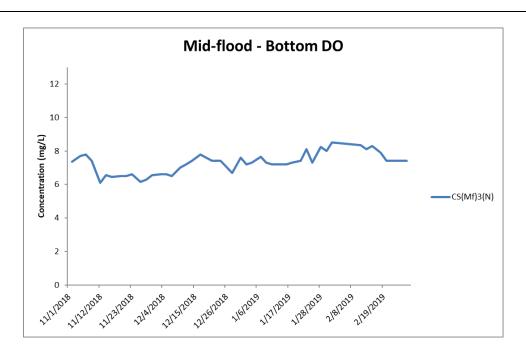


Figure H16 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





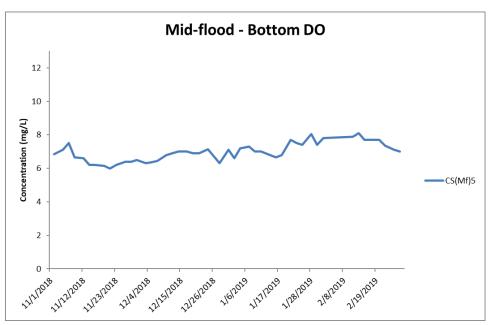
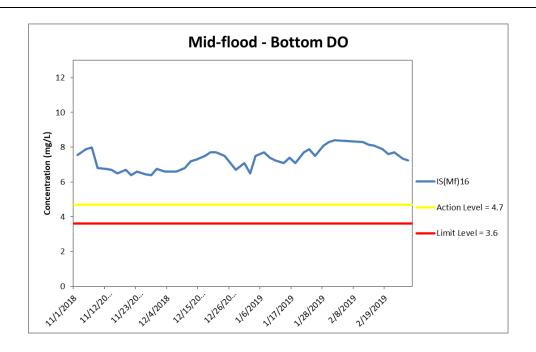


Figure H17 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





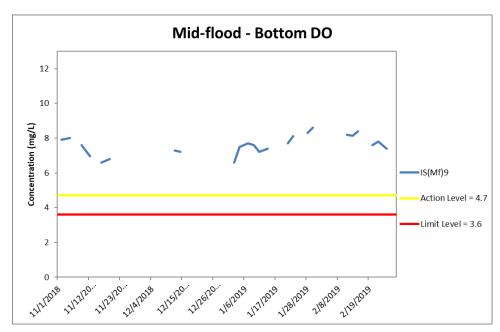
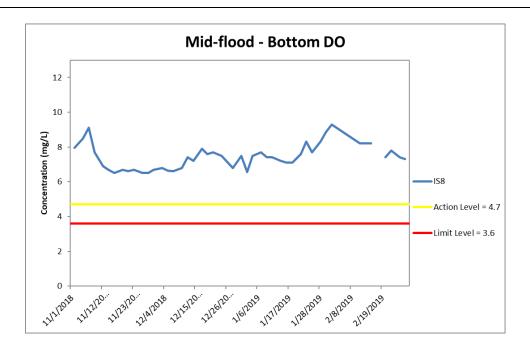


Figure H18 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





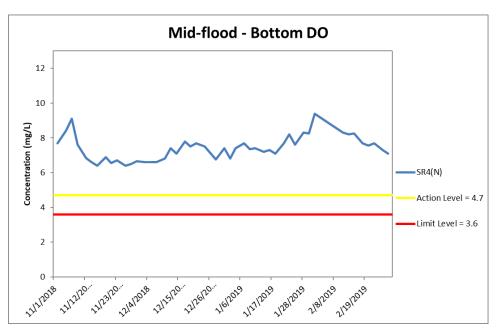


Figure H19 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



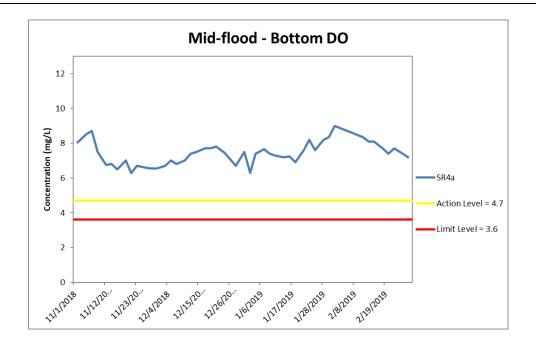
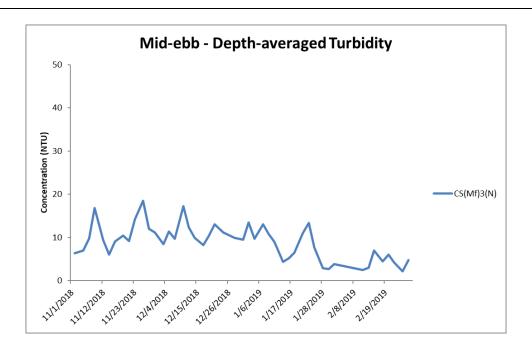


Figure H20 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





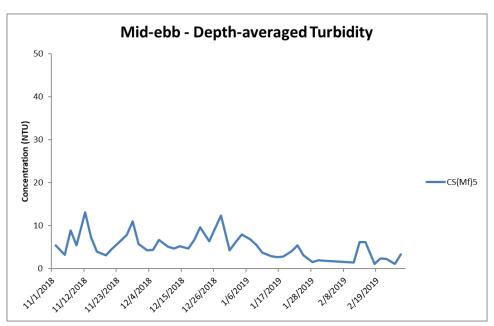
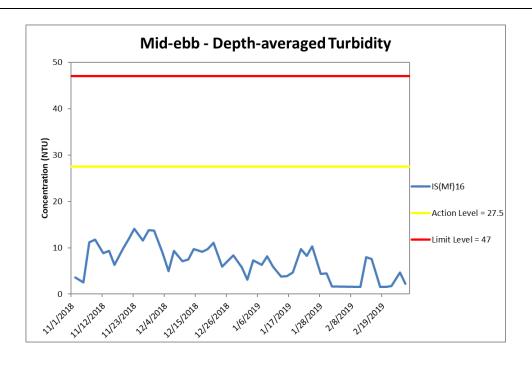


Figure H21 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





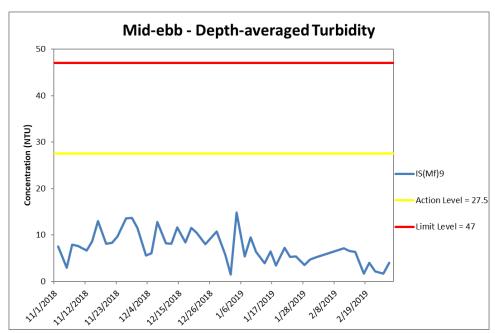
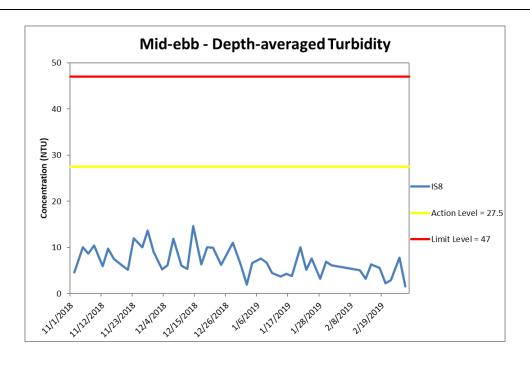


Figure H22 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





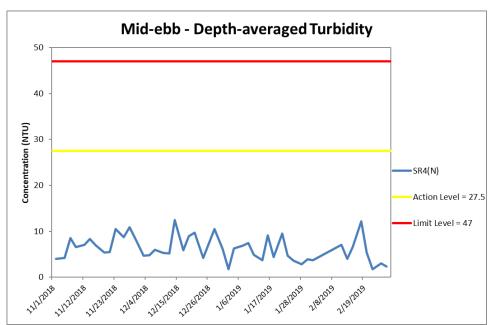


Figure H23 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



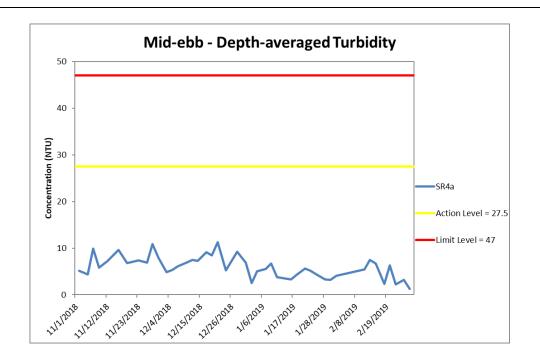
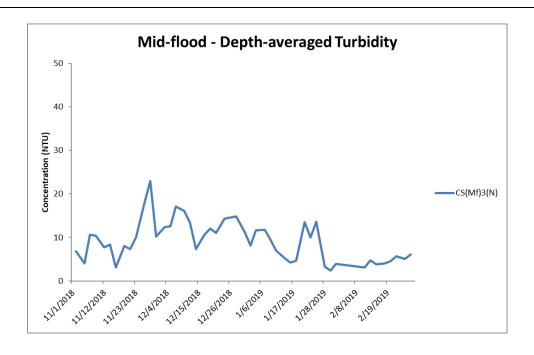


Figure H24 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





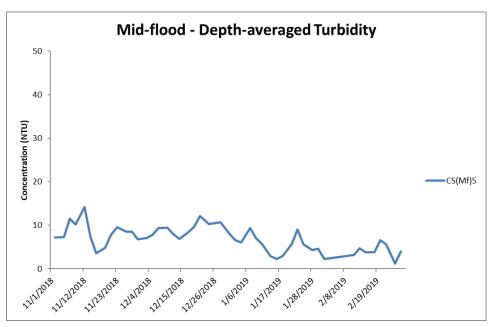
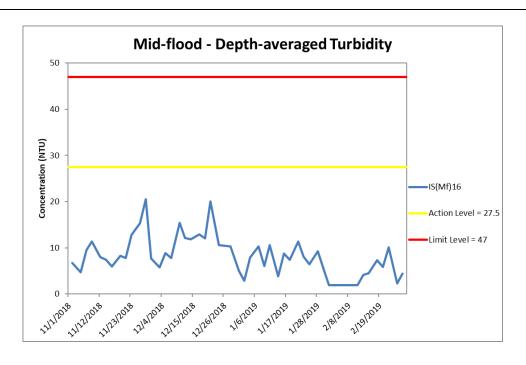


Figure H25 Impact Monitoring - Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(MF)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





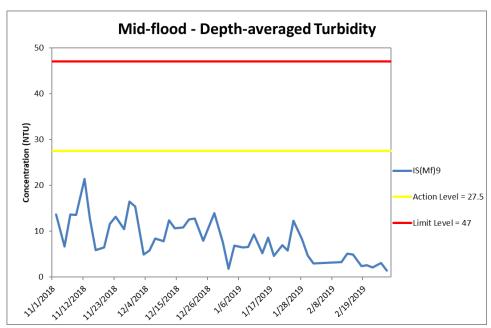
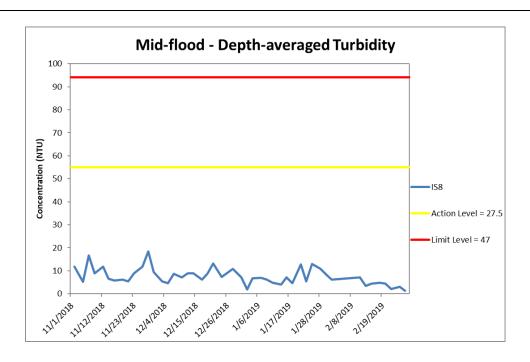
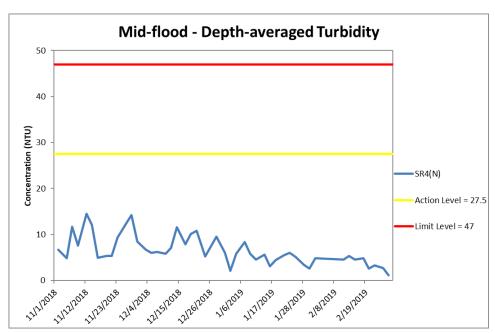


Figure H26 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.







`Figure H27 Impact Monitoring - Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



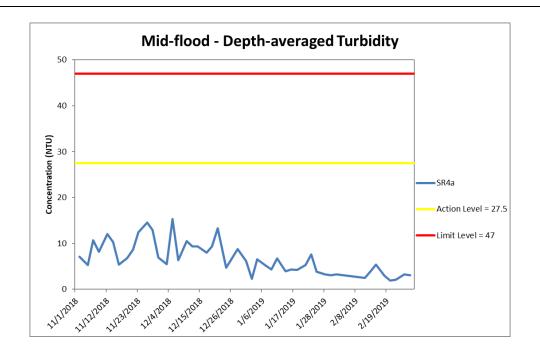
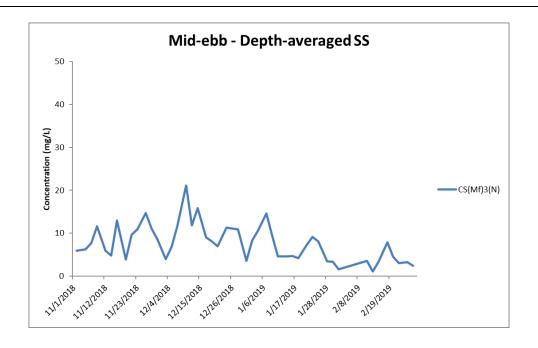


Figure H28 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





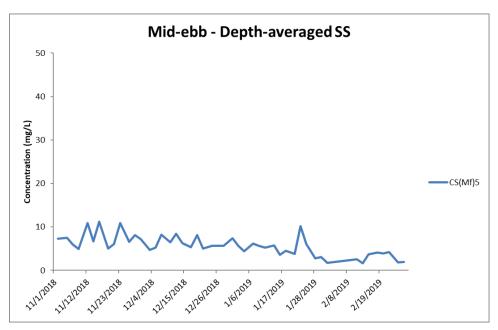
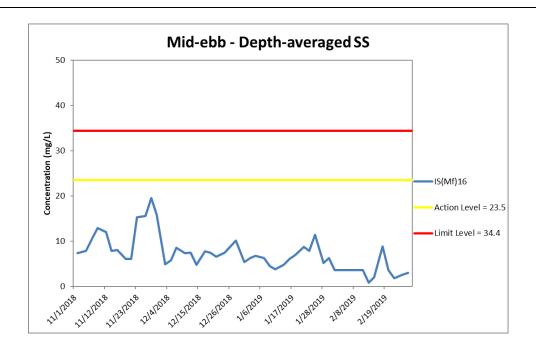


Figure H29 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





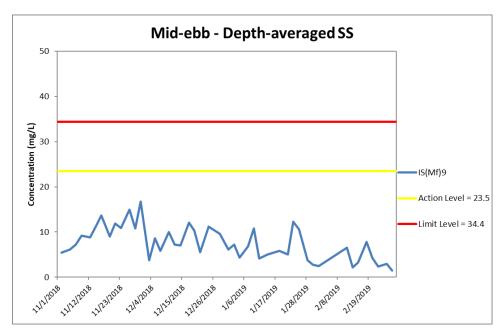
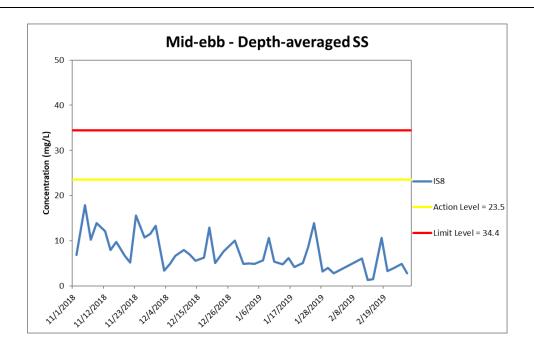


Figure H30 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





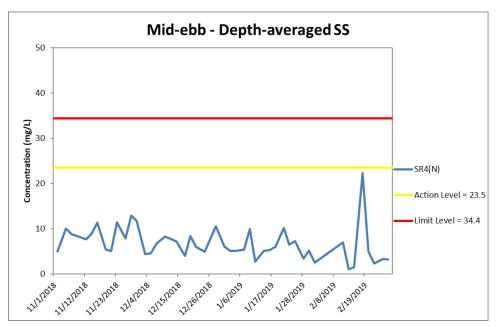


Figure H31 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



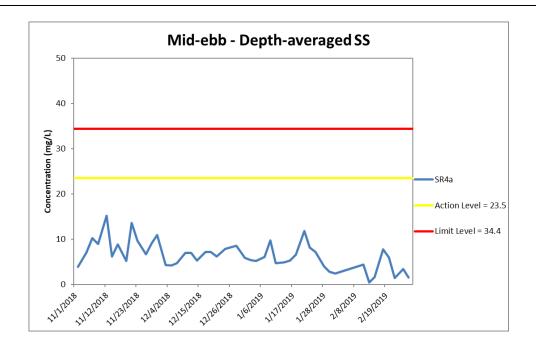
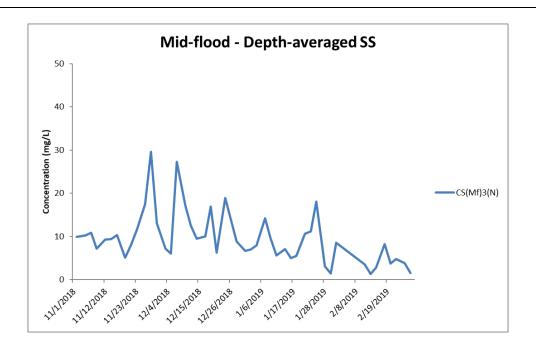


Figure H32 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-ebb tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.





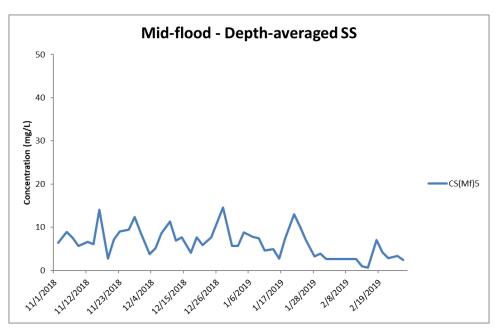
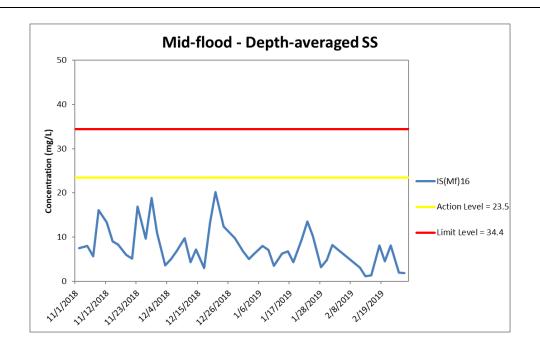


Figure H33 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2018 and 28 February 2019 at CS(Mf)3(N) and CS(Mf)5.

Marine works within the reporting period include Reinstatement of seawall at seafront.





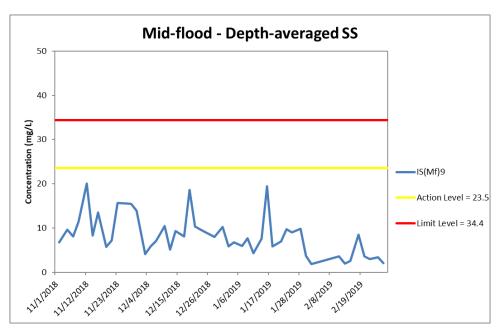
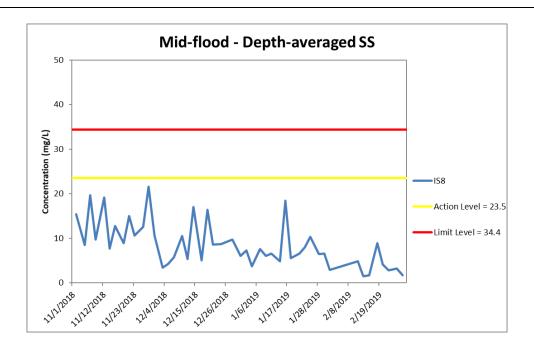


Figure H34 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2018 and 28 February 2019 at IS(Mf)16 and IS(Mf)9.

Marine works within the reporting period include Reinstatement of seawall at seafront.





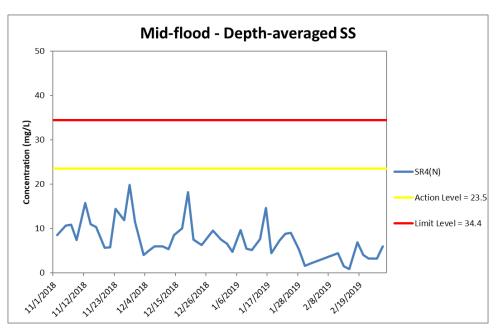


Figure H35 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2018 and 28 February 2019 at IS8 and SR4(N).

Marine works within the reporting period include Reinstatement of seawall at seafront.



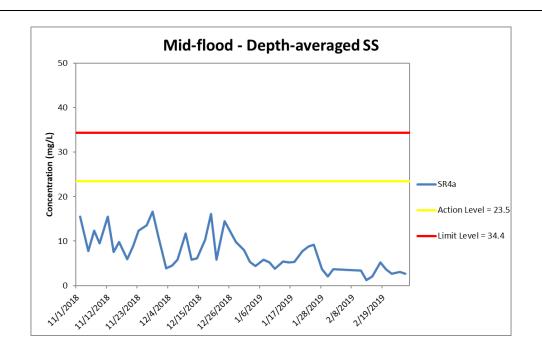


Figure H36 Impact Monitoring – Mean depth-averaged level of Suspended Solids (mg/L) during mid-flood tide between 1 November 2018 and 28 February 2019 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) WQM on 4, 6, 8 February 2019 was cancelled due to suspension of marine works. In-situ monitoring is taken according to the requirement specified in the EM&A Manual, i.e. 3 water depth namely 1m below sea surface, mid-depth and 1m above sea bed. If the water depth is less than 3m, mid-depth sampling only. If water depth less than 6m, mid-depth may be omitted.

Marine works within the reporting period include Reinstatement of seawall at seafront.



Appendix I

Impact Dolphin Monitoring Survey Results

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CONTRACT NO. HY/2012/07

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

21st Quarterly Progress Report (December 2018 – February 2019) submitted to Gammon Construction Limited

Submitted by Samuel K.Y. Hung, Ph.D., Hong Kong Cetacean Research Project

12 April 2019

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 21st 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 2018 to February 2019, utilizing the survey data collected by HKLR03 impact phase monitoring 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.

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	805476	820800	14	Start Point	817537	820220
2	End Point	805476	826654	14	End Point	817537	824613
3	Start Point	806464	821150	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	821500	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	821850	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	822150	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	822000	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



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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	821176	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	24	Start Point	805476	815900
12	End Point	815542	824882	24	End Point	805476	819100

- 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 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2017, 2018). 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 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.



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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 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 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[©] 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

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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-km² grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km²) and dolphin densities (total number of dolphins from on-effort sightings per km²) 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 sightings per 100 units of survey effort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of dolphins per 100 units of survey effort. Among the 1-km² grids that were partially covered by land, the 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-km² grid within the study area:

SPSE = $((S / E) \times 100) / SA\%$ DPSE = $((D / E) \times 100) / SA\%$

where S = total number of on-effort sightings



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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 2018 to February 2019, 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 801.74 km of survey effort was collected, with 94.7% 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, 302.10 km and 499.64 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 579.99 km, while the effort on secondary lines was 221.75 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 shown in Appendix I.
- 3.1.4. During the six sets of HKLR03 monitoring surveys from December 2018 to February 2019, 12 groups of 38 Chinese White Dolphins were sighted. Ten of the 12 dolphin sightings were made during on-effort search in this quarter, and eight of the ten on-effort dolphin sightings were made on primary lines. A summary table of dolphin sightings is shown in Appendix II.



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- 3.1.5. In this quarterly period, all dolphin groups were sighted in NWL, and no dolphin was sighted at all in NEL. In fact, since August 2014, only two sightings of two lone dolphins were made respectively in NEL during HKLR03 monitoring surveys.
- 3.2. Distribution
- 3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys from December 2018 to February 2019 is shown in Figure 1. These sightings were all scattered at the western portion of the North Lantau region, with no particular concentration (Figure 1). And as consistently recorded in the previous monitoring quarters, the dolphins were completely absent from the central and eastern portions of North Lantau waters (Figure 1).
- 3.2.2. Notably, all dolphin sightings were located far away from the alignment of TM-CLKL as well as the HKBCF and HKLR03 reclamation sites (Figure 1). However, two dolphin groups were sighted near the alignment of HKLR09 during the quarterly period.
- 3.2.3. Sighting distribution of dolphins during the present impact phase monitoring period (December 2018-February 2019) was drastically different from the one during the baseline monitoring period (Figure 1). 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). The nearly complete abandonment of NEL region by the dolphins has been consistently recorded in the past 23 quarters of HKLR03 monitoring, which has resulted in zero to extremely low dolphin encounter rates in this area.
- 3.2.4. In NWL survey area, dolphin occurrence was also significantly different between the baseline and impact phase periods. During the present impact monitoring period, dolphins were less frequently sighted here, and mainly at the western portion of the area, which was in contrary to their frequent occurrences throughout the area during the baseline period (Figure 1).
- 3.2.5. Another comparison in dolphin distribution was made between the six quarterly periods of winter months in 2013-19 (Figure 2). Among the six winter periods, dolphins were sighted regularly in NWL waters in 2013-14, but their usage there have progressively reduced in the five subsequent winter periods, with their occurrences mostly concentrated at the western portion of North Lantau waters (Figure 2).
- 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).

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Table 2. Dolphin encounter rates (sightings per 100 km of survey effort) during December 2018 – February 2019

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 (3 & 5 Dec 2018)	0.00	0.00	
	Set 2 (10 & 12 Dec 2018)	0.00	0.00	
Northeast	Set 3 (2 & 3 Jan 2019)	0.00	0.00	
Lantau	Set 4 (7 & 14 Jan 2019)	0.00	0.00	
	Set 5 (1 & 14 Feb 2019)	0.00	0.00	
	Set 6 (20, 25 & 26 Feb 2019)	0.00	0.00	
	Set 1 (3 & 5 Dec 2018)	3.95	11.86	
	Set 2 (10 & 12 Dec 2018)	0.00	0.00	
Northwest	Set 3 (2 & 3 Jan 2019)	3.32	14.94	
Lantau	Set 4 (7 & 14 Jan 2019)	0.00	0.00	
	Set 5 (1 & 14 Feb 2019)	3.86	7.72	
	Set 6 (20, 25 & 26 Feb 2019)	3.29	13.16	

Table 3. Comparison of average dolphin encounter rates from impact monitoring period (December 2018 – February 2019) 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 r (no. of on-effort dolph km of surve	in sightings per 100	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)		
	December 2018 – February 2019	September – November 2011	December 2018 – February 2019	September – November 2011	
Northeast Lantau	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81	
Northwest Lantau	2.40 ± 1.88	9.85 ± 5.85	7.95 ± 6.60	44.66 ± 29.85	

- 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 2.15 sightings and 7.11 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.
- 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 on-effort sighting being made, and such extremely low occurrence of dolphins in NEL have been consistently



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recorded in the past 23 quarters of HKLR03 monitoring (Table 4). This is a serious concern as the dolphin occurrence in NEL in the past several years (0.0-1.0 for ER(STG) and 0.0-3.9 for ER(ANI)) have remained exceptionally low when compared to the baseline period (Table 4). Dolphins have been virtually absent from NEL waters since August 2014, with only two lone dolphins sighted there on two separate occasions since then despite consistent and intensive survey effort being conducted in this survey area.

- 3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present impact phase monitoring period (reductions of 75.6% and 82.2% respectively) were only small fractions of the ones recorded during the three-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. When comparing among the seven winter quarters since 2013-14, the quarterly encounter rates in 2018-19 dropped to the lowest among all winter quarters during the HKLR03 construction phase (Table 5). Such dramatic drop in dolphin occurrence in NWL should raise serious concerns, and the temporal trend should be closely monitored in the upcoming monitoring quarters as the construction activities of HZMB works will soon be completed in coming months.
- 3.3.6. 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).
- 3.3.7. For the comparison between the baseline period and the present quarter (25th quarter of the impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.0041 and 0.0221 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.
- 3.3.8. For the comparison between the baseline period and the cumulative quarters in impact phase (i.e. the first 25 quarters of the impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were both 0.000000. Even if the alpha value is set at 0.00001, 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).



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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) (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)
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
March-May 2016 (Impact)	0.00	0.00
June-August 2016 (Impact)	0.00	0.00
September-November 2016 (Impact)	0.00	0.00
December 2016-February 2017 (Impact)	0.00	0.00
March-May 2017 (Impact)	0.00	0.00
June-August 2017 (Impact)	0.00	0.00
September-November 2017 (Impact)	0.00	0.00
December 2017-February 2018 (Impact)	0.00	0.00
March-May 2018 (Impact)	0.00	0.00
June-August 2018 (Impact)	0.00	0.00
September-November 2018 (Impact)	0.00	0.00
December 2018-February 2019 (Impact)	0.00	0.00



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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) (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)
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
March-May 2016 (Impact)	0.98 ± 1.10	4.78 ± 6.85
June-August 2016 (Impact)	1.72 ± 2.17	7.48 ± 10.98
September-November 2016 (Impact)	2.86 ± 1.98	10.89 ± 10.98
December 2016-February 2017 (Impact)	3.80 ± 3.79	14.52 ± 17.21
March-May 2017 (Impact)	0.93 ± 1.03	5.25 ± 9.53
June-August 2017 (Impact)	2.20 ± 2.88	6.58 ± 8.12
September-November 2017 (Impact)	3.12 ± 1.91	10.35 ± 9.66
December 2017-February 2018 (Impact)	4.75 ± 2.26	15.73 ± 15.94
March-May 2018 (Impact)	2.88 ± 4.81	11.12 ± 22.46
June-August 2018 (Impact)	1.16 ± 1.39	2.87 ± 3.32
September-November 2018 (Impact)	1.51 ± 2.25	2.70 ± 3.78
December 2018-February 2019 (Impact)	2.40 ± 1.88	7.95 ± 6.60

3.3.9. As indicated in both dolphin distribution patterns and encounter rates, dolphin usage has



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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 of the past few years.

- 3.3.10. The dramatic decline in dolphin usage of North Lantau region 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 2017, 2018). Apparently there has been little sign of recovery of dolphin usage even though almost all marine works associated with the HZMB construction have been completed, and the Brothers Marine Park has been established as a compensation measure for the permanent habitat loss in association with the HKBCF reclamation works.
- 3.4. Group size
- 3.4.1. Group size of Chinese White Dolphins ranged from one to seven individuals per group in North Lantau region during December 2018 to February 2019. 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 6.

Table 6. Comparison of average dolphin group sizes from impact monitoring period (December 2018 – February 2019) and baseline monitoring period (September – November 2011) (Note: ± denotes the standard deviation of the average group size)

	Average Dolph	Average Dolphin Group Size								
	December 2018 – February 2019 September – Novemb									
Overall	3.17 ± 1.80 (n = 12)	3.72 ± 3.13 (n = 66)								
Northeast Lantau		3.18 ± 2.16 (n = 17)								
Northwest Lantau	3.17 ± 1.80 (n = 12)	3.92 ± 3.40 (n = 49)								

- 3.4.2. The average dolphin group size in NWL waters during December 2018 to February 2019 was lower than the one recorded during the three-month baseline period, but it should also be noted that the sample size of 12 dolphin groups in the present quarter was very small when compared to the 66 groups sighted during the baseline period (Table 6).
- 3.4.3. Notably, with the exception of the three medium-sized groups with 5-7 animals, the other nine groups were small with 1-4 animals per group only (Appendix II).
- 3.4.4. Distribution of the larger dolphin groups with five individuals or more per group during the present quarter is shown in Figure 3, with comparison to the one in baseline period. The three medium-sized groups were distributed at the mouth of Deep Bay, near Lung Kwu Tan and between Sha Chau and Lung Kwu Chau respectively. Such distribution pattern was very different from the baseline period, when the larger dolphin groups were frequently sighted and evenly distributed in NWL waters, with a few also being sighted in NEL waters (Figure 3).
- 3.5. Habitat use
- 3.5.1. From December 2018 to February 2019, only nine grids in North Lantau waters recorded



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dolphin occurrence. Among them, the ones with moderately high dolphin densities were located near Lung Kwu Tan, between Sha Chau and Lung Kwu Chau, as well as to the north of the airport adjacent to the third runway expansion reclamation work site (Figures 4a and 4b). In contrast, the rest of the grids only recorded low to moderate densities.

- 3.5.2. Notably, all grids near HKLR03/HKBCF reclamation sites as well as TMCLKL/HKLR09 alignments did not record any presence of dolphins at all during on-effort search in the present quarterly period (Figures 4a and 4b).
- 3.5.3. It should be emphasized 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 is collected throughout the impact phase monitoring programme.
- 3.5.4. When compared with the habitat use patterns during the baseline period, dolphin usage in NEL and NWL has drastically 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).
- 3.5.5. The density patterns were also very different in NWL between the baseline and impact phase monitoring periods, with high 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, only several grids with moderate to high densities were scattered in the western portion of North Lantau waters during the present impact phase period (Figure 5).
- 3.6. *Mother-calf pairs*
- 3.6.1. During the present quarterly period, only one unspotted juvenile was sighted with its mother in the North Lantau region. In fact, that was the only young calf being sighted in the past two years of HKLR03 monitoring. This young calf was spotted with its mother (WL145, a known individual from the photo-identification catalogue) at the southwest corner of NWL survey area, or adjacent to the HKLR09 alignment (Figure 6).
- 3.6.2. It should be noted that the rare occurrence of young calves in the present quarter as well as in recent years of HKLR03 monitoring was very different from their regular occurrence in North Lantau waters during the baseline period (Figure 6). This should be of a serious concern, and such calf occurrence should be closely monitored in the upcoming quarters.
- 3.7. Activities and associations with fishing boats
- 3.7.1. Among the 12 dolphin groups, two of them were engaged in feeding activity, while none was engaged in socializing, traveling or milling/resting activity during the quarterly period.

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- 3.7.2. The percentage of sightings associated with feeding activity (16.7%) was higher than the one recorded during the baseline period (11.6%), but it should be noted the sample sizes on total numbers of dolphin sightings were very different between the two periods.
- 3.7.3. Distribution of dolphins engaged in various activities during the present three-month period and baseline period is shown in Figure 7. The two dolphin groups engaged in feeding activities were located to the north of the airport platform and adjacent to the HKLR09 alignment respectively, and this was very different from the baseline period when various dolphin activities occurred throughout the North Lantau region (Figure 7).
- 3.7.4. Notably, none of the 12 dolphin groups was found to be associated with any operating fishing vessel during the present impact phase period.
- 3.8. Summary of photo-identification works
- 3.8.1. From December 2018 to February 2019, about 1,200 digital photographs of Chinese White Dolphins were taken during the impact phase monitoring surveys for the photo-identification work.
- 3.8.2. In total, 16 individuals sighted 31 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. Five of the 16 individuals (i.e. CH34, NL123, NL136, NL182 and NL202) were re-sighted 3-4 times, while the rest were re-sighted only once or twice during the quarterly monitoring period (Appendix III).
- 3.8.3. Notably, only one individual (NL259) was sighted in WL waters during the HKLR09 monitoring surveys under the same three-month period.
- 3.9. Individual range use
- 3.9.1. Ranging patterns of the 16 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, in contrary to previous monitoring quarters, only one of the 16 individuals (NL259) have extended their range use to WL waters during the same winter quarter of 2018-19, while four individuals (i.e. WL98, WL243, WL273 and WL281) that have consistently utilized WL waters in the past have extended their range use to NWL waters during the present quarter.
- 3.9.4. In the upcoming quarters, individual range use and movements should be continuously monitored to examine whether there has been any consistent shifts of individual home ranges from North Lantau to West or Southwest Lantau and vice versa, as such shift could



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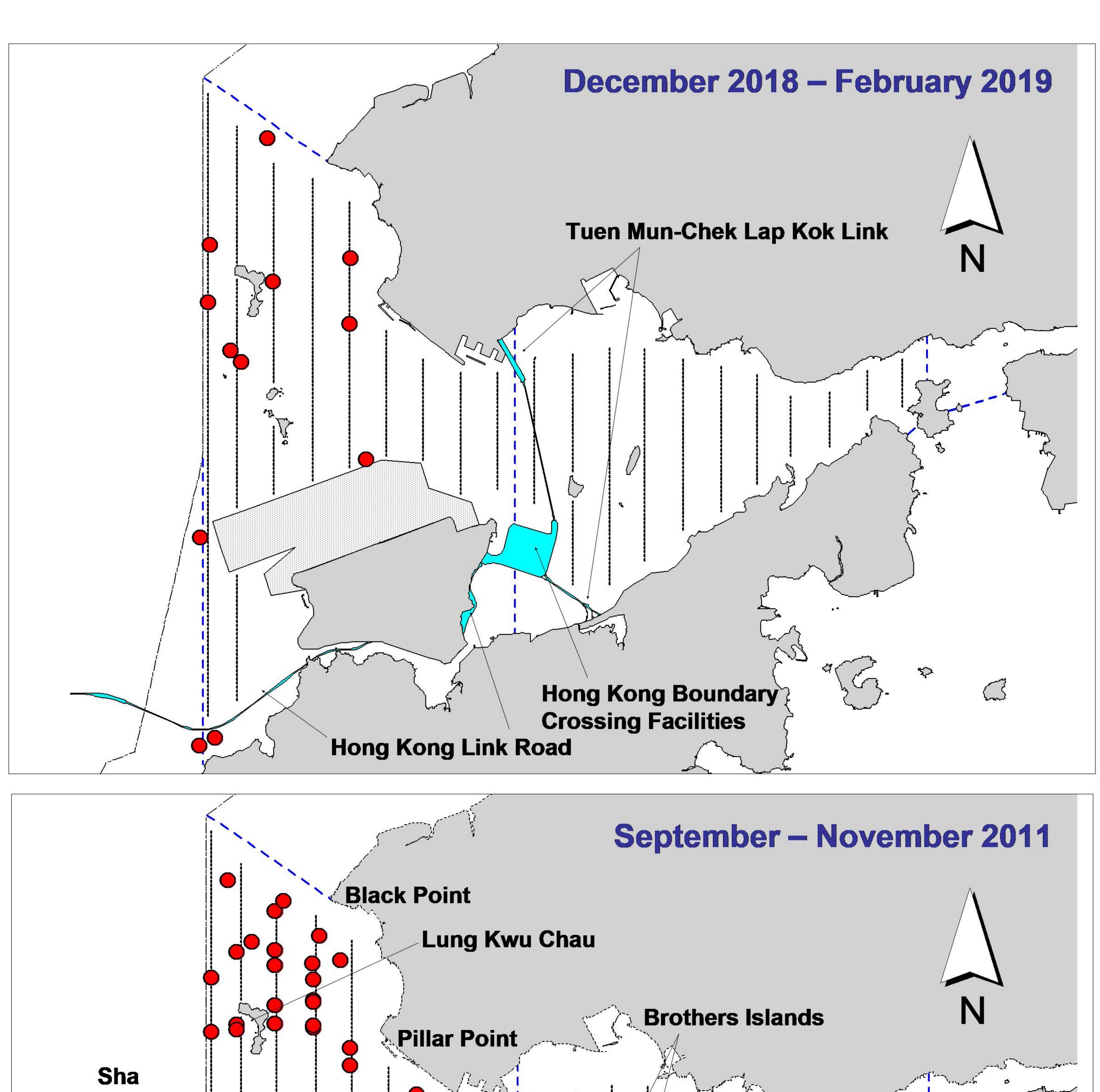
possibly be related to the HZMB-related construction works.

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 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

- Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.
- Hung, S. K. 2017. Monitoring of marine mammals in Hong Kong waters data collection: final report (2016-17). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 162 pp.
- Hung, S. K. 2018. Monitoring of marine mammals in Hong Kong waters data collection: final report (2017-18). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 174 pp.
- Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.



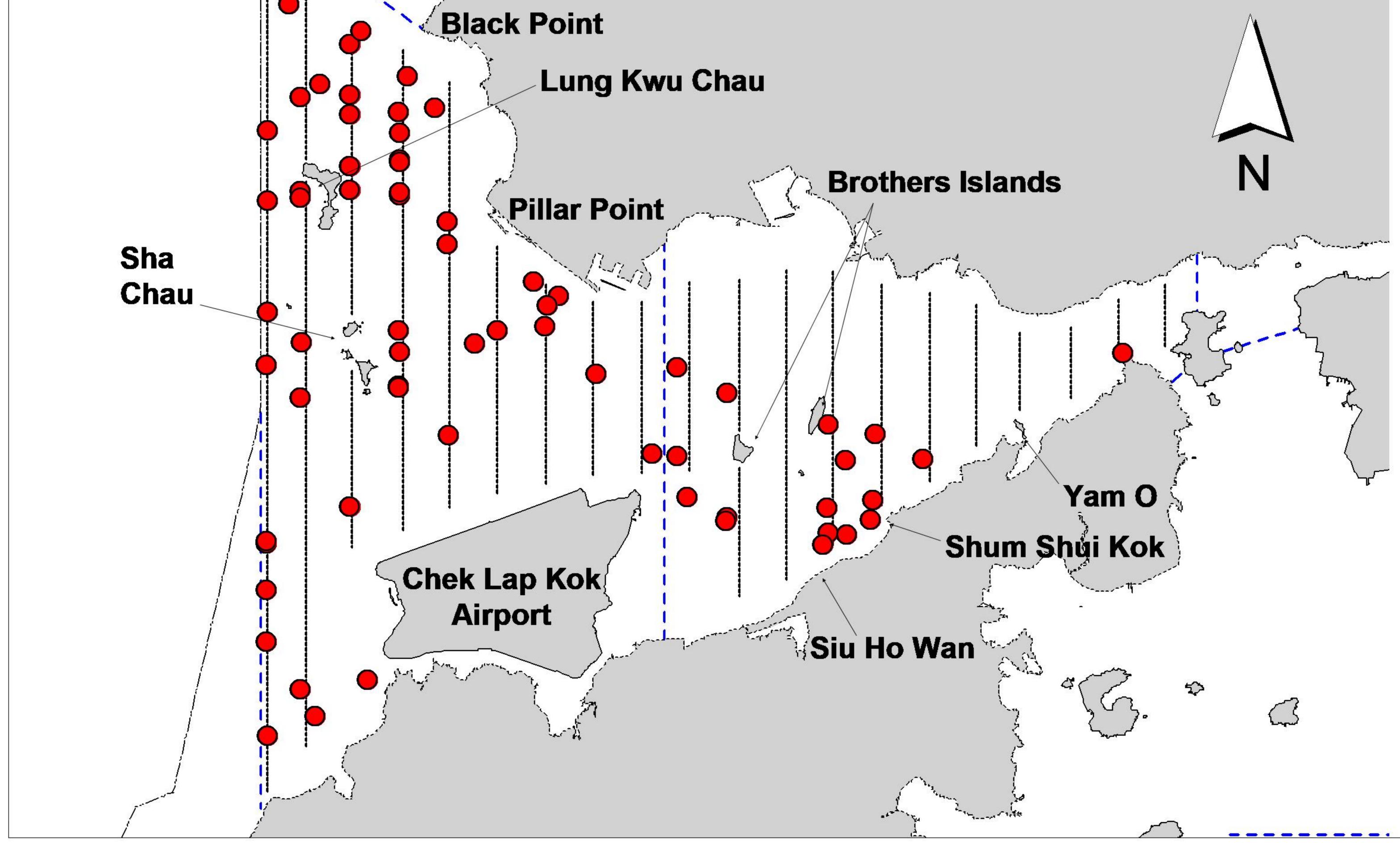


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

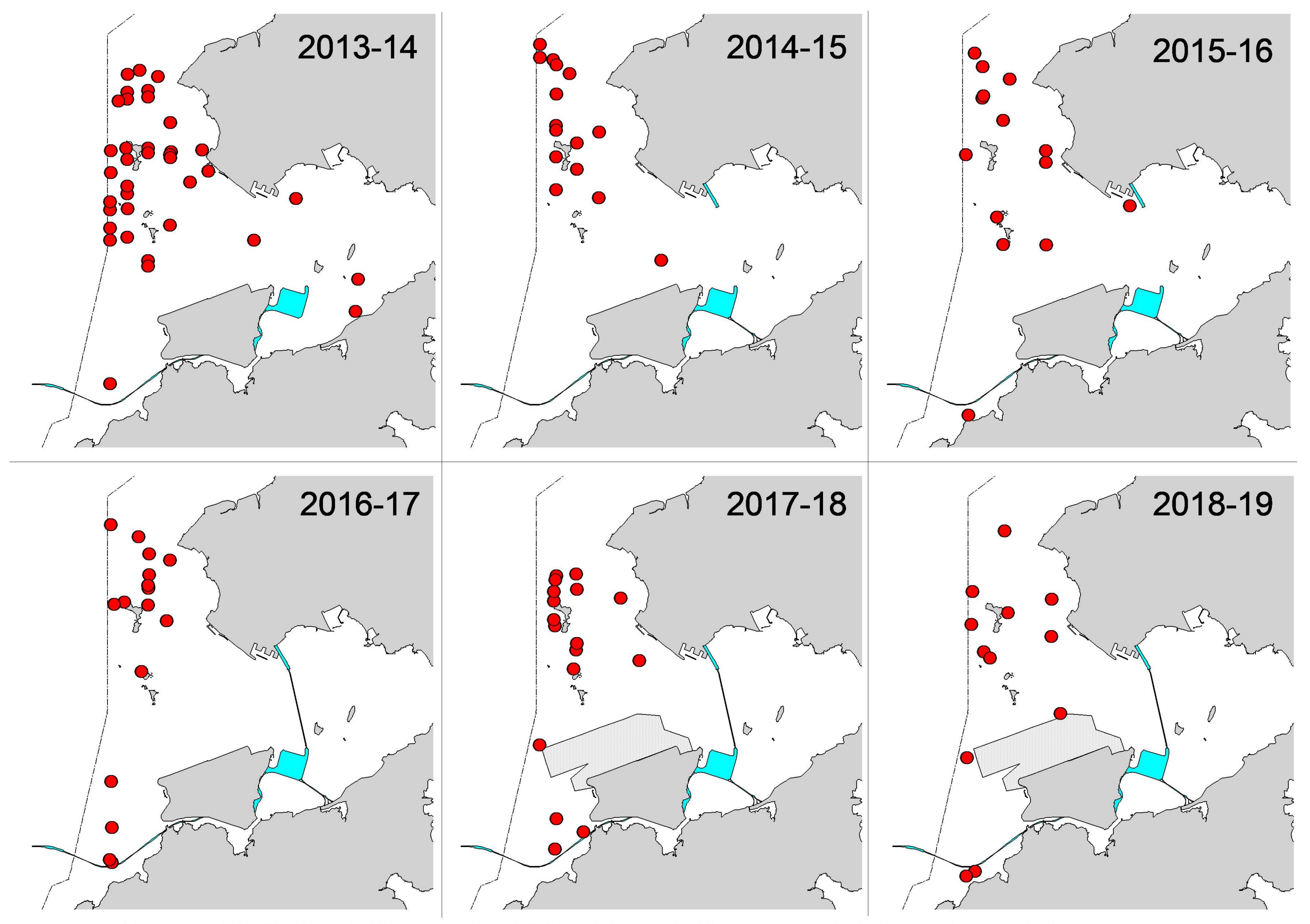


Figure 2. Distribution of Chinese white dolphin sightings in Northwest and Northeast Lantau during the past six winter quarters (December-February) of HKLR03 impact phase in 2013-19

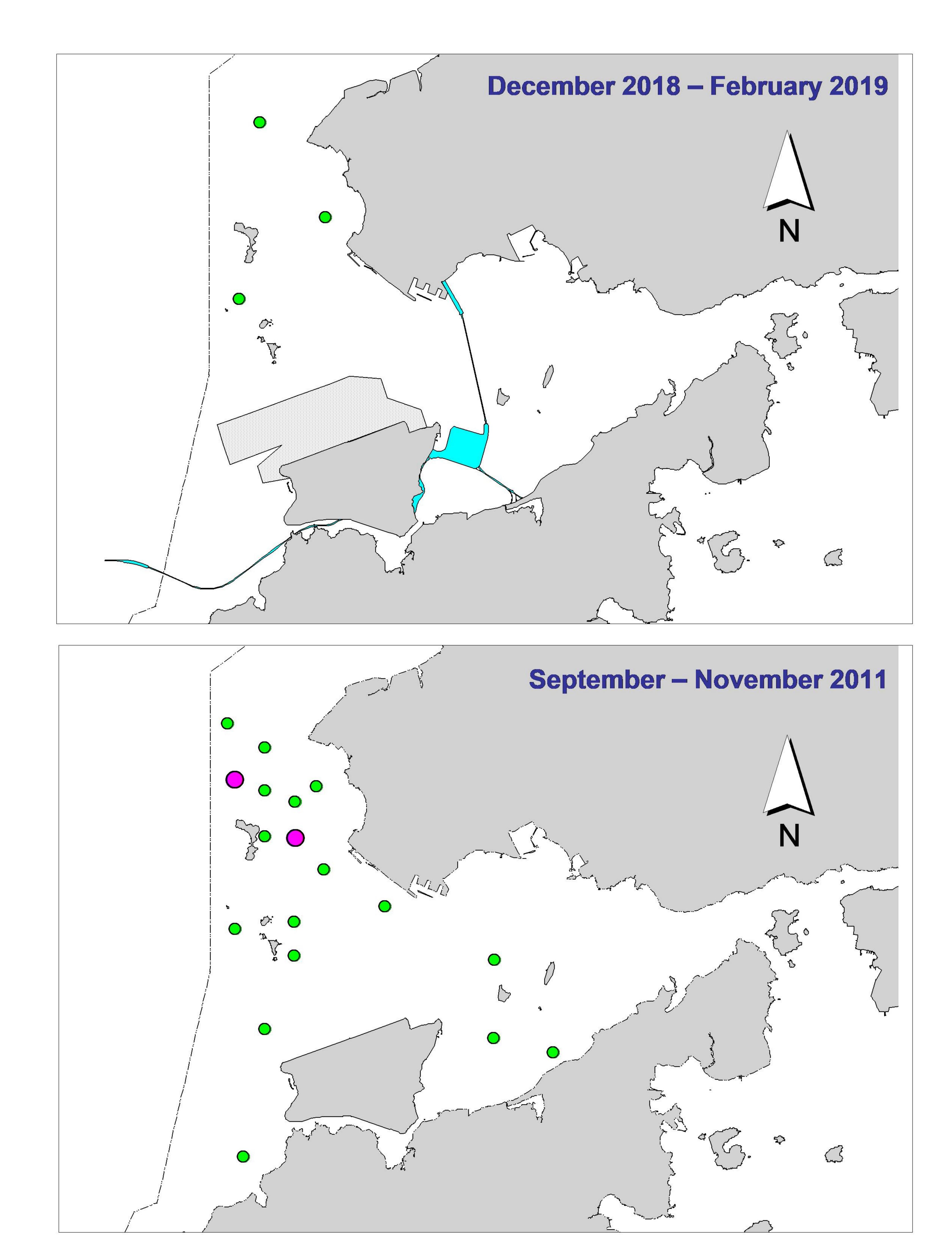


Figure 3. Distribution of Chinese white dolphins with larger group sizes during HKLR03 impact phase (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

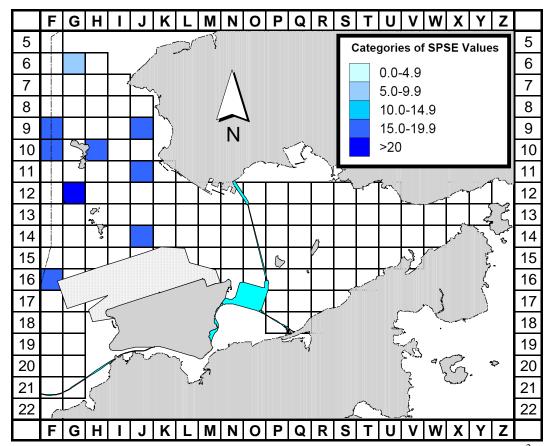


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Dec 18-Feb 19) (SPSE = no. of on-effort sightings per 100 units of survey effort)

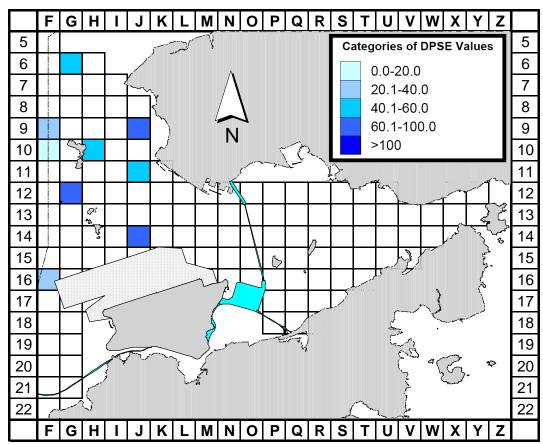


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km² in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Dec 18-Feb 19) (DPSE = no. of dolphins per 100 units of survey effort)

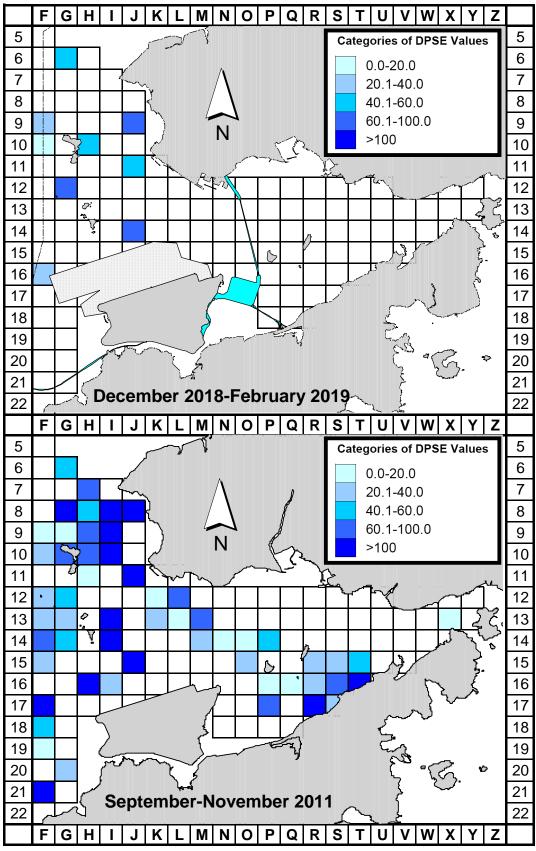


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km² in Northwest and Northeast Lantau survey area between the impact monitoring period (December 2018-February 2019) and baseline monitoring period (September-November 2011) (DPSE = no. of dolphins per 100 units of survey effort)

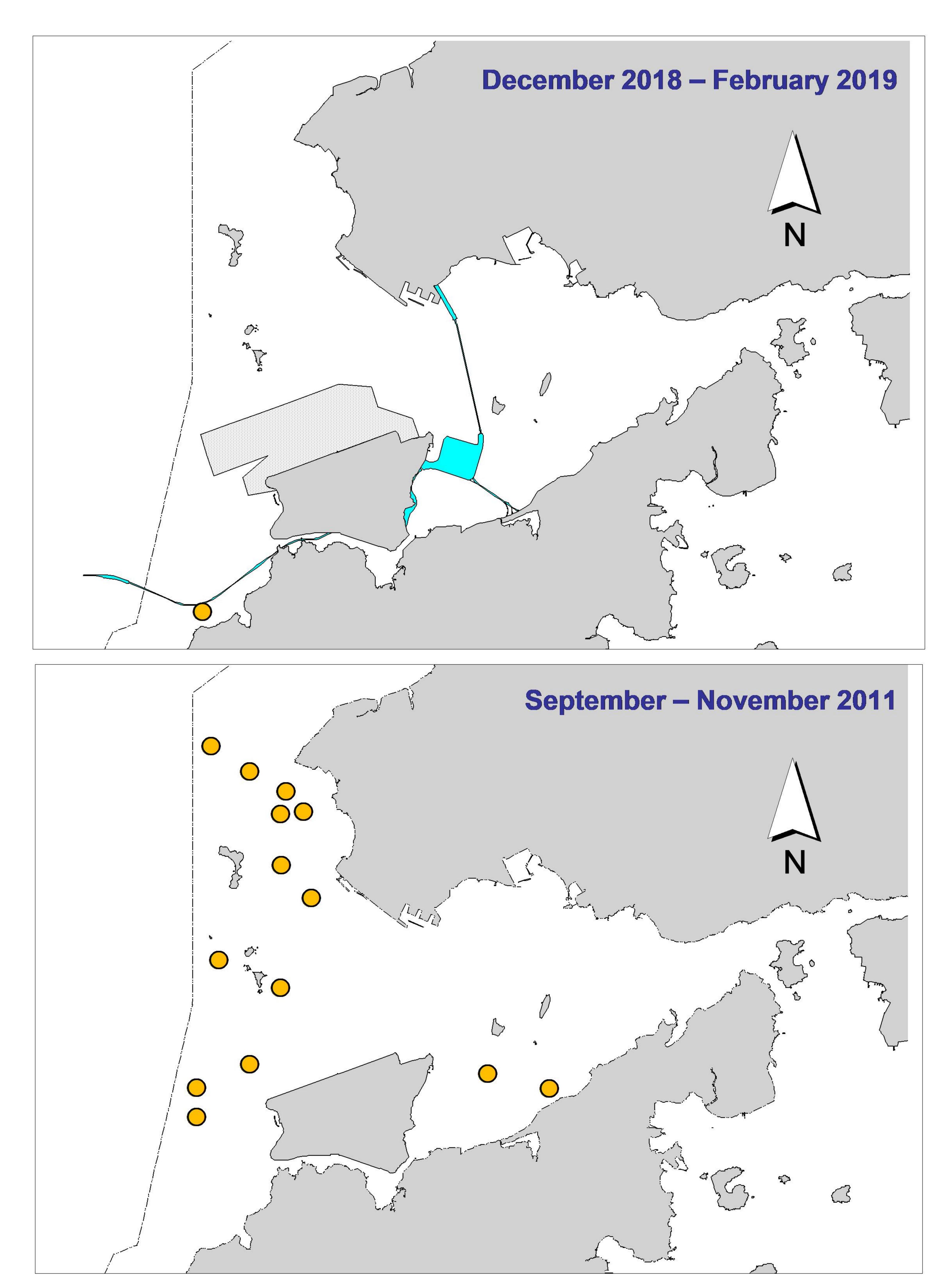


Figure 6. Distribution of young calves of Chinese white dolphins during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

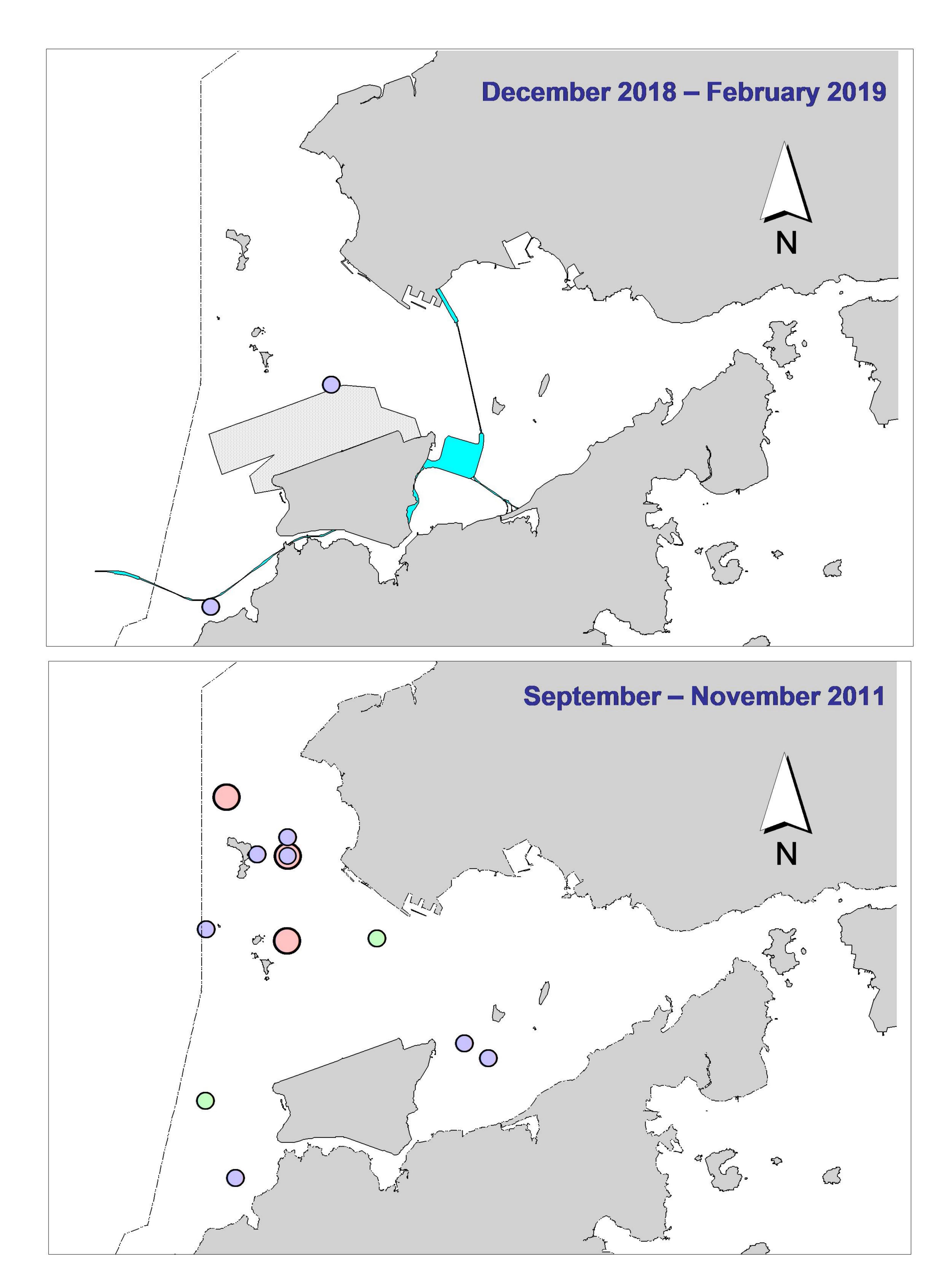


Figure 7. Distribution of Chinese white dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

Appendix I. HKLR03 Survey Effort Database (December 2018-February 2019)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
3-Dec-18	NW LANTAU	2	27.00	WINTER	STANDARD36826	HKLR	Р
3-Dec-18	NW LANTAU	3	4.18	WINTER	STANDARD36826	HKLR	Р
3-Dec-18	NW LANTAU	2	10.68	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NW LANTAU	3	19.43	WINTER	STANDARD36826	HKLR	Р
5-Dec-18	NW LANTAU	4	9.90	WINTER	STANDARD36826	HKLR	Р
5-Dec-18	NW LANTAU	3	6.57	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NW LANTAU	4	4.30	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NE LANTAU	2	8.60	WINTER	STANDARD36826	HKLR	Р
5-Dec-18	NE LANTAU	3	26.18	WINTER	STANDARD36826	HKLR	Р
5-Dec-18	NE LANTAU	4	1.10	WINTER	STANDARD36826	HKLR	Р
5-Dec-18	NE LANTAU	2	6.60	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NE LANTAU	3	6.22	WINTER	STANDARD36826	HKLR	S
10-Dec-18	NW LANTAU	2	13.34	WINTER	STANDARD36826	HKLR	P
10-Dec-18	NW LANTAU	3	22.85	WINTER	STANDARD36826	HKLR	Р
10-Dec-18	NW LANTAU	2	8.98	WINTER	STANDARD36826	HKLR	S
10-Dec-18	NW LANTAU	3	1.73	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NW LANTAU	2	7.60	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NW LANTAU	3	10.12	WINTER	STANDARD36826	HKLR	Р
12-Dec-18	NW LANTAU	4	7.55	WINTER	STANDARD36826	HKLR	Р
12-Dec-18	NW LANTAU	2	2.10	WINTER	STANDARD36826	HKLR	S
		3		WINTER			S
12-Dec-18	NW LANTAU	4	6.10		STANDARD36826	HKLR	
12-Dec-18	NW LANTAU	· ·	2.53	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NE LANTAU	2	33.02	WINTER	STANDARD36826	HKLR	Р
12-Dec-18	NE LANTAU	3	2.59	WINTER	STANDARD36826	HKLR	Р
12-Dec-18	NE LANTAU	2	12.69	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NW LANTAU	2	5.20	WINTER	STANDARD36826	HKLR	Р
2-Jan-19	NW LANTAU	3	23.70	WINTER	STANDARD36826	HKLR	Р
2-Jan-19	NW LANTAU	2	5.40	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NW LANTAU	3	3.96	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NW LANTAU	4	2.14	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NE LANTAU	2	17.54	WINTER	STANDARD36826	HKLR	Р
2-Jan-19	NE LANTAU	3	17.80	WINTER	STANDARD36826	HKLR	Р
2-Jan-19	NE LANTAU	2	8.76	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NE LANTAU	3	5.80	WINTER	STANDARD36826	HKLR	S
3-Jan-19	NW LANTAU	2	31.36	WINTER	STANDARD36826	HKLR	Р
3-Jan-19	NW LANTAU	2	11.88	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NW LANTAU	2	21.80	WINTER	STANDARD36826	HKLR	P
7-Jan-19	NW LANTAU	3	10.90	WINTER	STANDARD36826	HKLR	Р
7-Jan-19	NW LANTAU	2	2.20	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NW LANTAU	3	9.60	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NE LANTAU	2	35.83	WINTER	STANDARD36826	HKLR	Р
7-Jan-19	NE LANTAU	2	12.07	WINTER	STANDARD36826	HKLR	S
14-Jan-19	NW LANTAU	2	26.88	WINTER	STANDARD36826	HKLR	Р
14-Jan-19	NW LANTAU	2	13.92	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU NW LANTAU	2	6.59	WINTER	STANDARD36826	HKLR	P P
1-Feb-19	NW LANTAU NW LANTAU	3	20.70	WINTER	STANDARD36826	HKLR	P
1-Feb-19 1-Feb-19	NW LANTAU NW LANTAU	4	5.70	WINTER WINTER	STANDARD36826 STANDARD36826	HKLR	S
1-Feb-19 1-Feb-19	NW LANTAU NW LANTAU	1 2	1.06 5.60	WINTER	STANDARD36826 STANDARD36826	HKLR HKLR	S
	NW LANTAU	3					s S
1-Feb-19	INVV LAIVIAU	٥	4.30	WINTER	STANDARD36826	HKLR	3

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
1-Feb-19	NE LANTAU	1	2.60	WINTER	STANDARD36826	HKLR	Р
1-Feb-19	NE LANTAU	2	33.86	WINTER	STANDARD36826	HKLR	Р
1-Feb-19	NE LANTAU	1	2.30	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NE LANTAU	2	10.14	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	2	11.58	WINTER	STANDARD36826	HKLR	Р
14-Feb-19	NW LANTAU	3	12.95	WINTER	STANDARD36826	HKLR	Р
14-Feb-19	NW LANTAU	4	3.30	WINTER	STANDARD36826	HKLR	Р
14-Feb-19	NW LANTAU	2	1.76	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	3	7.76	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	2	15.35	WINTER	STANDARD36826	HKLR	Р
20-Feb-19	NW LANTAU	3	12.38	WINTER	STANDARD36826	HKLR	Р
20-Feb-19	NW LANTAU	2	7.25	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	3	5.06	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NW LANTAU	2	27.52	WINTER	STANDARD36826	HKLR	Р
25-Feb-19	NW LANTAU	3	5.53	WINTER	STANDARD36826	HKLR	Р
25-Feb-19	NW LANTAU	2	11.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	1	4.41	WINTER	STANDARD36826	HKLR	Р
25-Feb-19	NE LANTAU	2	15.20	WINTER	STANDARD36826	HKLR	Р
25-Feb-19	NE LANTAU	1	6.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	2	5.24	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	3	12.70	WINTER	STANDARD36826	HKLR	Р
26-Feb-19	NE LANTAU	4	3.51	WINTER	STANDARD36826	HKLR	Р
26-Feb-19	NE LANTAU	5	1.64	WINTER	STANDARD36826	HKLR	Р
26-Feb-19	NE LANTAU	3	8.80	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	4	0.55	WINTER	STANDARD36826	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (December 2018-February 2019)

(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
3-Dec-18	1	1046	5	NW LANTAU	2	821	ON	HKLR	827178	808517	WINTER	NONE	Р
3-Dec-18	2	1247	1	NW LANTAU	3	962	ON	HKLR	826056	804663	WINTER	NONE	Р
3-Jan-19	1	1151	7	NW LANTAU	2	614	ON	HKLR	830239	806267	WINTER	NONE	Р
3-Jan-19	2	1234	2	NW LANTAU	2	71	ON	HKLR	827529	804728	WINTER	NONE	Р
14-Jan-19	1	1319	2	NW LANTAU	2	ND	OFF	HKLR	814949	804866	WINTER	NONE	N/A
14-Jan-19	2	1336	3	NW LANTAU	2	ND	OFF	HKLR	814739	804443	WINTER	NONE	N/A
1-Feb-19	1	1233	3	NW LANTAU	3	219	ON	HKLR	825495	808493	WINTER	NONE	Р
14-Feb-19	1	1024	2	NW LANTAU	3	341	ON	HKLR	820043	804465	WINTER	NONE	S
14-Feb-19	2	1102	1	NW LANTAU	3	197	ON	HKLR	824826	805278	WINTER	NONE	Р
14-Feb-19	3	1356	4	NW LANTAU	3	82	ON	HKLR	822050	808930	WINTER	NONE	S
20-Feb-19	1	1220	5	NW LANTAU	3	878	ON	HKLR	824548	805556	WINTER	NONE	Р
25-Feb-19	1	1146	3	NW LANTAU	2	147	ON	HKLR	826584	806435	WINTER	NONE	Р

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in December 2018 - February 2019

ID#	DATE	STG#	AREA
CH34	03/12/18	1	NW LANTAU
	03/01/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
NL33	03/01/19	1	NW LANTAU
	14/01/19	2	NW LANTAU
NL98	03/01/19	2	NW LANTAU
	25/02/19	1	NW LANTAU
NL123	01/02/19	1	NW LANTAU
	14/02/19	3	NW LANTAU
	20/02/19	1	NW LANTAU
NL136	03/01/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
NL182	03/12/18	1	NW LANTAU
	03/01/19	1	NW LANTAU
	01/02/19	1	NW LANTAU
NL202	03/12/18	2	NW LANTAU
	03/01/19	1	NW LANTAU
	01/02/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
NL259	14/01/19	2	NW LANTAU
NL321	14/02/19	3	NW LANTAU
NL322	03/01/19	1	NW LANTAU
	14/01/19	2	NW LANTAU
NL331	14/02/19	1	NW LANTAU
WL17	14/02/19	3	NW LANTAU
WL98	14/01/19	1	NW LANTAU
WL243	14/02/19	1	NW LANTAU
WL273	03/01/19	1	NW LANTAU
WL281	20/02/19	1	NW LANTAU

Appendix IV. Sixteen individual dolphins that were identified during December 2018 to February 2019 under HKLR03 impact phase monitoring surveys



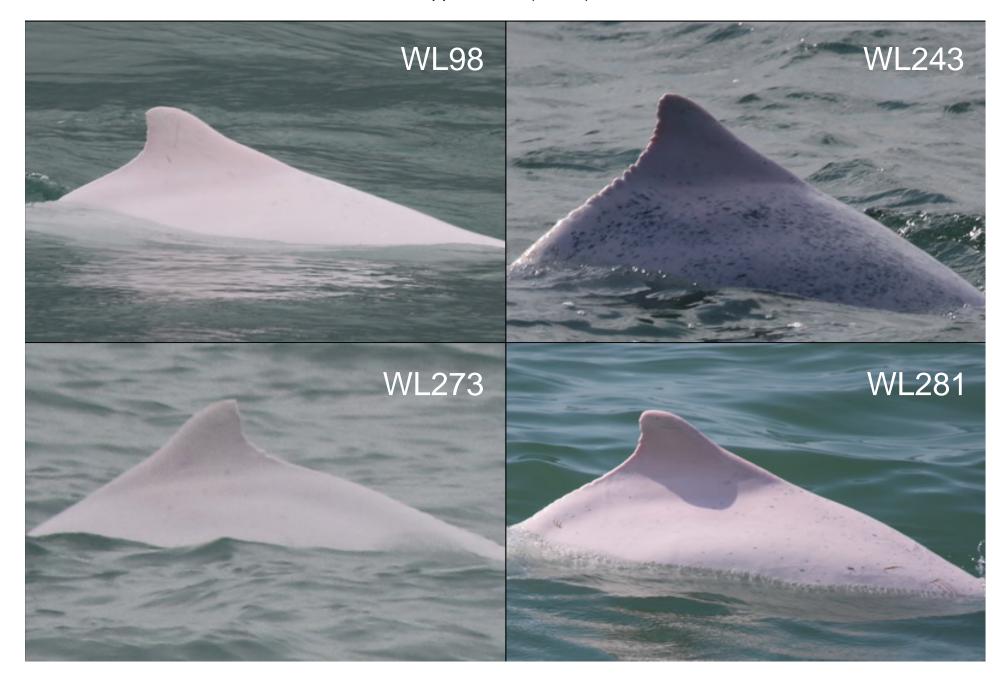
Appendix IV. (cont'd)



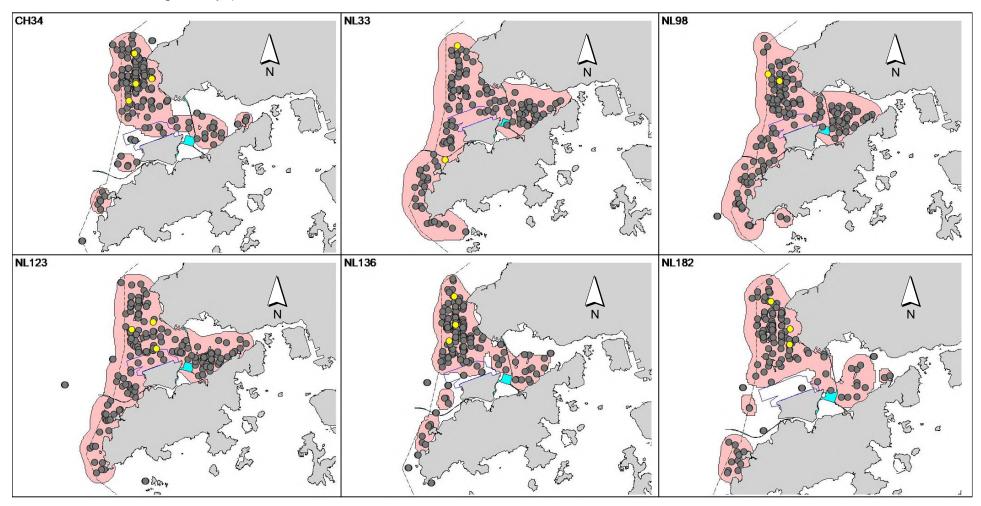
Appendix IV. (cont'd)



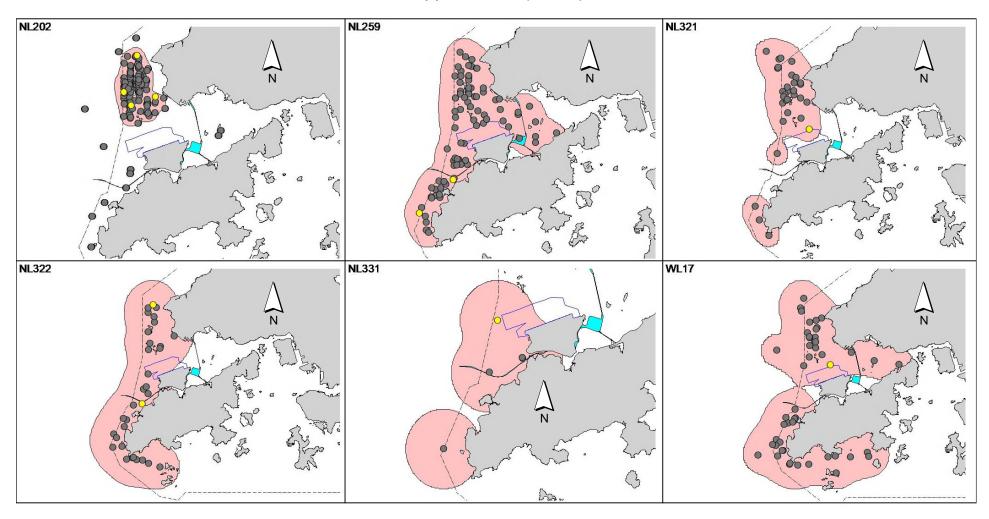
Appendix IV. (cont'd)



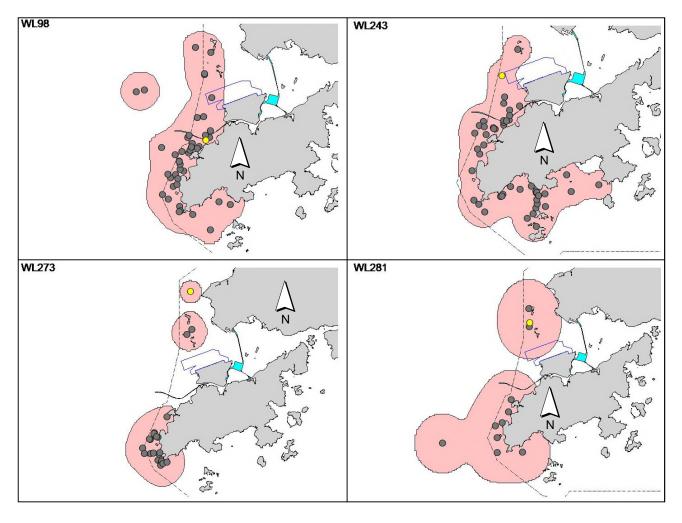
Appendix V. Ranging patterns (95% kernel ranges) of 16 individual dolphins that were sighted during HKLR03 impact phase monitoring period (note: yellow dots indicate sightings made in Dec 2018 – Feb 2019 during HKLR03 and HKLR09 monitoring surveys)



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

	ACTION												
EVENT	ET (1)	IEC (1)	SOR ⁽¹⁾	Contractor									
Limit Level													
1. Exceedance for one sample	 Identify the source. Inform the SOR and the DEP. 	1. Check monitoring data submitted by the ET.	 Confirm receipt of notification of failure in writing. 	Take immediate action to avoid further exceedance									
	 Repeat measurement to confirm finding. Increase monitoring frequency to daily. Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 	 Check Contractor's working method. Discuss with the ET and the Contractor on possible remedial measures. Advise the SOR on the effectiveness of the proposed remedial measures. Supervisor implementation of remedial measures. 	2. Notify the Contractor.3. Ensure remedial measures are properly implemented.	2. Submit proposals for remedial actions to IEC within 3 working days of notification3. Implement the agreed proposals4. Amend proposal if appropriate									
2. Exceedance for two or more consecutive samples	 Notify the IEC, the SOR, the DEP and the Contractor. Identify the source. Repeat measurements to confirm findings. Increase monitoring frequency to daily. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and 	 Discuss amongst the SOR, ET and the Contractor on the potential remedial actions. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly. Supervise the implementation of remedial measures. 	 Confirm receipt of notification of failure in writing. Notify the Contractor. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. Ensure remedial measures are properly implemented. 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. 	 Take immediate action to avoid further exceedance. Submit proposals for remedial actions to IEC within 3 working days of notification. Implement the agreed proposals. Resubmit proposals if problem still not under control. Stop the relevant activity of works as determined by the SOR until the exceedance is abated. 									

the SOR informed of the results.

8. If exceedance stops cease additional monitoring.

Appendix J2 Event/Action Plan for Construction Noise

		ACTI	ION	
EVENT	ET	IEC	SOR	Contractor
Action Level	 Notify the IEC and the Contractor. Carry out investigation. 	Review the analysed results submitted by the ET.	Confirm receipt of notification of failure in writing.	Submit noise mitigation proposals to IEC
	 Report the results of investigation to the IEC and the Contractor. Discuss with the Contractor and formulate remedial measures. Increase monitoring frequency to check mitigation effectiveness. 	 Review the proposed remedial measures by the Contractor and advise the SOR accordingly. Supervise the implementation of remedial measures. 	 Notify the Contractor. Require the Contractor to propose remedial measures for the analysed noise problem. Ensure remedial measures are properly implemented. 	Implement noise mitigation proposals
Limit Level	 Notify the IEC, the SOR, the DEP and the Contractor. 	and the Contractor on the potential	Confirm receipt of notification of failure in writing.	Take immediate action to avoid further exceedance
3.4.5.6.		remedial actions. 2. Review the Contractor's remedial actions whenever necessary to	Notify the Contractor. Require the Contractor to propose remedial measures for the analysed	Submit proposals for remedial actions to IEC within 3 working days of notification
	4. Increase monitoring frequency.	assure their effectiveness and advise the SOR accordingly.3. Supervise the implementation of	noise problem. 4. Ensure remedial measures are properly implemented.	3. Implement the agreed proposals4. Resubmit proposals if problem still not under control
	possible mitigation to be implemented.6. Inform the IEC, the SOR and the DEP the causes & actions taken for the exceedances.	remedial measures.	5. 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.	5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.
	 Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 			
	8. If exceedance stops, cease additiona monitoring.	1		

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 anys	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;		Request Contractor to critically review the working methods;		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
		incurous,		effectiveness and advise the		4.	٥.	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.		6.7. Consider and instruct, if necessary, the Contractor to slow down or to stop all		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.				
	Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.				

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	 Repeat statistical data analysis to confirm findings; Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; Identify source(s) of impact; Inform the IEC, SO and Contractor; Check monitoring data; Carry out audit to ensure all dolphin protective 	 Check monitoring data submitted by ET and Contractor; Discuss monitoring with the ET and the Contractor; 	 Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; Make agreement on measures to be implemented. 	 Inform the SO and confirm notification of the non- compliance in writing; Discuss with the ET and the IEC and propose measures to the IEC and the SO; Implement the agreed measures. 						
	measures are implemented fully and additional measures be proposed if necessary									

EVENT	ACTION								
	ET Leader	IEC	SO	Contractor					
Limit 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 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	 Repeat statistical data analysis to confirm findings; Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; Identify source(s) of impact; Inform the IEC, SO and Contractor; Check monitoring data; Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary 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. 	 Check monitoring data submitted by ET and Contractor; Discuss monitoring with the ET and the Contractor; Review proposals for additional monitoring and any other measures submitted by the Contractor and advise ER accordingly. 	 Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; Make agreement on measures to be implemented. 	 Inform the SO and confirm notification of the non- compliance in writing; Discuss with the ET and the IEC and propose measures to the IEC and the SO; Implement the agreed measures. 					

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 2018 (Year)

		Actual Qu	antities of Inert	C&D Materials (Generation			Actua	al Quantities of C	C&D wastes Ger	neration		Actual	Quantities of Re	ecyclables Gene	eration
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	Plastics
	sub-total	sub-total	sub-total	sub-total	sub-total	sub-total					· · · · · · · · · · · · · · · · · · ·				packaging	
Location																
Density (ton/m³)															7kg/bag	5kg/number
ID no.												(web record)				
Unit	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	4.288	0.405	0.137	-	4.151	-	-	-	-	-	-	211.060		2.540	0.084	-
Feb	2.662	0.241	0.826	-	1.836	-	-	-	-	-	-	184.880	-	12.280	0.028	-
Mar	5.916	0.289	2.503	-	1.536	1.877	-	-	-	-	1.200	307.670	-	30.190	0.161	-
Apr	6.103	0.352	0.852	-	1.274	3.977	•	-	-	-	-	349.640		19.150	0.112	
May	4.492	0.616	1.333	0.148	1.676	1.336	-	-	-	-	-	438.160	-	-	0.056	-
Jun	2.801	0.763	1.134	-	1.600	0.067	-	-	-	-		669.690	-	9.570	0.035	-
SUB-TOTAL	26.262	2.666	6.783	0.148	12.074	7.257	-	-	-	-	1.200	2161.100	-	73.730	0.476	-
Jul	1.361	0.555	0.208	-	0.973	0.181	-	-	-	-	-	639.210	-	13.260	0.056	-
Aug	2.369	0.357	0.104	0.085	0.726	1.455	-	-	-	-	1.200	508.670	-	-	-	-
Sep	1.866	0.700	-	-	1.866		-	-	-	-	4.000	419.480	-	4.930	0.056	-
Oct	3.182	1.956	0.059	-	3.123	_	-	-	-	-	4.800	365.740	-	-	0.056	-
Nov	5.090	1.592	-	-	5.090		-	-	-	-	2.600	406.980	-	-	-	-
Dec	8.079	1.077	-	-	8.079	-	-	-	-	-	-	346.730	-	-	0.077	-
TOTAL	48.209	8.902	7.153	0.233	31.931	8.893	-	-	-	-	13.800	4,847.910		91.920	0.721	-

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 includes 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 2019 (Year)

		Actual Qu	antities of Inert	C&D Materials (Generation			Actua	l Quantities of C	C&D wastes Ger	neration		Actual	Quantities of Re	ecyclables Gen	eration
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 ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000m ³)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	3.687	0.861	-	-	3.687	-	-	-	-	-	0.800	251.110	-	-	-	-
Feb	1.254	0.046	-	0.637	0.617	-	-	-	-	-	-	84.990	-	-	-	-
Mar	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jun	-	0.000	-	-	-	-	-	-	-	-		-	-	-	-	-
SUB-TOTAL	4.940	0.907	0.000	0.637	4.303	0.000	-	-	-	-	0.800	336.100	-	0.000	-	-
Jul	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aug	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sep	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nov	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dec	-	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	4.940	0.907	-	0.637	4.303	-		-	-	-	0.800	336.100	-	-	-	-

- 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 includes 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 contract commencement
1-Hr TSP	Action	0	0
	Limit	0	1
24-Hr TSP	Action	0	2
	Limit	0	0
Noise	Action	0	0
	Limit	0	0
Water Quality	Action	0	224
•	Limit	0	24
Impact Dolphin	Action	0	11
Monitoring	Limit	1	15

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

Reporting Period	Cumulative Statistics							
	Complaints	Successful						
		Summons	Prosecutions					
This quarter	0	0	0					
Total No. received since contract commencement	14	0	0					

Email message Environmental Resources Management

To Ramboll Hong Kong, Limited (ENPO)

2507 25/F

From ERM- Hong Kong, Limited

One Harbourfront 18 Tak Fung Street Hunghom Kowloon

Ref/Project number

Contract No. HY/2012/07 Tuen Mun-Chek Lap Kok Link-Southern Connection Viaduct Section Hong Kong Telephone: (852) 2271 3113 Facsimile: (852) 2723 5660 E-mail: jasmine.ng@erm.com

Subject Notification of Exceedance for Impact Dolphin

,

Monitoring

S

Date 6 May 2019

Dear Sir or Madam,

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

0215660_December2018/February 2019_dolphin_STG&ANI_NEL&NWL

A total of one limit level exceedance was recorded in the quarterly impact dolphin monitoring data between December 2018 to February 2019.

Regards,

Dr Jasmine Ng

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_Dec2018/Feb2019_dolphin_STG&ANI_NEL&NWL							
	[Total No. of Exceedance = 1]							
Date	December 2018 - February 2019 (monitored)							
	12 April 2019 (results received by ERM)							
Monitoring Area	Northeast	: Lantau (NEL) and Northwest Lantau (NWL)						
Parameter(s) with	Quarter	ly encounter rate of dolphin sightings (STG)						
Exceedance(s)	Quarterly en	ncounter rate of total number of dolphins (ANI)						
Action Levels		NEL: STG < 4.2 & ANI < 15.5						
		or NWL: STG < 6.9 & ANI < 31.3						
Limit Levels	North Lantau Social cluster	NEL: STG < 2.4 & ANI < 8.9						
Limit Levels		and						
		NWL: STG < 3.9 & ANI < 17.9						
Recorded Levels	NEL	STG = 0 & ANI = 0						
	NWL	STG = 2.40 & ANI = 7.95						
	One Limit Level Exceedance was recorded in the quarterly impact dolphin monitoring at NEL and							
	NWL between December 2018 to February 2019. The exceedance was reported in the approved							
	Sixty-fourth Monthly EM&A Repo	rt dated 14 March 2018.						
Statistical Analyses	Contract, statistical analyses wer							
	• A two-way ANOVA with repeated measures and unequal sample size was conducted using Period (2 levels: baseline vs impact – present impact quarter, December 2018 to February 2019) 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 ($p = 0.0029$) and ANI ($p = 0.0143$) were detected between Periods.							
	• 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 February 2019) 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 $\alpha = 0.00001$ as the significance level in the statistical tests, significant difference in STG ($p = 0.000000$) and in ANI ($p = 0.000000$) between Cumulative Period (baseline and impact phases) and Location (NEL and NWL) were detected * Note: The commencement date under <i>Contract No. HY/2012/07</i> is 31 October 2013.							
Works Undertaken (in	_	r 2018 to February 2019, marine works was undertaken under						
the monitoring	Contract No. HY/2012/07 include	reinstatement of seafront.						
quarter)								

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 (2017 18) ⁽¹⁾ reported that dolphin usage and traveling activities to the northern side of the airport (dolphin traveling corridor)
 - 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 one of the factors 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 *Monitoring of Marine Mammals in Hong Kong Waters* (2017-2018) also reported that CWD decline were likely influenced by reclamation works, bored piling and intensive marine traffic from construction activities.
 - Based on these possible reasons, implementation of mitigation measures are reviewed. This Contract does not have any reclamation works, thus no habitat loss was caused by reclamation. In the reporting period, the Contractor implemented the marine traffic control as per the requirements in the *EP-354/2009/D* and the updated *EM&A Manual*. Most of the vessels of this Contract also worked within the site boundary, in which the area is seldom used by CWD. Disturbance from vessels of this Contract is considered minor. All of the marine bored piling works of this Contract was completed in September 2015. Thus, underwater noise emission from this Contract had been substantially reduced. 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 2018 to February 2019, there was no exceedance recorded during water quality impact monitoring in the reporting period.

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.

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 marine park boundaries;
- 5. Vessels speed limited at 5 knots and 10 knots within existing marine park boundaries 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 11 March 2019 for discussion on CWD trend, with attendance of ENPO, Representatives of Resident Site Staff (RSS), Representatives of Environmental Teams (ETs) for Contract No. HY/2011/03, HY/2012/07, HY/2012/08 and HY/2013/04. The discussion/ recommendation as presented in 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. It was reminded that the ETs shall keep reviewing the implementation status of the dolphin related mitigation measures and remind the contractors to ensure the relevant measures are fully implemented. 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 possible. The participants were also reminded that the protection measures (e.g. speed limit control) for the BMP shall be implemented so as to provide a better habitat for dolphin recovery. It is noted that even though marine vessels may moor within the mooring site of BMP, commercial activities including loading / unloading / transhipment are not allowed except a permit is obtained. The HZMB works vessels were recommended to avoid the BMP. It was also recommended that the marine works footprint and vessels for the marine works should be reduced as much as possible, and vessels idling / mooring in other part of the North Lantau shall be avoided whenever possible.

Dolphin specialists of the Projects confirmed that the CWD sighting nearby north of Sha Chau and Lung Kwu Chau Marine Park has significantly declined. The reason for the decline was likely related to the re-routing of high-speed ferry from Skypier.

Remarks

The results of impact water quality and impact dolphin monitoring, the status of implemented marine ecological mitigation measures are documented in the approved *Sixty-second* to *Sixty-fourth Monthly EM&A Reports*. Comparison on water quality between impact and baseline periods is elaborated in the 21st Quarterly EM&A Report.