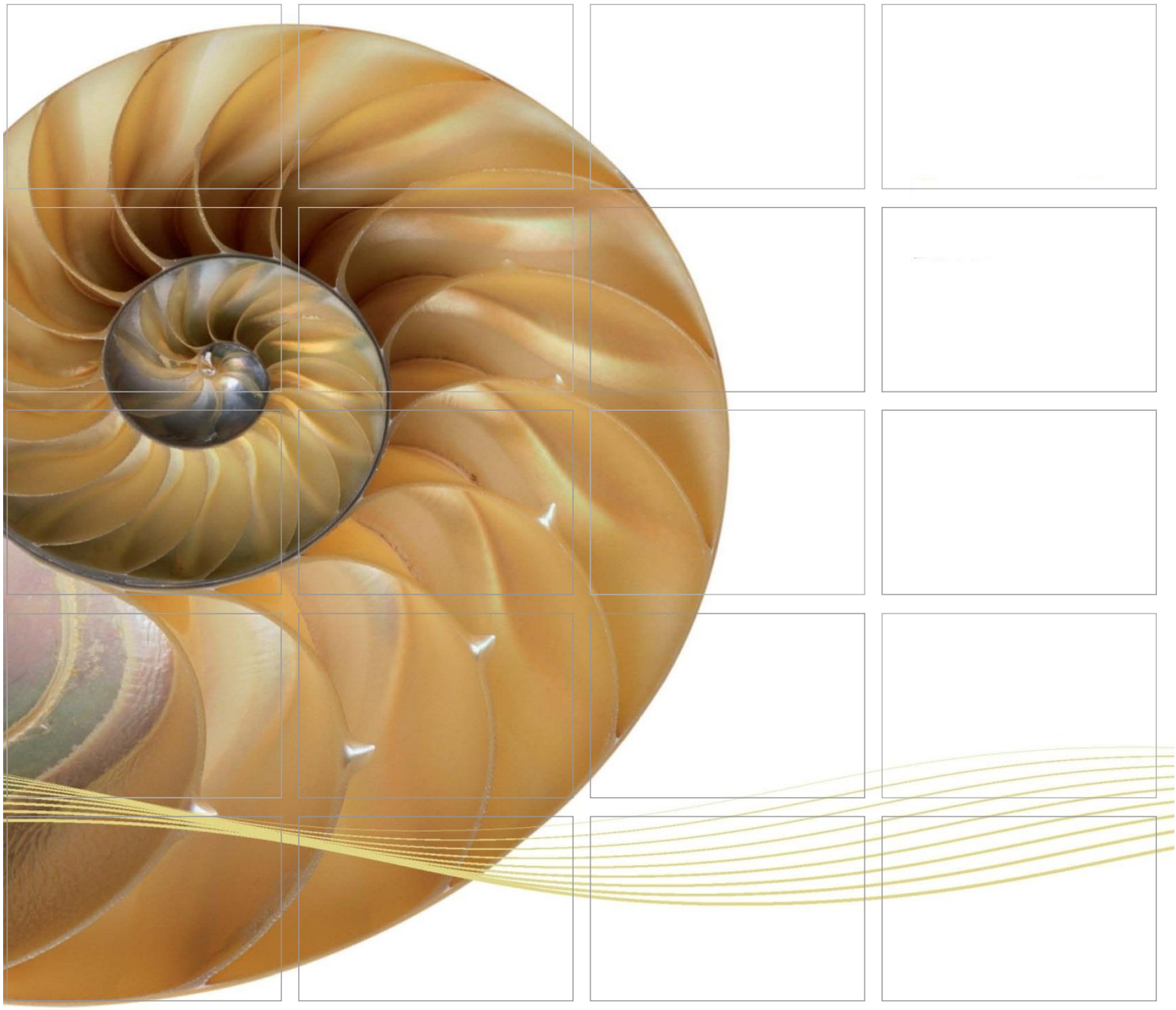
Report



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

Fifth Annual Environmental Monitoring & Audit (EM&A) Report

26 June 2019

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

www.erm.com

ERM

The business of sustainability

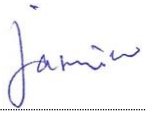
Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

Fifth Annual Environmental Monitoring & Audit (EM&A) Report

Document Code:
0215660_5th annual EM&A_20180626.docx

Environmental Resources Management

16/F, Berkshire House
25 Westlands Road
Quarry Bay, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
E-mail: post.hk@erm.com
http://www.erm.com

Client:	Project No:
Gammon	0215660
Summary:	Date: 26 June 2019
This document presents the Fifth Annual EM&A Report for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.	Approved by:  *Mr Craig Reid* *Partner*
	Certified by:  *Dr Jasmine Ng* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	5th Annual EM&A Report	CY	JT	CAR	26/6/19

Distribution

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ISO 9001 : 2008 Certificate No. FS 32515

RAMBOLL

Ref.: HYDHZMBEEM00_0_7482L.19.docx 27 June 2019

AECOM By Fax (3691 2899) and By Post
Supervising Officer's Representative's Office
780 Cheung Tung Road, Lantau, N.T.

Attention: Mr. Daniel Ip

Dear Mr. Ip,

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

Contract No. HY/2012/07 TM-CLKL Southern Connection Viaduct Section
Fifth Annual EM&A Report (November 2017 – October 2018)

Reference is made to the Fifth Annual Environmental Monitoring and Audit (EM&A) Report (Nov. 2017 – Oct. 2018) (ET's ref.: *0215660_5th annual EM&A_20180626.docx* dated 26 June 2019) certified by the ET Leader and provided to us via e-mail on 27 June 2019.

Please be advised that we have no further comment on the captioned Annual EM&A Report at this stage. However, as mentioned in our verification letters for the first, second, third and fourth annual reports (Ref. No. HYDHZMBEEM00_04105L.16 dated 25 April 2016, HYDHZMBEEM00_0_4358L.16 dated 14 July 2017, HYDHZMBEEM00_0_5449L.17 dated 7 June 2017 and HYDHZMBEEM00_06479aL.18 dated 14 May 2018, respectively), we would like to draw your attention that the ET shall supplement the Report with respect to the following observation:

1. Detailed review, analysis and evaluation of dolphin monitoring data covering annual period as per sections 1.5.1.6 and 12.9.1.1 (vi) of the EM&A Manual for TM-CLKL with level of details not less than the same part in your submitted quarterly EM&A Report and AFCD's annual marine mammal monitoring reports applicable to the dolphin monitoring.

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

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\2019\HYDHZMBEEM00_0_7482L.19.docx

Ramboll Hong Kong Limited 英環香港有限公司
21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong Tel: 852.3465 2888 Fax: 852.3465 2899
www.ramboll.com

Yours sincerely,

F. C. Tsang
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

c.c.	HyD	Mr. Stephen Chan	(By Fax: 3188 6614)
	HyD	Mr. Cheng Pan	(By Fax: 3188 6614)
	AECOM	Mr. Conrad Ng	(By Fax: 3922 9797)
	ERM	Dr. Jasmine Ng	(By Fax: 2723 5660)
	Gammon	Mr. Roy Leung	(By Fax: 3520 0486)

Internal: DY, YH, RY, DF, HW, ENPO Site

TABLE OF CONTENTS

List of Appendices

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 Fifth Annual EM&A Report presenting the EM&A works carried out during the period from 1 November 2017 to 31 October 2018 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:

Marine-based Works

- Uninstallation of marine piling platform;

Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;

- Road works along North Lantau Highway;
- Launching gantry operation;
- Installation of pier head and deck segments;
- Asphalt paving;
- Construction of sign gantries, light poles and street furniture;
- Parapet and barriers installation; 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	70 sessions at ASR8A
	70 sessions at ASR9
1-hour TSP monitoring	70 sessions at ASR8A
	70 sessions at ASR9
Noise monitoring	70 sessions at NSR1A
Water quality monitoring	150 sessions
Dolphin monitoring	24 sessions
Joint Environmental site inspection	51 sessions

Breaches of Action and Limit Levels for Air Quality

One (1) Limit Level of 1-hour TSP was recorded for air quality monitoring in the reporting period.

Breaches of Action and Limit Levels for Noise

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

Breaches of Action and Limit Levels for Water Quality

Eighty-six (86) Action Level and eight (8) Limit Level of Dissolved Oxygen (DO) exceedances, nine (9) Action Level and one (1) Limit Level of Suspended Solids (SS) exceedance and one (1) Action Level of Turbidity exceedance were recorded for water quality impact monitoring in the reporting period.

Impact Dolphin Monitoring

Two (2) Action Level and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for four (4) sets of quarterly dolphin monitoring

data between November 2017 and October 2018. 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 Dolphin) was noticeable from general observations during the dolphin monitoring in this reporting period.

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 were four (4) complaints received from EPD / 1823 in the reporting period. Complaints included construction dust nuisance at Hong Kong Boundary Crossing (HKBCF) of Hong Kong-Zhuhai-Macau Bridge Projects, a suspected sighting of dolphin near the viaduct at Tai Ho Wan and construction materials failing from the nearby elevated structures on 29 January 2018, discharge of muddy water nearby HKBCF on 13 June 2018 and construction noise nuisance nearby the Kowloon-boundary lane of the North Lantau Highway on 16 June 2018. Upon investigation, there were no adequate evidences to conclude that the complaint cases were related to this Contract.

There was no notification of summons or successful prosecution recorded in the reporting period.

Reporting Change

There was no reporting change in this reporting period.

Future Key Issues

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

1 INTRODUCTION

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-354/2009/A*) was issued on 8 December 2010.

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*. 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.

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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 l.*

1.2 SCOPE OF THIS REPORT

This is the Fifth Annual 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 November 2017 to 31 October 2018.

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)	Project Coordinator	Stanley Chan	2762 3406	3188 6614
	Senior Engineer	Steven Shum	2762 4133	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Daniel Ip	3553 3800	2492 2057
	Resident Engineer	Kingman Chan	3691 3950	3691 2899
ENPO / IEC (Ramboll Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Dr. F.C. Tsang	3465 2851	3465 2899
Contractor (Gammon Construction Limited)	Environmental Manager	Brian Kam	3520 0387	3520 0486
	Environmental Officer	Roy Leung	3520 0387	3520 0486
	24-hour Complaint Hotline		9738 4332	

大小磨刀
THE BROTHERS

鹿頸灣
LUK KENG BAY

鹿頸村
Luk Keng Tsuen

陰仔灣
YAM TSAI WAN

欣澳灣
YAN O WAN

陰仔
Yam Tsai

打棚埔
Ta Pang Po

欣澳篤
YAN O TUK

Site Office WA5

匙羹洲
TSZ KAN CHAU

東葉坑
Tung Yip Hang

深水角
Sham Shui Kok

四白坳
SZE PAK AU

犁壁山
LAI PIK SHAN

三白坳
SAM PAK AU

大輋峒
TAI CHE TUNG

濾水廠
Water Treatment Works

污水處理廠
Sewage Treatment Works

小蠔灣
SIU HO WAN

三白
Sam Pak

三白灣
SAM PAK WAN

牛頭灣
NGAU TAU WAN

鐵路車廠
Railway Depot

二白坳
YI PAK AU

時峰
Neo Horizon

尚堤
Chianti

津堤
Amalfi

海澄湖畔
Siena

頤峰

大白灣
DISCOVERY BAY
(TAI PAK WAN)

榴花峒
LAU FA TUNG

二白灣
YI PAK WAN

Greenvale Village

明翠台
Parkridge Village

蟹鉗咀
Hai Kam Tsui

蔚陽
Headland Village

愉景灣
Discovery Bay

老虎頭
LO FU TAU

碧濤

畔峰
Midvale Village

Beach Village

大白咀
Tai Pak Tsui

菜園灣
TSOI YUEN WAN

海堤居
La Costa

寶峰
Parkvale Village

大蠔灣
TAI HO WAN

白芒
Pak Mong

大蠔

海蝶居
La Vista

Hillgrove Village

海鄰居
La Serene

N

Kilometers
0 0.5 1

Key
Site Boundary

Figure 1.1

General Layout Plan of the Project

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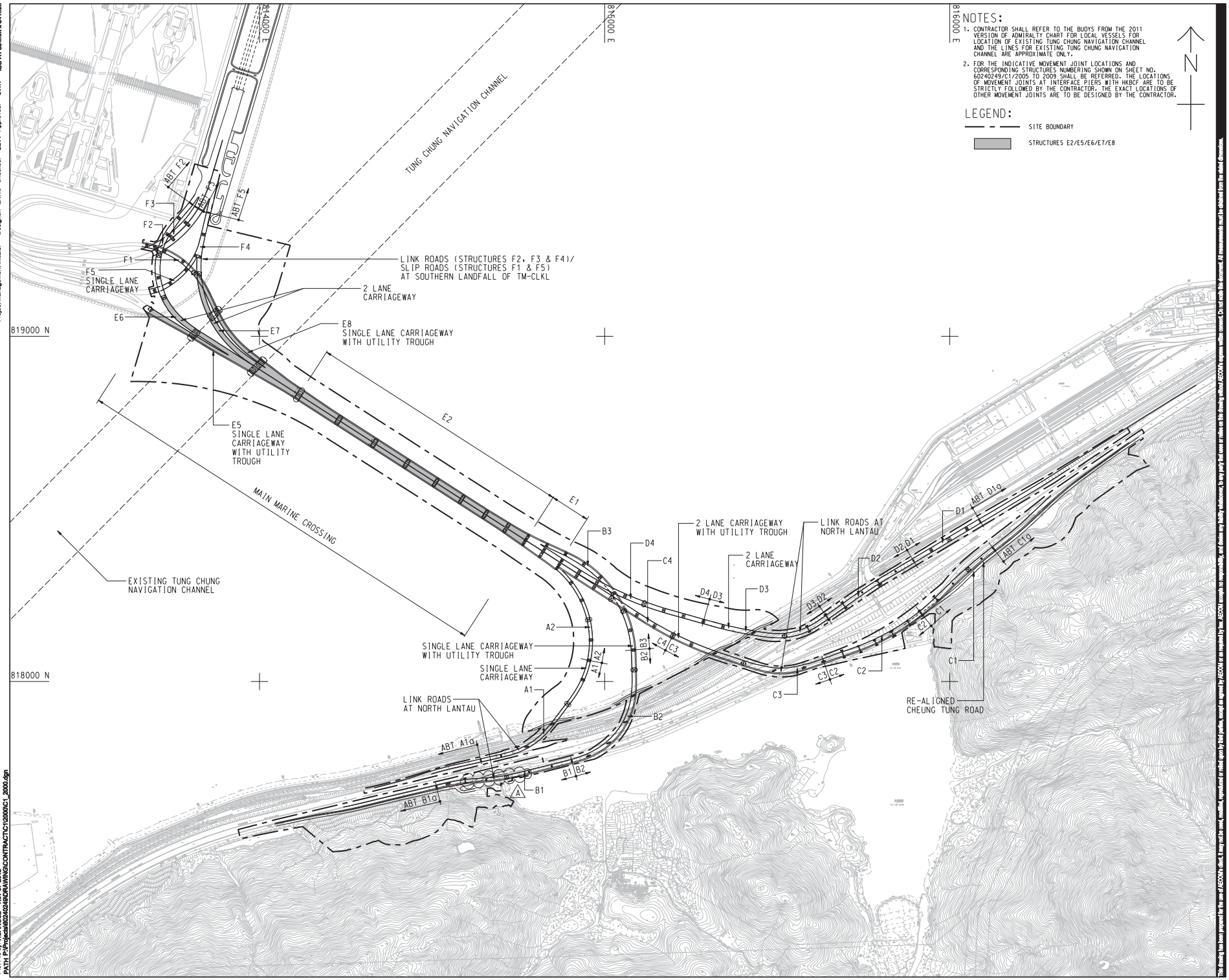
Environmental Resources Management

ERM



AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

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

CLIENT
路政署 HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

Figure 1.2a

ISSUE/REVISION

IR	DATE	DESCRIPTION	CHK.
A	NOV. 12	TENDER ADDENDUM NO. 1	CWN
-	OCT. 12	TENDER DRAWING	CWN

STATUS

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KEY PLAN

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
SOUTHERN CONNECTION GENERAL LAYOUT PLAN

SHEET NUMBER
60240249/C1/2000A

Project Management Initials: Designer: LKWB Checked: SLYY Approved: CWN ISO A1 594mm x 841mm CWN

Plot File by: HUANGC2 Nov-07-2012
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KEY PLAN

NOTES

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LEGEND

- SITE BOUNDARY
- GF1 FAULT

EXISTING G.I.STATIONS :

- BOREHOLE BY GIU DATA EXCLUDING VC
- BOREHOLE BY GCL CONTRACT HY/2012/04
- BOREHOLE BY GCL CONTRACT NL8/97
- BOREHOLE BY GCL CONTRACT HY/2009/23
- TRIAL PIT BY GCL CONTRACT HY/2012/04
- SLOPE STRIPPING BY GCL CONTRACT HY/2012/04

PROPOSED G.I.STATIONS :

- PBH01 PROPOSED BOREHOLE
- TP01 PROPOSED TRIAL PIT
- CH01 PROPOSED COREHOLE
- SS01 SS02 PROPOSED SLOPE STRIPPING

MATCH LINE
FOR CONTINUATION
SEE DRG J3518/P/OAP/04/01101

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B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				

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Checked: DS — Approved: DOP
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Client: 路政署 HIGHWAYS DEPARTMENT, Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

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

Drawing title: **Figure 1.2b**

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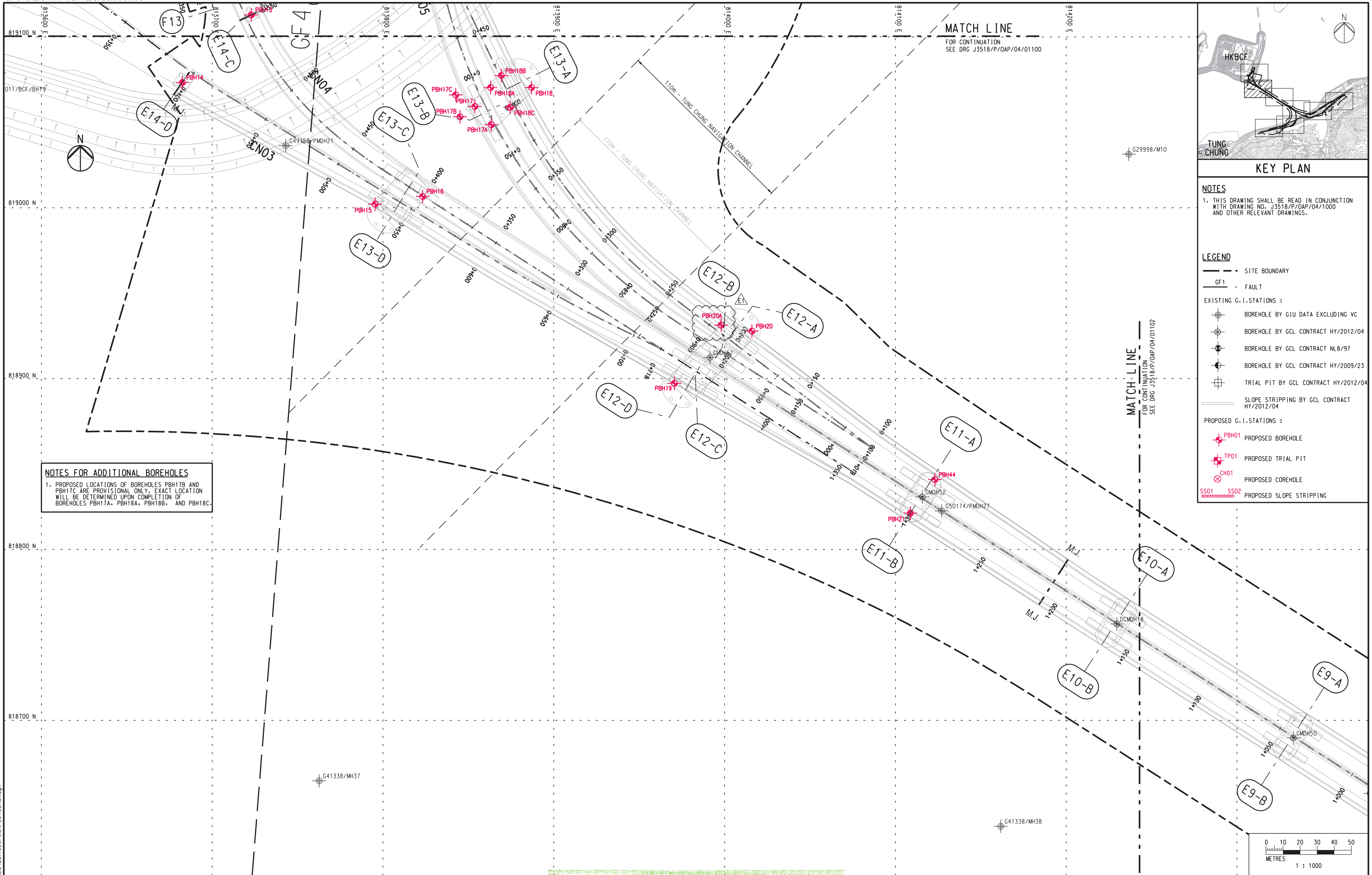

NOTES FOR ADDITIONAL BOREHOLES

1. PROPOSED LOCATIONS OF BOREHOLES PBH17B AND PBH17C ARE PROVISIONAL ONLY. EXACT LOCATION WILL BE DETERMINED UPON COMPLETION OF BOREHOLES PBH17A, PBH18A, PBH18B, AND PBH18C.

NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING NO. J3518/P/OAP/04/1000 AND OTHER RELEVANT DRAWINGS.

LEGEND

- SITE BOUNDARY
- GF1 FAULT

EXISTING G.I. STATIONS :

- BOREHOLE BY GIU DATA EXCLUDING VC
- BOREHOLE BY GCL CONTRACT HY/2012/04
- BOREHOLE BY GCL CONTRACT NL8/97
- BOREHOLE BY GCL CONTRACT HY/2009/23
- TRIAL PIT BY GCL CONTRACT HY/2012/04
- SLOPE STRIPPING BY GCL CONTRACT HY/2012/04

PROPOSED G.I. STATIONS :

- PBH01 PROPOSED BOREHOLE
- TP01 PROPOSED TRIAL PIT
- CH01 PROPOSED COREHOLE
- SS01 SS02 PROPOSED SLOPE STRIPPING

Rev	Description	By	Date	Rev	Description	By	Date
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B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				
D	SUBMISSION	RC	10/13				
E1	FOR INTERNAL REVIEW	RC	11/13				

Drawn: RL Date: 07/13
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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

Supervising Officer: AECOM

Contractor: Gammon

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

Originator: ARUP

Drawing title

Figure 1.2c

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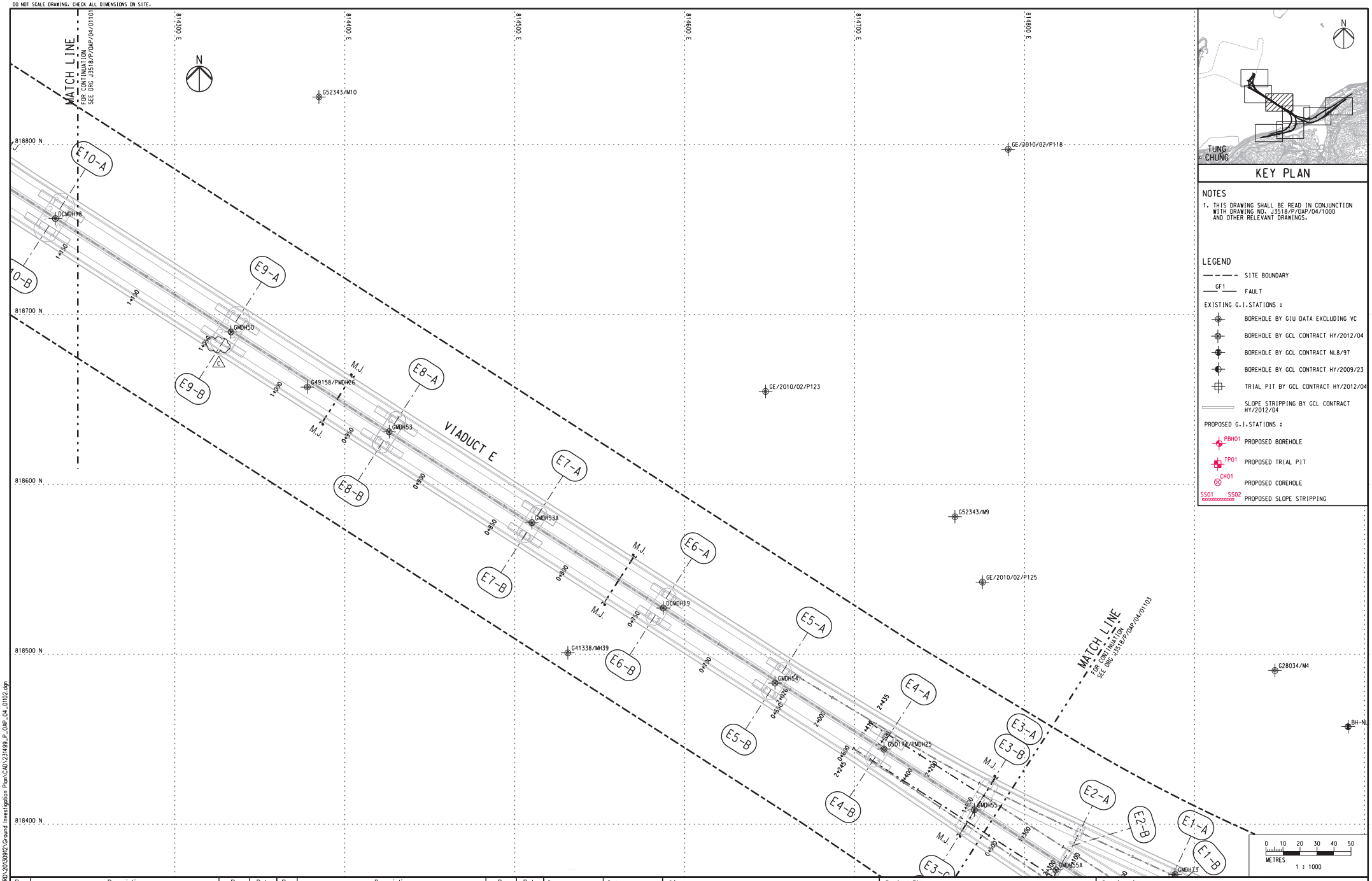

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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office

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

Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title: **Figure 1.2d**

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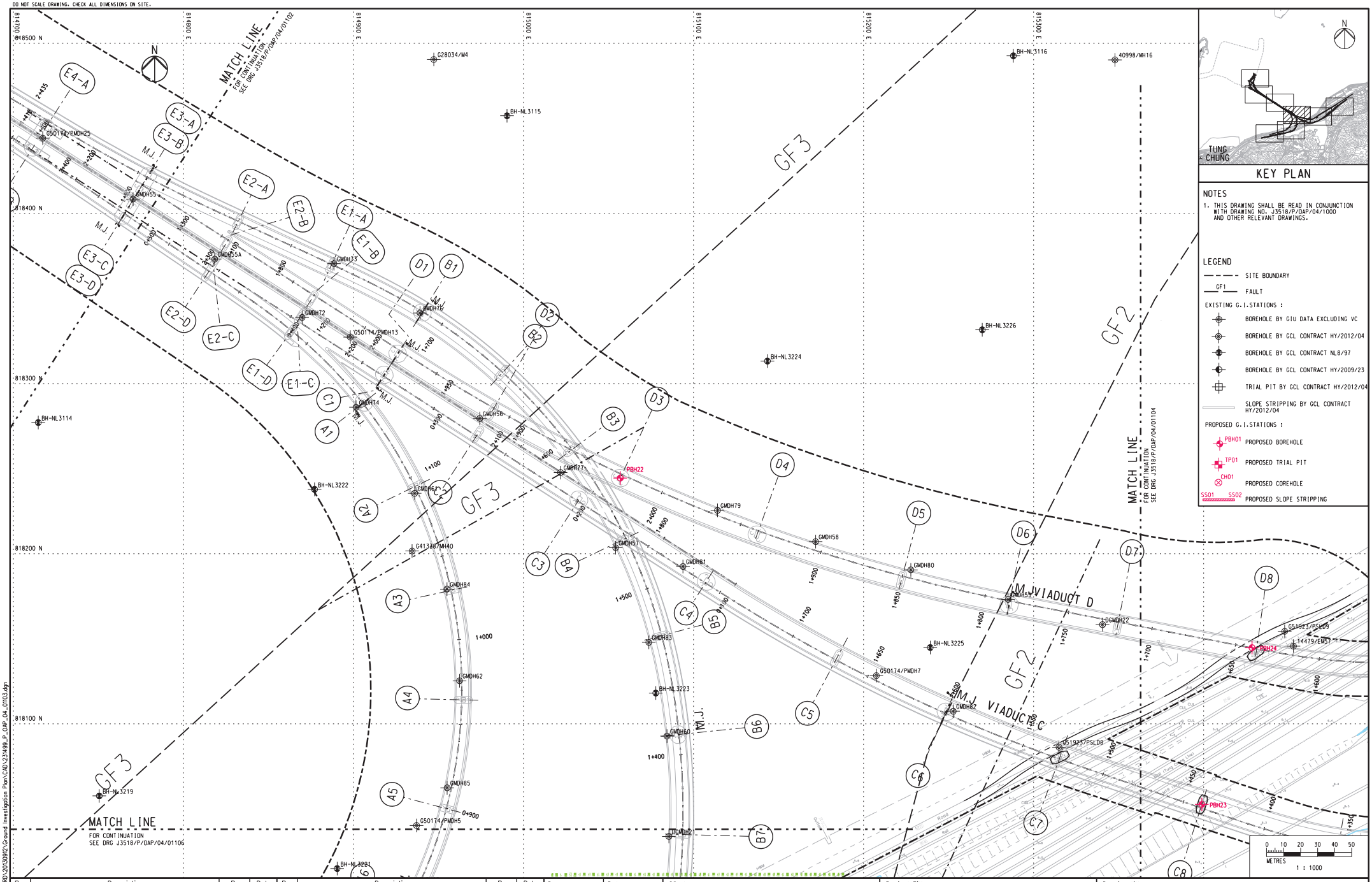

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C	SUBMISSION	RC	09/13				

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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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

Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title: **Figure 1.2e**

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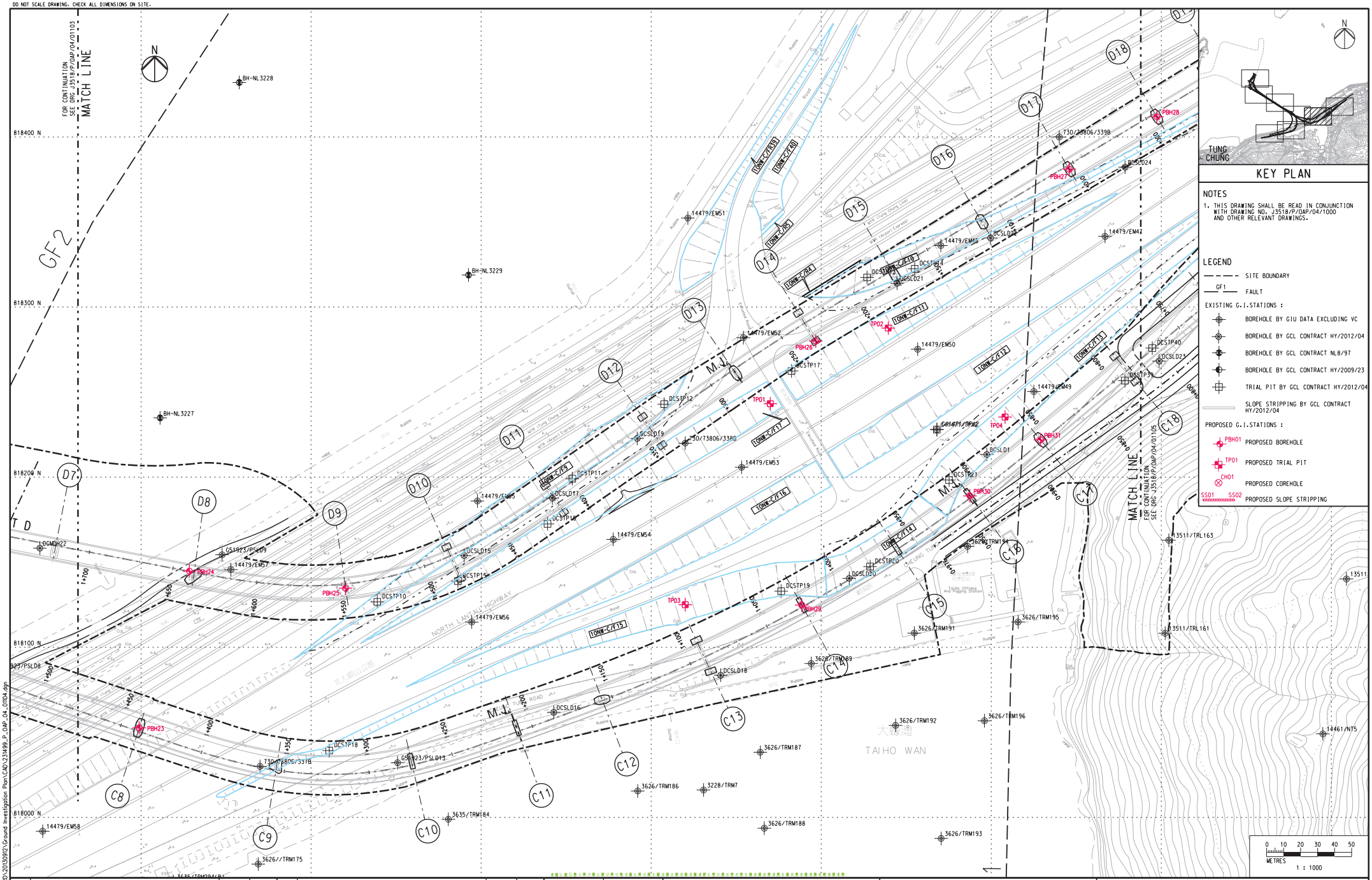

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Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title: **Figure 1.2f**

Drawing no. J3518/P/OAP/04/01104 Rev. C

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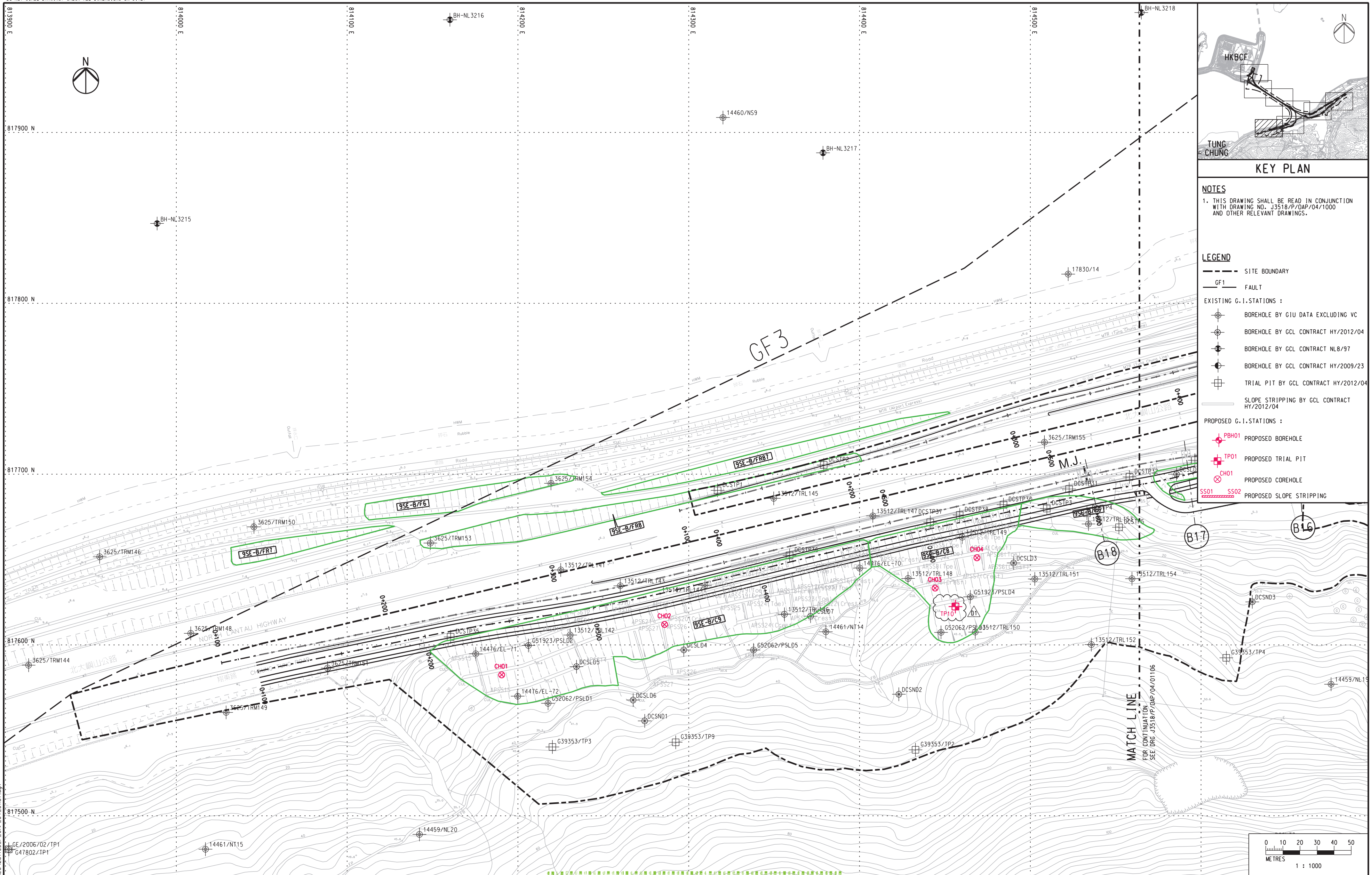

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A	SUBMISSION	RC	07/13				
B	SUBMISSION	RC	07/13				
C	SUBMISSION	RC	09/13				
D1	FOR INTERNAL REVIEW	RC	11/13				

Drawn: RL | Date: 07/13
Checked: DS | Approved: DOP
Scale: 1:1000 @ A1 / 1:2000 @ A3

Client: 路政署 HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處
Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

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

Supervising Officer: AECOM
Contractor: Gammon
Originator: ARUP

Drawing title
Figure 1.2g

Drawing no. J3518/P/OAP/04/01107 | Rev. D1

Printed by : 07/11/2013
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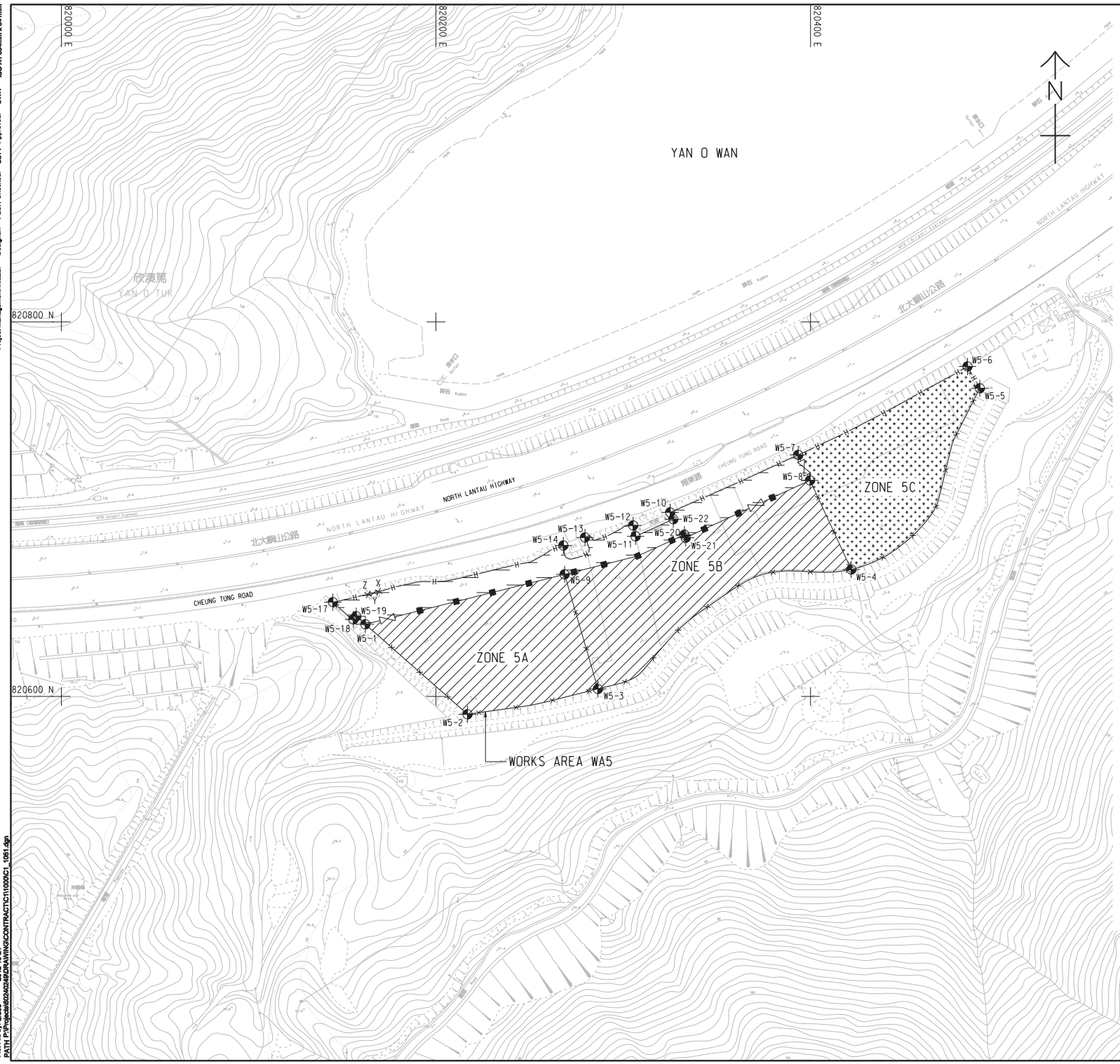

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TIS 619. IN CASE OF DISCREPANCY BETWEEN THE BOUNDARY SHOWN ON THIS DRAWING AND THE BOUNDARY INDICATED ON THE ENGINEERING CONDITIONS, THE LATTER SHALL PREVAIL.
3. DEMARCATION OF THE WORKS AREA SHALL BE DETERMINED ON SITE.
4. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6110 AND H6111 FOR DETAILS OF HOARDING.
5. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6121 AND H6122 FOR DETAILS OF CHAIN LINK FENCE.
6. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NO. H6121 FOR DETAILS OF GATE.
7. CHAIN LINK FENCE SHALL BE ERECTED ALONG THE WORKS AREA BOUNDARY. THE ALIGNMENT AND EXTENT OF CHAIN LINK FENCE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
8. THE LOCATION AND WIDTH OF GATE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
9. NO STRUCTURES SHALL BE ERECTED OTHER THAN SUCH STRUCTURES NOT EXCEEDING TWO STOREYS IN HEIGHT, WHICH ARE APPROVED BY THE DISTRICT LANDS OFFICER AS BEING APPROPRIATE FOR THE USE OF THE SITE AS A WORKS AREA.
10. THE TENTATIVE OCCUPATION PERIOD SHALL BE REFERRED TO EMPLOYER'S REQUIREMENTS PART 2 AND PART 14 SECTION 1 CLAUSE 1.45A.
11. THE WORKS AREAS SHOWN ON THIS DRAWING ARE TO BE SHARE-USED AMONG THE CONTRACTS OF TM-CLKL RELATED CONTRACTS.THE AREAS HATCHED WITH ▨ ARE TENTATIVELY ALLOCATED FOR THE USE BY THIS CONTRACT.
12. THE COMMON AREA SHALL BE CONCRETE PAVED BY THE CONTRACTOR.

LEGEND:

- WORKS AREA UNDER THIS CONTRACT
- COMMON AREA (MAINTAINED UNDER THIS CONTRACT) TO BE SHARE-USED WITH OTHER CONTRACTS
- WORKS AREA FOR THIS CONTRACT TO BE EARLY HANDED OVER BY THE CONTRACTOR.
- H — HOARDING AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED BY OTHERS)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)

SETTING OUT COORDINATES OF WORKS AREA WA5

POINT	COORDINATES	
	EASTING	NORTHING
W5-1	820162.308	820638.492
W5-2	820216.839	820590.455
W5-3	820286.496	820603.985
W5-4	820421.757	820667.742
W5-5	820490.425	820764.554
W5-6	820483.839	820776.180
W5-7	820393.451	820728.958
W5-8	820399.746	820715.343
W5-9	820268.674	820665.173
W5-10	820325.075	820698.276
W5-11	820306.587	820685.458
W5-12	820305.269	820691.287
W5-13	820279.580	820684.863
W5-14	820268.027	820680.572
X	820169.407	820655.859
Y	820166.601	820655.172
Z	820163.794	820654.484
W5-17	820144.957	820650.334
W5-18	820155.899	820641.093
W5-19	820157.432	820642.788
W5-20	820332.642	820686.314
W5-21	820333.350	820684.738
W5-22	820326.723	820694.608

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

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

CLIENT
HIGHWAYS DEPARTMENT
路政署
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

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

STATUS

SCALE: A1 1 : 1000
DIMENSION UNIT: METRES

KEY PLAN

Figure 1.2h

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA AND HOARDING PLAN

SHEET 1 OF 2

SHEET NUMBER
60240249/C1/1051

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

Plot File by: LIUJ3 2012-10-24
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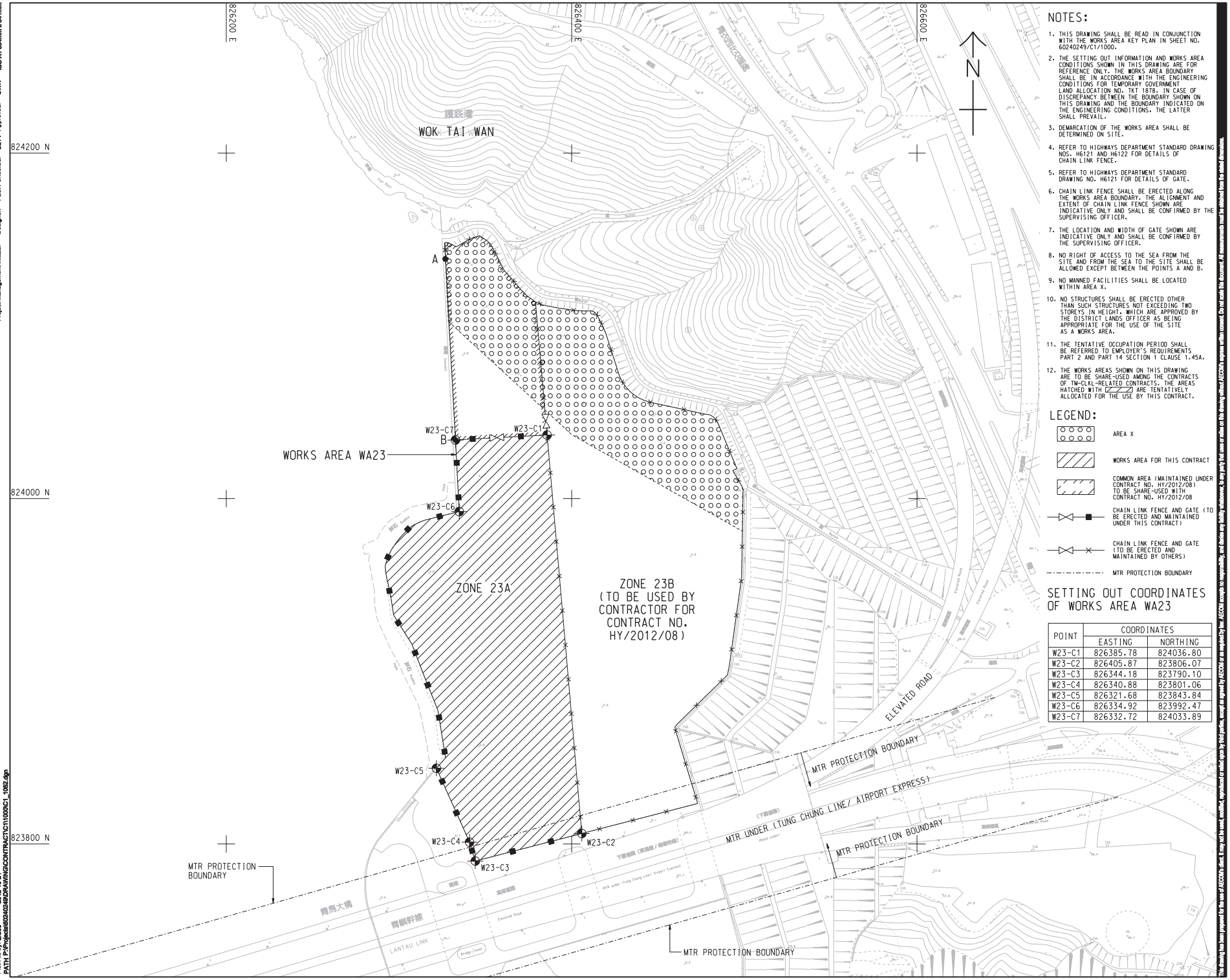

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TKT 1878. IN CASE OF DISCREPANCY BETWEEN THE BOUNDARY SHOWN ON THIS DRAWING AND THE BOUNDARY INDICATED ON THE ENGINEERING CONDITIONS, THE LATTER SHALL PREVAIL.
3. DEMARCATION OF THE WORKS AREA SHALL BE DETERMINED ON SITE.
4. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NOS. H6121 AND H6122 FOR DETAILS OF CHAIN LINK FENCE.
5. REFER TO HIGHWAYS DEPARTMENT STANDARD DRAWING NO. H6121 FOR DETAILS OF GATE.
6. CHAIN LINK FENCE SHALL BE ERECTED ALONG THE WORKS AREA BOUNDARY. THE ALIGNMENT AND EXTENT OF CHAIN LINK FENCE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
7. THE LOCATION AND WIDTH OF GATE SHOWN ARE INDICATIVE ONLY AND SHALL BE CONFIRMED BY THE SUPERVISING OFFICER.
8. NO RIGHT OF ACCESS TO THE SEA FROM THE SITE AND FROM THE SEA TO THE SITE SHALL BE ALLOWED EXCEPT BETWEEN THE POINTS A AND B.
9. NO MANNED FACILITIES SHALL BE LOCATED WITHIN AREA X.
10. NO STRUCTURES SHALL BE ERECTED OTHER THAN SUCH STRUCTURES NOT EXCEEDING TWO STOREYS IN HEIGHT, WHICH ARE APPROVED BY THE DISTRICT LANDS OFFICER AS BEING APPROPRIATE FOR THE USE OF THE SITE AS A WORKS AREA.
11. THE TENTATIVE OCCUPATION PERIOD SHALL BE REFERRED TO EMPLOYER'S REQUIREMENTS PART 2 AND PART 14 SECTION 1 CLAUSE 1.45A.
12. THE WORKS AREAS SHOWN ON THIS DRAWING ARE TO BE SHARE-USED AMONG THE CONTRACTS OF TM-CLKL-RELATED CONTRACTS. THE AREAS HATCHED WITH ▨ ARE TENTATIVELY ALLOCATED FOR THE USE BY THIS CONTRACT.

LEGEND:

- AREA X
- WORKS AREA FOR THIS CONTRACT
- COMMON AREA (MAINTAINED UNDER CONTRACT NO. HY/2012/08) TO BE SHARE-USED WITH CONTRACT NO. HY/2012/08
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED UNDER THIS CONTRACT)
- CHAIN LINK FENCE AND GATE (TO BE ERECTED AND MAINTAINED BY OTHERS)
- MTR PROTECTION BOUNDARY

SETTING OUT COORDINATES OF WORKS AREA WA23

POINT	COORDINATES	
	EASTING	NORTHING
W23-C1	826385.78	824036.80
W23-C2	826405.87	823806.07
W23-C3	826344.18	823790.10
W23-C4	826340.88	823801.06
W23-C5	826321.68	823843.84
W23-C6	826334.92	823992.47
W23-C7	826332.72	824033.89

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

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

CLIENT
HIGHWAYS DEPARTMENT
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

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

STATUS

SCALE: A1 1 : 1000
DIMENSION UNIT: METRES

KEY PLAN

Figure 1.2i

PROJECT NO.: 60240249
CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA AND HOARDING PLAN

SHEET 2 OF 2

SHEET NUMBER
60240249/C1/1052

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

Plot File by: LIUJ3 2012-10-24
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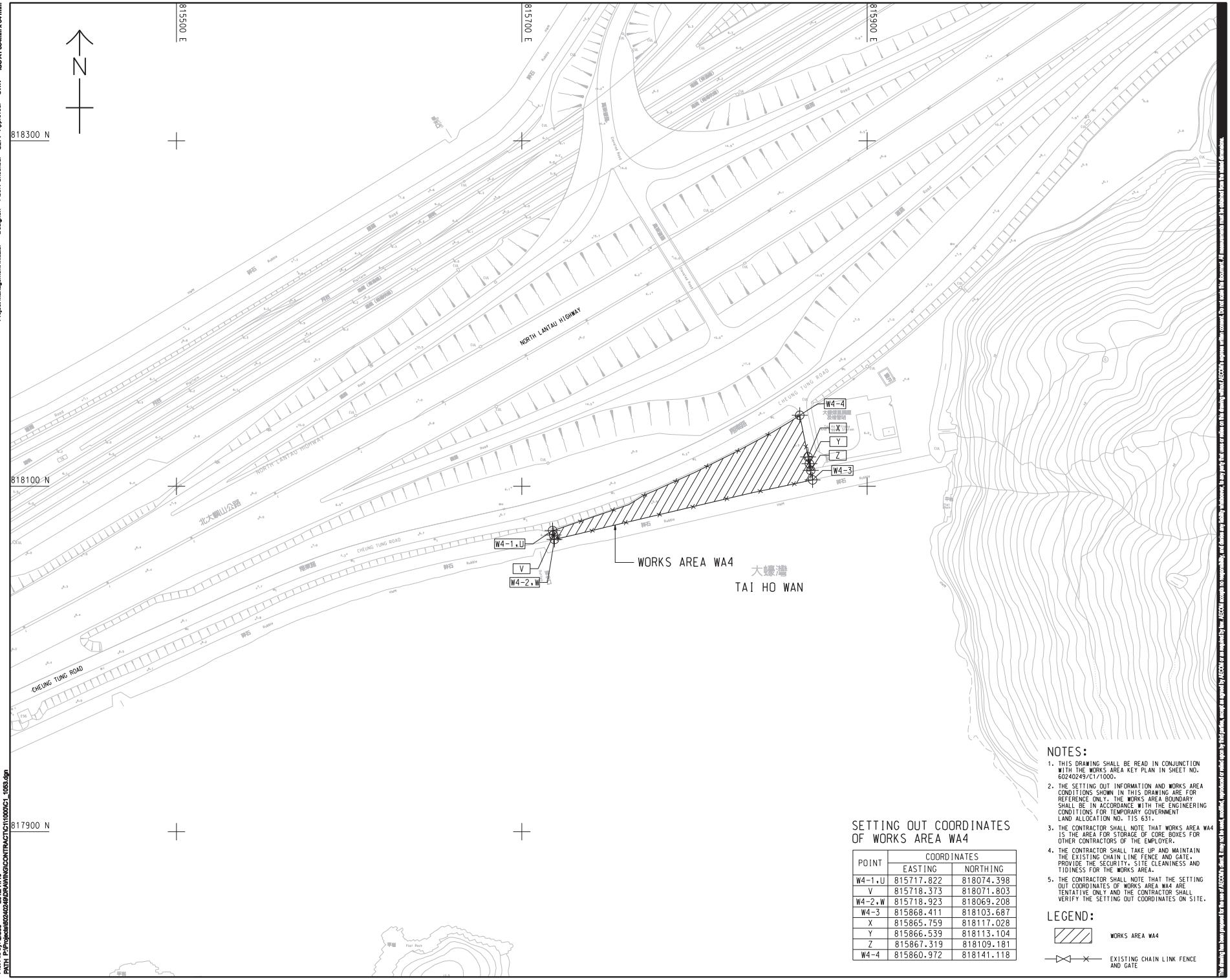


SETTING OUT COORDINATES OF WORKS AREA WA4

POINT	COORDINATES	
	EASTING	NORTHING
W4-1,U	815717.822	818074.398
V	815718.373	818071.803
W4-2,W	815718.923	818069.208
W4-3	815868.411	818103.687
X	815865.759	818117.028
Y	815866.539	818113.104
Z	815867.319	818109.181
W4-4	815860.972	818141.118

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE WORKS AREA KEY PLAN IN SHEET NO. 60240249/C1/1000.
2. THE SETTING OUT INFORMATION AND WORKS AREA CONDITIONS SHOWN IN THIS DRAWING ARE FOR REFERENCE ONLY. THE WORKS AREA BOUNDARY SHALL BE IN ACCORDANCE WITH THE ENGINEERING CONDITIONS FOR TEMPORARY GOVERNMENT LAND ALLOCATION NO. TIS 631.
3. THE CONTRACTOR SHALL NOTE THAT WORKS AREA WA4 IS THE AREA FOR STORAGE OF CORE BOXES FOR OTHER CONTRACTORS OF THE EMPLOYER.
4. THE CONTRACTOR SHALL TAKE UP AND MAINTAIN THE EXISTING CHAIN LINE FENCE AND GATE. PROVIDE THE SECURITY, SITE CLEANINESS AND TIDINESS FOR THE WORKS AREA.
5. THE CONTRACTOR SHALL NOTE THAT THE SETTING OUT COORDINATES OF WORKS AREA WA4 ARE TENTATIVE ONLY AND THE CONTRACTOR SHALL VERIFY THE SETTING OUT COORDINATES ON SITE.

LEGEND:

WORKS AREA WA4

EXISTING CHAIN LINK FENCE AND GATE

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK

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

CLIENT
HIGHWAYS DEPARTMENT
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

Figure 1.2j

ISSUE/REVISION

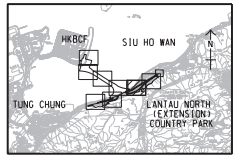
VR	DATE	DESCRIPTION	CHK.
-	NOV. 12	TENDER ADDENDUM NO. 1	CWN

STATUS

SCALE: A1 1 : 1000

DIMENSION UNIT: METRES

KEY PLAN



PROJECT NO.: 60240249

CONTRACT NO.: HY/2012/07

SHEET TITLE
WORKS AREA WA4

SHEET NUMBER
60240249/C1/1053

Project Management Initials: Designer: PLCK Checked: SLYY Approved: CWN ISO A1 594mm x 841mm

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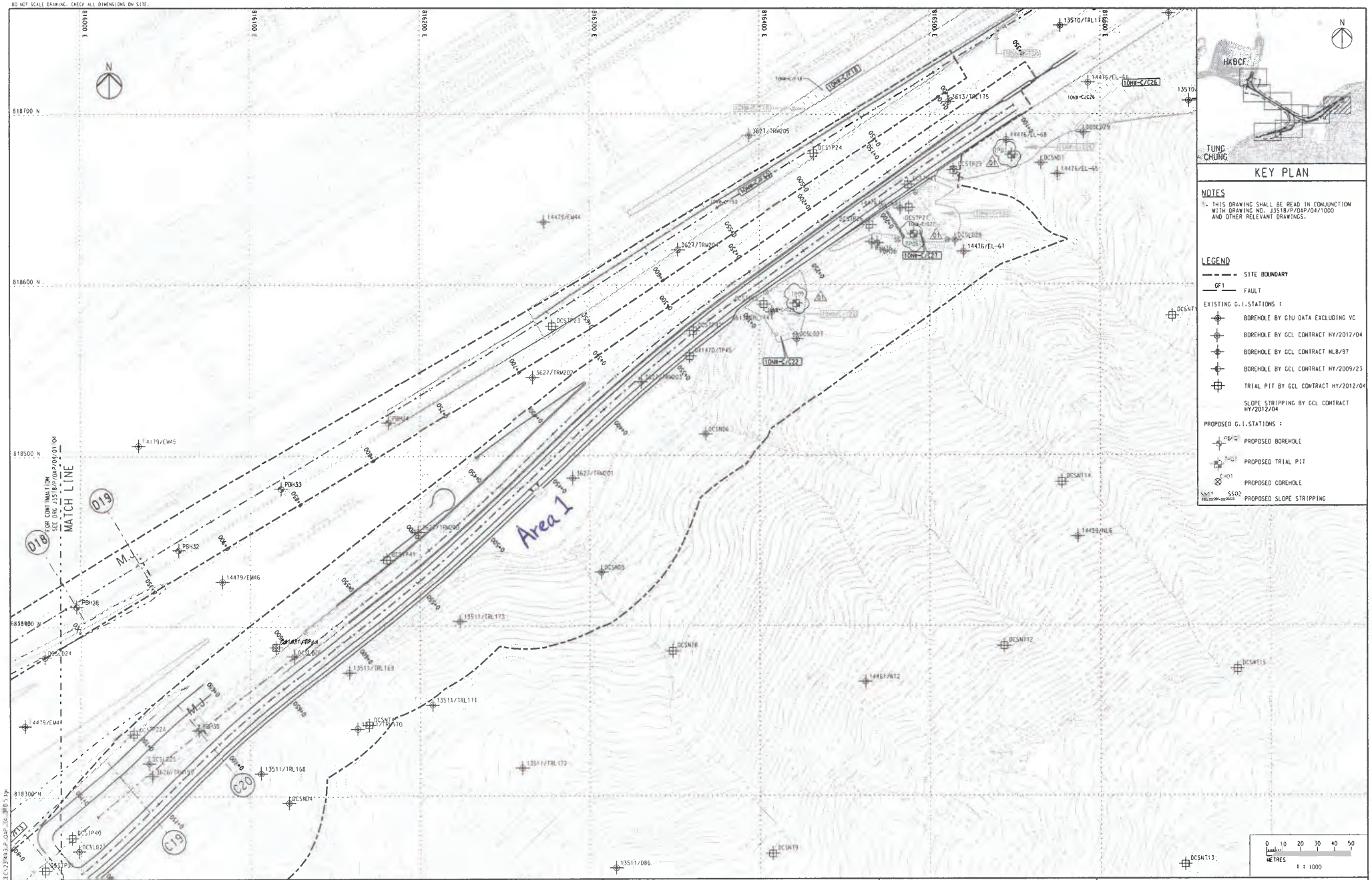


Rev.	Description	By	Date	Rev.	Description	By	Date
A	[illegible]	RL	07/13				
B	[illegible]	RL	07/13				
C	[illegible]	RL	09/13				
D1	ETA INTERNAL REVIEW	RL	10/13				

Drawn: RL	Date: 07/13
Checked: DS	Approved: DOP
Scale: 1:1000 @ A1 / 1:2000 @ A3	

Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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

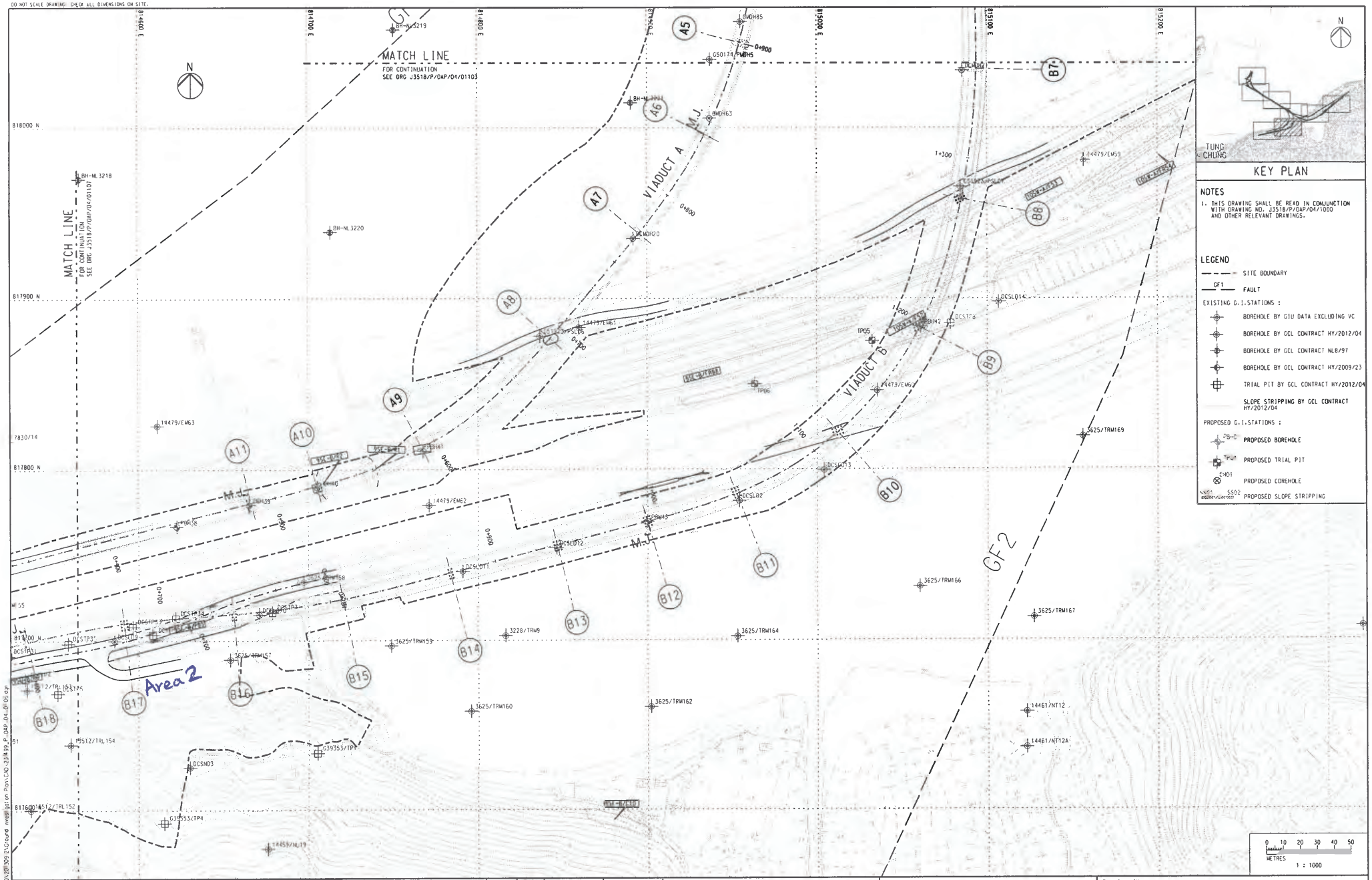
Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title: **Figure 1.2k**

Drawing no. J3518/P/OAP/04/01105 Rev. D1



Rev	Description	By	Date
A	[illegible]	RC	07/13
B	[illegible]	RC	07/13
C	[illegible]	RC	09/13

Drawn	RL
Date	07/13
Checked	DS
Approved	DOP
Scale	1:1000 @ A1 / 1:2000 @ A3

Client: 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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

Supervising Officer: AECOM

Contractor: Gammon

Originator: ARUP

Drawing title: **Figure 1.2I**

Drawing no. J3518/P/OAP/04/01106 Rev C

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Party	Position	Name	Telephone	Fax
ET (ERM-HK)	ET Leader	Jovy Tam (November 2017 to 7 August 2018)/ Dr. Jasmine Ng (8 August 2018 onwards)	2271 3113/2271 3311	2723 5660

1.4 SUMMARY OF CONSTRUCTION WORKS

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

Marine-based Works

- Uninstallation of marine piling platform;

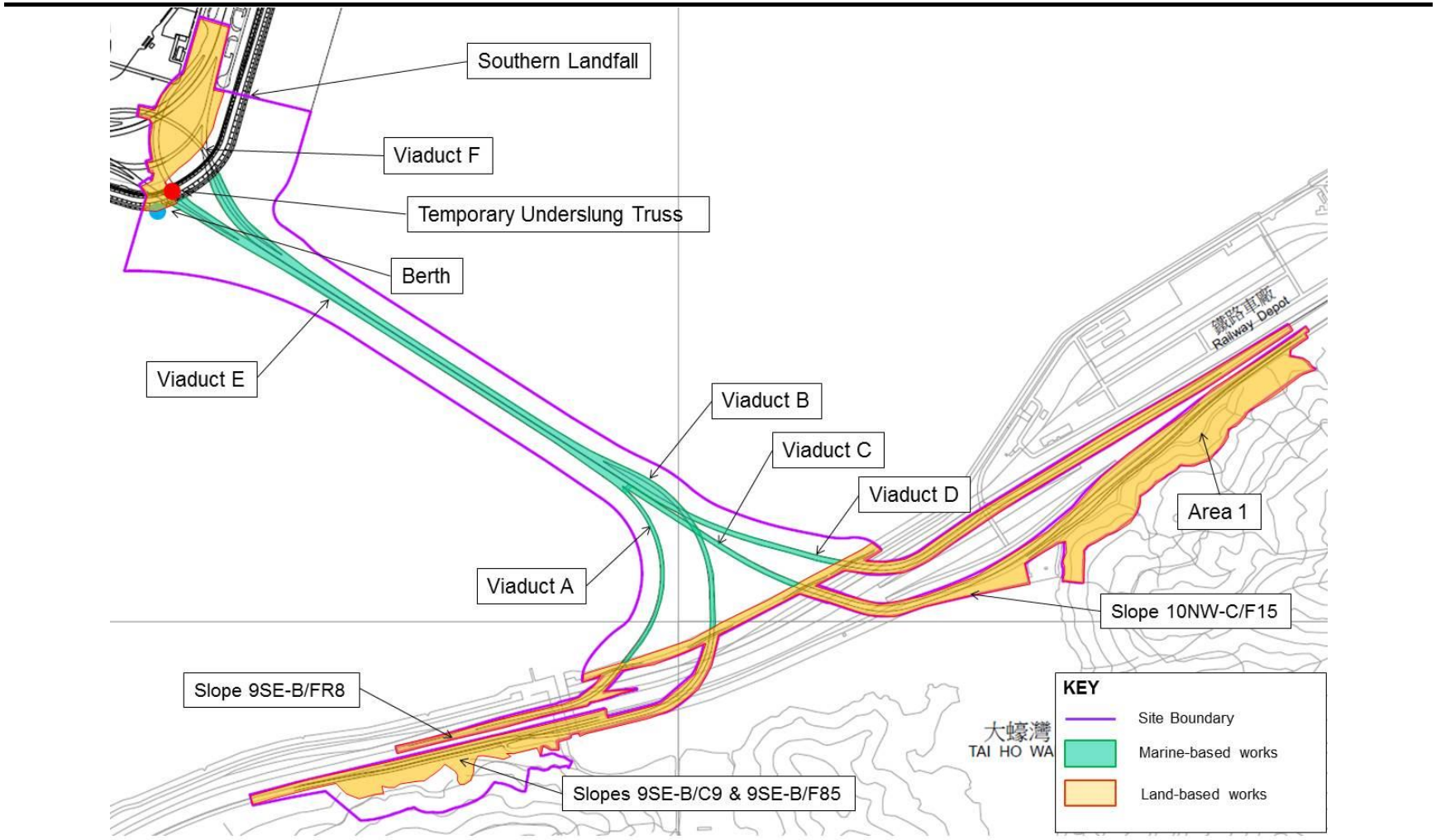
Land-based Works

- Pier construction;
- Re-alignment of Cheung Tung Road;
- Road works along North Lantau Highway;
- Launching gantry operation;
- Installation of pier head and deck segments;
- Asphalt paving;
- Construction of sign gantries, light poles and street furniture;
- Parapet and barriers installation; 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 B*.

Figure 1.3 Locations of Construction Activities in the Reporting Period



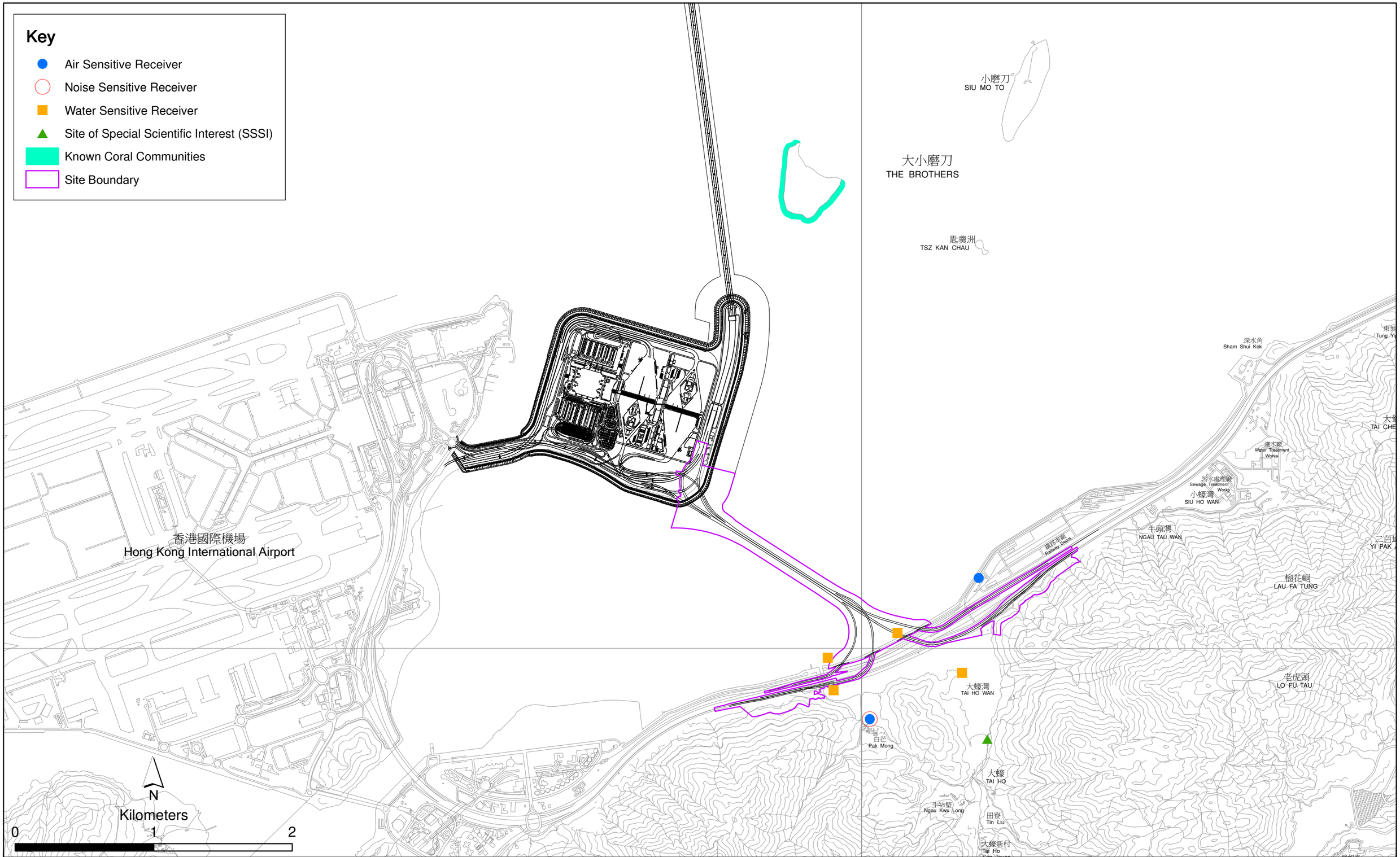


Figure 1.4

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

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Date: 18/5/2015

Environmental Resources Management

ERM

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;
- Action and Limit levels for all environmental parameters;
- Event Action Plan;
- Tested environmental impact hypotheses;
- Environmental mitigation measures, as recommended in the approved EIA Report; and
- Environmental requirement in contract documents.

2 *EM&A RESULTS*

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

2.1 AIR QUALITY

The baseline air quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HZMB) 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 in every six (6) days and impact 24-hour TSP monitoring was carried out once in every six (6) days when the highest dust impact was expected.

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

High Volume Samplers (HVSs) were installed at two alternative air quality monitoring stations for carrying out 1-hour and 24-hour TSP monitoring in the reporting period. The wind sensor was installed at ASR8A (Area 4) for

(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

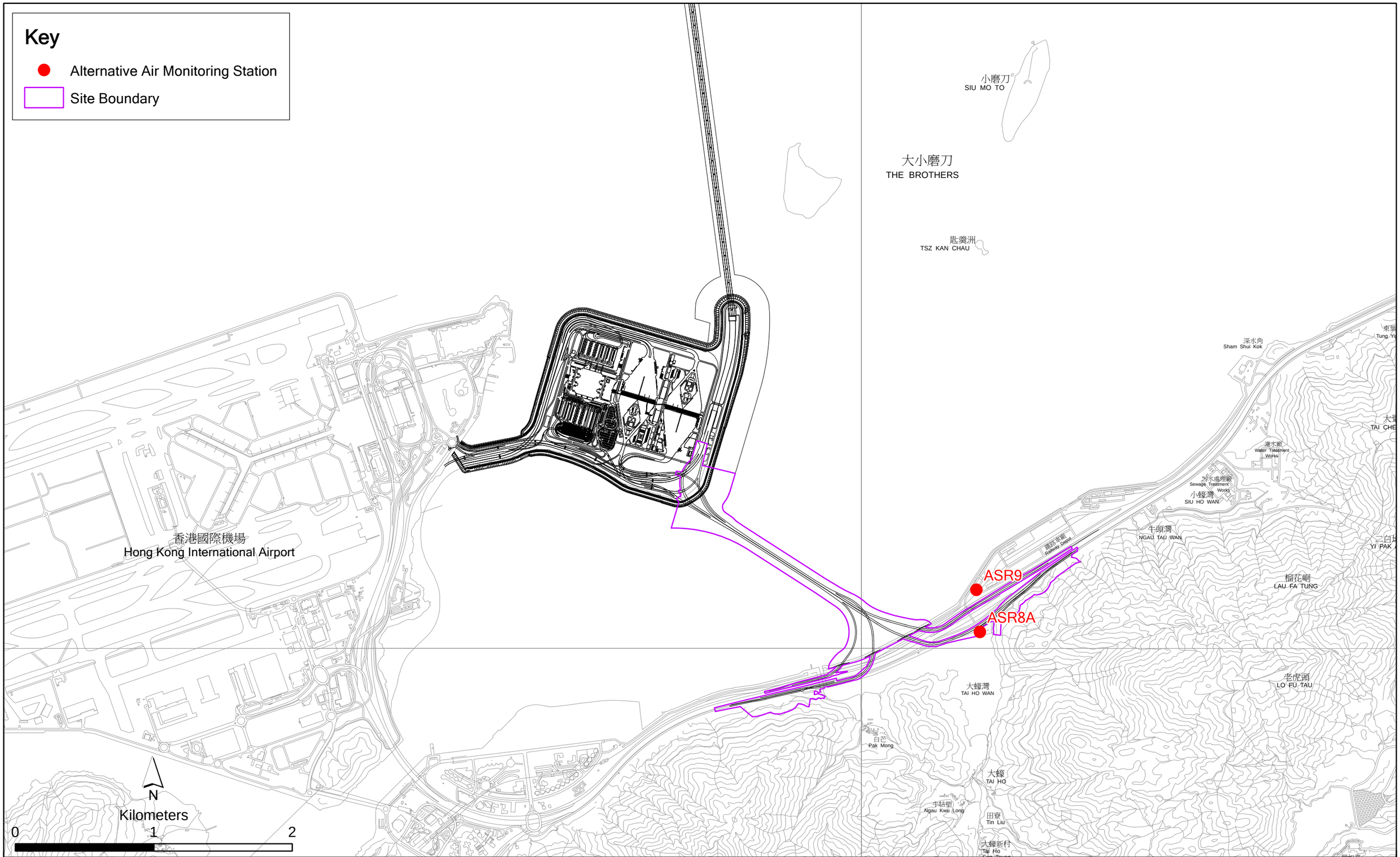

Figure 2.1

Locations of Air Quality Monitoring Stations

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Date: 7/1/2015

Environmental Resources Management

ERM

logging wind speed and wind direction in the reporting period. Details of the equipment deployed in air quality monitoring are provided in *Table 2.2*.

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

Monitoring Station (1)	Monitoring Period (2)	Location	Description	Parameters & Frequency
ASR8A	From 1 November 2017 to 31 October 2018	Area 4	On ground at the Area 4	• 1-hour Total Suspended Particulates (1-hour TSP, $\mu g/m^3$), 3 times per day every 6 days • 24-hour Total Suspended Particulates (24-hour TSP, $\mu g/m^3$), daily for 24-hour every 6 days
ASR9	From 1 November 2017 to 31 October 2018	Entrance of MTRC Depot	On ground at the entrance	

Note:

(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.

(2) Changes in monitoring schedule are provided in Section 2.1.3.

Table 2.2 Air Quality Monitoring Equipment

Equipment	Brand and Model
High Volume Sampler (1-hour TSP and 24-hour TSP)	Tisch Environmental Mass Flow Controlled 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 C*. The Event Action Plan is presented in *Appendix H*.

2.1.3 Monitoring Schedule for the Reporting Period

The schedules for air quality monitoring in the reporting period were presented in the approved *Forty-ninth* to *Sixtieth Monthly EM&A Reports*.

2.1.4 *Results and Observations*

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

A total of 70 monitoring events for 1-TSP and 24-hour TSP were undertaken at ASR8A and ASR9 in the reporting period. One (1) Limit Level of 1-hour TSP was recorded for air quality monitoring in the reporting period. However, there was no Action nor Limit Level exceedance was recorded for 24-hour TSP monitoring. Actions were taken in accordance with the Event Action Plan as presented in *Appendix H*. Detailed investigation reports on exceedances were presented in *Appendix N* of *Forty-ninth to sixtieth Monthly EM&A Reports*.

The impact monitoring results for 1-hour TSP and 24-hour TSP in the reporting period are summarized in *Tables 2.3* and *2.4,* respectively. Baseline and impact monitoring are presented graphically in *Appendix D*. The detailed impact monitoring data and meteorological information were reported in the *Forty-ninth* to *Sixtieth Monthly EM&A Reports*.

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)
Nov 2017	ASR 8A	82	33-165	394	500
	ASR 9	83	35-148	393	500
Dec 2017	ASR 8A	90	31-149	394	500
	ASR 9	90	41-180	393	500
Jan 2018	ASR 8A	80	13-294	394	500
	ASR 9	93	16-263	393	500
Feb 2018	ASR 8A	100	21-183	394	500
	ASR 9	141	42-680	393	500
Mar 2018	ASR 8A	62	13-137	394	500
	ASR 9	108	20-261	393	500
Apr 2018	ASR 8A	86	41-152	394	500
	ASR 9	116	56-199	393	500
May 2018	ASR 8A	86	14-236	394	500
	ASR 9	86	14-200	393	500
Jun 2018	ASR 8A	62	23-135	394	500
	ASR 9	72	13-103	393	500
Jul 2018	ASR 8A	48	19-78	394	500
	ASR 9	53	17-108	393	500
Aug 2018	ASR 8A	72	23-162	394	500
	ASR 9	77	38-180	393	500
Sept 2018	ASR 8A	90	28-346	394	500
	ASR 9	63	31-97	393	500
Oct 2018	ASR 8A	104	61-212	394	500

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
	ASR 9	101	66-148	393	500

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

Month	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
Nov 2017	ASR 8A	64	30-109	178	260
	ASR 9	59	35-92	178	260
Dec 2017	ASR 8A	86	38-151	178	260
	ASR 9	95	45-172	178	260
Jan 2018	ASR 8A	74	41-131	178	260
	ASR 9	75	42-150	178	260
Feb 2018	ASR 8A	65	38-95	178	260
	ASR 9	75	48-102	178	260
Mar 2018	ASR 8A	57	35-86	178	260
	ASR 9	65	47-100	178	260
Apr 2018	ASR 8A	57	49-72	178	260
	ASR 9	64	39-88	178	260
May 2018	ASR 8A	35	10-65	178	260
	ASR 9	46	25-75	178	260
Jun 2018	ASR 8A	30	24-39	178	260
	ASR 9	31	16-44	178	260
Jul 2018	ASR 8A	28	18-32	178	260
	ASR 9	31	21-44	178	260
Aug 2018	ASR 8A	39	19-66	178	260
	ASR 9	42	20-70	178	260
Sept 2018	ASR 8A	70	21-100	178	260
	ASR 9	51	28-83	178	260
Oct 2018	ASR 8A	75	54-110	178	260
	ASR 9	78	64-100	178	260

As shown in *Table 2.5*, the annual-averaged 1-hour TSP and 24-hour TSP levels in the reporting period were lower than the corresponding average baseline levels at all monitoring stations.

In order to determine any significant air quality impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average TSP levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The annual-averaged levels of TSP level are presented in *Table 2.5* and the statistical results are presented in *Table 2.6*. For 1-hour TSP at ASR8A and ASR9 and 24-hour TSP at ASR8A, the TSP levels in the reporting period were significantly lower than the baseline levels. However, there were no

significant difference between the TSP levels in the reporting period and the baseline levels, although the average values of TSP levels recorded in the reporting period is lower than the average baseline values.

Table 2.5 ***Summary of Average Levels of TSP Level of Baseline Monitoring and Reporting Period (in μg/m³)***

Monitoring Station (1)	Average Baseline Monitoring	Average Impact Monitoring
ASR9 (1-hour TSP)	220	90
ASR9 (24-hour TSP)	74	57
ASR8A (1-hour TSP)	222	80
ASR8A (24-hour TSP)	74	59

Note:

(1) Baseline monitoring results of ASR9A and ASR9C are applied to ASR8A and ASR9 respectively.

Table 2.6 ***One-way ANOVA Results for annual-averaged level of TSP level Comparison between Impact and Baseline Periods***

Monitoring Station	F ratio	p-value
ASR9 (1-hour TSP)	$F_{1,250} = 114$	<0.01
ASR9 (24-hour TSP)	$F_{1,81} = 8$	<0.05
ASR8A (1-hour TSP)	$F_{1,250} = 284$	<0.01
ASR8A (24-hour TSP)	$F_{1,81} = 20$	0.07

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any relationship between TSP levels and time during this yearly monitoring period at each monitoring station. Linear regression analysis makes assumptions of equal variance and normal distribution of data. Therefore, the significance level of

the test was set at 1 % (i.e. p = 0.01) to reduce the chance of committing a Type 1 error. If a significant regression relationship was found between TSP level and time (i.e. $p < 0.01$), r^2 value from the analysis would be further assessed. This value represents the proportion of the total variation in the dependent variable (i.e. TSP level) that is accounted for by the fitted regression line and is referred to as the coefficient of determination. An r^2 value of 1 indicates a perfect relationship (or fit) whereas a value of 0 indicates that there is no relationship (or no fit) between the dependent and independent variables. As there are no specific criteria to indicate how meaningful an r^2 value is, for the purposes of this EM&A programme a value of 0.60 was adopted to indicate a meaningful regression. If $r^2 < 0.60$ then it was considered that there was a weak relationship between TSP level and time or none at all. If the regression analysis indicated $r^2 > 0.60$ then it had been interpreted that there was in fact a strong relationship between the dependent and independent variables (i.e. a strong temporal trend of increasing / decreasing TSP level with time).

As shown in *Table 2.7*, results of the regression analysis indicated that there was no significant relationship between TSP level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing / decreasing TSP level in this monitoring period.

Table 2.7 Linear Regression Result of TSP Monitoring

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
1-hour TSP	ASR8A	<u><0.001</u>	0.012	<0.001	178	-0.010
	ASR9	<u>0.021</u>	4.47	<0.001	115	-0.144
24-hour TSP	ASR8A	<u>0.049</u>	3.48	<0.001	76	-0.322
	ASR9	<u>0.087</u>	6.49	<0.001	85	-0.431

Note:

1. Dependent variable is set as TSP levels (in µg/m3) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

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 was 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 stipulated in the Updated EM&A Manual. Details of the monitoring stations are provided in *Figure 2.2* and *Table 2.8.*

Noise monitoring was performed by sound level meter in compliance with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications at the designated monitoring station. Details of the equipment deployed in noise monitoring are provided in *Table 2.9*.

Table 2.8 Location of Impact Noise Monitoring Station and Monitoring Dates in this Reporting Period

Monitoring Station [1]	Monitoring Period	Location	Parameters & Frequency
NSR1A	From 1 November 2017 to 31 October 2018	Entrance of Pak Mong Village	• 30-mins measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). L_{eq}, L_{10} and L_{90} would be recorded. • At least once a week

(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

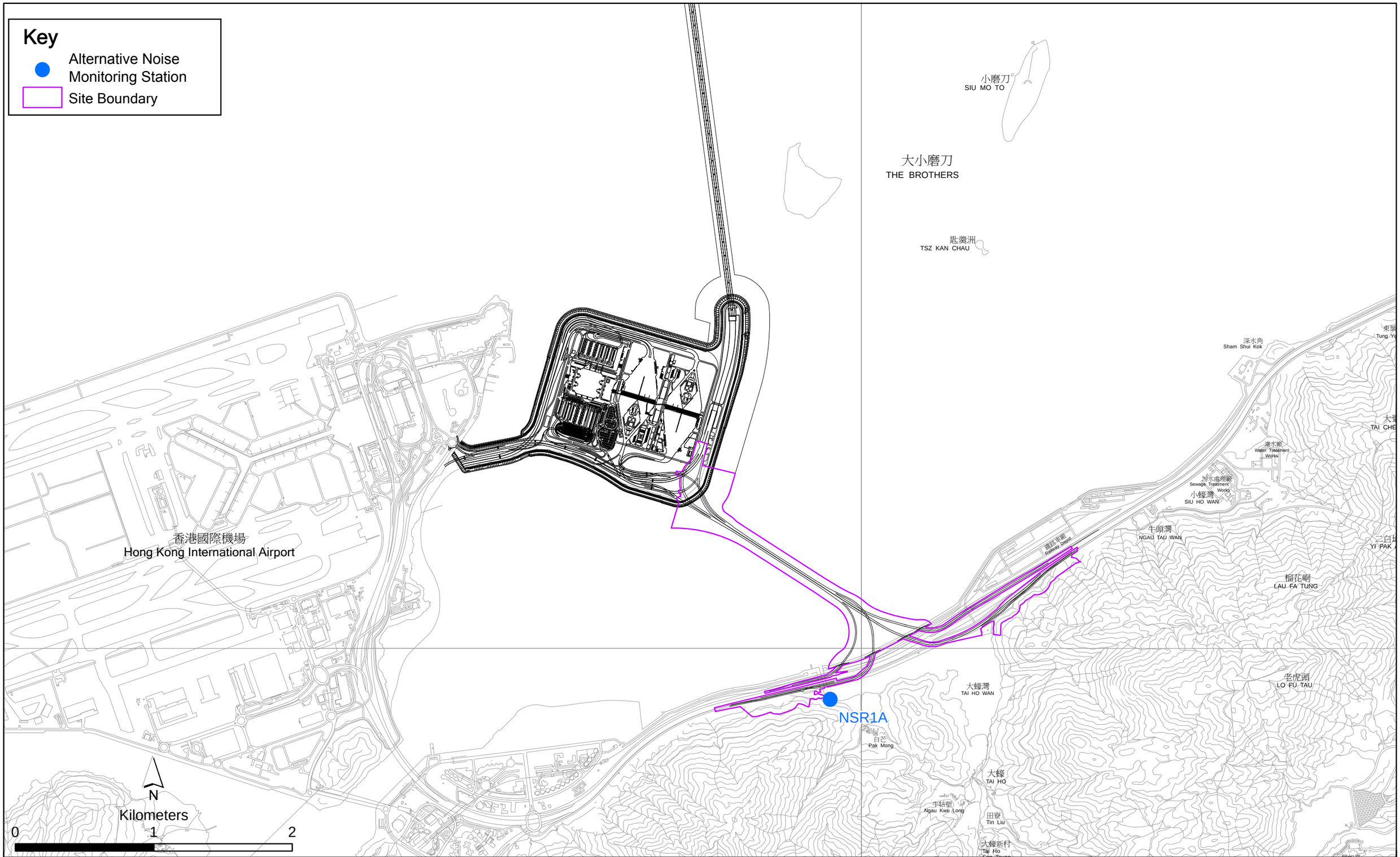

Figure 2.2

Location of Noise Monitoring Station

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Date: 7/1/2015

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Monitoring Station (1)	Monitoring Period	Location	Parameters & Frequency

Note:

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

Table 2.9 Noise Monitoring Equipment

Equipment	Brand and Model
Integrated Sound Level Meter	Rion NL-31 / 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 C*. The Event Action Plan is presented in *Appendix H*.

2.2.3 *Monitoring Schedule for the Reporting Period*

The schedules for noise monitoring in the reporting period are provided in the *Forty-ninth to Sixtieth Monthly EM&A Reports.*

2.2.4 *Results and Observations*

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

A total of seventy (70) monitoring events were undertaken in the reporting period with no Action Level and Limit Level exceedance recorded at the monitoring stations in the reporting period, thus no action was required to be taken in accordance with the Event Action Plan.

The impact monitoring results for noise monitoring in the reporting period are summarized in *Table 2.10*. Baseline and impact monitoring are presented graphically in *Appendix E*. The detailed impact monitoring data was reported in the *Thirty-seventh to Forty-eighth Monthly EM&A Reports*.

Table 2.10 *Summary of Construction Noise Monitoring Results at NSR1A in the Reporting Period*

Month	Average , dB(A), L_{eq} (30mins)	Range, dB(A), L_{eq} (30mins)	Limit Level, dB(A), L_{eq} (30mins)
Nov 2017	63	62-64	75
Dec 2017	63	61-64	75
Jan 2018	63	62-64	75
Feb 2018	63	62-64	75
Mar 2018	64	63-65	75
Apr 2018	64	62-65	75
May 2018	63	62-64	75
Jun 2018	64	62-69	75
Jul 2018	64	62-65	75
Aug 2018	64	63-66	75
Sep 2018	65	62-67	75
Oct 2018	65	63-70	75

Note:

Noise Monitoring Station NSR1 was relocated to NSR1A since December 2014.

As shown in *Table 2.11*, the annual-averaged noise level in the reporting period was higher than the average baseline levels at the monitoring station.

In order to determine any significant noise impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average noise levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The statistical results are presented in *Tables 2.12*. Difference in noise level between reporting and baseline monitoring periods was significant, in which the annual-averaged noise level in the reporting period was higher than average baseline level. However, all monitoring results in the reporting period complied with the Action/Limit Levels. In general, noise levels recorded in the reporting period were mostly comparable to the results obtained during the baseline monitoring period. No specific trend of the noise monitoring results or existence of persistent noise impact from the Contract during the impact monitoring period was noticeable. The ET will keep track on the future noise monitoring results during construction phase.

Table 2.11 ***Summary of Average Levels of Noise Level of Baseline Monitoring and Reporting Period (in dB(A))***

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
NSR1A	56	64

Table 2.12 ***One-way ANOVA Results for Annual-averaged Level of Noise Level Comparison between Impact and Baseline Periods***

Monitoring Station	F ratio	p-value
NSR1A	$F_{1,356} = 669$	**<0.01**

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any relationship between noise levels and time during this yearly monitoring period at the designated noise monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.4* for TSP monitoring. As shown in *Table 2.13*, results of the regression analysis indicated that there was no significant relationship between noise level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing / decreasing noise level during this yearly monitoring period.

Table 2.13 ***Linear Regression Result of Noise Monitoring***

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
$L_{eq\ 30min}$	NSR1A	<u>0.188</u>	15.7	<0.001	53	0.006

Note:

1. Dependent variable is set as Leq 30min (in dB(A)) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

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*

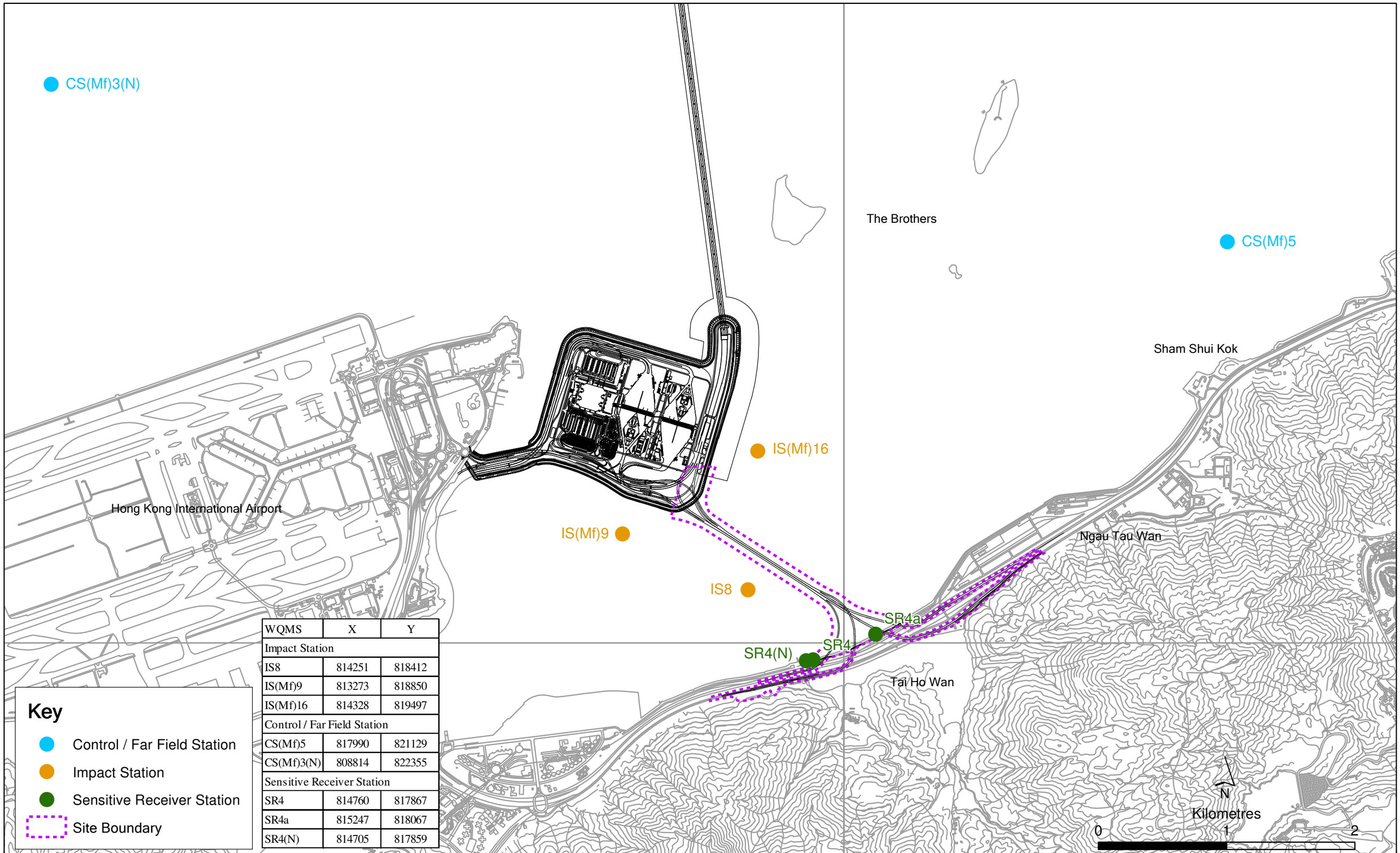
Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action could be taken to rectify the situation. Impact water quality monitoring was undertaken three days per week during mid-ebb and mid-flood tides in the construction period at seven water quality monitoring stations in accordance with the Updated EM&A Manual. Details of monitoring stations are provided in *Figure 2.3* and *Table 2.14*.

The locations of the monitoring stations under the Contract and those covered by Contract No. HY/2010/02 are shown in *Figure 2.3* and *Table 2.14*.

Table 2.14 Locations of Water Quality Monitoring Stations and the Corresponding Monitoring Requirements

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	• Temperature(°C) • pH(pH unit) • Turbidity (NTU) • Water depth (m) • Salinity (ppt) • Dissolved Oxygen (DO)	3 water depths: 1m below sea surface,	Impact monitoring: 3 days per week, at mid-flood and mid-ebb tides during

(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.



WQMS	X	Y
Impact Station		
IS8	814251	818412
IS(Mf)9	813273	818850
IS(Mf)16	814328	819497
Control / Far Field Station		
CS(Mf)5	817990	821129
CS(Mf)3(N)	808814	822355
Sensitive Receiver Station		
SR4	814760	817867
SR4a	815247	818067
SR4(N)	814705	817859

Key

- Control / Far Field Station
- Impact Station
- Sensitive Receiver Station
- Site Boundary

Figure 2.3

Locations of Water Quality Monitoring Stations

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Date: 8/9/2017

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Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497	(mg/L and % of saturation) • Suspended Solid (SS) (mg/L)	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.	the construction period of the Contract.
IS8	Impact Station(Close to HKBCF construction site)	814251	818412			
SR4	Sensitive receiver (Tai Ho Inlet)	814760	817867			
SR4a	Sensitive receiver	815247	818067			
SR4(N)	Sensitive receiver (Tai Ho)	814705	817859			
CS(Mf)3	Control Station	809989	821117			
CS(Mf)3(N)	Control Station	808814	822355			
CS(Mf)5	Control Station	817990	821129			

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.

Details of the equipment deployed in water quality monitoring are provided in *Table 2.15.*

Table 2.15 Water Quality Monitoring Equipment

Equipment	Brand and Model
DO, Temperature meter and Salinity	YSI Pro2030
Turbidimeter	HACH Model 2100Q
pH meter	Thermo Scientific Orion 2 Star / HANNA HI8314
Positioning Equipment	Koden913MK2 with KBG-3 DGPS antenna / Furuno GP-170
Water Depth Detector	Speedtech Instrument SM-5 / Lowrance Mark 5x / Garmin Striker 4
Water Sampler	Kemmerer 1520 (1520-C25) 2.2L with messenger / WildCo Vertical Alpha Bottles 1120-2.2L /1120-3.2L Aquatic Research Instrument Vertical/Horizontal Point Water Sampler 2.2L / 3.0L
Multi-parameters (Dissolved Oxygen, Salinity, Turbidity, Temperature, pH)	YSI ProDSS / YSI 6920 V2 Sonde

2.3.2 *Action & Limit Levels*

The Action and Limit Levels of the water quality monitoring are provided in *Appendix C*. The Event Action Plan is presented in *Appendix H*.

2.3.3 *Monitoring Schedule for the Reporting Period*

The schedules for water quality monitoring in the reporting period are provided in the *Forty-ninth to Sixtieth Monthly EM&A Reports* [(1)]. Water quality monitoring at monitoring stations, IS(Mf)9 and CS(Mf)3(N), at mid-

(1) The schedules for water quality monitoring for the period between June and July 2017 could be referred to the published Monthly EM&A Reports of *Contract No. HY/2010/02 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Reclamation Works*. Available at http://www.hzmbenpo.com/

flood tide and all monitoring stations at mid-ebb tide on 8 January 2018 was cancelled due to adverse weather. Water quality monitoring during mid-flood tide at all water quality monitoring stations, except CS(Mf)5, on 5 March 2018 was cancelled due to adverse weather. Water quality monitoring during mid-flood tide at all water quality monitoring stations, on 6 June 2018 and 18 July 2018, except CS(Mf)5 on 6 June and all monitoring stations during both mid-ebb and mid-flood tide on 8 June 2018 were cancelled due to adverse weather. Water quality monitoring during mid-ebb tide on 12 September 2018 and during both mid-ebb and mid-flood tides on 17 September 2018 were cancelled due to adverse weather. Water quality monitoring on 17 and 19 February, 18 June and 1 and 17 October 2018 were cancelled due to suspension of marine works during holidays.

2.3.4 Results and Observations

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting period. The detailed impact water quality monitoring data was reported in the *Forty-ninth to sixtieth Monthly EM&A Reports*.

In this reporting period, a total of 150 monitoring events were undertaken. Eighty –six (86) Action Level and eight (8) Limit Level of Dissolved Oxygen (DO) exceedances, nine (9) Action Level and one (1) Limit Level of Suspended Solids (SS) exceedances and one (1) Action Level of Turbidity exceedance were recorded for water quality impact monitoring in the reporting period. Actions were taken in accordance with the Event Action Plan as presented in *Appendix H*. Detailed investigation reports on exceedances were presented in *Appendix N* of *Forty-ninth to sixtieth Monthly EM&A Reports.*

In order to determine any significant water quality impacts caused by construction activities from this Contract, One-way ANOVA (with α set at 0.05) was conducted to examine any significant difference in average DO, Turbidity and SS levels between the impact monitoring in this reporting period and the baseline monitoring before commencement of construction activities. The annual-averaged levels of DO, Turbidity and SS are presented in *Tables 2.16 to 2.18* and the statistical results are presented in *Tables 2.19* to

2.21. Baseline and impact monitoring results are presented graphically in *Appendix F*.

In the reporting period, most annual-averaged DO levels during both mid-ebb and mid-flood tides at all depth of the impact monitoring stations were higher than corresponding average baseline levels, except the bottom DO levels at mid-flood at IS(Mf)16, IS(Mf)9, IS8 and SR4/SR4(N) were lower or the same (see *Table 2.16* and *2.19*). The annual depth-averaged turbidity level *(see Table 2.17* and *2.20)* and annual-averaged SS levels (*see Table 2.18* and *2.21)* recorded during the reporting period were comparable or lower than the results obtained during the baseline monitoring period. In general, DO, turbidity and SS levels were varied across sampling months (see *Appendix F*) and these variations were, however, not consistent throughout the reporting period. The graphical plots of the trends of the monitoring results suggested that there was no specific trend in the overall water quality monitoring.

Table 2.16 ***Summary of Annual Means of DO Level of Baseline Monitoring and Reporting Period (in mg/L)***

Tide	Station	Depth	Annual mean of DO of baseline monitoring	Annual mean of DO of reporting period
Mid-ebb	IS(Mf)16	Surface	6.3	7.0
	IS(Mf)9	Surface	6.6	7.4
	IS8	Surface	6.4	7.3
	SR4/ SR4(N)	Surface	6.1	7.0
	SR4a	Surface	5.5	6.9
Mid-flood	IS(Mf)16	Surface	6.3	7.1
	IS(Mf)9	Surface	6.5	7.0
	IS8	Surface	6.4	7.1
	SR4/ SR4(N)	Surface	6.3	7.0
	SR4a	Surface	5.5	7.0
Mid-ebb	IS(Mf)16	Middle	6.3	6.9
	IS(Mf)9	Middle	-	7.2

Tide	Station	Depth	Annual mean of DO of baseline monitoring	Annual mean of DO of reporting period
Mid-flood	IS(Mf)16	Middle	6.1	6.5
	IS(Mf)9	Middle	6.2	7.6
	IS8	Middle	-	7.4
	SR4/ SR4(N)	Middle	-	5.1
Mid-ebb	IS(Mf)16	Bottom	5.9	6.6
	IS(Mf)9	Bottom	6.6	7.2
	IS8	Bottom	6.2	6.9
	SR4/ SR4(N)	Bottom	6.0	6.8
	SR4a	Bottom	5.3	6.5
Mid-flood	IS(Mf)16	Bottom	6.0	5.9
	IS(Mf)9	Bottom	6.7	5.9
	IS8	Bottom	6.3	6.1
	SR4/ SR4(N)	Bottom	6.2	6.2
	SR4a	Bottom	5.2	5.7

Table 2.17 Summary of Annual Means of Depth-averaged Turbidity Level of Baseline Monitoring and Reporting Period (in NTU)

Station	Station	Annual mean of depth-averaged turbidity of baseline monitoring	Annual mean of depth-averaged turbidity of reporting period
Mid-ebb	IS(Mf)16	8.9	6.1
	IS(Mf)9	8.2	6.8
	IS8	8.4	8.1
	SR4/ SR4(N)	8.9	7.6
	SR4a	8.9	8.1
Mid-flood	IS(Mf)16	11.3	6.9
	IS(Mf)9	10.2	8.3
	IS8	11.9	9.0
	SR4/ SR4(N)	10.3	8.7

Station	Station	Annual mean of depth-averaged turbidity of baseline monitoring	Annual mean of depth-averaged turbidity of reporting period
	SR4a	7.8	8.6

Table 2.18 Summary of Annual Means of Depth-averaged SS Level of Baseline Monitoring and Reporting Period (in mg/L)

Station	Station	Annual mean of depth-averaged SS of baseline monitoring	Annual mean of depth-averaged SS of reporting period
Mid-ebb	IS(Mf)16	11.3	6.9
	IS(Mf)9	10.9	7.0
	IS8	11.3	7.9
	SR4/ SR4(N)	11.1	7.9
	SR4a	9.1	7.9
Mid-flood	IS(Mf)16	10.4	7.6
	IS(Mf)9	14.7	8.8
	IS8	13.5	9.8
	SR4/ SR4(N)	12.2	9.7
	SR4a	9.8	9.9

Table 2.19 One-way ANOVA Results for DO Comparison between Impact and Baseline Periods

Tide	Station	Depth	F ratio	p-value
Mid-ebb	IS(Mf)16	Surface	$F_{1,158}$ =2.9	0.089
Mid-ebb	IS(Mf)9	Surface	$F_{1,145}$ = 3.2	0.075
Mid-ebb	IS8	Surface	$F_{1,158}$ = 4.0	**0.048**
Mid-ebb	SR4/SR4(N)	Surface	$F_{1,158}$ = 4.2	**0.041**
Mid-ebb	SR4a	Surface	$F_{1,138}$ = 14.7	**<0.001**
Mid-flood	IS(Mf)16	Surface	$F_{1,147}$ = 4.8	**0.030**
Mid-flood	IS(Mf)9	Surface	$F_{1,99}$ = 1.0	0.327
Mid-flood	IS8	Surface	$F_{1,154}$ = 3.5	0.064

Tide	Station	Depth	F ratio	p-value
Mid-flood	SR4/SR4(N)	Surface	$F_{1,156}$ =3.4	0.066
Mid-flood	SR4a	Surface	$F_{1,157}$ = 15.2	**<0.001**
Mid-ebb	IS(Mf)16	Middle	$F_{1,18}$ = 3.3	0.085
Mid-flood	IS(Mf)9	Middle	$F_{1,7}$ = 0.5	0.512
Mid-flood	IS8	Middle	$F_{1,56}$ = 2.4	0.124
Mid-ebb	IS(Mf)16	Bottom	$F_{1,158}$ = 2.2	0.136
Mid-ebb	IS(Mf)9	Bottom	$F_{1,145}$ = 1.6	0.204
Mid-ebb	IS8	Bottom	$F_{1,158}$ = 2.5	0.117
Mid-ebb	SR4/SR4(N)	Bottom	$F_{1,155}$ = 3.0	0.087
Mid-ebb	SR4a	Bottom	$F_{1,158}$= 8.1	**0.005**
Mid-flood	IS(Mf)16	Bottom	$F_{1,157}$ = 5.1	**0.025**
Mid-flood	IS(Mf)9	Bottom	$F_{1,99}$ =0.2	0.694
Mid-flood	IS8	Bottom	$F_{1,154}$ = 3.1	0.078
Mid-flood	SR4/SR4(N)	Bottom	$F_{1,154}$ =3.6	0.058
Mid-flood	SR4a	Bottom	$F_{1,157}$ = 14.2	**<0.001**

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

Table 2.20 One-way ANOVA Results for Depth-averaged Turbidity Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS(Mf)16	$F_{1,158}$ = 10.9	**0.001**
Mid-ebb	IS(Mf)9	$F_{1,158}$ = 1.9	0.171
Mid-ebb	IS8	$F_{1,158}$ = 0.7	0.797
Mid-ebb	SR4/SR4(N)	$F_{1,158}$ = 1.8	0.182
Mid-ebb	SR4a	$F_{1,158}$ = 0.4	0.524
Mid-flood	IS(Mf)16	$F_{1,157}$ = 18.0	**<0.001**
Mid-flood	IS(Mf)9	$F_{1,157}$ = 2.3	0.134
Mid-flood	IS8	$F_{1,157}$ = 3.7	0.057
Mid-flood	SR4/SR4(N)	$F_{1,157}$ = 1.5	0.220
Mid-flood	SR4a	$F_{1,157}$ = 0.5	0.485

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

Table 2.21 ***One-way ANOVA Results for Depth-averaged SS Comparison between Impact and Baseline Periods***

Tide	Station	F ratio	p-value
Mid-ebb	IS(Mf)16	$F_{1,158} = 24.6$	**<0.001**
Mid-ebb	IS(Mf)9	$F_{1,158} = 21.1$	**<0.001**
Mid-ebb	IS8	$F_{1,158} = 7.9$	0.006
Mid-ebb	SR4/SR4(N)	$F_{1,158} = 11.4$	**<0.001**
Mid-ebb	SR4a	$F_{1,158} = 1.4$	0.241
Mid-flood	IS(Mf)16	$F_{1,157} = 9.1$	**0.003**
Mid-flood	IS(Mf)9	$F_{1,157} = 19.8$	**<0.001**
Mid-flood	IS8	$F_{1,157} = 5.2$	**0.024**
Mid-flood	SR4/SR4(N)	$F_{1,157} = 3.6$	0.058
Mid-flood	SR4a	$F_{1,157} = 0.01$	0.924

Note:

By setting α at 0.05, p-values < 0.05 (significant difference) are bold.

In addition, linear regression was conducted to examine any significant relationship between DO / Turbidity / SS levels and time during this yearly monitoring period at each monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.4* for TSP monitoring. As shown in *Tables 2.22* to 2.*24*, results of the regression analysis indicated that all DO levels did not have significant relationship with the time during this yearly monitoring period. Detailed investigation reports on exceedances were presented in *Appendix N* of *Forty-ninth to Sixtieth Monthly EM&A Reports*. The ET will keep track on the future water quality monitoring results during construction phase. Apart from DO level, there was no significant relationship between Turbidity / SS level and time during this yearly monitoring period. As such, it is considered that there is no apparent trend of increasing or decreasing Turbidity / SS levels in this reporting period.

Table 2.22 Linear Regression Result of DO

Parameter	Station	R^2	F ratio	p-value	Intercept	Coefficient of days of construction
Mid-ebb	IS(Mf)16	0.249	48.6	<0.001	17.90	-0.007
Surface DO	IS(Mf)9	0.131	20.1	<0.001	15.54	-0.005
	IS8	0.148	25.4	<0.001	15.77	-0.005
	SR4	0.193	34.9	<0.001	16.30	-0.006
	SR4a	0.269	53.6	<0.001	17.12	-0.006
Mid-flood	IS(Mf)16	0.120	19.7	<0.001	14.25	-0.004
surface DO	IS(Mf)9	0.166	17.7	<0.001	16.01	-0.005
	IS8	0.110	17.6	<0.001	14.17	-0.004
	SR4	0.107	17.3	<0.001	13.68	-0.004
	SR4a	0.479	113.0	<0.001	13.48	-0.005
Mid-ebb	IS(Mf)16	0.050	0.6	0.046	9.82	-0.002
middle DO	IS(Mf)9	0.449	9.0	0.012	18.9	-0.007
Mid-flood	IS(Mf)9	0.055	3.1	0.082	12.16	-0.003
middle DO						
Mid-ebb	IS(Mf)16	0.430	109.9	<0.001	20.90	-0.009
bottom DO	IS(Mf)9	0.206	34.5	<0.001	17.79	-0.006
	IS8	0.248	48.2	<0.001	18.21	-0.007
	SR4	0.248	48.1	<0.001	18.09	-0.007
	SR4a	0.402	98.3	<0.001	20.45	-0.009
Mid-flood	IS(Mf)16	0.285	57.9	<0.001	16.83	-0.006
bottom DO	IS(Mf)9	0.230	26.6	<0.001	17.11	-0.006
	IS8	0.212	38.2	<0.001	15.81	-0.005
	SR4	0.183	32.3	<0.001	15.05	-0.005
	SR4a	0.306	63.9	<0.001	17.98	-0.007

Note:

1. Dependent variable is set as DO (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

Table 2.23 Linear Regression Result of Turbidity

Parameter	Station	R^2	F ratio	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth-averaged turbidity	IS(Mf)16	0.001	0.1	0.728	4.85	0.001
	IS(Mf)9	0.022	3.3	0.072	14.68	-0.005
	IS8	0.055	8.5	0.004	23.84	-0.010
	SR4	0.001	0.1	0.739	6.13	0.001
	SR4a	0.004	0.6	0.450	3.91	0.003
Mid-flood depth-averaged turbidity	IS(Mf)16	<0.001	0.1	0.768	8.15	-0.001
	IS(Mf)9	0.035	5.3	0.023	20.37	-0.007
	IS8	0.023	3.4	0.067	20.64	-0.007
	SR4	0.032	4.7	0.031	20.05	-0.007
	SR4a	<0.001	<0.001	0.995	8.60	<0.001

Note:

1. Dependent variable is set as turbidity (in NTU) and independent variable is set as number of day of construction works.
2. R^2 values of insignificant regression model are underlined.

Table 2.24 Linear Regression Result of SS

Parameter	Station	R^2	F ratio	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth-averaged SS	IS(Mf)16	0.001	0.2	0.686	8.21	-0.001
	IS(Mf)9	0.065	10.2	0.002	17.49	-0.006
	IS8	0.078	12.3	0.001	24.35	-0.010
	SR4	0.011	1.6	0.215	12.70	-0.003
	SR4a	0.064	9.9	0.002	19.97	-0.010
Mid-flood depth-averaged SS	IS(Mf)16	0.016	2.4	0.129	13.56	-0.004
	IS(Mf)9	0.146	24.7	<0.001	33.66	-0.015
	IS8	0.112	18.2	<0.001	36.46	-0.016
	SR4	0.030	4.5	0.036	21.28	-0.007
	SR4a	0.048	7.4	0.007	27.54	-0.011

Note:

1. Dependent variable is set as suspended solids (in mg/L) and independent variable is set as number of day of construction works.

2. R^2 values of insignificant regression model are underlined.

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 monthly basis is adopted to avoid duplicates of survey effort.

2.4.2 Monitoring Equipment

Table 2.25 summarizes the equipment used for the impact dolphin monitoring.

Table 2.25 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 and reticules
Vessel for Monitoring	65 foot single engine motor vessel with viewing platform 4.5m above water level

2.4.3 Monitoring Parameter, Frequencies & Duration

The dolphin monitoring covered 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 were 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 2.26* [(1)] below.

Table 2.26 Impact Dolphin Monitoring Line Transect Co-ordinates

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

(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).

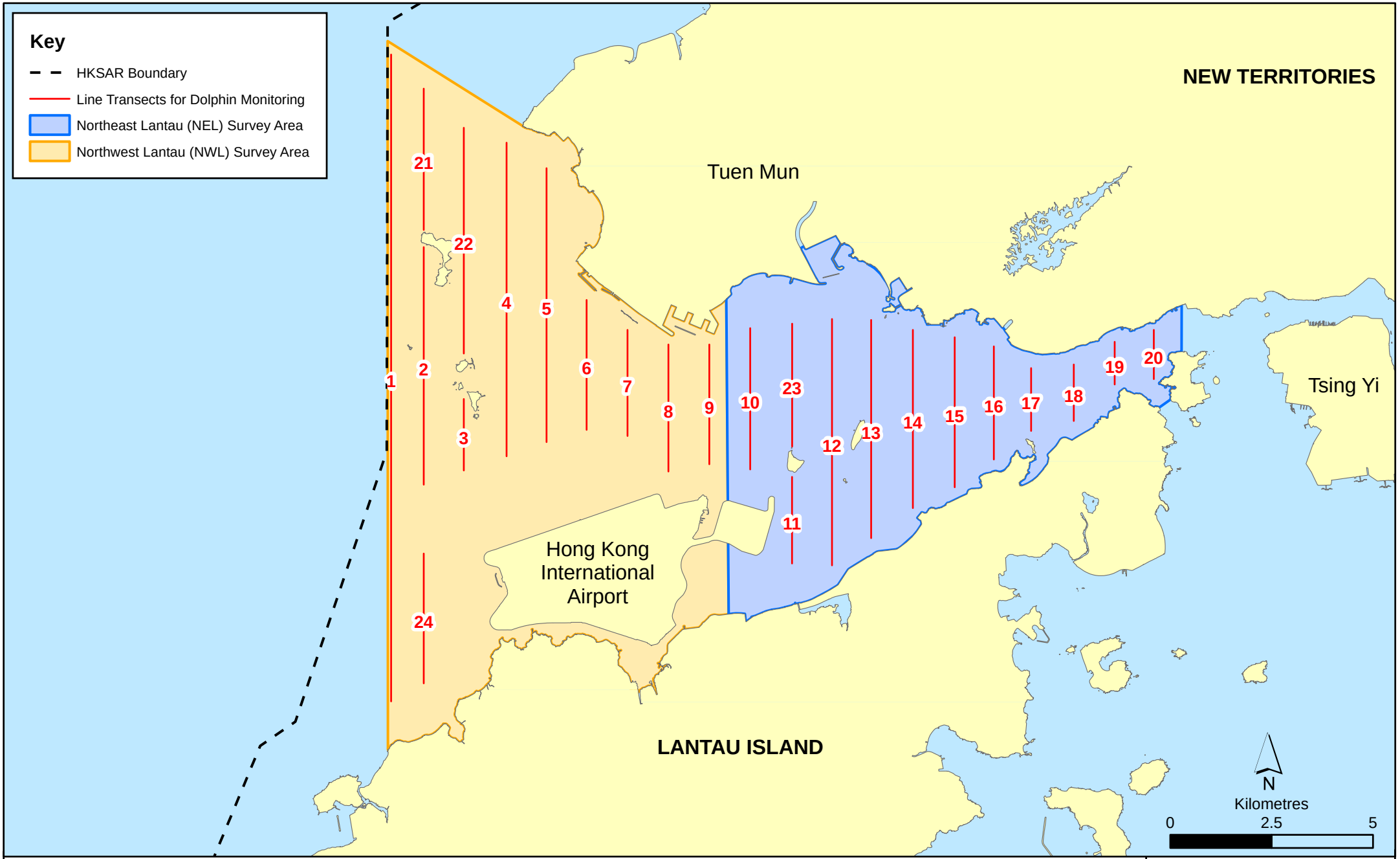

Figure 2.4

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

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Line No.		Easting	Northing	Line No.		Easting	Northing
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 C*. The Event Action Plan is presented in *Appendix H*.

2.4.6 *Monitoring Schedule for the Reporting Period*

The dolphin monitoring schedules for the reporting period are provided in the *Forty-ninth to sixtieth Monthly EM&A Reports*.

2.4.7 *Results & Observations*

A total of 3,152.08 km of survey effort was collected, with 93.6% 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, 1,160.48 km and 1,991.60 km of survey effort were conducted in NEL and NWL survey areas, respectively. The total survey effort conducted on primary lines was 2,300.78 km while the effort on secondary lines was 851.30 km. Both survey efforts conducted on primary and secondary lines were considered as on-effort survey data. The survey efforts are summarized in *Appendix G*.

During the twenty-four sets of monitoring surveys from November 2017 to October 2018, a total of 42 groups of 131 Chinese White Dolphins (CWDs) were sighted. In this 12-month period, all except two (2) dolphin sightings were made during on-effort search. Thirty-three (33) out of 40 on-effort dolphin sightings were made on primary lines, while seven (7) groups of dolphins were sighted on secondary lines. All sightings were made in NWL region. No sighting was made in the proximity of the Project's alignment. Summary table of the dolphin sightings is shown in *Appendix II of Appendix G*.

During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and first three year of impact phases as shown in *Table 2.27*.

Table 2.27 Average Dolphin 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)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2017-18, this reporting period)	0.00	2.68 ± 3.04	0.00	9.02 ± 14.63
Impact Phase (2016-17)	0.00	2.35 ± 2.62	0.00	8.57 ± 11.05
Impact Phase (2015-16)	0.00	2.10 ± 1.83	0.00	8.54 ± 8.53
Impact Phase (2014-15)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04
Impact Phase (2013-14)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-13)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06

Baseline Phase (2011-12)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

Comparison of average daily dolphin encounter rates from this impact phase (November 2017 – October 2018), the first four years of impact phases (November 2013 – October 2017), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (± denotes the standard deviation of the value)

Group size of Chinese White Dolphins ranged from 1-12 individuals per group in North Lantau region during November 2017 - October 2018. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline and transitional and first four years of impact phases, as shown in *Table 2.28.*

Table 2.28 Comparison of Average Dolphin Group Size

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2017-18, this reporting period)	3.12 ± 2.86 (n = 42)	0.00	3.12 ± 2.86 (n = 42)
Impact Phase (2016-17)	3.51 ± 2.68 (n = 43)	0.00	3.51 ± 2.68 (n = 43)
Impact Phase (2015-16)	3.73 ± 3.14 (n = 45)	1.00 (n = 1)	3.80 ± 3.14 (n = 44)
Impact Phase (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

Comparison of average dolphin group size from this impact phase (November 2017– October 2018, the first four years of impact phases (November 2013 – October 2017), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (± denotes the standard deviation of the value)

Two (2) Action Level and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for four (4) sets of quarterly dolphin monitoring data between November 2017 and October 2018. In this reporting period, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from general observations. It is essential to continue monitoring the dolphin usage in North Lantau region for the rest of

the impact phase monitoring period. Photo IDs of sighted dolphin are presented in *Appendix K of the Forty-eighth to sixtieth Monthly EM&A Report*.

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 not undertaken 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 weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. Fifty-one (51) site inspections were carried out in the reporting period. Key observations were summarized in the section of *EM&A Site Inspection* in the *Forty-ninth to sixtieth Monthly EM&A Reports*. The Contractor has rectified all of the observations identified during environmental site inspections in the reporting period.

2.6 WASTE MANAGEMENT STATUS

The Contractor had 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 and chemical waste. Reference has been made to the waste flow table prepared by the Contractor (*Appendix I*). The quantities of different types of wastes are summarized in *Table 2.29*.

Table 2.29 Quantities of Different Waste Generated in the Reporting Period

Month/ Year	Inert Construction Waste [a] (m^3)	Imported Fill (m^3)	Inert Construction Waste Re-used (m^3)	Non-inert Construction Waste [b] (tonnes)	Recyclable Materials [c] (kg)	Chemical Wastes (kg)	Marine Sediment (m^3)		
							Category L	Category M (M_P & M_f)	Category H
November 2017	3,354	0	23	159,650	5,868	5,400	0	0	0
December 2017	3,054	0	164	181,710	15,636	2,400	0	0	0
January 2018	4,288	0	137	211,060	84	0	0	0	0
February 2018	2,662	0	826	184,880	28	0	0	0	0
March 2018	5,916	1,877	2,503	307,670	30,351	1,200	0	0	0
April 2018	6,103	3,977	852	349,640	19,262	0	0	0	0
May 2018	4,492	1,336	1,481	438,160	56	0	0	0	0
June 2018	2,801	67	1,134	669,690	9,605	0	0	0	0
July 2018	1,361	181	208	639,210	13,316	0	0	0	0
August 2018	2,369	1,455	189	508,670	0	1,200	0	0	0
September 2018	1,866	0	0	419,480	4,986	4,000	0	0	0
October 2018	3,182	0	0	365,740	56	4,800	0	0	0
Total	41,448	8,893	7,517	4,435,560	99,248	19,000	0	0	0

Notes:

(a) Inert construction wastes include hard rock and large broken concrete, and materials disposed as public fill.

(b) Non-inert construction wastes include general refuse disposed at landfill.

(c) Recyclable materials include metals, paper, cardboard, plastics, timber and others.

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

For chemical waste containers, the Contractor was reminded to treat properly and store temporarily in designated chemical waste storage area on site in accordance with the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

2.7 *ENVIRONMENTAL LICENSES AND PERMITS*

The status of environmental licensing and permit is summarized in *Table 2.30* below.

Table 2.30 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
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 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 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 HY/2012/07 (WA5 adjacent to Cheung Tung Road, Yam O)
Construction Dust Notification	361571	05-Jul-13	N/A	GCL	
Construction Dust Notification	362093	17-Jul-13	N/A	GCL	For Area 23
Construction Waste Disposal Account	7017735	10-Jul-13	N/A	GCL	-
Construction Waste Disposal Account	7019470	03-Mar-14	Vessel CHIT Account	GCL	Vessel CHIT Account
Waste Water Discharge License	WT00019017-2014	13 May 2014	31 May 2019	GCL	Discharge for marine portion
Waste Water Discharge License	WT00019018-2014	13 May 2014	31 May 2019	GCL	Discharge for land portion
Construction Noise Permit for night works and works in general holidays	GW-RW0294-17	19 Jun 2017	18 Dec 2017	GCL	General works at WA5
Construction Noise Permit for night works and works in general holidays	GW-RW0650-17	19-Dec-17	18-Jun-18	GCL	General works at WA5

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
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-RS0540-17	20 Jun 2017	15 Dec 2017	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-RS1112-17	14-Dec-17	31-Mar-18	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-RS0244-18	30-Mar-18	29-Sep-18	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-RS0740-18	20 Aug-18	16 Feb-19	GCL	Broad Permit for Whole Site Areas
Construction Noise Permit for night works and works in general holidays	GW-RS1025-17	30-Nov-17	31-Dec-17	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS1153-17	31-Dec-17	31-Mar-18	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0201-18	12-Mar-18	30-Apr-18	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0328-18	30-Apr-18	29-Jun-18	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0426-18	11 Jun 2018	31 Jul 2018	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0654-18	1 Aug 2018	30 Sep 2018	GCL	Broad Permit for Segment Launching at Land Portion

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Construction Noise Permit for night works and works in general holidays	GW-RS0829-17	29 Sep 2017	30 Nov 2017	GCL	Broad Permit for Segment Launching at Land Portion
Construction Noise Permit for night works and works in general holidays	GW-RS0668-17	7 Aug 2017	6 Feb 2018	GCL	Pre-casted pile cap shell installation at E8-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0954-17	5 Nov 2017	30 Nov 2017	GCL	Contingency plan for DN800T works at Tung Chung Seafront Road
Construction Noise Permit for night works and works in general holidays	GW-RS0064-18	1-Feb-18	29-Jul-18	GCL	Pre-casted pile cap shell installation at E8-E13
Construction Noise Permit for night works and works in general holidays	GW-RS0411-18	26-May-18	31-May-18	GCL	Street Lamp Replacement at East Coast Road
Construction Noise Permit for night works and works in general holidays	GW-RS0657-18	1 Aug 2018	31 Oct 2018	GCL	Cover Traffic Sign at Tung Chung
Construction Noise Permit for night works and works in general holidays	GW-RS0658-18	1 Aug 2018	22 Aug 2018	GCL	East Coast Road Street Light Repairing
Construction Noise Permit for night works and works in general holidays	GW-RS0752-18	28 Aug 2018	31 Oct 2018	GCL	Traffic Light Installation
Construction Noise Permit for night works and works in general holidays	GW-RS0909-18	16 Oct 2018	30 Nov 2018	GCL	Road milling and paving at Airport Road
Construction Noise Permit for night works and works in general holidays	GW-RS0911-18	12 Oct 2018	30 Oct 2018	GCL	Broad Permit for Segment Launching at Land Portion
Marine Dumping Permit	EP/MD/18-031	1 Jul 2017	31 Dec 2017	GCL	For dumping Type I sediment

2.8 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

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

2.9 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

One (1) Limit Level of 1-hour TSP was recorded for air quality monitoring in the reporting period and no exceedance in 24-hour TSP for air quality monitoring and construction noise in the reporting period.

In this reporting period, a total of 150 monitoring events were undertaken. Eighty –six (86) Action Level and eight (8) Limit Level of Dissolved Oxygen (DO) exceedances, nine (9) Action Level and one (1) Limit Level of Suspended Solids (SS) exceedance and one (1) Action Level of Turbidity exceedance were recorded for water quality impact monitoring in the reporting period. Actions were taken in accordance with the Event Action Plan as presented in *Appendix H*.

Two (2) Action Level and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for impact dolphin monitoring for both NEL and NWL regions. No unacceptable impact from the construction activities of the TM-CLKL Southern Connection Viaduct Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting period. Detailed investigation reports were presented in *Appendix L* of *Sixteen to Nineteen Quarterly EM&A Reports*.

2.10 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

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

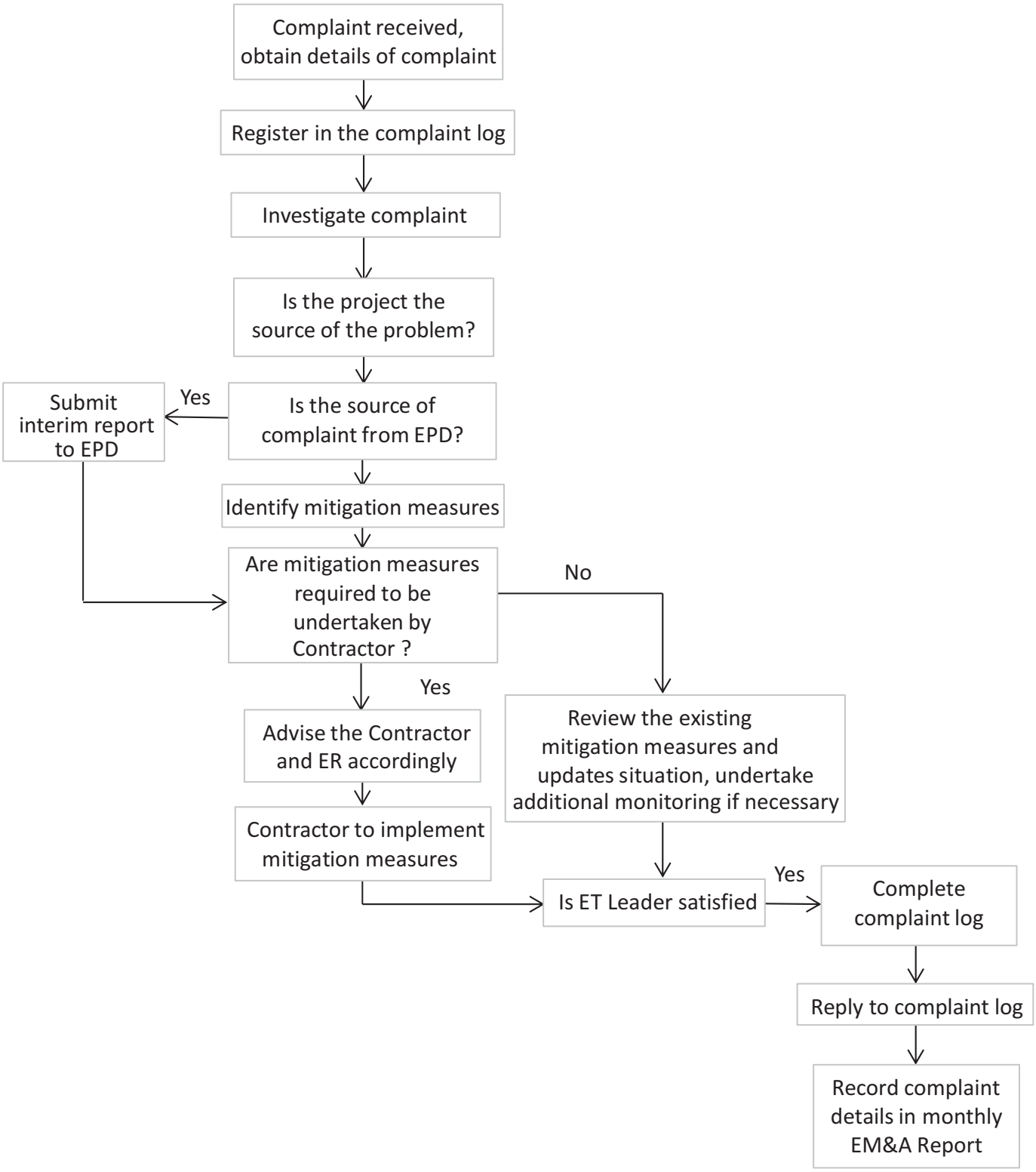

Figure 2.5 Environmental Complaint Handling Procedure

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Environmental Resources Management

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There were four (4) complaints received in the reporting period. Complaints included construction dust nuisance at Hong Kong Boundary Crossing (HKBCF) of Hong Kong-Zhuhai-Macau Bridge Projects, a suspected sighting of dolphin near the viaduct at Tai Ho Wan and construction materials failing from the nearby elevated structures on 29 January 2018, discharge of muddy water nearby HKBCF on 13 June 2018 and construction noise nuisance nearby the Kowloon-boundary lane of the North Lantau Highway on 16 June 2018. Upon investigation, there were no adequate evidences to conclude that the complaint cases were related to this Contract. The detailed investigation reports were presented in the *Appendix N* of the *Forty--ninth to sixtieth Monthly EM&A Report*.

No notification of summons or successful prosecution was received in the reporting period.

Statistics on complaints, notifications of summons, successful prosecutions are summarized in *Appendix J*.

3 COMPARISON OF EM&A RESULTS WITH EIA PREDICTIONS AND BASELINE MONITORING RESULTS

The EM&A results in the reporting period are compared to the predictions from EIA Report and baseline monitoring result in order to review the validity of EIA predictions.

3.1 AIR QUALITY MONITORING

Air quality monitoring for this Contract was undertaken during the baseline and impact monitoring periods. As identified in the TM-CLKL EIA Report, key construction activities of this Contract include excavation works, road works, slope works and foundation works. Comparison of EM&A results with EIA predictions is presented in *Table 3.1*. Maximum 1-hour TSP level in this yearly impact monitoring was comparable to the baseline range, in which most of the impact and baseline TSP levels were higher than the levels predicted in the EIA Report. The average 1-hour TSP and 24-hour TSP levels measured in this yearly impact monitoring were lower than the corresponding TSP levels measured in the baseline monitoring at all stations and thus suggested that no noticeable deterioration of air quality was caused by the construction activities of this Contract during the impact monitoring period.

Table 3.1 Comparison of Impacts on Air Quality (in μg/m³) between EIA Prediction and Impact Monitoring Period

Monitoring Station	EIA Predicted Maximum	Maximum Baseline Monitoring	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring
ASR9 (1-hour TSP)	205 (1) /240	462	680	220	90
ASR9 (24-hour TSP)	83 (1) / 108	113	172	74	59
ASR8A (1-hour TSP)	293 / 205 (1)	464	346	222	80
ASR8A (24-hour TSP)	105 /83 (1)	128	151	74	57

Note:

1. EIA prediction of maximum of ASR8 is presented for reference.

Monitoring Station	EIA Predicted Maximum	Maximum Baseline Monitoring	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring

2. Scenario 1 of EIA prediction is adopted, in which north and south reclamations of TMCLKL were included in the modelling.
3. EIA predictions and baseline monitoring results of ASR9A and ASR9C are applied to ASR8A and ASR9 respectively.

3.2 *NOISE IMPACT MONITORING*

Noise impact monitoring for this Contract was undertaken during the baseline and impact monitoring periods. Major noise sources of this Contract during the reporting period included construction activities, nearby traffic noise and aircraft noise. Construction Noise Permits (CNP), as recommended in the EIA Report, were applied and complied with when Power Mechanical Equipment (PME) was deployed for construction works during restricted hours. The EIA assessment has predicted that marginal impacts would be expected at the Pak Mong Village during construction phase. Comparison of EM&A results with EIA predictions is presented in *Table 3.2*. In general, the average impact noise monitoring results recorded in the reporting period were within the range of the predicted noise levels in the EIA Report and thus suggested that no unacceptable level of construction noise generated from the Contract during the impact monitoring period.

Table 3.2 Comparison of Impacts on Noise (in dB (A)) between EIA Prediction and Impact Monitoring Period

Monitoring Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Baseline Monitoring	Average Impact Monitoring
NSR1	74	70	57	61

Note:
1. EIA maximum noise level was predicted in SPL. Baseline and impact monitoring were measured in $L_{eq,30min}$.

3.3 *WATER QUALITY MONITORING*

Water quality monitoring for this Contract was undertaken during the baseline and impact monitoring periods. Major construction activities of this

Contract in the reporting period included uninstallation of marine piling platform. According to EIA prediction, no SS exceedance is anticipated from this Project at the water sensitive receivers nearby the Contract works area (WSR 22a, WSR 22b and WSR 22c). The average baseline and impact monitoring results are presented in *Table 3.3*. It is noted that most of the annual-averaged SS levels recorded in the reporting period were comparable to or lower than the baseline monitoring results, except for SR4a during mid-mid-flood tide in which annual-averaged SS levels were slightly higher than the corresponding average baseline levels. Although one (1) Limit Level of exceedance on depth-averaged SS were recorded in the reporting period, the exceedances were considered not related to this Contract upon further investigation. Thus, the impact monitoring results are considered influenced by fluctuation of background regional water quality and no unacceptable impacts on marine water was observed caused by this Project.

Table 3.3 ***Comparison of Depth-averaged SS (in mg/L) between Baseline and Impact Monitoring Period***

Monitoring Station	Tide	Baseline monitoring	Impact Monitoring of this Reporting Period
CS(Mf)3/ CS(Mf)3(N)	Mid-ebb	8.8	7.9
CS(Mf)5		9.2	6.5
IS(Mf)16		11.3	6.9
IS(Mf)9		10.9	7.0
IS8		11.3	7.9
SR4/SR4(N)		11.1	7.9
SR4a		9.1	7.9
CS(Mf)3/ CS(Mf)3(N)	Mid-flood	12.4	9.6
CS(Mf)5		11.5	6.5
IS(Mf)16		10.4	7.6
IS(Mf)9		14.7	8.8
IS8		13.5	9.8
SR4/SR4(N)		12.2	9.7
SR4a		9.8	9.9

3.4 MARINE ECOLOGY

According to the baseline results in the *Appendix F* of the approved EIA Report, the dolphin groups were largely sighted near waters around Lung Kwu Chau and Sha Chau. There was no dolphin sighted along the alignment of this Contract. Two-way ANOVAs with repeated measures were conducted to compare results of average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) between baseline, transitional and impact periods. Although the STG and ANI in impact monitoring period were lower than that before the commencement of this Contract (see *Section 2.4.7*) and the differences between the six periods are statistically significant (see *Section 3.3.4* of *Appendix G*), the distribution pattern was still similar between the impact monitoring periods and before the commencement (i.e. transition period in 2012 – 2013) of this Contract. Dolphins were observed mainly around Lung Kwu Chau and less frequently in the North Lantau region where the works area of this Contract is situated. The monitoring results in this reporting period are considered to be in line with the EIA predictions, and the review of monitoring data suggested that no unacceptable impacts was noted from the marine works under this Contract. It is essential to monitor the dolphin usage in North Lantau region for the rest of impact monitoring period to keep track on the trend of dolphin ranging pattern.

3.5 WASTE MANAGEMENT

In general, wastes generated from the construction activities including C&D materials (inert and non-inert), chemical wastes, marine sediment and recyclable materials. The summary of waste generation amount is presented in *Table 2.30*.

Waste monitoring and audit programme has been undertaken during this reporting period. Wastes arising from this Project have been managed in accordance with the recommendations in the EIA Report, the EM&A Manual, the Waste Management Plan and other relevant statutory requirements.

The requirements for construction waste management have been reviewed and were considered as adequate. No change to the requirements was considered to be necessary.

3.6 SUMMARY OF MONITORING METHODOLOGY AND EFFECTIVENESS

The EM&A monitoring programme has been reviewed and was considered effective and adequate to cater for the nature of works in progress. No further change to the monitoring programme was considered to be necessary.

The EM&A programme will be evaluated as appropriate in the next reporting period and improvements in the EM&A programme will be recommended if deemed necessary.

3.7 SUMMARY OF MITIGATION MEASURES

The mitigation measures stipulated in the Updated EM&A Manual were undertaken by the Contractor in the reporting period. The mitigation measures were reviewed and considered effective. No addition or change on mitigation measures was considered to be necessary.

4 FUTURE KEY ISSUES

4.1 KEY ISSUES FOR THE COMING PERIOD

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

5 CONCLUSION AND RECOMMENDATIONS

This Fifth Annual EM&A Report presents findings of the EM&A activities undertaken during the period from 1 November 2017 to 31 October 2018, in accordance with the Updated EM&A Manual and the requirements of the Environmental Permits (*EP-354/2009/D* and *EP-353/2009/K*).

Eighty-six (86) Action Level and eight (8) Limit Level of Dissolved Oxygen (DO) exceedances, nine (9) Action Level and one (1) Limit Level of Suspended Solids (SS) exceedance and one (1) Action Level of Turbidity exceedance were recorded for water quality impact monitoring in the reporting period.

One (1) Limit Level of 1-hour TSP was recorded for air quality monitoring in the reporting period. There were no Action nor Limit Level exceedances observed for 24-hour TSP air quality monitoring in the reporting period.

There were no Action Level nor Limit Level exceedances were observed for noise monitoring in this reporting period.

A total of 42 groups of 131 Chinese White Dolphins (CWDs) were sighted. Two (2) Action Level and three (3) Limit Level exceedances for both NEL and NWL regions were recorded for four (4) sets of quarterly dolphin monitoring data between November 2017 and October 2018, whilst no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations. It is essential to continue monitoring the dolphin usage in North Lantau region for the rest of the impact phase monitoring period.

Environmental site inspection was carried out fifty-one (51) times in the reporting period. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site audits.

There were four (4) complaints received from EPD / 1823 in the reporting period. Complaints included construction dust nuisance at Hong Kong Boundary Crossing (HKBCF) of Hong Kong-Zhuhai-Macau Bridge Projects, a suspected sighting of dolphin near the viaduct at Tai Ho Wan and construction materials failing from the nearby elevated structures on 29

January 2018, discharge of muddy water nearby HKBCF on 13 June 2018 and construction noise nuisance nearby the Kowloon-boundary lane of the North Lantau Highway on 16 June 2018. Upon investigation, there were no adequate evidences to conclude that the complaint cases were related to this Contract.

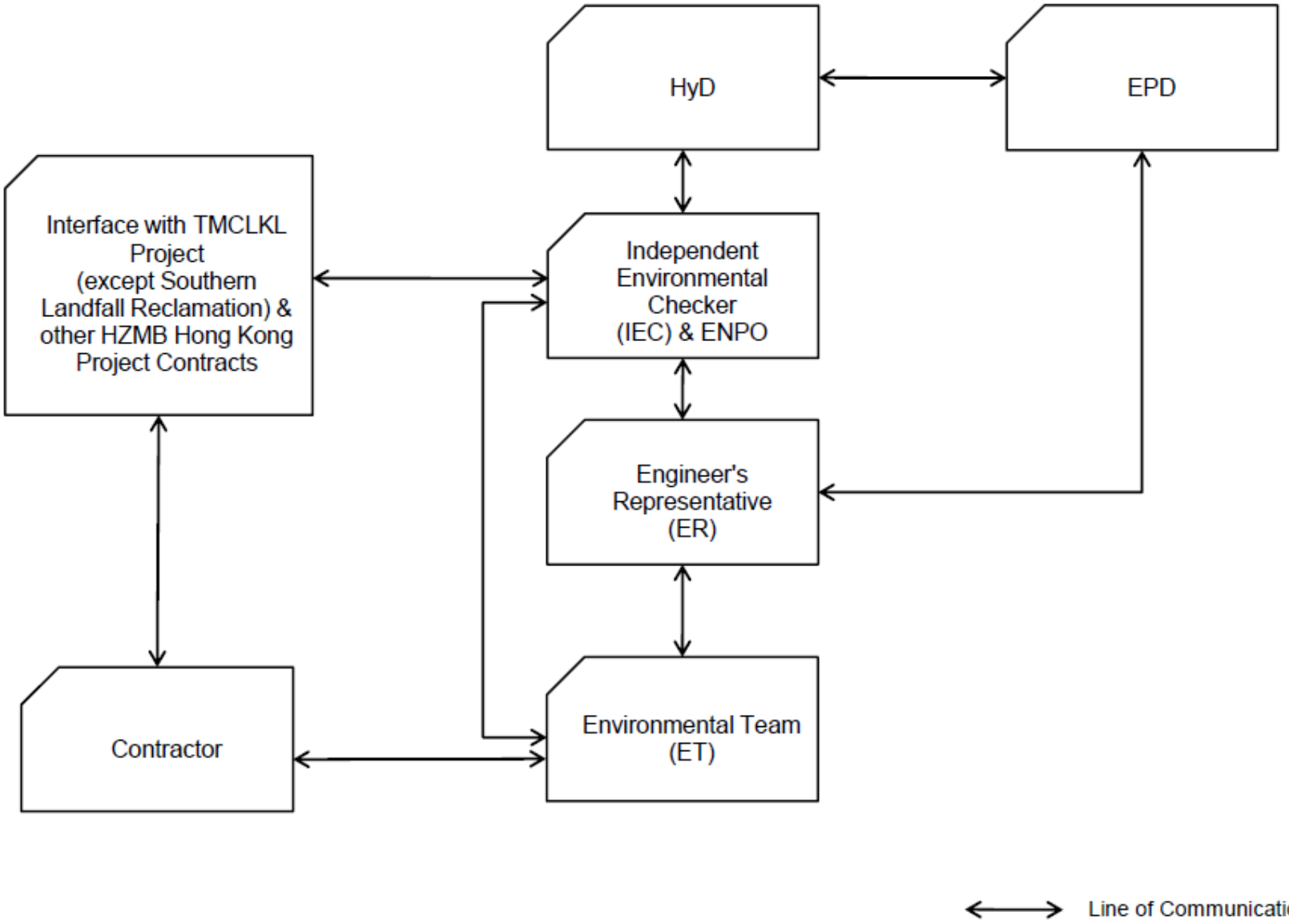
No summons/ prosecution were received during the reporting period.

The review of monitoring data suggested that the construction works under this Contract have proceeded in an environmentally acceptable manner in this reporting period. In general, the monitoring results were in line with EIA predictions.

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

DATE: 06/03/2013

Environmental Resources Management

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Appendix B

Environmental Mitigation and Enhancement Measure Implementation Schedules

(Adopted from: CINOTECH (2011) Agreement No. CE35/2011 EP Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao BridgeTuen Mun-Chep Lap Kok Link – Investigation. UpdatedEM&A Manual for Tuen Mun-Chek Lap Kok Link)

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
AIR QUALITY									
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 Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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									
5.11	Section 4	Noise monitoring	All existing representative sensitive receivers / during North Lantau Viaduct construction	Contractor	EM&A Manual		Y		✓
WATER QUALITY									
General Marine 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		✓
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		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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		✓
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		✓
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		✓
6.10	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
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 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		✓
	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		✓
	5.2	One additional water quality monitoring station is	During temporary	Contractor			Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		proposed at station SR4a In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution will be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration will be arranged at the monitoring station SR4a,	staging works						
Land Works									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
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 soaks away shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
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 storm water to such silt removal facilities. Catch pits 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 Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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		Y		✓
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 Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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		Y	✓
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 Quality 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	Y	✓
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 Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
			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		Y		n/a
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All marine bored piling and temporary staging works areas/Detailed Design/during all marine bored piling and temporary staging works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600m² 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	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		✓
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Tai Ho Wan (donor site) and Yam Tsui Wan (receptor site) /Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		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 Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
			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		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									
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 prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. (Tree	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	C	O	
		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		✓
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		✓
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

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
									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	Y		✓
10.9	7.6	Re-vegetation of affected woodland/shrubland with native species (OM1)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	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	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	HyD/LCSD
10.9	7.6	Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	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	HyD
WASTE									

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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 where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
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		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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 materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and	All areas / throughout construction period	Contractor	TMEIA		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		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.							
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows: - suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; - Having a capacity of <450L unless the specifications have been approved by the EPD; and - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. Clearly labelled and used solely for the storage of chemical wastes; - Enclosed with at least 3 sides; - Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest; - Adequate ventilation; - 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.	All areas / throughout construction period	Contractor	TMEIA		Y		<>

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
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 utilizing them.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
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 By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
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 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, aluminum cans, plastic bottles, etc. should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		✓
12.6	Section 8	EM&A of waste handling, storage, transportation,	All areas /	Contractor	EM&A Manual		Y		✓

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status
						D	C	O	
		disposal procedures and documentation through the site audit programme shall be undertaken.	throughout construction period						
CULTURAL HERITAGE									
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

Remark:

✓ 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 C

Summary of Action and Limit Levels

Table C1 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 μg /m³	ASR9A/ASR8A = 394 ASR9C/ASR8/ASR9 = 393	500

Table C2 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 C3 Action and Limit Levels for Water Quality

Parameter	Action Level#	Limit Level#
DO in mg/L [(a)]	Surface and Middle **5.0 mg/L** Bottom **4.7 mg/L**	Surface and Middle **4.2 mg/L** Bottom **3.6 mg/L**
Turbidity in NTU (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., **27.5 NTU**	130% of upstream control station at the same tide of the same day and 99%-ile of baseline data, i.e., **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

Parameter	Action Level#	Limit Level#
(e) The 1%-ile of baseline data for surface and middle DO is 4.2 mg/L, whilst for bottom DO is 3.6 mg/L.		

Table C4 Action and Limit Levels for Impact Dolphin Monitoring

	North Lantau Social Cluster	
	NEL	**NWL**
Action Level	STG < 70% of baseline & ANI < 70% of baseline	STG < 70% of baseline & ANI < 70% of baseline
Limit Level	[STG < 40% of baseline & ANI < 40% of baseline] and STG < 40% of baseline & ANI < 40% of baseline	

Notes:

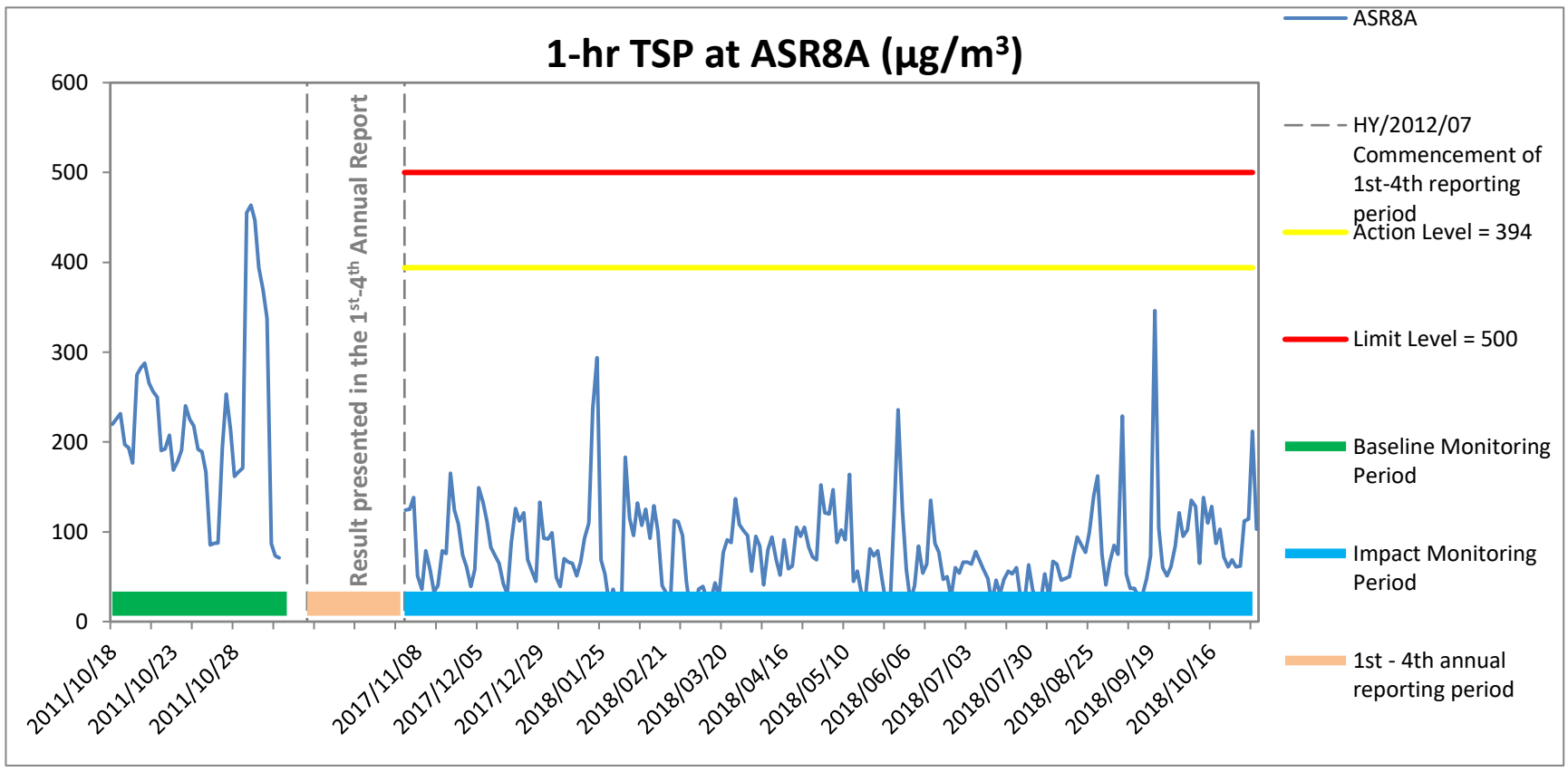
1. STG means quarterly encounter rate of number of dolphin sightings, which is **6.00 in NEL** and **9.85 in NWL** during the baseline monitoring period
2. ANI means quarterly encounter rate of total number of dolphins, which is **22.19 in NEL** and **44.66 in NWL** during the baseline monitoring period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

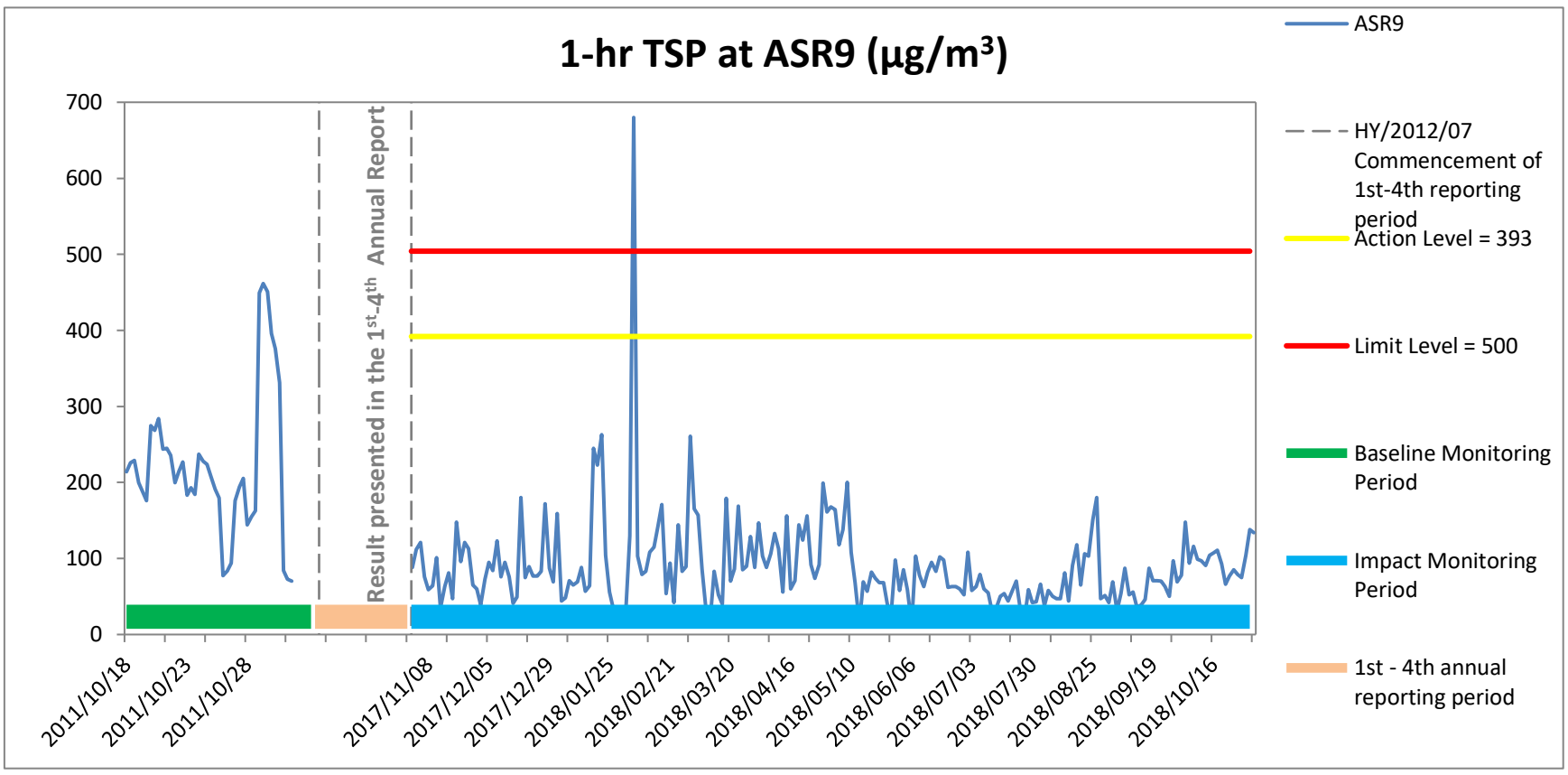
Table C5 Derived Value of Action Level (AL) and Limit Level (LL)

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

Appendix D

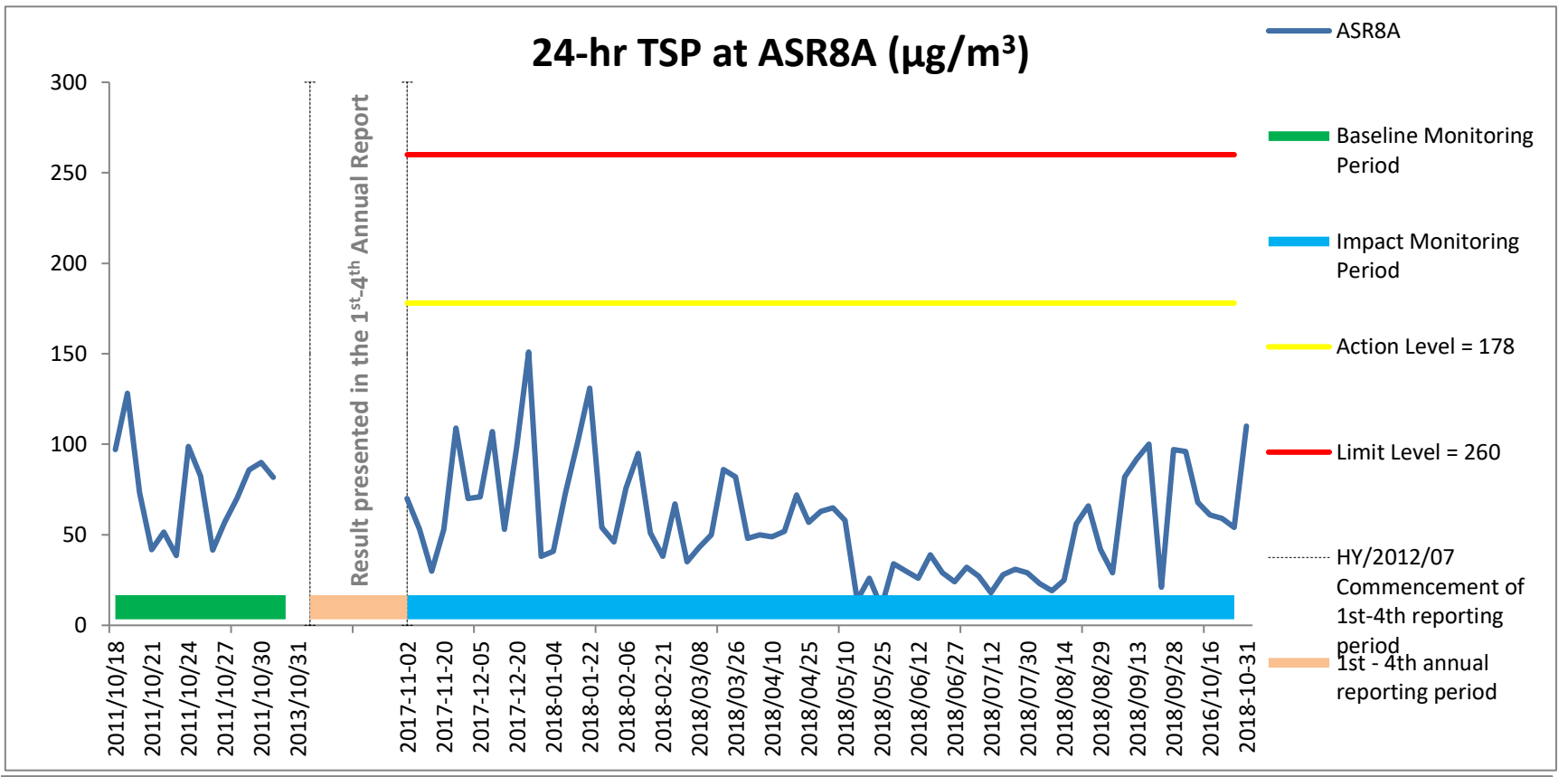
Impact Air Quality Monitoring Graphical Presentation

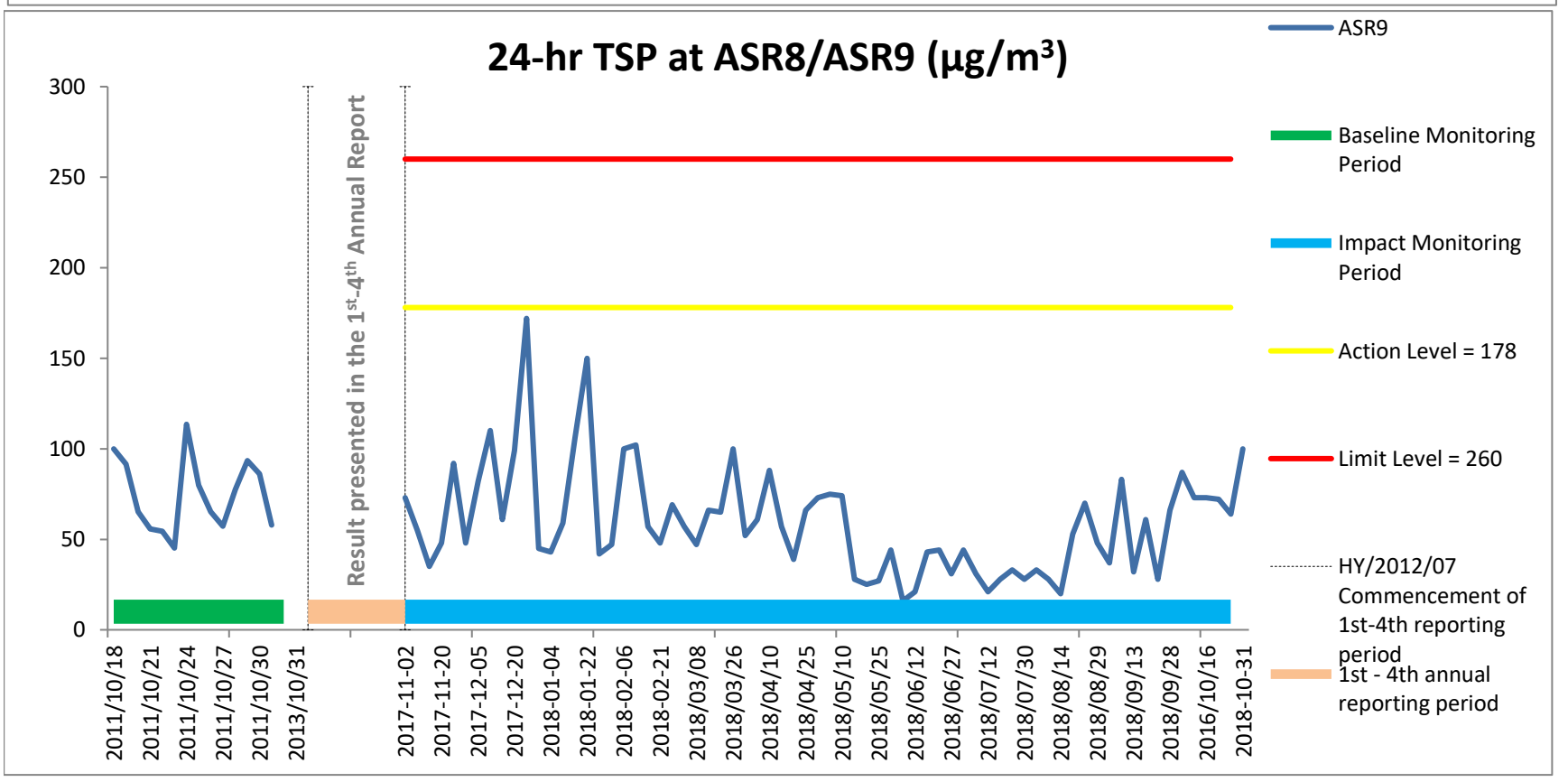




Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Road works along North Lantau Highway; Launching gantry operation; Installation of pier head and deck segments; Asphalt paving, Constucton of sign ganties; Parapet and barriers installation and Slope work of Viaducts A, B,C & D.

Marine works within the reporting period include Uninstallation of marine piling platform.

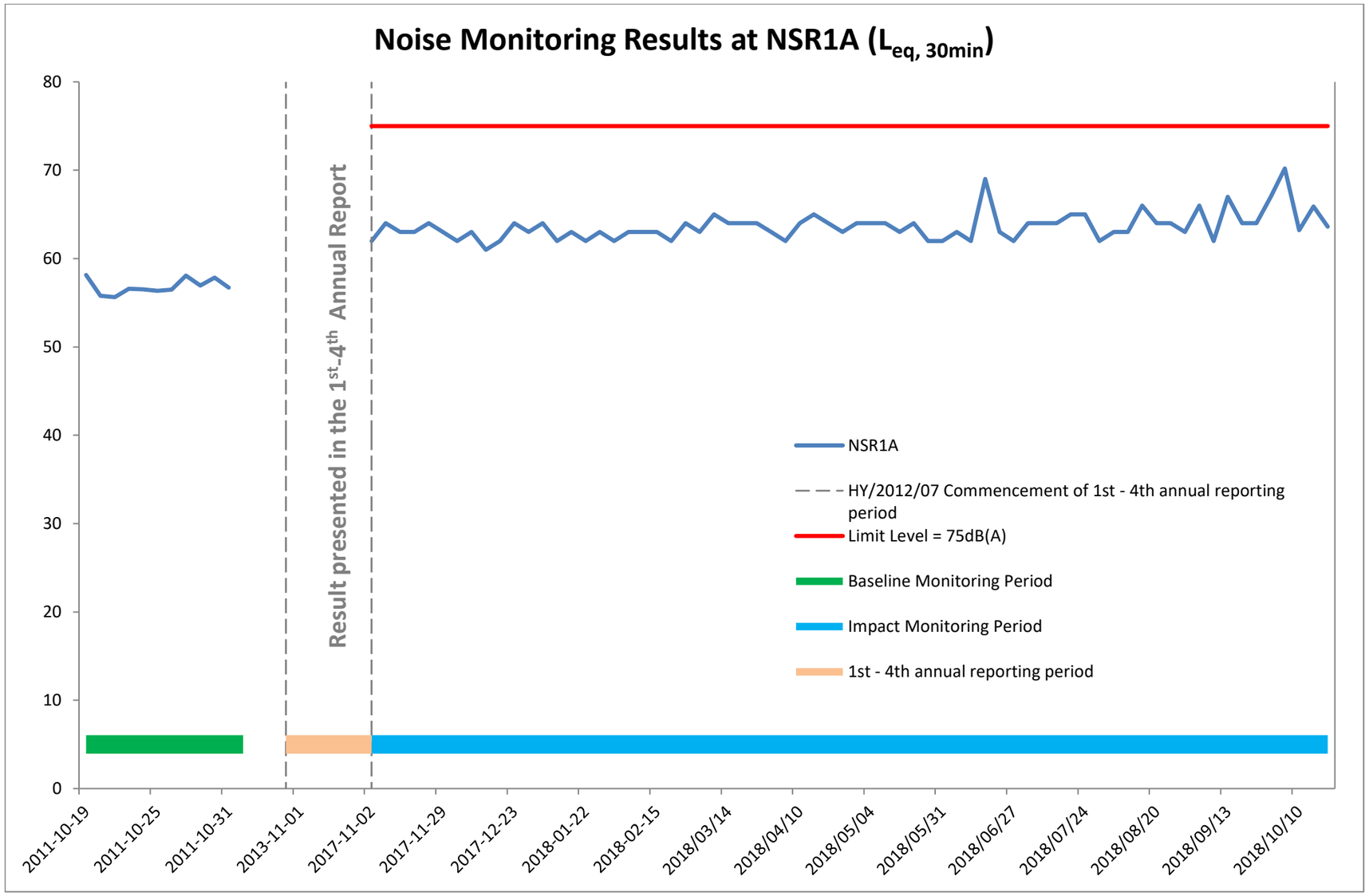




Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions.
Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Road works along North Lantau Highway; Launching gantry operation; Installation of pier head and deck segments; Asphalt paving, Constucton of sign ganties; Parapet and barriers installation and Slope work of Viaducts A, B,C & D.
Marine works within the reporting period include Uninstallation of marine piling platform.

Appendix E

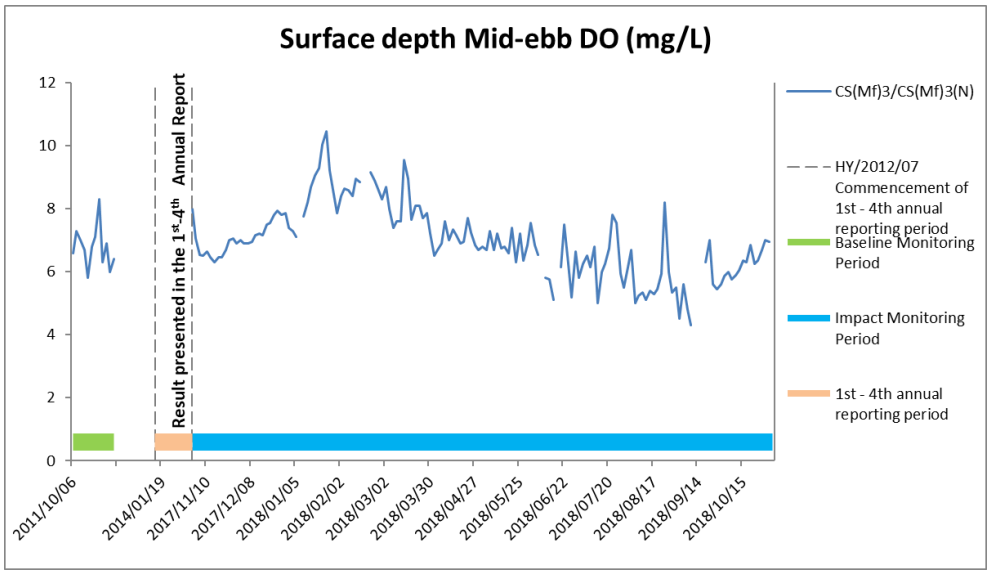
Impact Noise Monitoring Graphical Presentation



Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions.
Major construction works undertaken within the reporting period include Pier construction; Re-alignment of Cheung Tung Road; Road works along North Lantau Highway; Launching gantry operation; Installation of pier head and deck segments; Asphalt paving, Constucton of sign ganties; Parapet and barriers installation and Slope work of Viaducts A, B,C & D.
Marine works within the reporting period include Uninstallation of marine piling platform.
Baseline monitoring results are presented graphically in daily average.

Appendix F

Impact Water Quality Monitoring Graphical Presentation



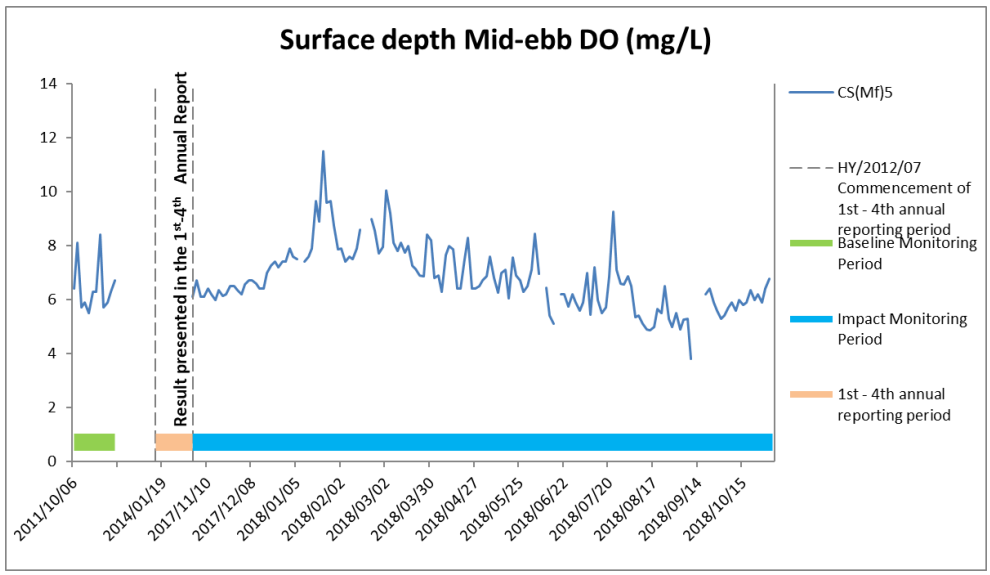
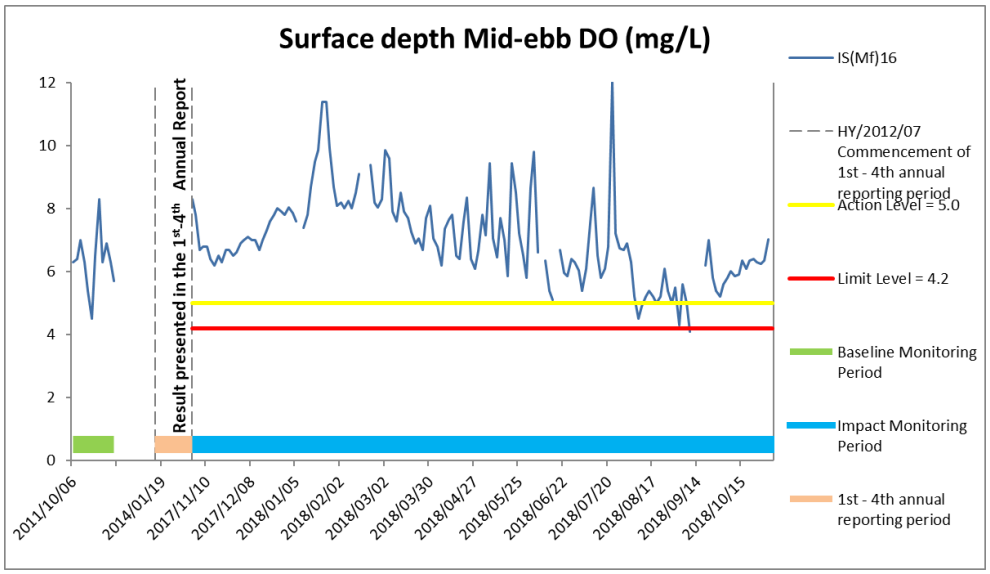


Figure F1 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



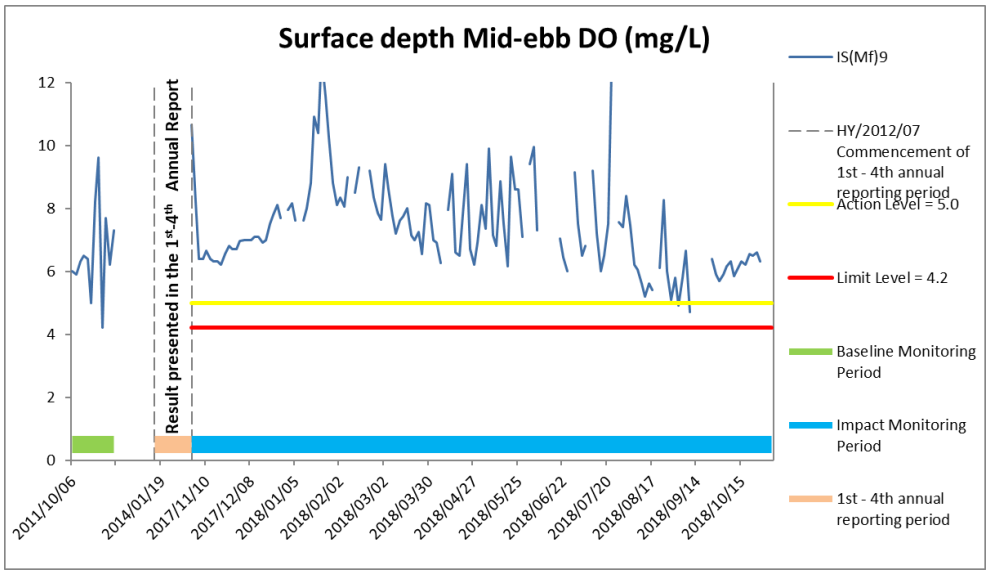
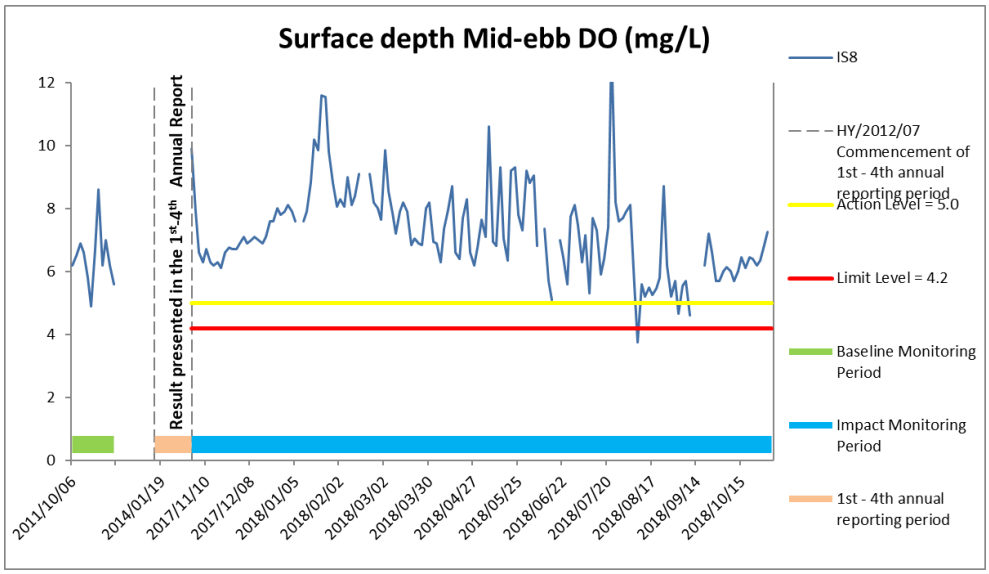


Figure F2 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



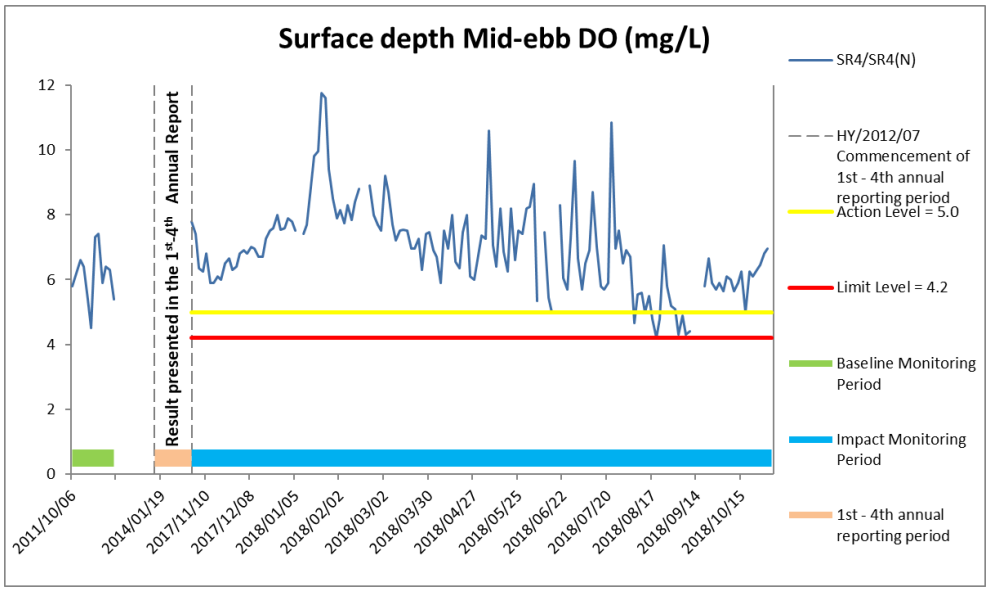


Figure F3 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

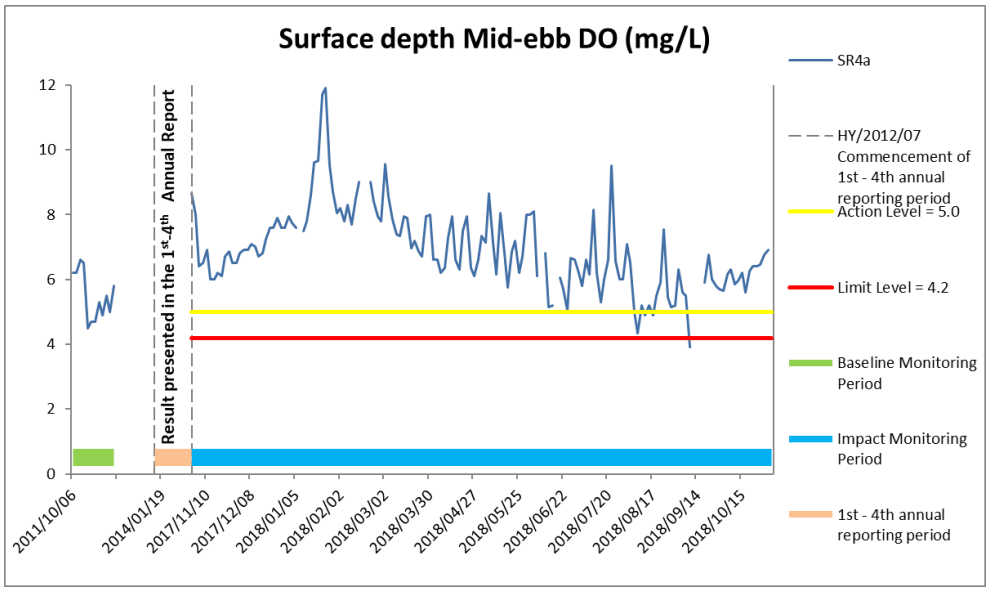
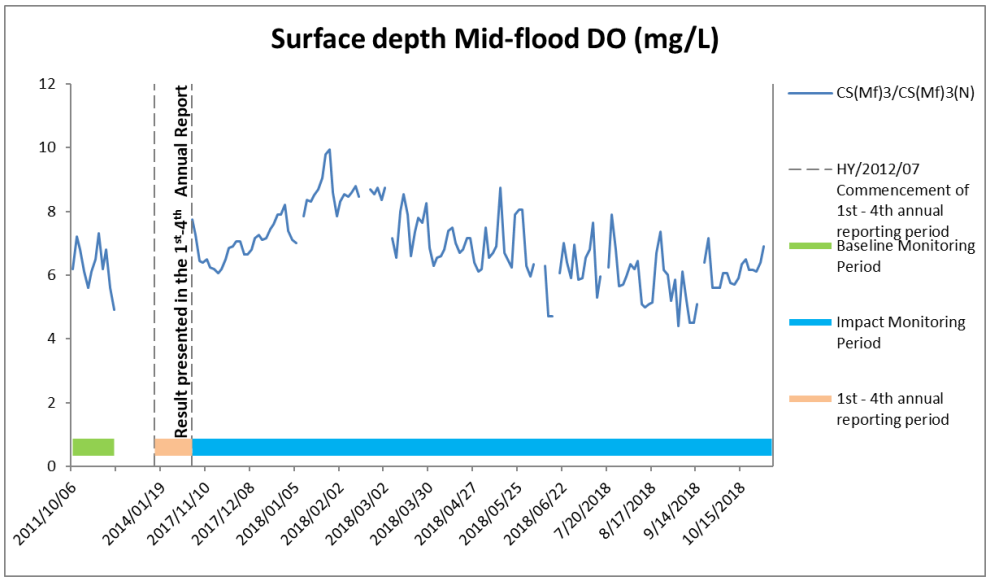


Figure F4 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



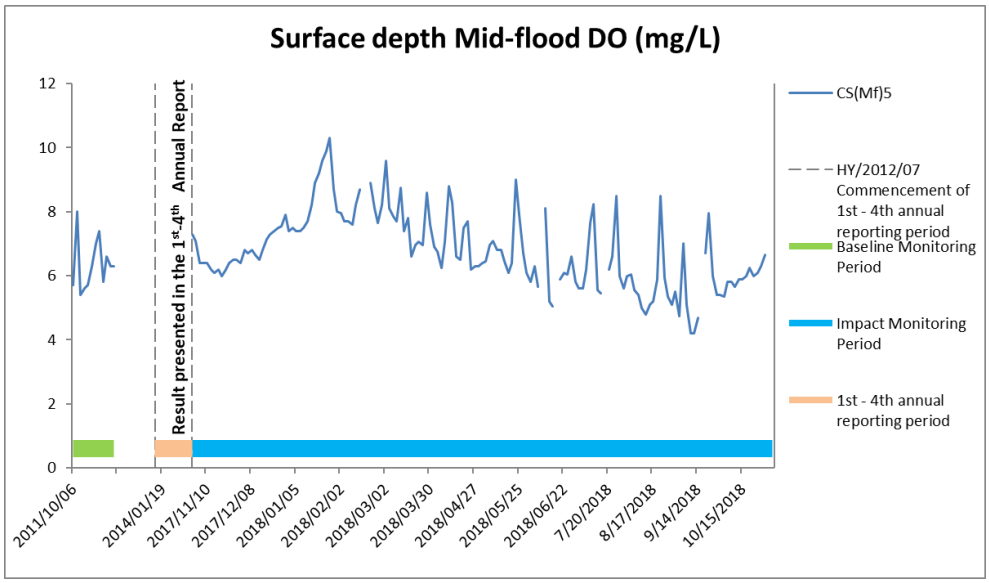
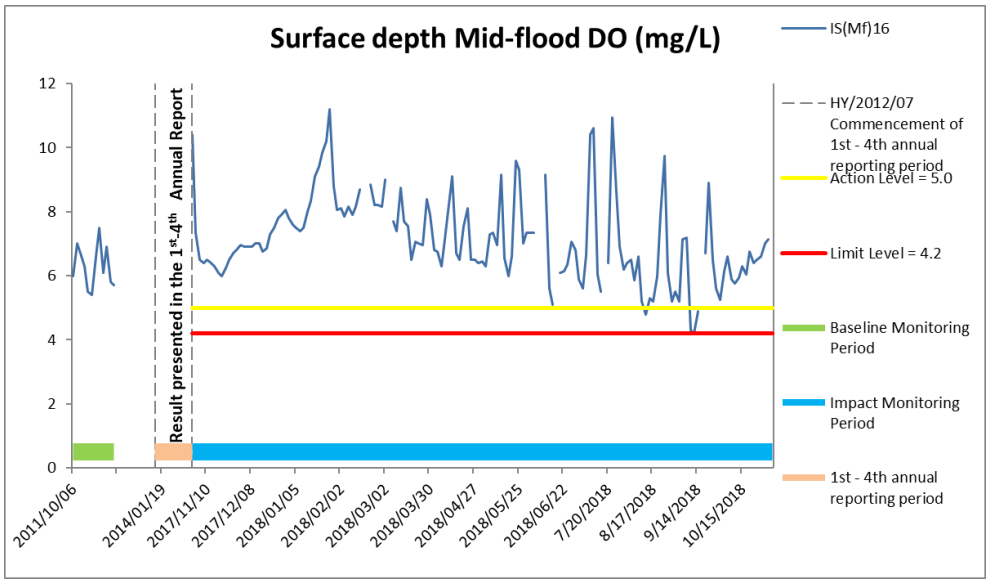


Figure F5 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



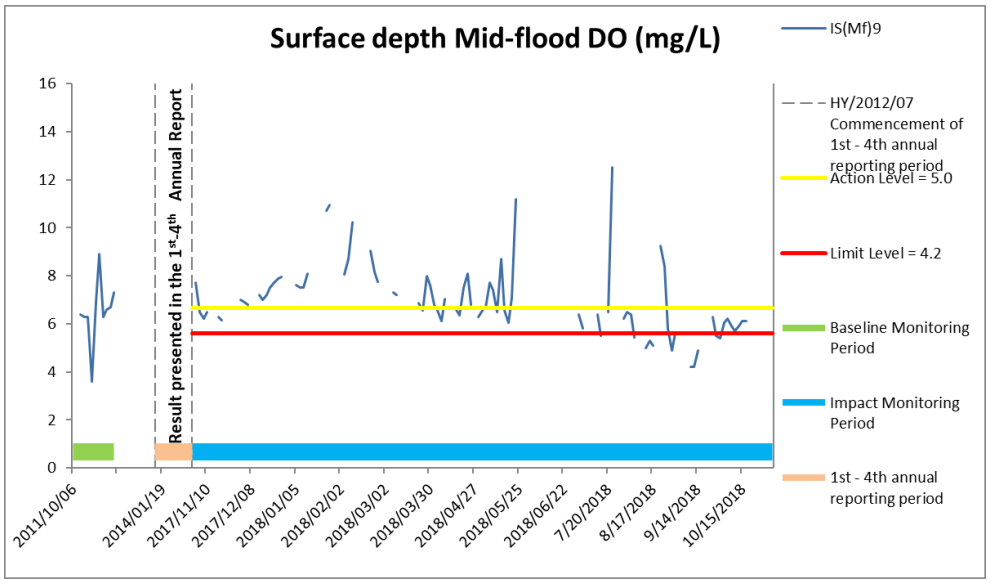
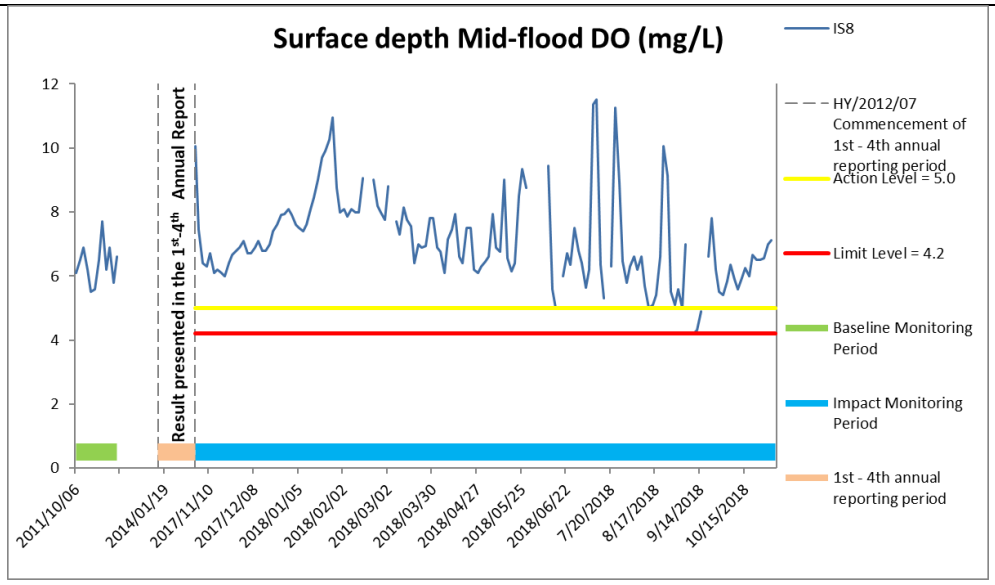


Figure F6 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



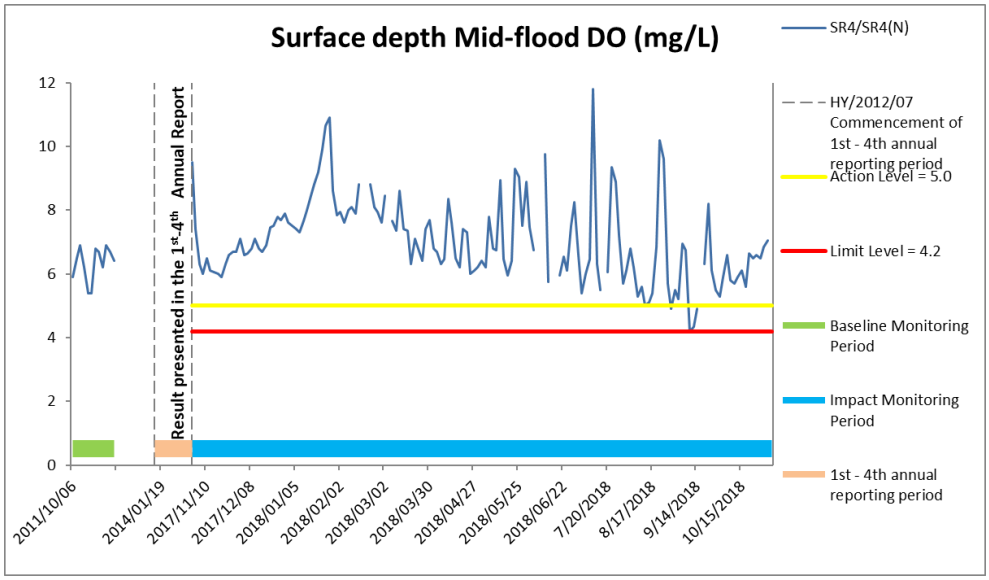


Figure F7 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM

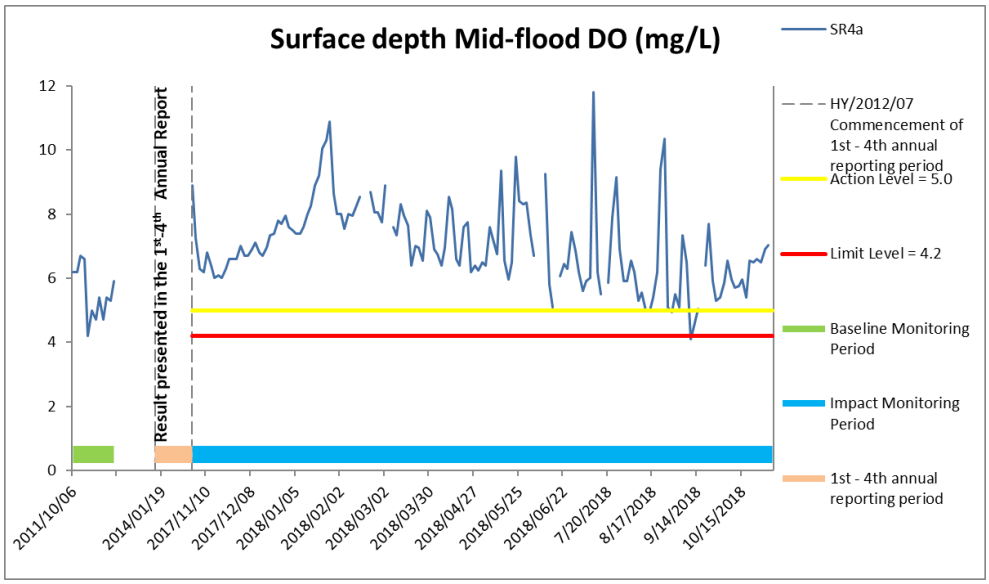
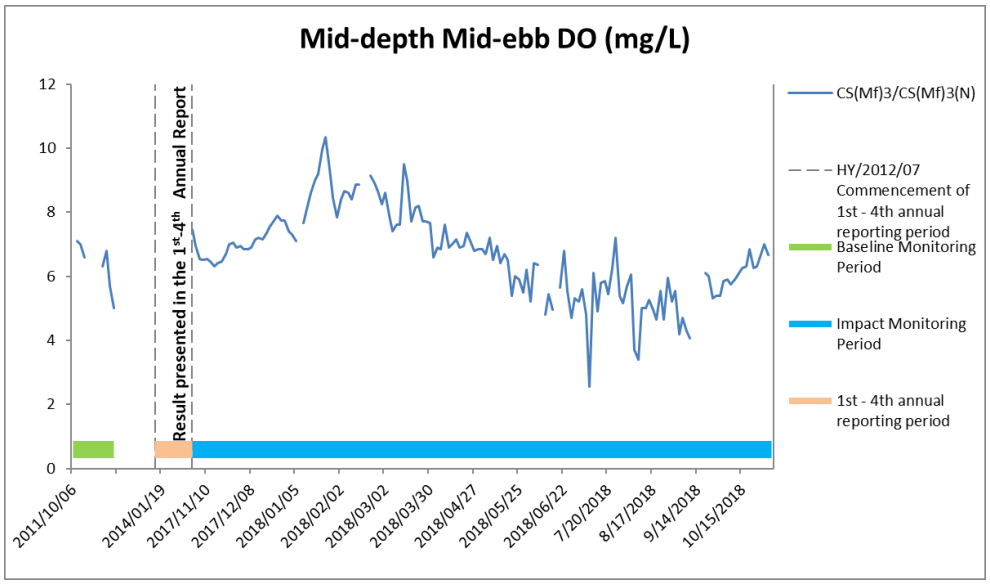


Figure F8 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters during mid-flood tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



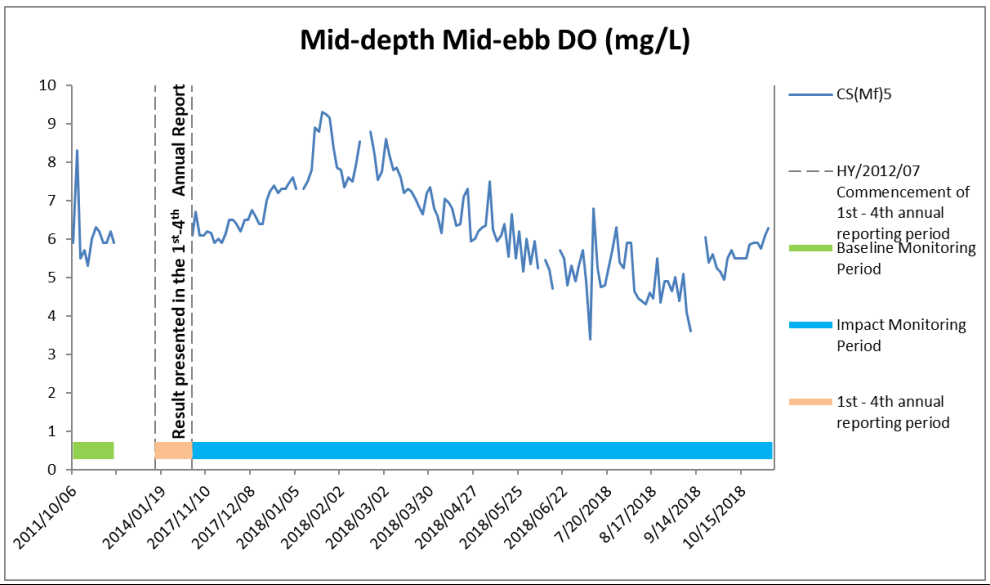


Figure F9 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM

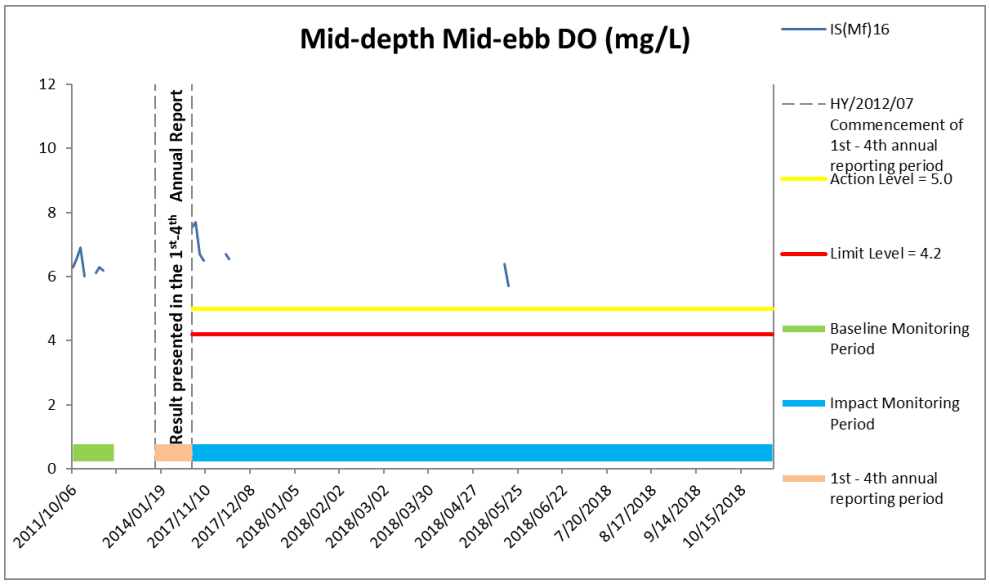
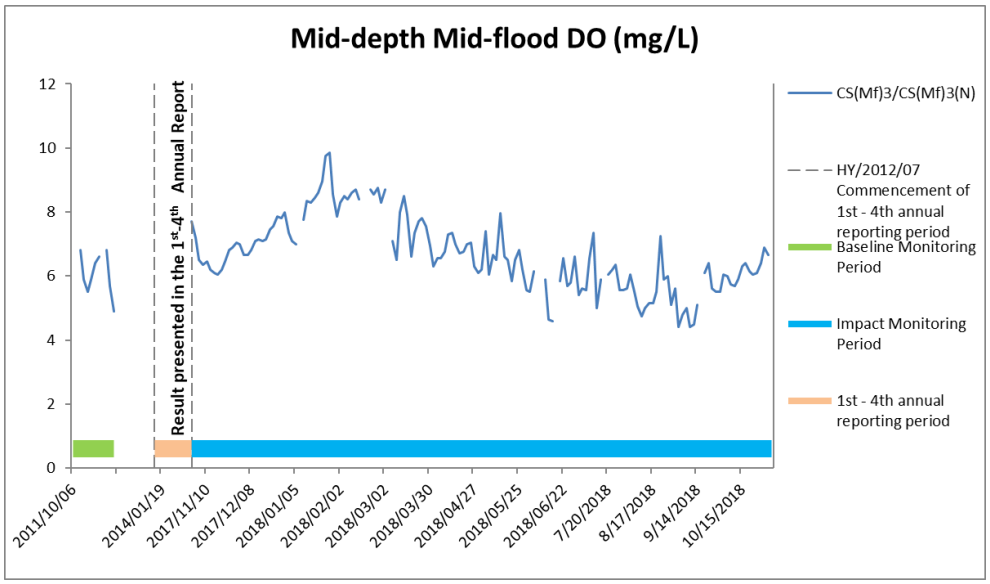


Figure F10 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS(Mf)16.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



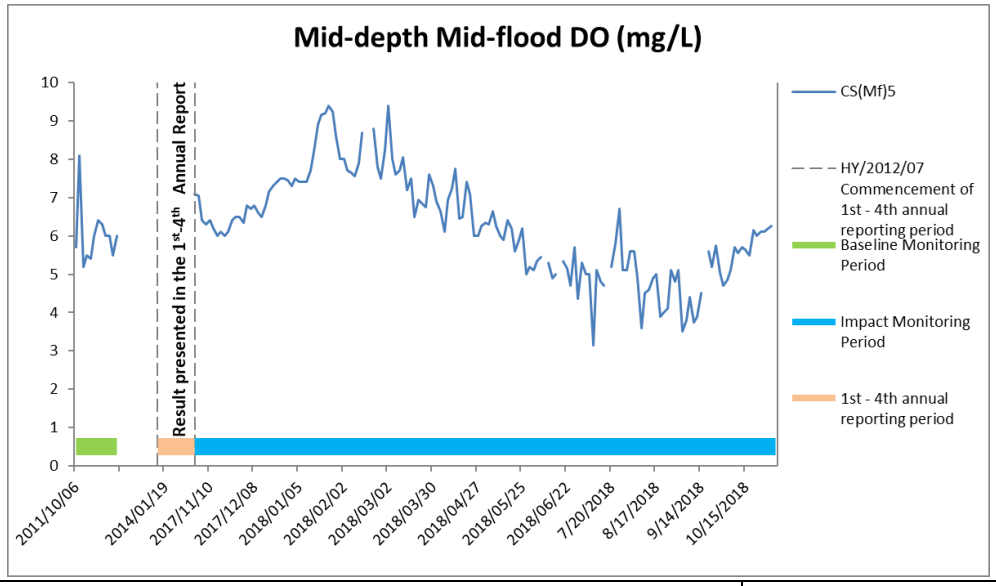


Figure F11 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2017 and 31 October 2018 at CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM

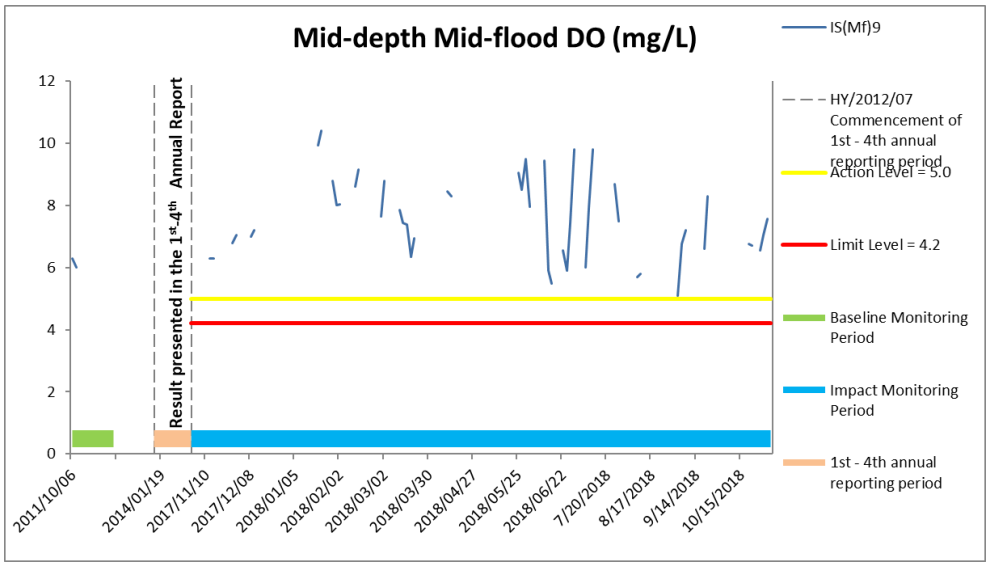
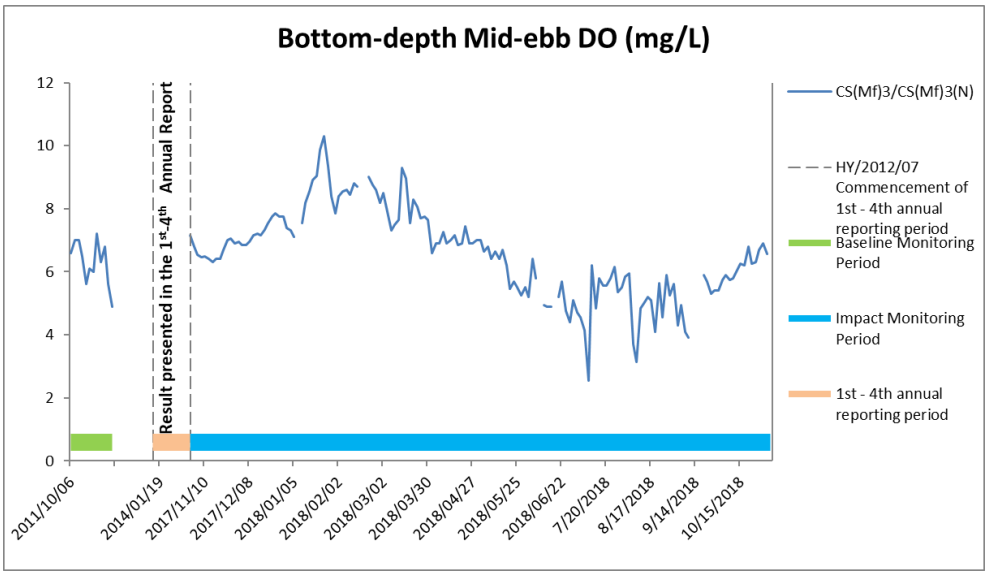


Figure F12 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters during mid-flood tide between 1 November 2017 and 31 October 2018 at IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



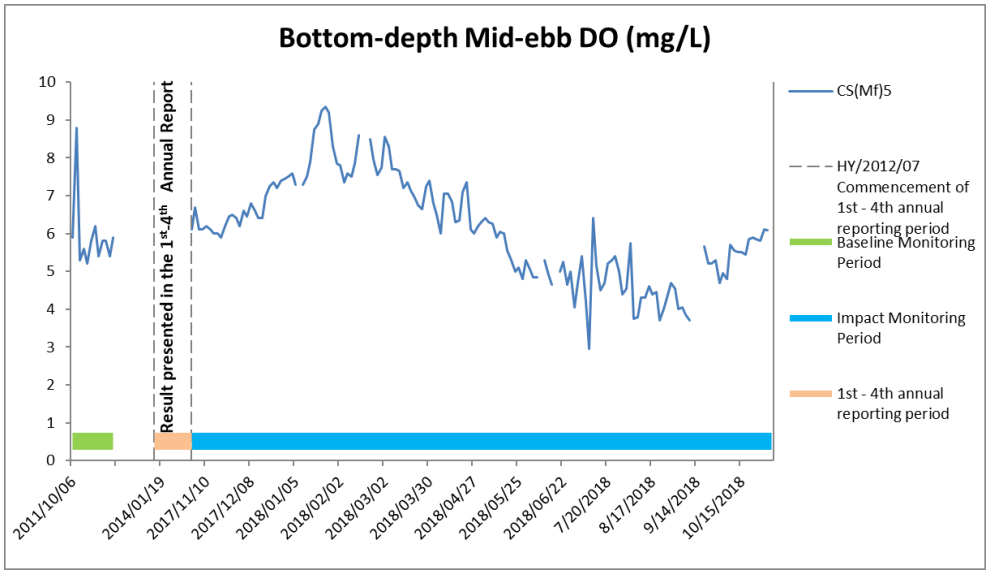
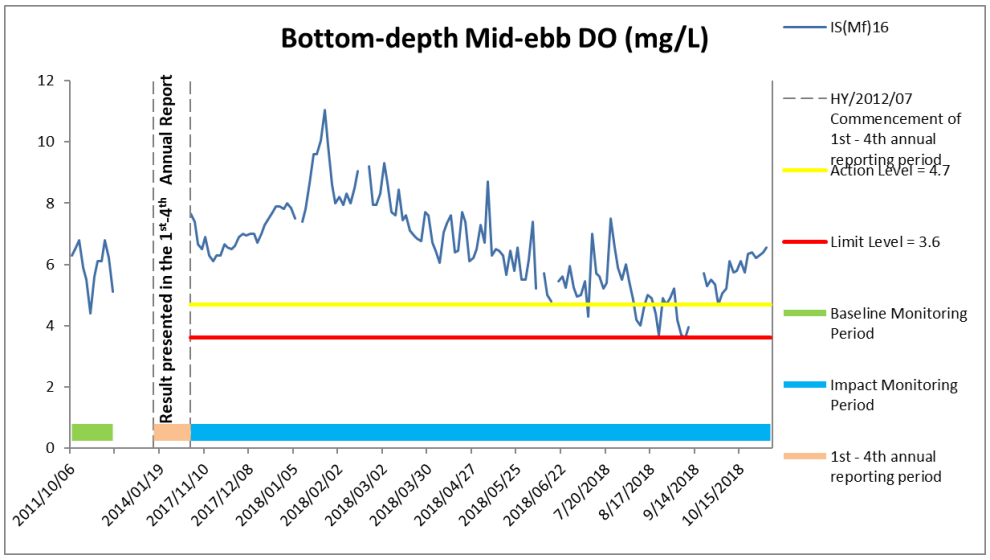


Figure F13 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



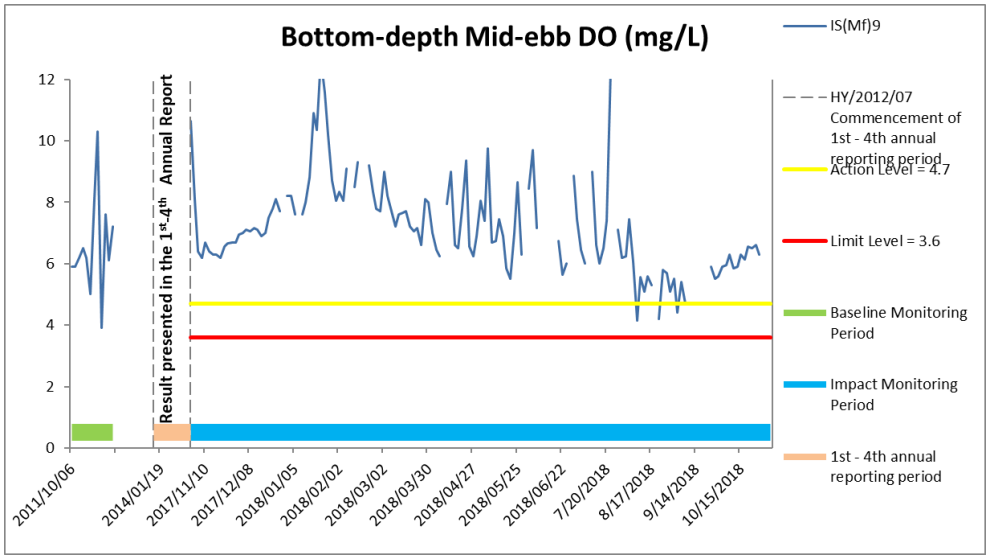
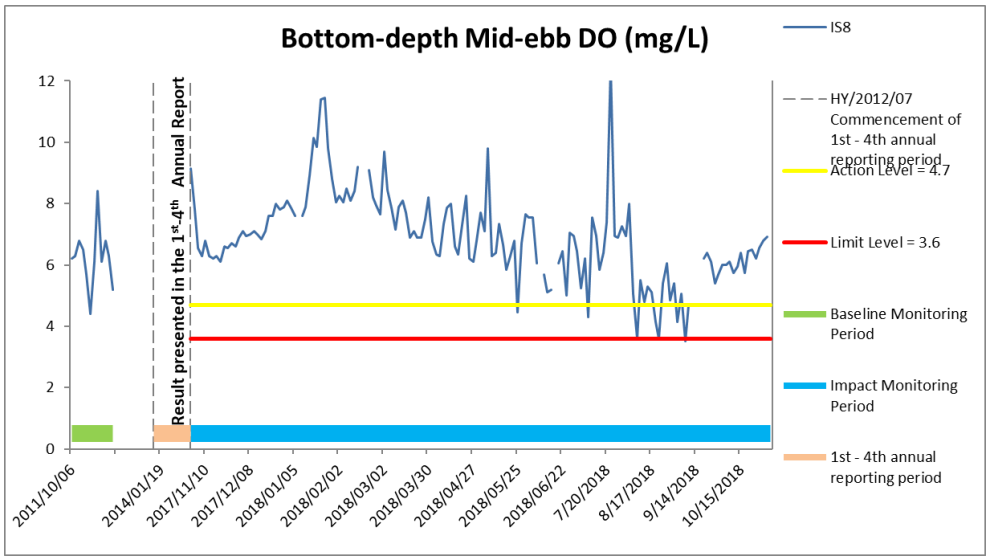


Figure F14 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



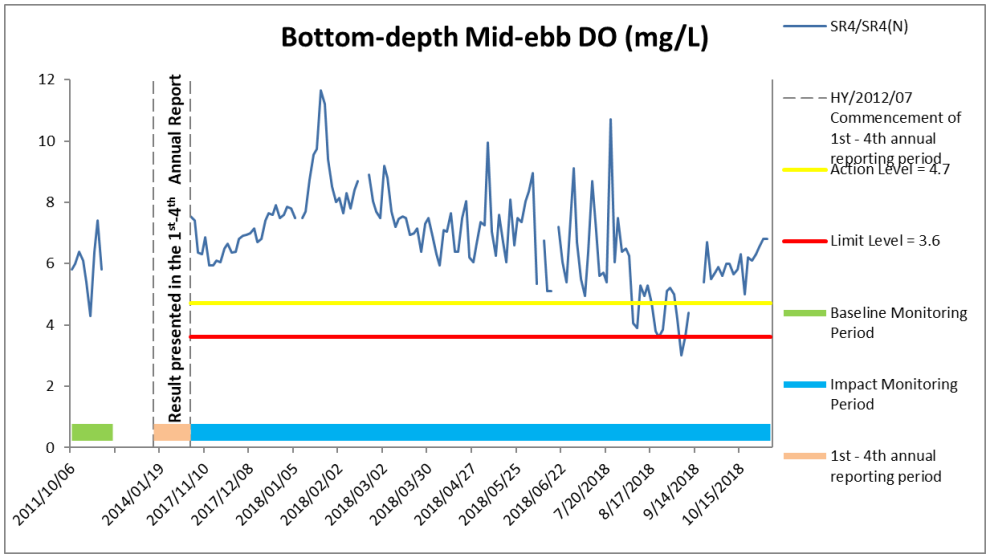


Figure F15 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM

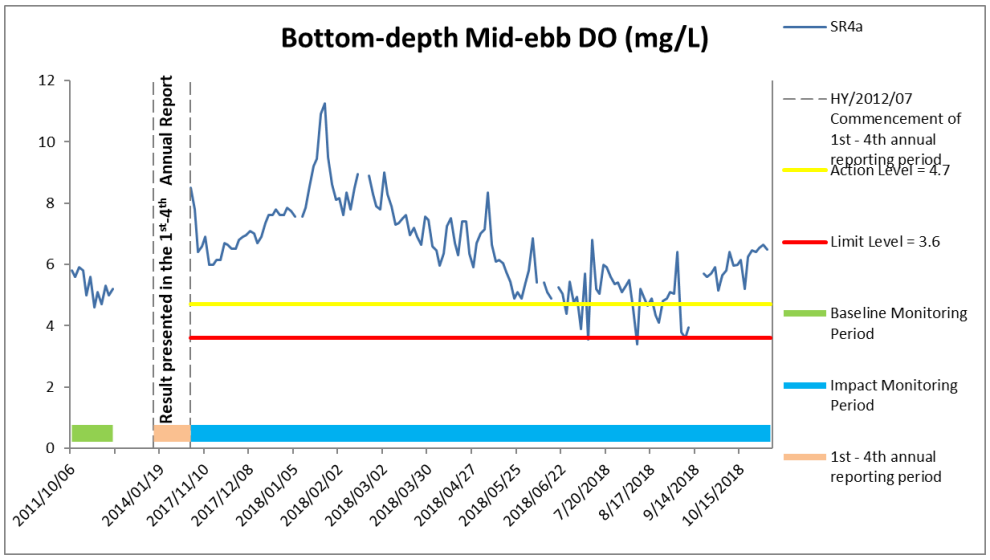
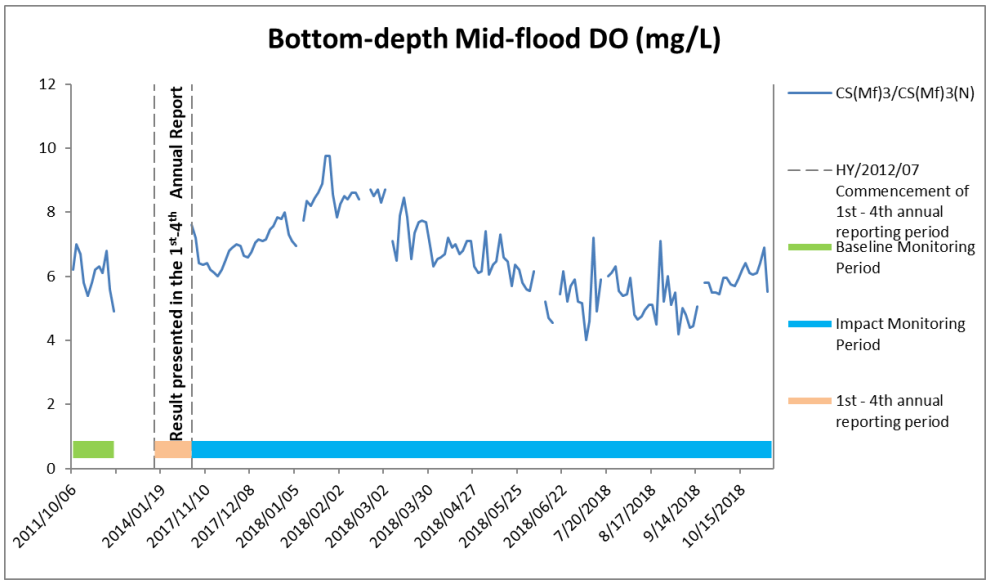


Figure F16 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-ebb tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



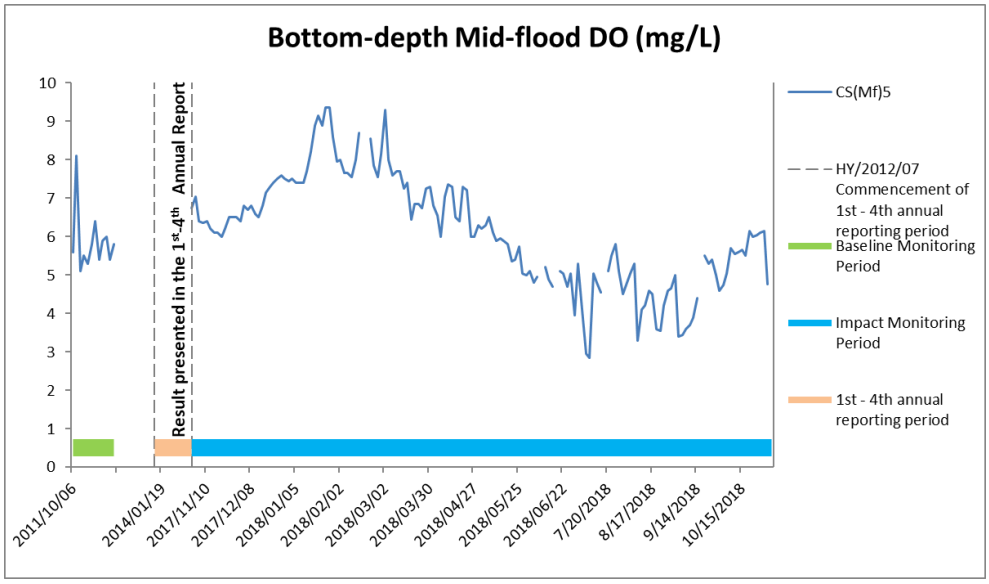
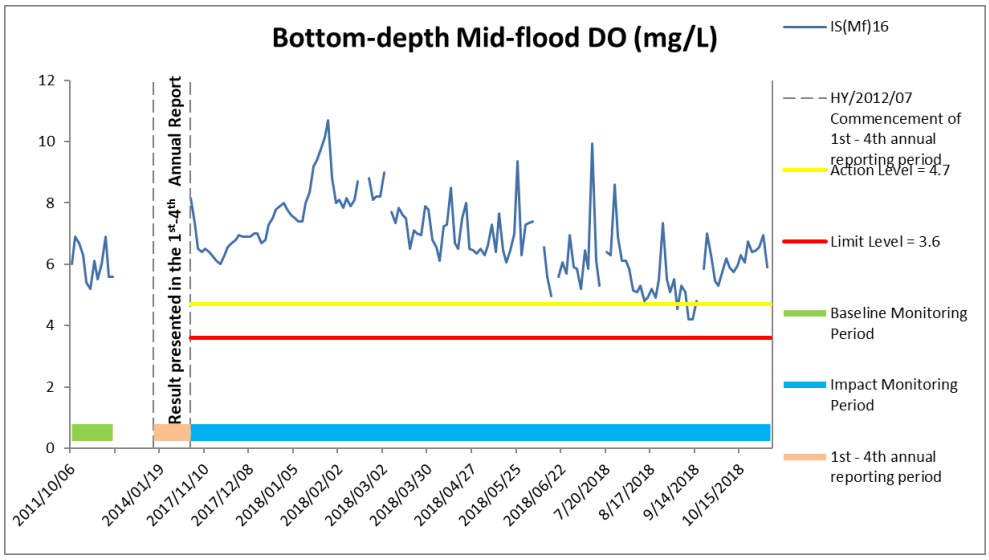


Figure F17 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



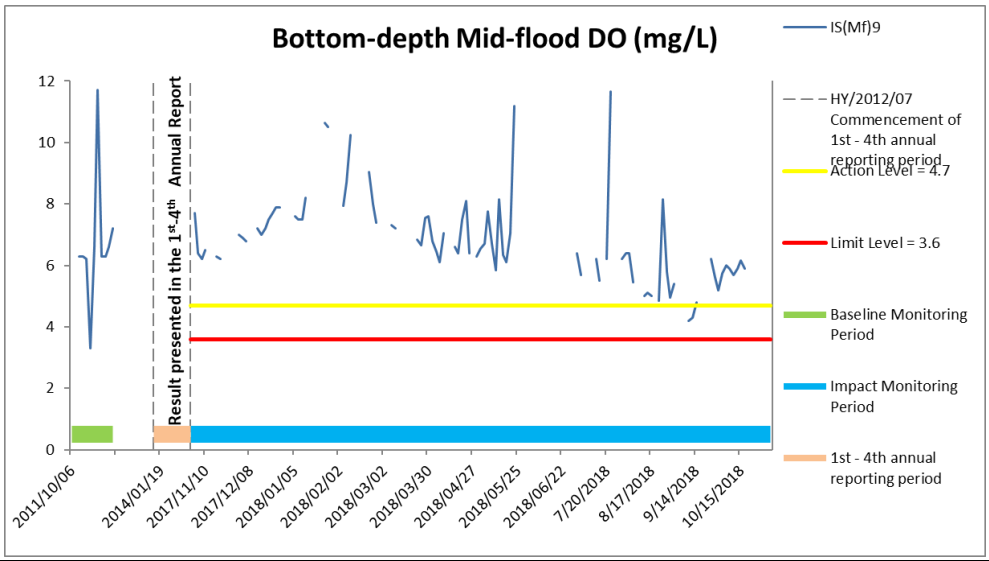
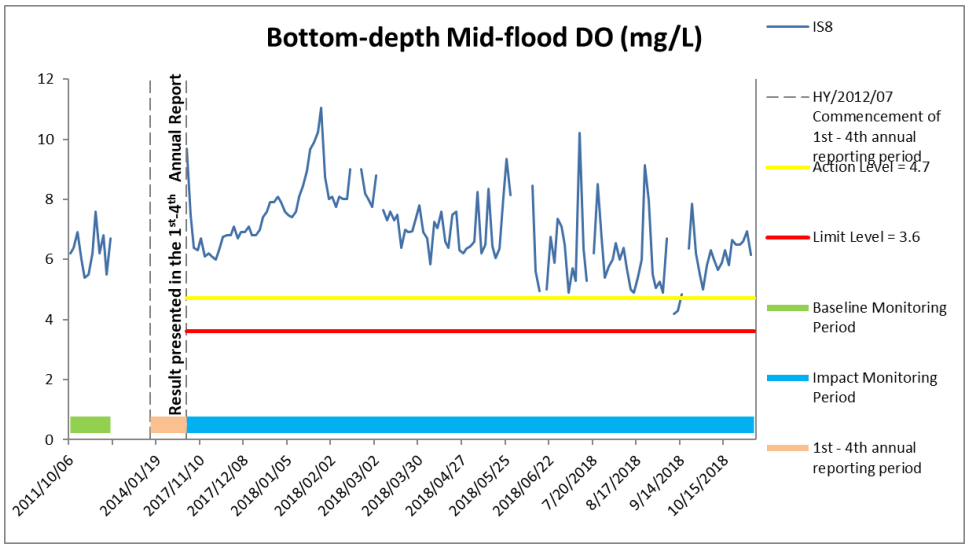


Figure F18 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



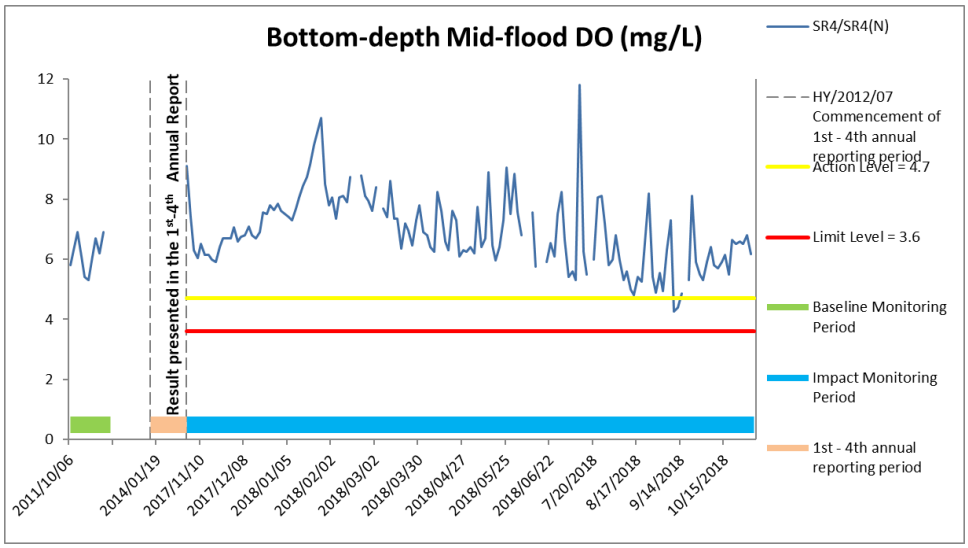


Figure F19 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

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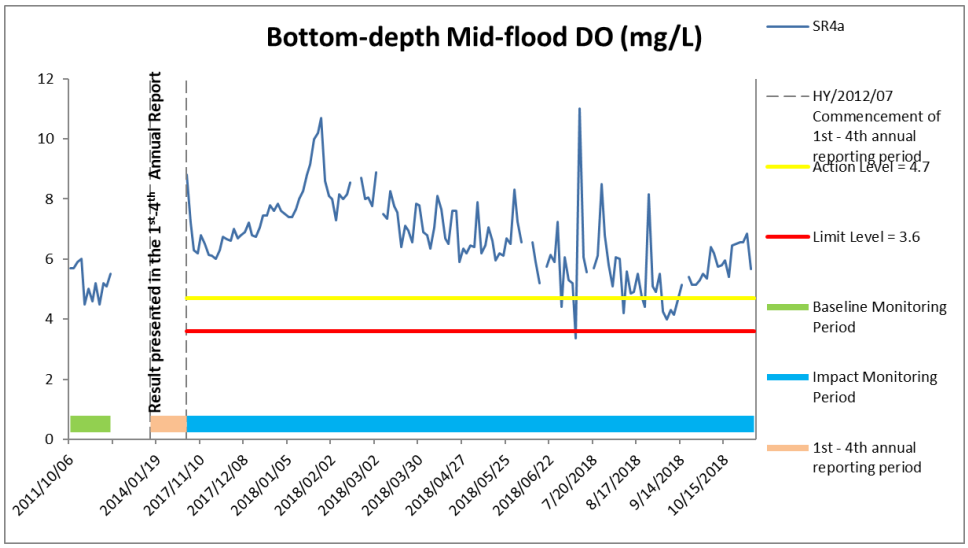

Figure F20 Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom waters during mid-flood tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

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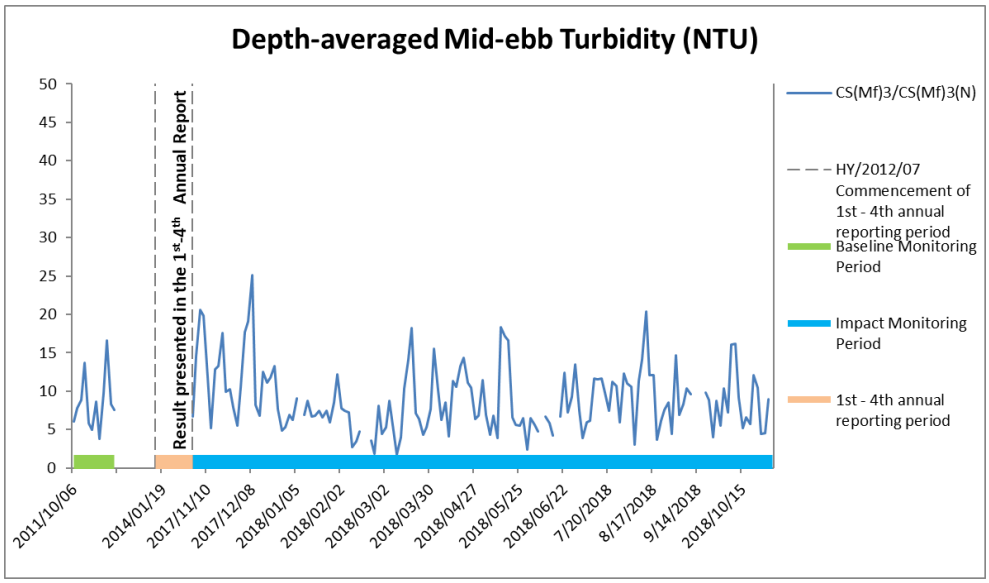

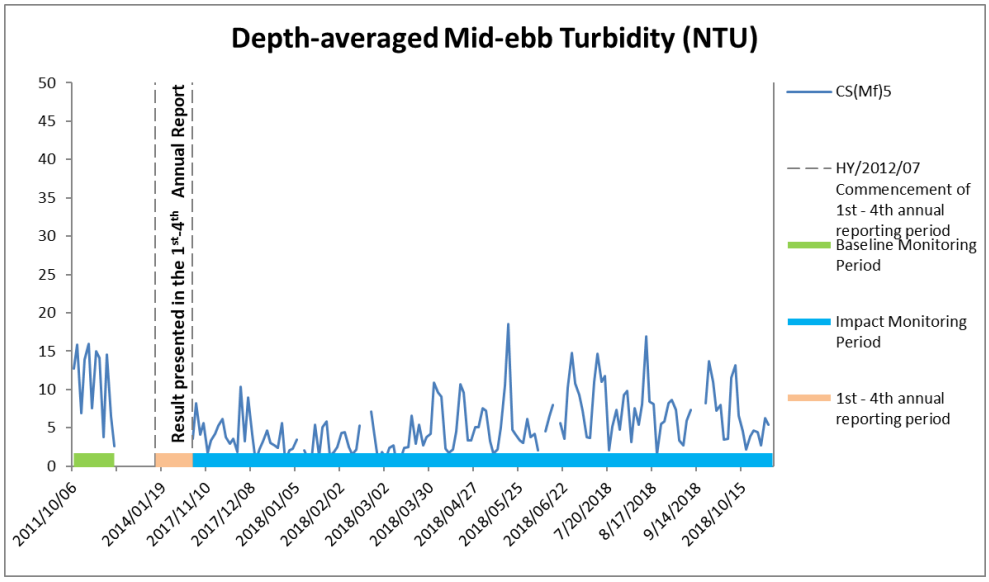

Figure F21 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

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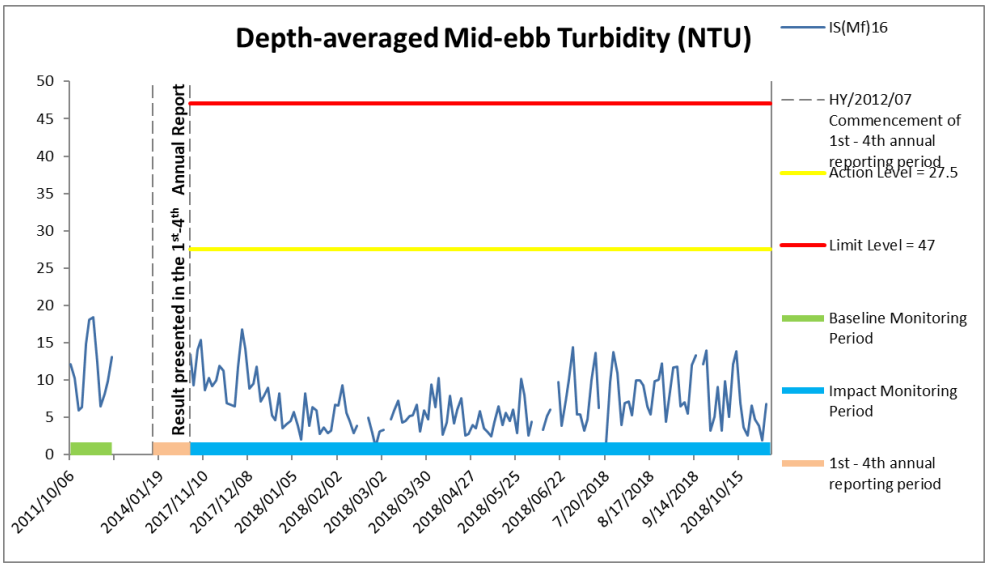


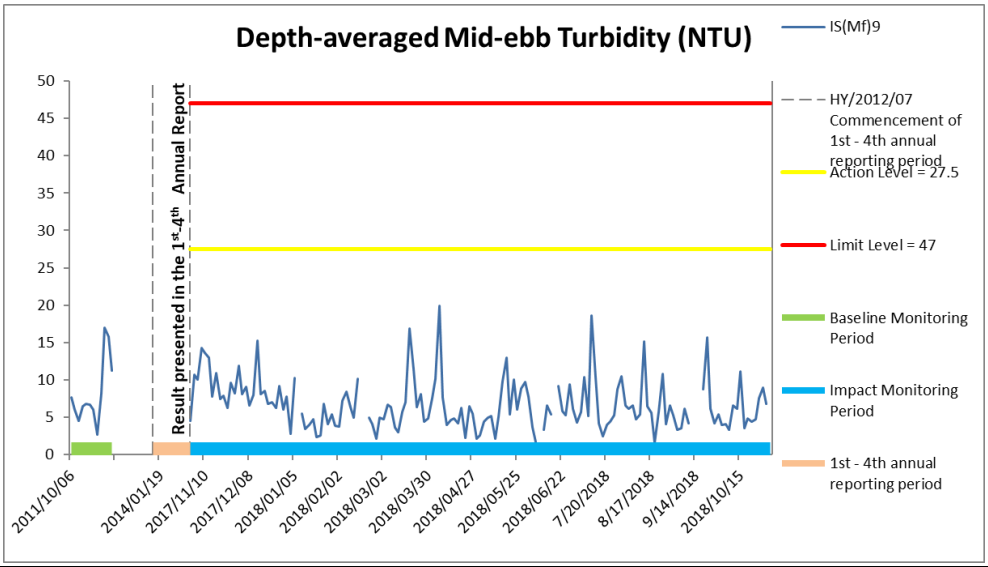
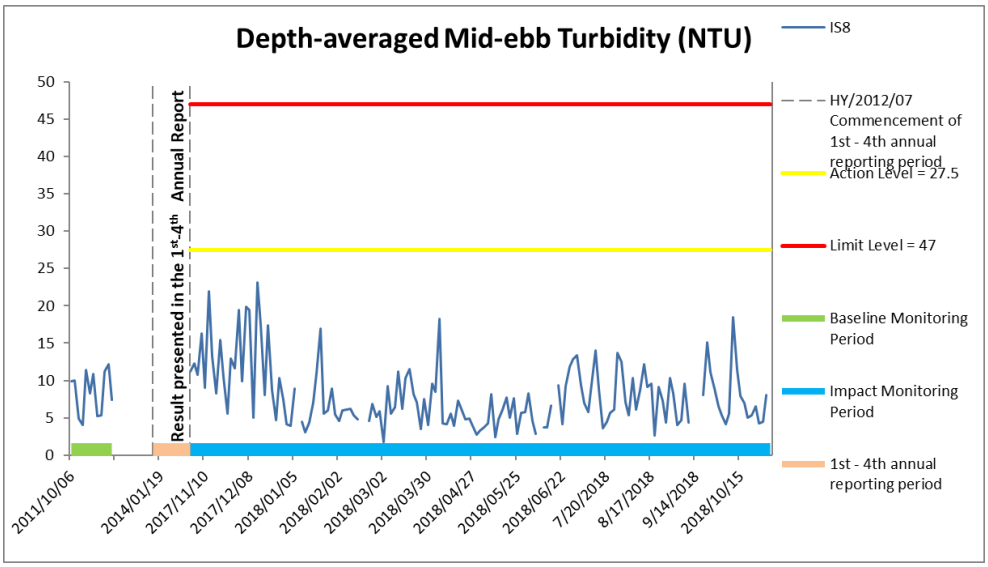


Figure F22 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



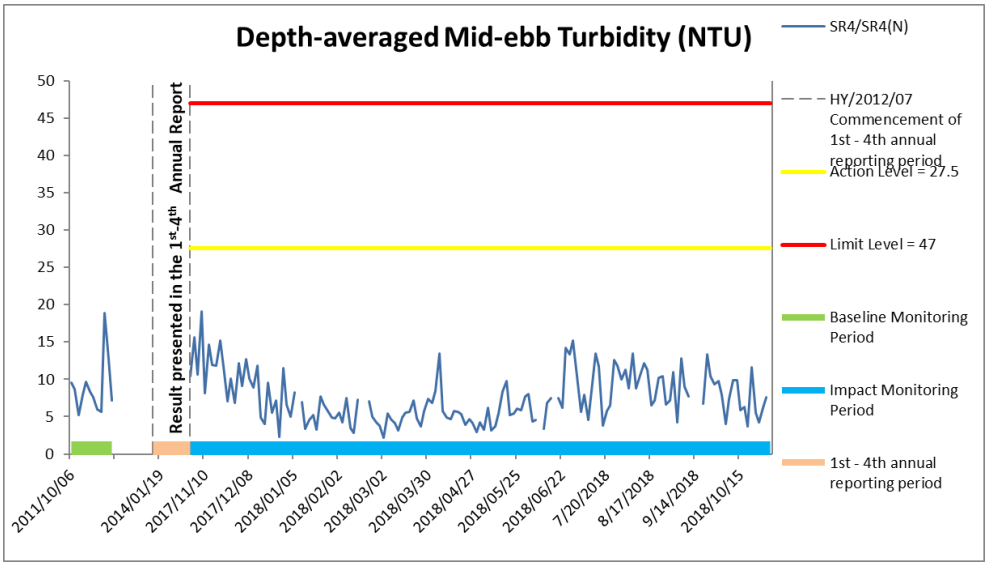


Figure F23 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

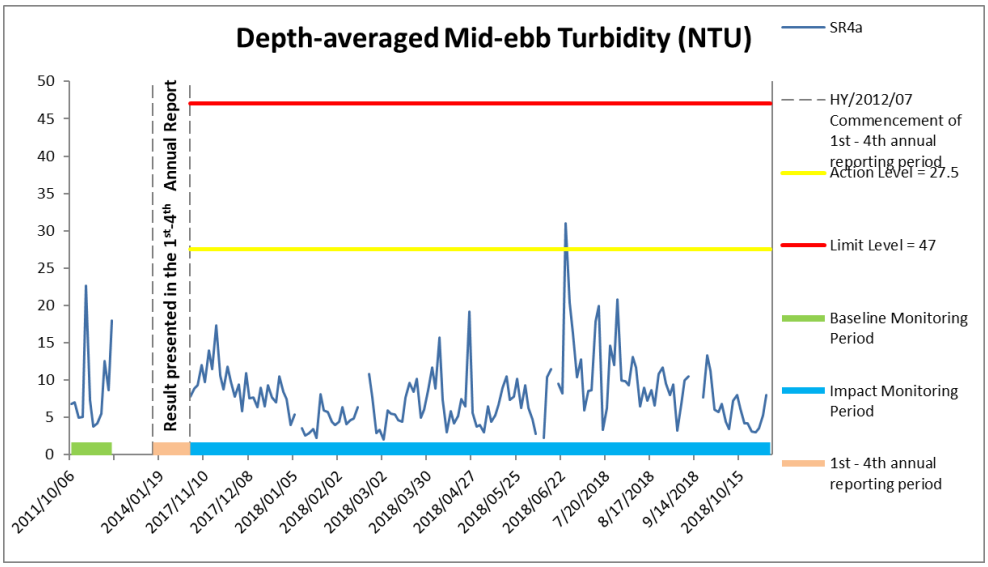
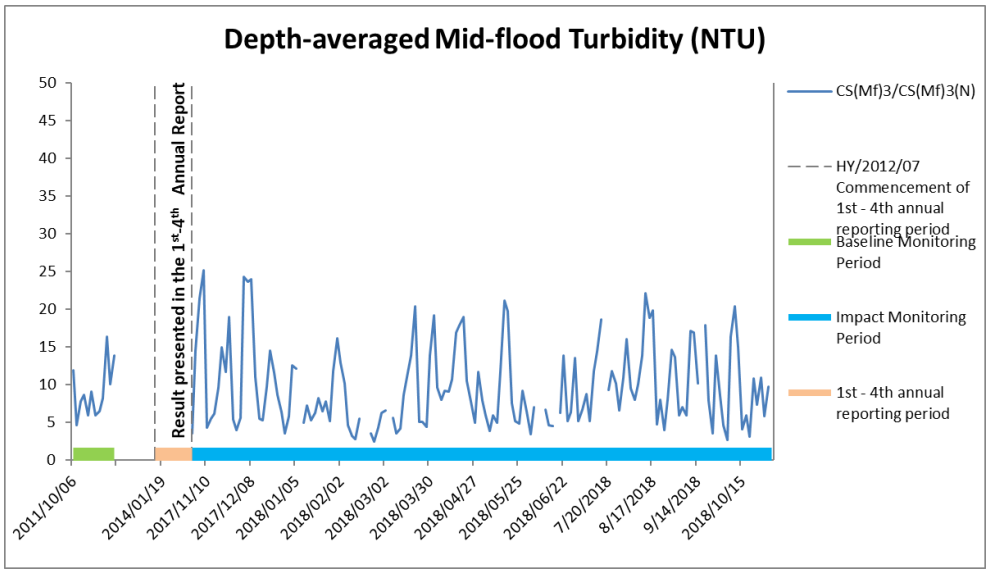


Figure F24 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-ebb tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



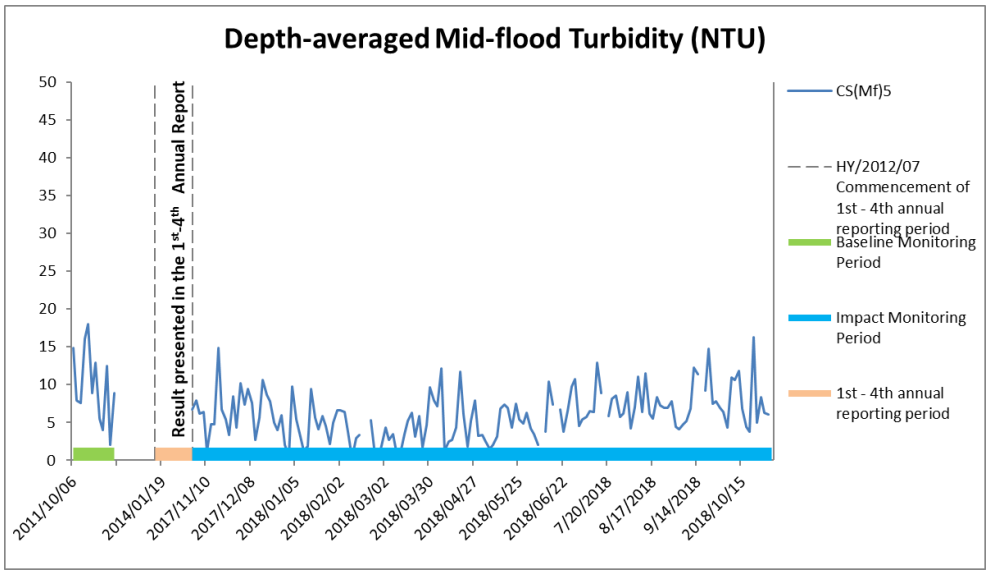
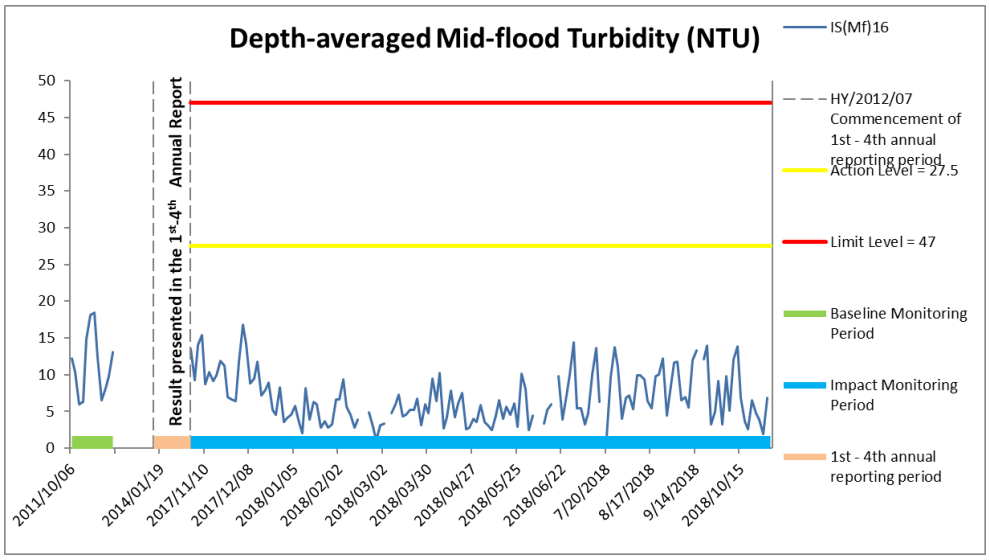


Figure F25 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

Environmental Resources Management

ERM



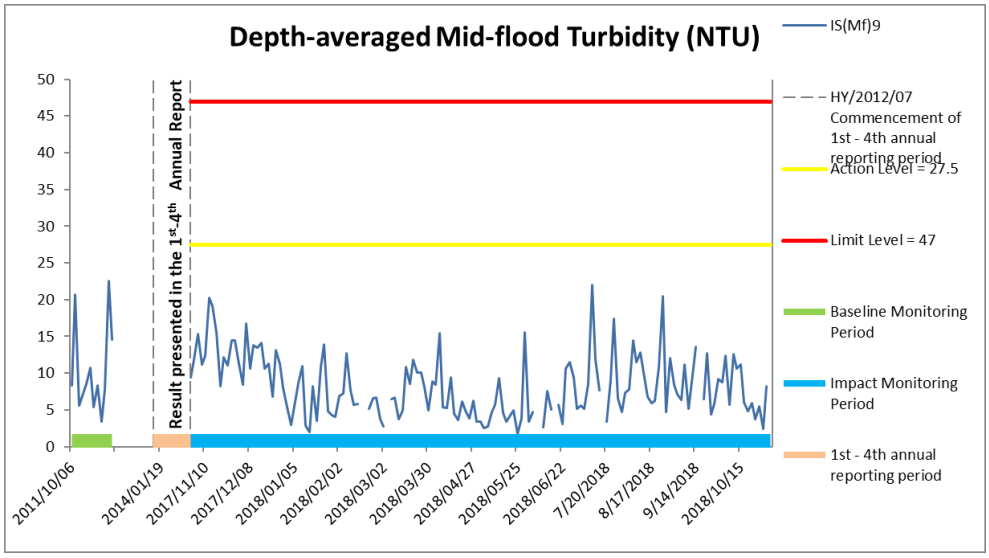
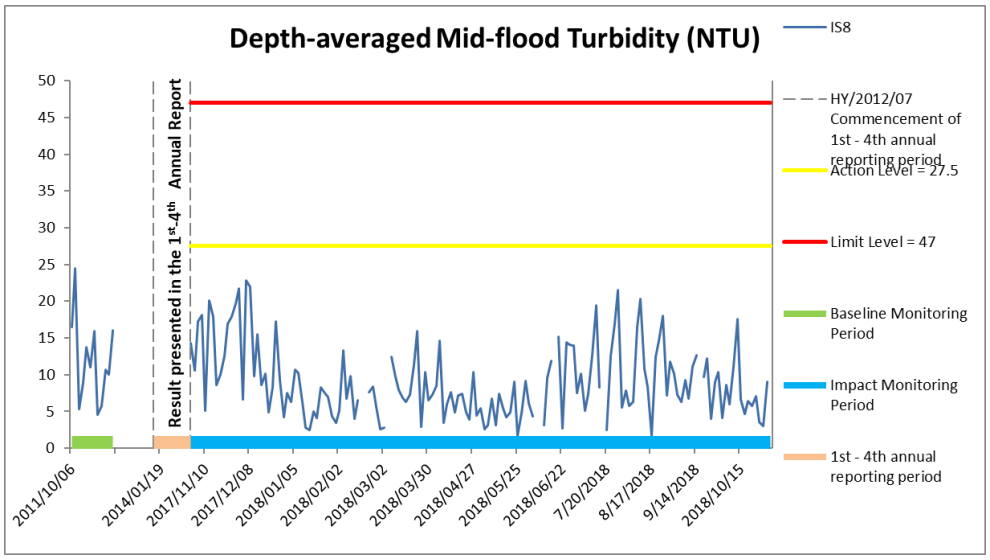


Figure F26 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



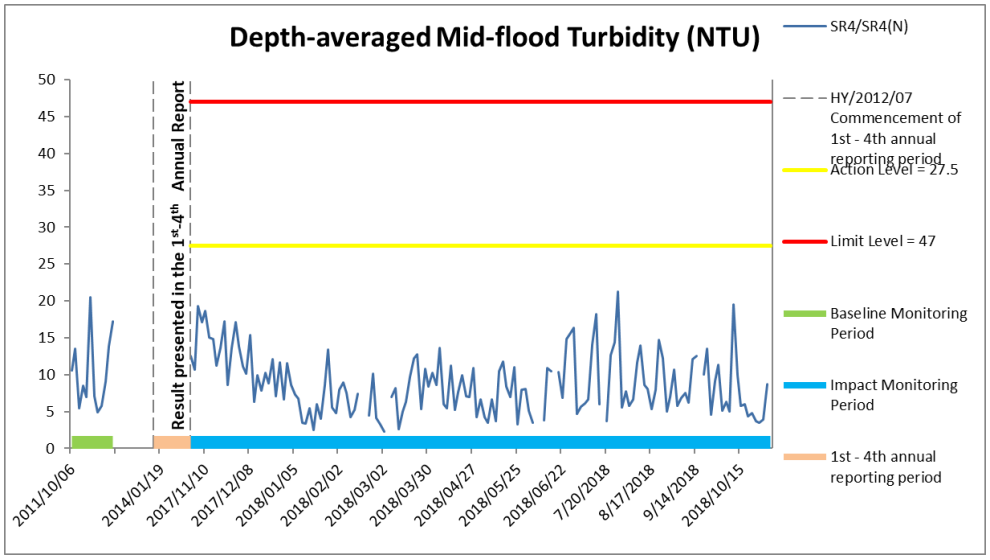


Figure F27 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

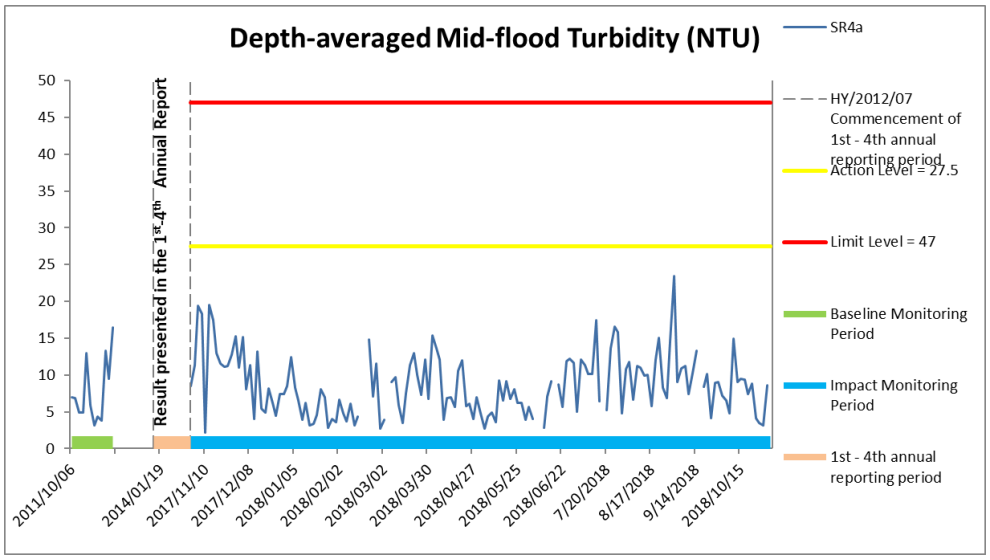
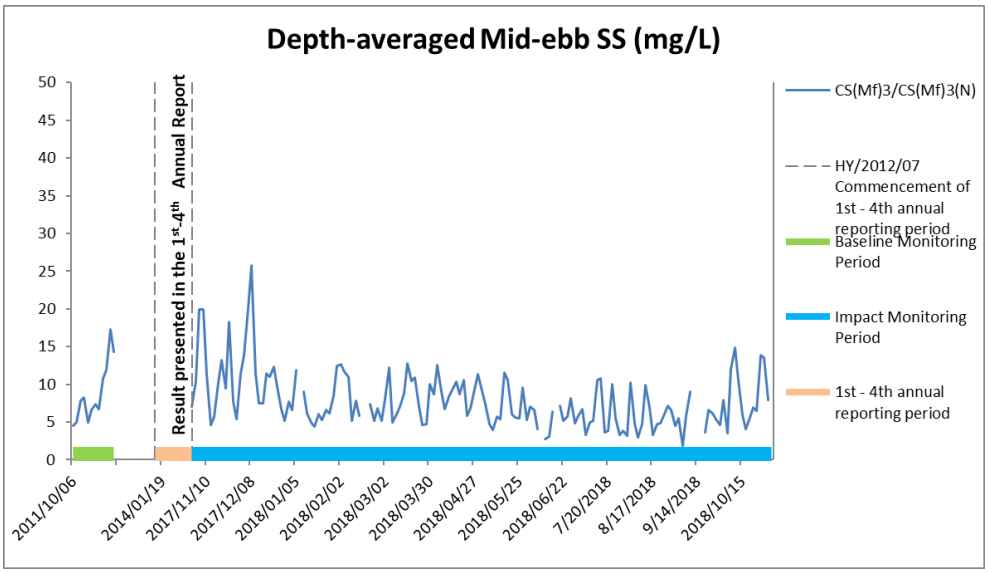


Figure F28 Impact Monitoring – Mean Level of depth-averaged Turbidity (NTU) during mid-flood tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



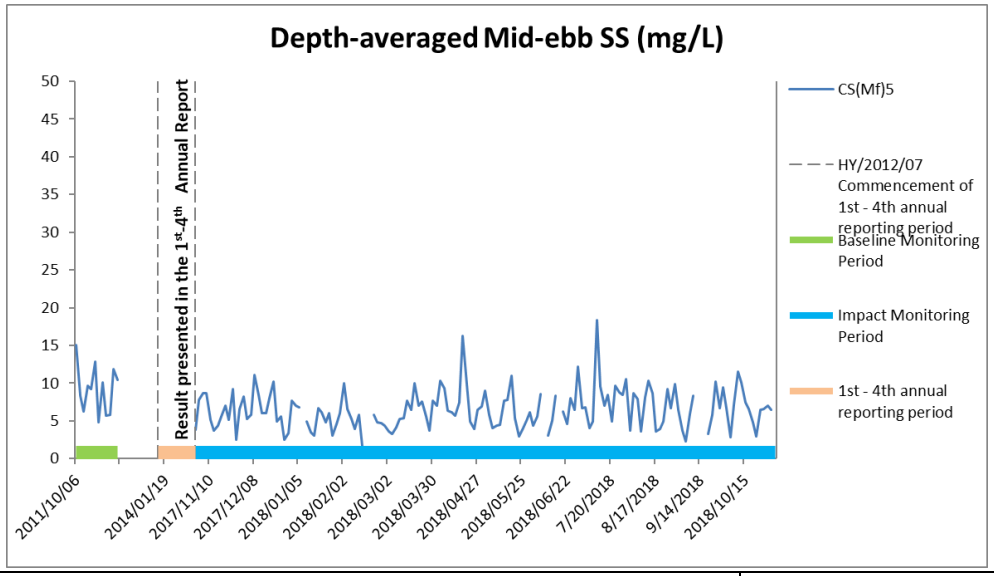


Figure F29 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

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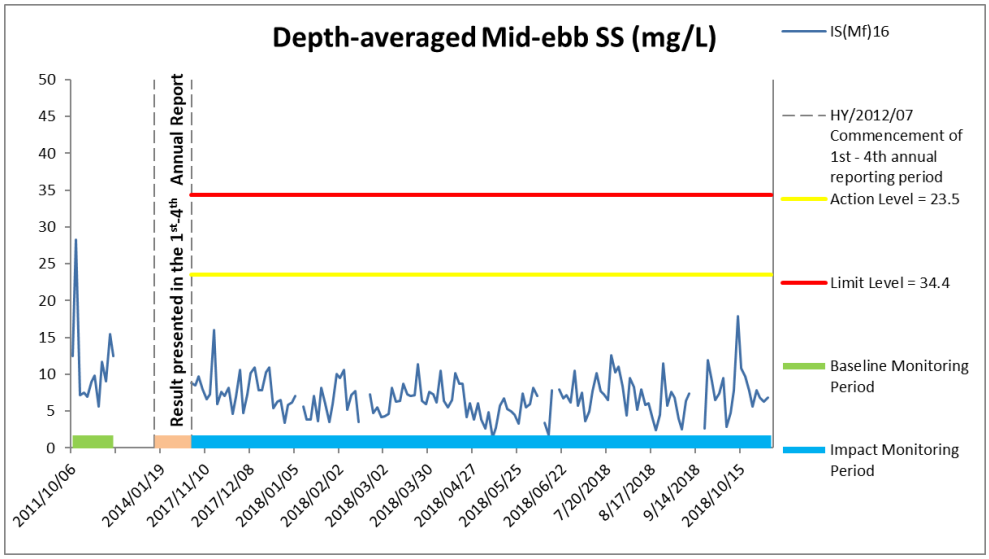

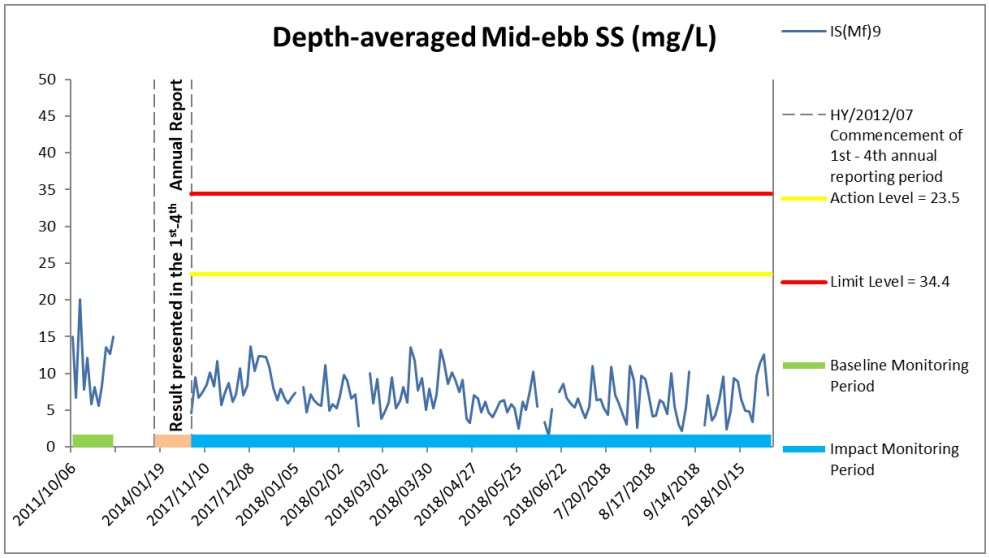

Figure F30 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

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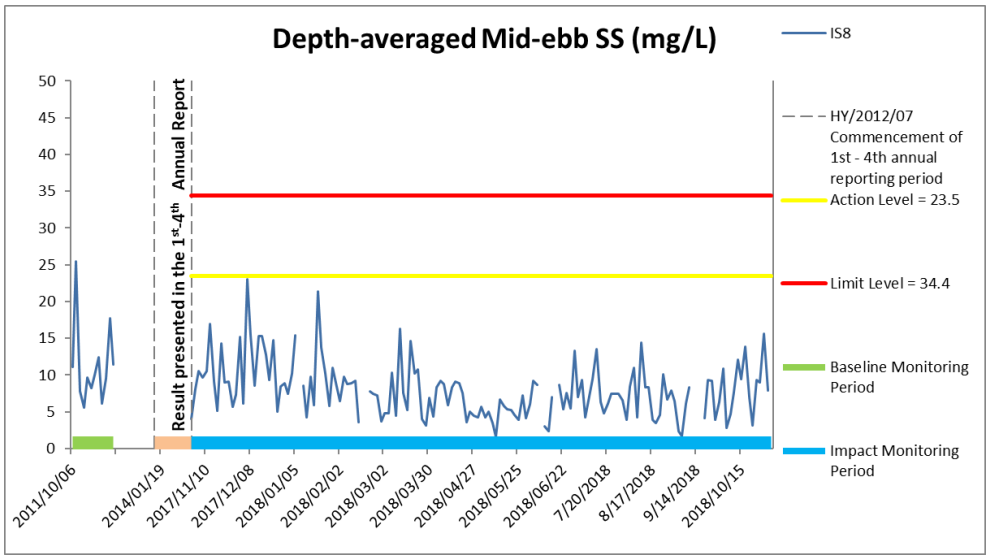

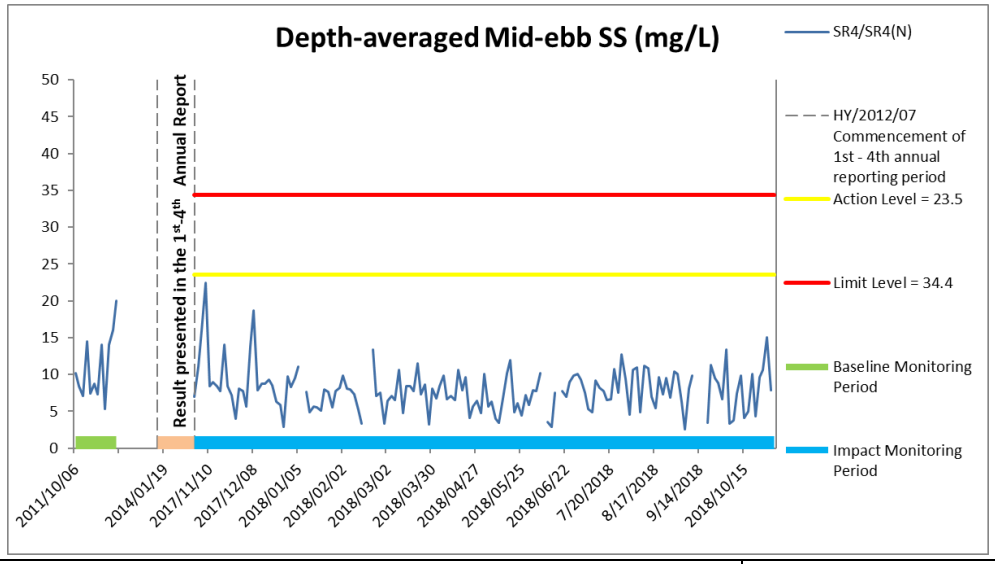

Figure F31 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

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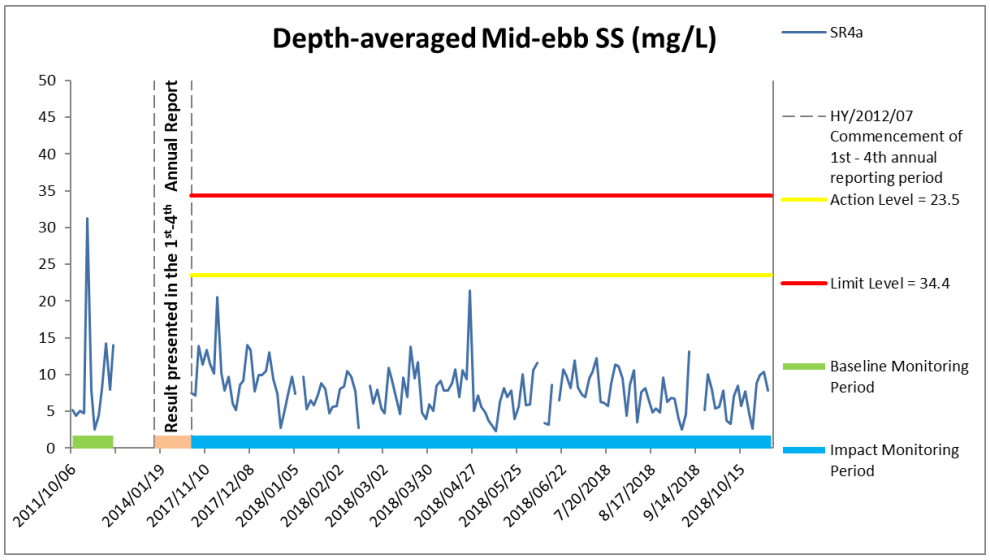
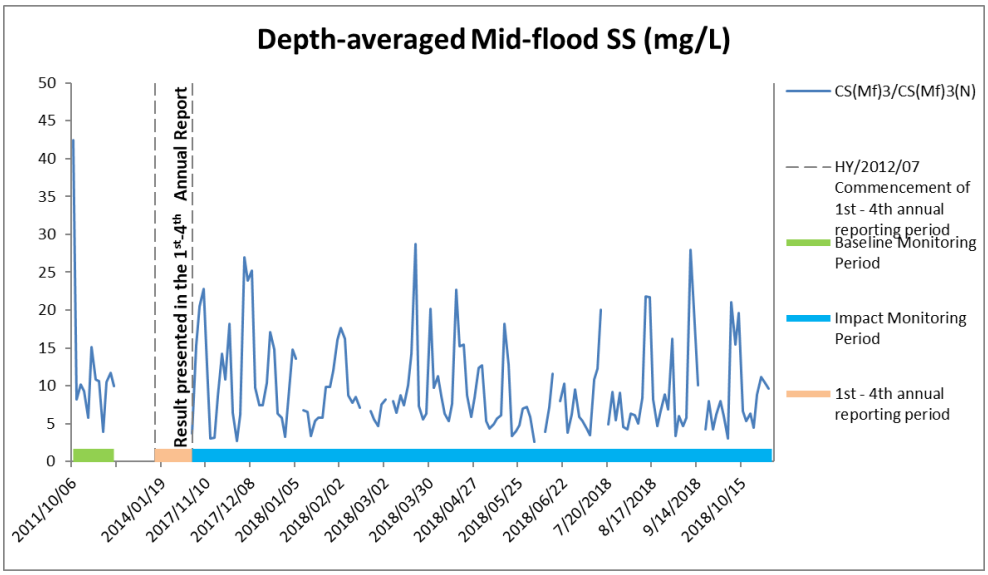


Figure F32 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-ebb tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



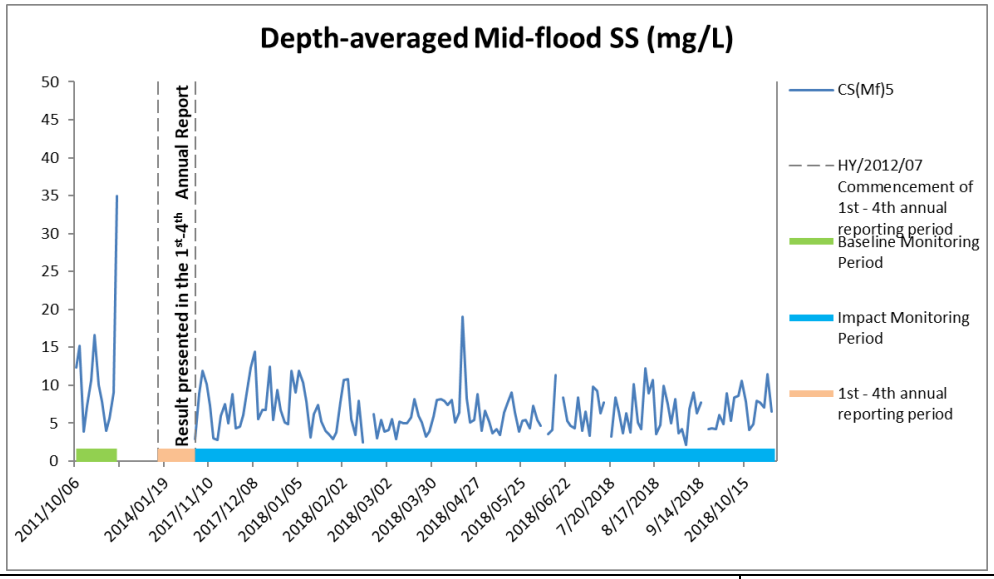
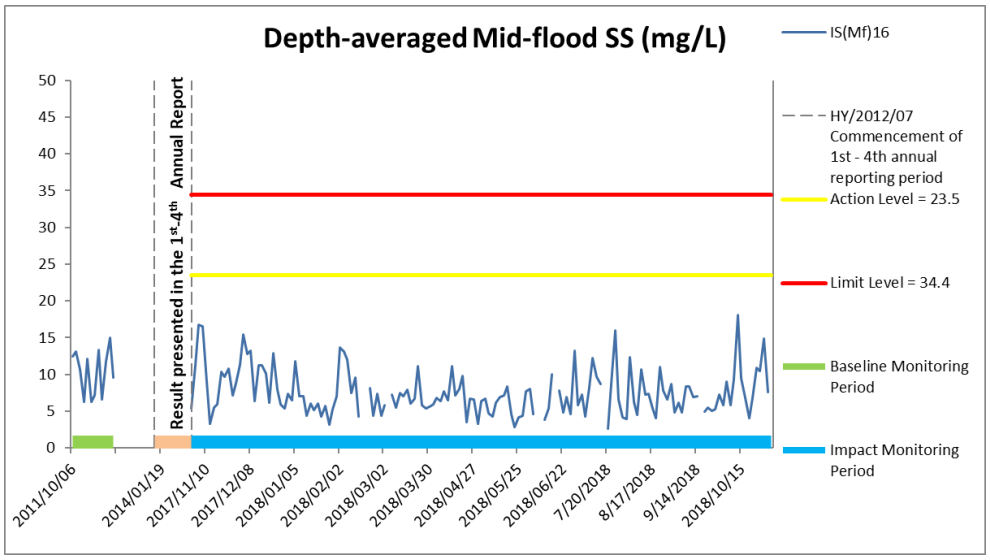


Figure F33 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2017 and 31 October 2018 at CS(Mf)3/CS(Mf)3(N) and CS(Mf)5.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



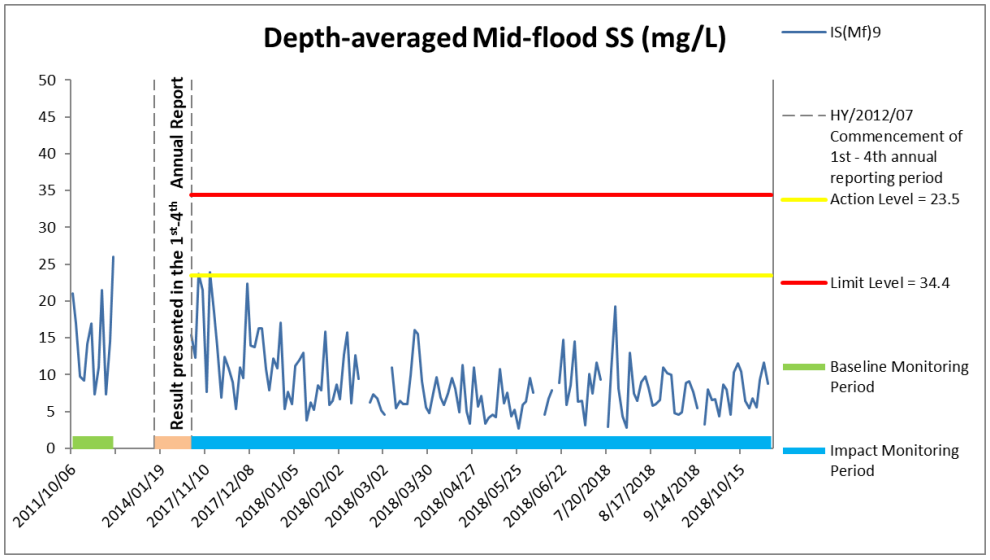
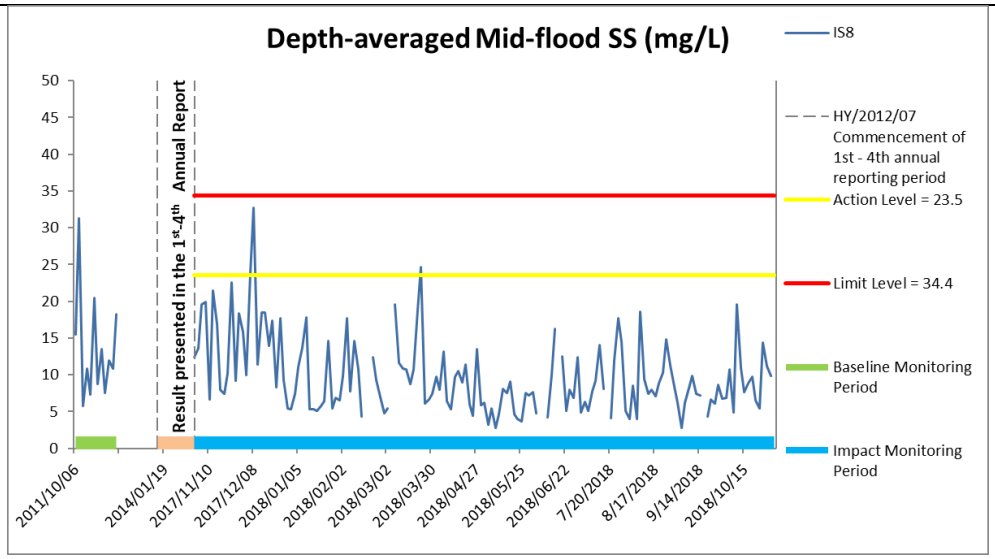


Figure F34 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2017 and 31 October 2018 at IS(Mf)16 and IS(Mf)9 .

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.



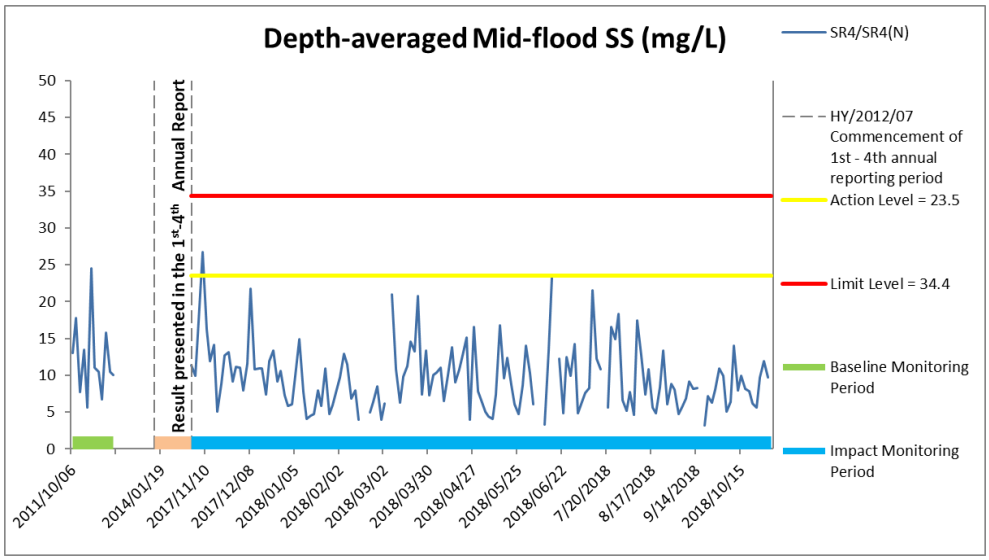


Figure F35 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2017 and 31 October 2018 at IS8 and SR4/SR4(N).

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

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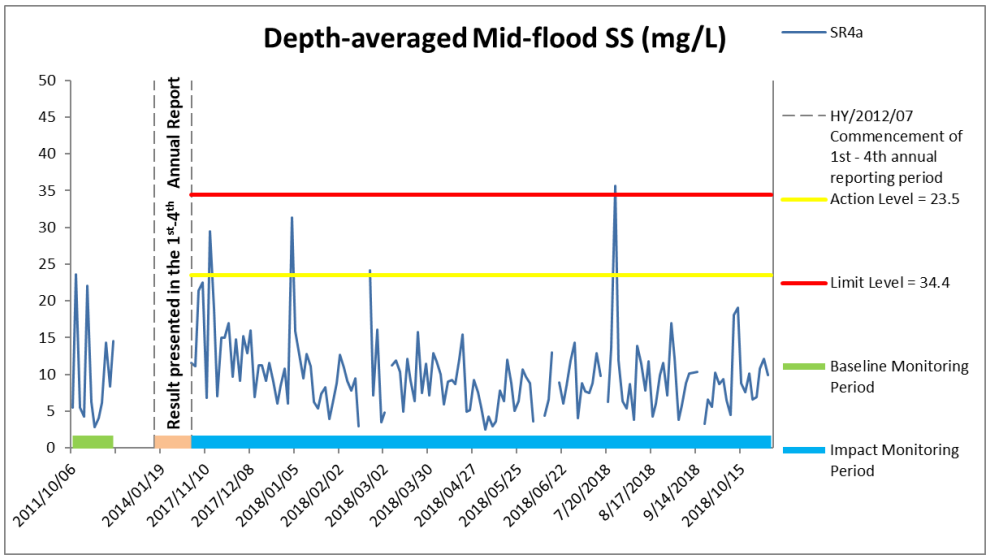

Figure F36 Impact Monitoring – Mean Level of depth-averaged Suspended Solids (mg/L) during mid-flood tide between 1 November 2017 and 31 October 2018 at SR4a.

(Weather condition varied between sunny to rainy within the reporting period.) Overall monitoring results were not affected by weather conditions. Marine works in the reporting period include Uninstallation of marine piling platform. 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.

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Appendix G

Impact Dolphin Monitoring Survey Result

CONTRACT NO. HY/2012/07
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Southern Connection Viaduct Section)
Chinese White Dolphin Monitoring

Fifth Annual Progress Report (November 2017 - October 2018)
submitted to Gammon Construction Limited

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

6 May 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 their 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

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

1.5. This report is the fifth annual 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 November 2017 to October 2018, utilizing the survey data collected by HKLR03 project.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period of HZMB. The co-ordinates of all transect lines conducted during the HKLR03 dolphin monitoring surveys 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	1	Start Point
1	End Point	804671	831404		13	End Point	1	End Point
2	Start Point	805476	820800		14	Start Point	2	Start Point
2	End Point	805476	826654		14	End Point	2	End Point
3	Start Point	806464	821150		15	Start Point	3	Start Point
3	End Point	806464	822911		15	End Point	3	End Point
4	Start Point	807518	821500		16	Start Point	4	Start Point
4	End Point	807518	829230		16	End Point	4	End Point
5	Start Point	808504	821850		17	Start Point	5	Start Point
5	End Point	808504	828602		17	End Point	5	End Point
6	Start Point	809490	822150		18	Start Point	6	Start Point
6	End Point	809490	825352		18	End Point	6	End Point

7	Start Point	810499	822000		19	Start Point	7	Start Point
7	End Point	810499	824613		19	End Point	7	End Point
8	Start Point	811508	821123		20	Start Point	8	Start Point
8	End Point	811508	824254		20	End Point	8	End Point
9	Start Point	812516	821303		21	Start Point	9	Start Point
9	End Point	812516	824254		21	End Point	9	End Point
10	Start Point	813525	821176		22	Start Point	10	Start Point
10	End Point	813525	824657		22	End Point	10	End Point
11	Start Point	814556	818853		23	Start Point	11	Start Point
11	End Point	814556	820992		23	End Point	11	End Point
12	Start Point	815542	818807		24	Start Point	12	Start Point
12	End Point	815542	824882		24	End Point	12	End Point

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 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 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.

2.1.4. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). 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.

2.1.5. 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.

2.1.6. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

2.1.7. 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.

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

2.2. Photo-identification Work

2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

2.2.2. A professional digital camera (*Canon* EOS 7D or 60D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).

2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

2.3. Data Analysis

2.3.1. The following analyses were performed utilizing the HKLR03 dolphin monitoring data collected under the present impact phase (the fifth year of TMCLKL construction; i.e. November 2017 to October 2018). In addition, these analyses were also conducted for the one-year baseline phase (one year before any HZMB construction works have commenced; i.e. February 2011 to January 2012); the one-year transitional phase (one year after the HZMB construction works (HKBCF and HKLR works) have commenced, but before the commencement of TMCLKL construction works; i.e. November 2012 to October 2013); and the first, second, third, fourth and fifth years of TMCLKL construction (i.e. November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016; November 2016 to October 2017; November 2017 to October 2018).

2.3.2. Along with the analyzed results from the baseline and transitional as well as the first four years of impact phase, results from the fifth year of impact phase can then be interpreted from the examination of any temporal changes before and during the construction activities of TMCLKL on dolphin usage in North Lantau waters. For the baseline phase, both baseline monitoring data collected under HZMB contract as well as the AFCD long-term dolphin monitoring data were included to increase the sample size in order to match the similar amount of survey effort in transitional and impact phases, both of which only HKLR03 monitoring data were included for the various analyses.

Distribution analysis

2.3.3. 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.

Encounter rate analysis

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

2.3.5. Firstly, for the comparison with the HZMB 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 the 24 events during the present 12-month study period (i.e. 24 sets of line-transect surveys in North Lantau), which was also compared with the ones

deduced from the events during the first four years of impact period as well as the transitional period and baseline period.

2.3.6. Secondly, the encounter rates were also calculated using both primary and secondary survey effort as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by diving the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the present 12-month study period.

Quantitative grid analysis on habitat use

2.3.7. To conduct quantitative grid analysis of habitat use, positions of on-effort sightings of Chinese White Dolphins collected during the quarterly impact phase monitoring period were plotted onto 1-km^2 grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km^2) and dolphin densities (total number of dolphins from on-effort sightings per km^2) were then calculated for each 1 km by 1 km grid with the aid of GIS.

2.3.8. 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).

2.3.9. The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort **s**ightings **p**er 100 units of **s**urvey **e**ffort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of **d**olphins **p**er 100 units of **s**urvey **e**ffort. Among the 1-km^2 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-km^2 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
D = total number of dolphins from on-effort sightings
E = total number of units of survey effort
SA% = percentage of sea area

Behavioural analysis

2.3.10. 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. Sighting distribution 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.

Ranging pattern analysis

2.3.11. Location data of individual dolphins that occurred during the present 12-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 fifth year of TMCLKL impact phase monitoring (i.e. November 2017 to October 2018), a total of 24 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 3,152.08 km of survey effort was collected, with 93.6% 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, 1,160.48 km and 1,991.60 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 2,300.78 km, while the effort on secondary lines was 851.30 km. The survey effort conducted on primary and secondary lines were both considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.

3.1.4. From the 24 sets of HKLR03 monitoring surveys from November 2017 to October 2018, a total of 42 groups of 131 Chinese White Dolphins were sighted. All except two dolphin groups were sighted during on-effort search. Among the 40 on-effort sightings, 33 of them were made on primary lines, while the other seven dolphin sightings were made on secondary lines.

3.1.5. During this 12-month period, all dolphin sightings were made in NWL, and while none of them were made in NEL. A summary table of the dolphin sightings is shown in Appendix II.

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys in November 2017 to October 2018 is shown in Figure 1.

3.2.2. The majority of dolphin sightings made during the fifth year of impact phase were concentrated at the northwestern portion of the North Lantau region, mainly in the waters around Lung Kwu Chau (Figure 1). Several dolphin sightings were also made near Black Point, Pillar Point and Sha Chau, while some were sighted near the juncture of Northwest and West Lantau survey areas, or just to the north and south of the HKLR09 alignment (Figure 1).

3.2.3. Notably, none of the dolphin groups were sighted in the vicinity of the entire alignment of TMCLKL or the reclamation sites of HKLR03 and HKBCF (Figure 1). As mentioned above, several sightings were made adjacent to the HKLR09 alignment near Shum Wat (Figure 1). In general, dolphins appeared to have mostly avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution during the first four years of impact phase.

3.2.4. Dolphin sighting distribution of the present impact phase monitoring period (November 2017 to October 2018) was compared to the ones during the baseline phase (February 2011 to January 2012), the transitional phase (November 2012 to October 2013) and the first four years of impact phase (November 2013 to October 2017) (Figure 2).

3.2.5. During the present impact phase period in 2017-18, dolphin distribution was quite similar to the previous three impact phase periods in 2014-15, 2015-16 and 2016-17, with dolphins being largely vacated from the eastern and central portions of the North Lantau region (Figure 2). This was in stark contrast to their very frequent occurrence around the Brothers Islands, Shum Shui Kok, the waters between Pillar Point and airport platform, and the vicinity of HZMB-associated work sites during the baseline period (Figure 2). Even in the transitional phase, dolphins still utilized these waters in a moderate extent, but such usage has progressively diminished during the five periods of impact phase of TMCLKL construction (Figure 2).

3.2.6. The only area where dolphin occurrence was consistently high across the seven periods was around the Lung Kwu Chau area, but even so such occurrence there was progressively diminishing in past four monitoring periods (Figure 2).

3.3. Encounter rate

3.3.1. During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and first four years of impact phases (Table 2).

3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 2.17 sightings and 7.06 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil with no on-effort sighting being made there in 2017-18.

Table 2. Comparison of average daily dolphin encounter rates from the first five years of impact phase, transitional phase and baseline phase monitoring periods (Note: encounter rates deduced from the five periods were calculated based on survey and on-effort sighting data made along the primary transect lines under favourable conditions; ± 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)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2017-18)	0.00	2.68 ± 3.04	0.00	9.02 ± 14.63
Impact Phase (2016-17)	0.00	2.35 ± 2.62	0.00	8.57 ± 11.05
Impact Phase (2015-16)	0.00	2.10 ± 1.83	0.00	8.54 ± 8.53
Impact Phase (2014-15)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04
Impact Phase (2013-14)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-13)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-12)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

3.3.3. In NEL, the dolphin encounter rates (both STG and ANI) in the fifth year of TMCLKL impact monitoring period were nil as in the previous two periods in 2015-16 and 2016-17, which was in stark contrast to the averages during the baseline phase and transitional phase (Table 2). Such progressive decline has actually existed in this area since the transitional phase (i.e. well before the TMCLKL construction works commenced), with the averages in the transitional phase being much lower than the ones in the baseline phase (reductions of 71.9% for STG and 76.1% respectively). Since then, dolphin occurrence has further diminished to an extremely low level during the first and second monitoring periods of TMCLKL construction works, and then to complete absence in the third, fourth and fifth monitoring periods.

3.3.4. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were much lower (reductions of 65.4% and 69.5% respectively) than the ones recorded in the baseline period, indicating a dramatic decline in dolphin usage of this survey area during the fifth year of TMCLKL impact phase monitoring period (Table 2). Moreover, those encounter rates consistently remained at a low level in the four consecutive monitoring periods between 2014-18.

3.3.5. Notably, the encounter rates in NWL during the first year of impact phase (2013-14) were only slightly lower than the baseline period, but such decline has quickly escalated during the following monitoring periods during the impact phase. This signaled a further widespread of declining usage by the dolphins throughout the entire North Lantau region with no sign of recovery, even though most of the marine works of HZMB construction has been completed.

3.3.6. A two-way ANOVA with repeated measures of variance and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline, transitional and the five impact phase periods. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).

3.3.7. For the comparison between the different monitoring periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were both 0.000000 and 0.00000 respectively. Even if the alpha value is set at 0.00001, significant differences were detected among the different periods in both dolphin encounter rates of STG and ANI.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to 12 individuals per group in North Lantau region during November 2017 – October 2018. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline, transitional and first four years of impact phases, as shown in Table 3.

Table 3. Comparison of average dolphin group sizes from the first five years of impact phase, transitional phase and baseline phase monitoring periods (± denotes the standard deviation of the average encounter rates)

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2017-18)	3.12 ± 2.86 (n = 42)	0.00	3.12 ± 2.86 (n = 42)
Impact Phase (2016-17)	3.51 ± 2.68 (n = 43)	0.00	3.51 ± 2.68 (n = 43)
Impact Phase (2015-16)	3.73 ± 3.14 (n = 45)	1.00 (n = 1)	3.80 ± 3.14 (n = 44)
Impact Phase (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

3.4.2. The average dolphin group sizes in NWL waters (and also the entire North Lantau region) during the present impact phase monitoring period were the lowest among all five impact phase monitoring periods as well as the baseline and transitional phases (Table 3).

3.4.3. Among the 42 dolphin groups sighted during the impact phase, 33 of them were

composed of 1-4 individuals only, while there were nine groups with more than 5 animals and only two groups with more than 10 individuals (Appendix II).

3.4.4. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present impact phase is shown in Figure 3, with comparison to the ones in the first four years of impact phase, transitional phase and baseline phase. During the impact phase in 2017-18, distribution of the larger dolphin groups were mainly concentrated around and to the north of Lung Kwu Chau, while the two very large groups with 12 animals each were sighted at the mouth of Deep Bay and between Sha Chau and Lung Kwu Chau respectively (Figure 3).

3.4.5. Throughout the five impact phases, distribution of these larger groups has been largely confined to the northwestern portion of North Lantau region. Such limited distribution was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many of them also sighted in NEL waters (Figure 3).

3.5. Habitat use

3.5.1. During the present impact phase monitoring period in 2017-18, the most heavily utilized habitats by Chinese White Dolphins were only found to the northeast of Lung Kwu Chau (Figures 4a and 4b). For the rest of North Lantau region, only a handful of grids between Sha Chau and Lugn Kwu Chau, near Pillar Point, Black Point, at the mouth of Deep Bay, and adjacent to the HKLR09 alignment have recorded low to moderately low dolphin densities (Figures 4a and 4b). Moreover, all grids near the HKLR03 and HKBCF reclamation sites as well as the entire alignment of TMCLKL did not record any presence of dolphins in the present 12-month impact monitoring period in 2017-18 (Figures 4a and 4b).

3.5.2. When compared with the habitat use patterns during the baseline phase, dolphin usage in NEL has progressively diminished during the transitional phase and the four periods of impact phases (Figure 5). During the baseline period, a number of grids between Siu Mo To and Shum Shui Kok recorded moderately high to high dolphin densities, and most grids in NEL recorded dolphin usage. This was in stark contrast to the complete absence of dolphin in this area during the present and previous two impact phase periods (Figure 5).

3.5.3. Moreover, dolphin usage of NWL waters has also declined dramatically during the recent monitoring periods (including the present one in 2017-18), with the only higher densities occurred near Lung Kwu Chau. This is in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and the first year of impact phase monitoring (Figure 5). Apparently, there has been a more widespread decline of dolphin usage throughout the North Lantau waters in the past four years of the impact monitoring periods.

3.6. Mother-calf pairs

3.6.1. During the present 12-month impact phase monitoring period, no young calf was sighted at all in North Lantau waters. Notably, the extremely low occurrence of young calves

have been persistent in recent monitoring periods between 2014-18, ranging from 0% in 2015-16 and 2017-18 to 1.3% in 2014-15, when compared to the higher percentages during the impact phase period of 2013-14 (5.7%), transitional phase (6.7%) and baseline phase (4.5%).

3.6.2. The near absence of young calves in North Lantau region during recent monitoring periods was drastically different from the distribution patterns during the baseline and transitional phases when the young calves were sighted throughout NWL waters (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. Only three dolphin sightings were associated with feeding activities during the 12-month impact phase monitoring period. The percentage of sightings associated with feeding activities during the present impact phase (7.1%) was much lower than the impact phase periods in 2016-17 (18.6%), 2015-16 (11.1%), 2014-15 (18.5%), transitional phase (8.6%) and baseline phase (12.8%), but was slightly higher than the one during 2013-14 period (5.9%).

3.7.2. Moreover, two sightings were also associated with socializing activities in 2017-18, and the percentage of such sightings (4.8%) was lower than the previous impact monitoring periods in 2015-16 (8.9%), 2014-15 (5.5%) and 2013-14 (5.9%) as well as the transitional period (6.4%), but higher than the baseline period (3.8%) and the previous monitoring period in 2016-17 (0%). On the contrary, none of the 42 dolphin group was engaged in traveling or resting/milling activities in 2017-18.

3.7.3. Distribution of dolphins engaged in feeding and socializing activities during the present impact phase monitoring period is shown in Figure 7. Two of the three groups engaged in feeding activities were located near Lung Kwu Chau, while another group was found near HKLR09 alignment (Figure 7). On the other hand, the two groups engaged in socializing activities were found near Lung Kwu Chau and at the mouth of Deep Bay (Figure 7).

3.7.4. The comparison in distribution of dolphins engaged in different activities during different monitoring phases revealed that feeding activities were frequently sighted during the baseline and transitional periods along the Urmston Road, within the Sha Chau and Lung Kwu Chau Marine Park, to the west of the airport platform and around the Brothers Islands, while the socializing activities were more scattered throughout the North Lantau region in the same period (Figure 7). It is apparent that the “hotspots” where dolphins engaged in different activities were considerably different between the baseline, transitional and impact phases.

3.7.5. Notably, only one of the 42 dolphin groups sighted during the impact phase monitoring period in 2017-18 were found to be associated with an operating purse-seiner. The rare events of fishing boat associations by the dolphins during the five periods of impact phase as well as the transitional phase was quite different from the baseline period with 14 of 288 dolphin groups associated with fishing boats.

3.8. Summary of photo-identification works

3.8.1. During the 12-month impact phase monitoring period in 2017-18, a total of 44 individuals sighted 96 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL.

3.8.2. More than two-thirds of the 44 identified individuals were sighted only once or twice, while the other 13 individuals were sighted more frequently during the 12-month period. For example, CH34 and NL286 were sighted 5-6 times, while NL136 and NL182 were sighted seven and nine times respectively in 2017-18. Their frequent occurrences during the fifth year of impact phase monitoring indicated strong reliance of NWL waters as their home ranges.

3.8.3. Notably, a total of six well-recognized females (i.e. NL33, NL202, NL233, WL28, WL145, WL179) were accompanied with their calves during their re-sightings, and most of these calves are older and already in their juvenile stage.

3.9. Individual range use

3.9.1. Ranging patterns of the 44 individuals identified during the 12-month impact phase monitoring period in 2017-18 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. The majority of identified dolphins sighted within this 12-month period were utilizing their ranges primarily in NWL, with the exception of NL311, NL327, WL28, WL62, WL124, WL145, WL179, WL188, WL251, WL273 and WL288 that primarily utilized WL waters (Appendix IV). Moreover, 28 of the 44 individuals have occurred in both North and West Lantau waters based on the HKLR09 monitoring data collected concurrently during the same 12-month period in 2017-18 (Appendix IV). On the contrary, all identified dolphins have avoided the NEL waters (Appendix IV), the area where many of them have utilized as their core areas of activities before the HZMB construction.

3.9.3. Temporal changes in range use of 13 individual dolphins that have consistently occurred in baseline phase, transitional phase and all five periods of impact phases were examined in details (Appendix V). It is apparent that seven of them (e.g. CH34, NL33, NL136, NL182) have gradually shifted their range use away from their previously important habitat in NEL since 2013-14, and have been completely absent from there in the recent impact phase periods (Appendix V).

3.9.4. Moreover, some individual dolphins have gradually diminished their utilization of NWL waters during the TMCLKL impact phases, and at the same time nine of them (e.g. NL98, NL123, NL210) have increased their utilization of WL waters (Appendix V). Three individuals (NL33, NL120 and NL269) have even expanded their range use to Southwest Lantau waters as well during the past several impact phase monitoring periods (Appendix V). However, it should also be noted that such range expansion or shift has been reversed for a number of individuals (e.g. NL120, NL82) in 2016-17 and 2017-18, as they have once again utilized NWL waters primarily for their range use (Appendix V).

3.9.5. On the contrary, three individuals (NL46, NL202 and NL286) have no changes in their range use throughout the different monitoring periods. Moreover, five individuals (e.g. NL104, NL210) have utilized Lantau waters less in recent years (Appendix V).

3.9.6. The abovementioned temporal changes in individual range use should be continuously monitored for the rest of the TMCLKL construction period, to determine whether such range shifts are temporary or permanent, and whether the dolphins would continue the North Lantau waters once the HZMB-related construction works have completed.

4. Conclusion

4.1. During the fifth year of TMCLKL impact phase monitoring of Chinese white dolphins, no adverse impact from the activities of the TMCLKL construction project on the 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 drastically reduced in the entire North Lantau region, and many individuals have shifted away from the important habitats around the Brothers Islands and the rest of North Lantau waters.

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

5. References

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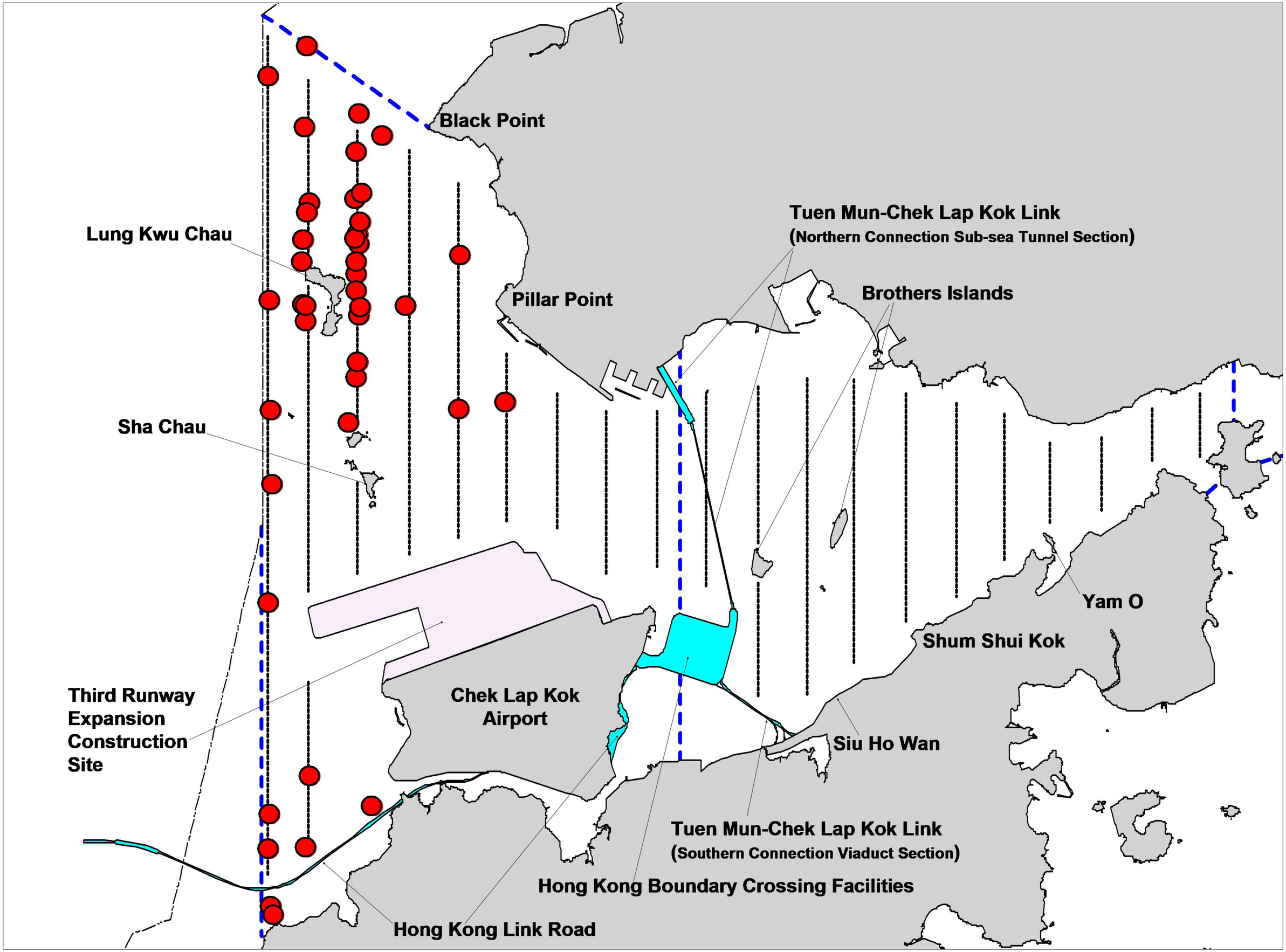


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the fifth year of TMCLKL construction works (November 2017 to October 2018), utilizing the HKLR03 monitoring data

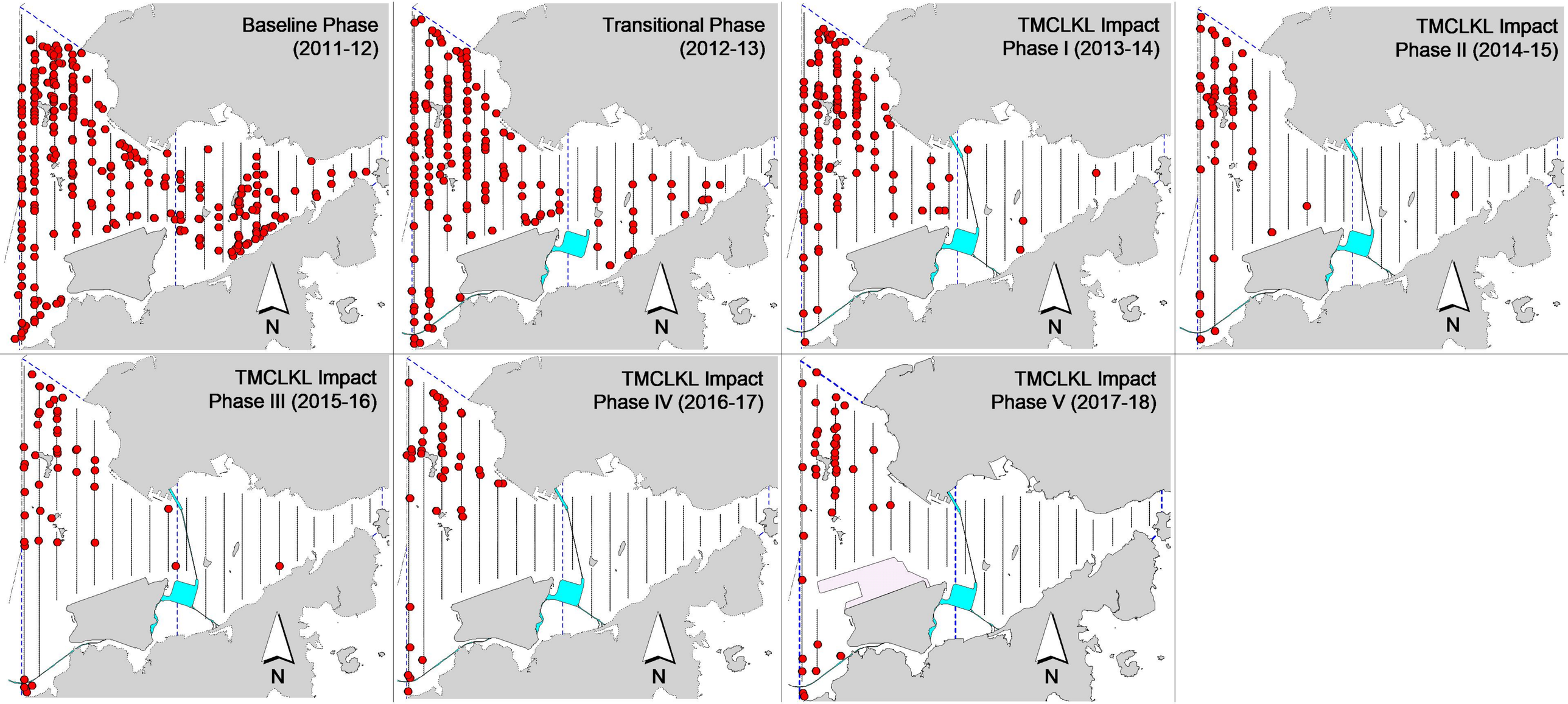


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline (2011-12), transitional (2012-13) and five impact phases (2013-14, 2014-15, 2015-16, 2016-17 & 2017-18) of TMCLKL construction works

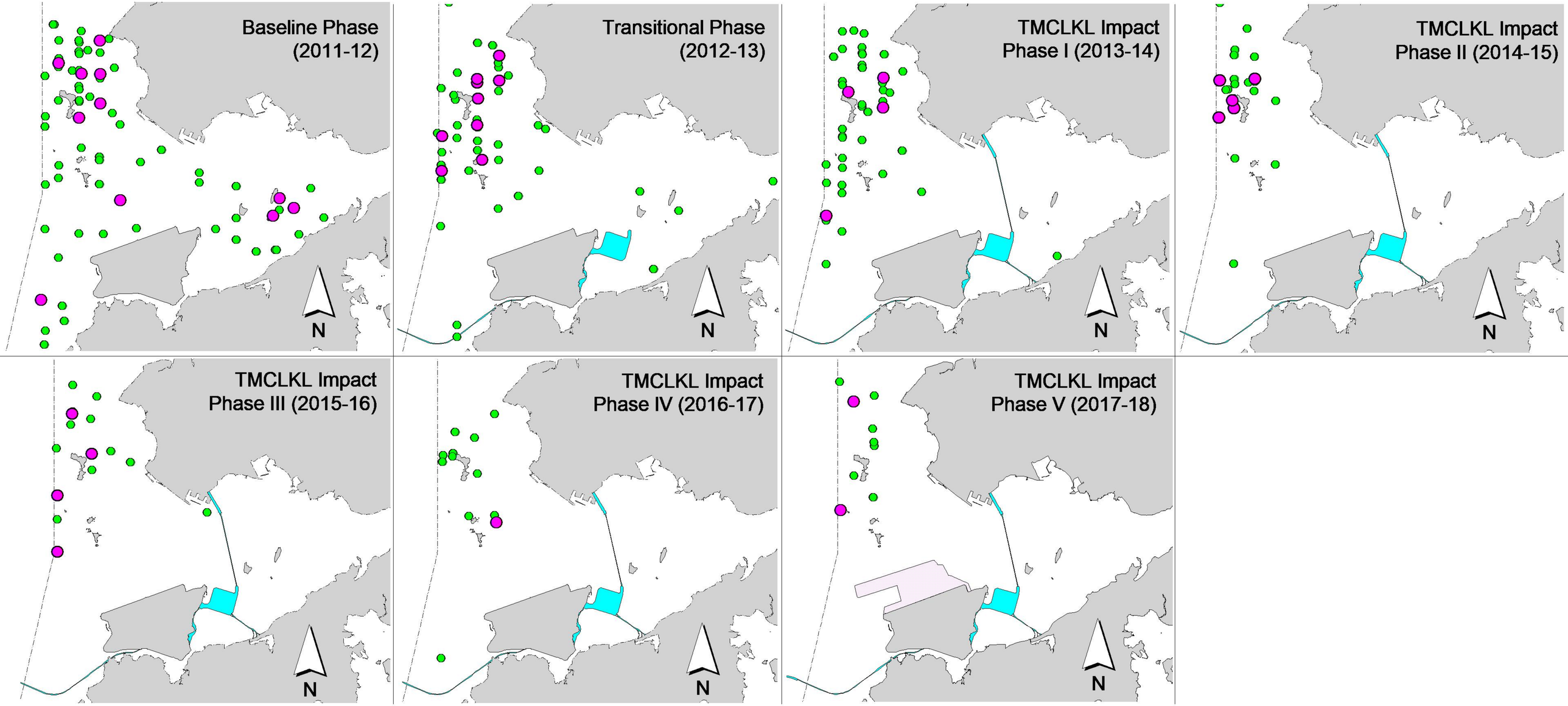


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

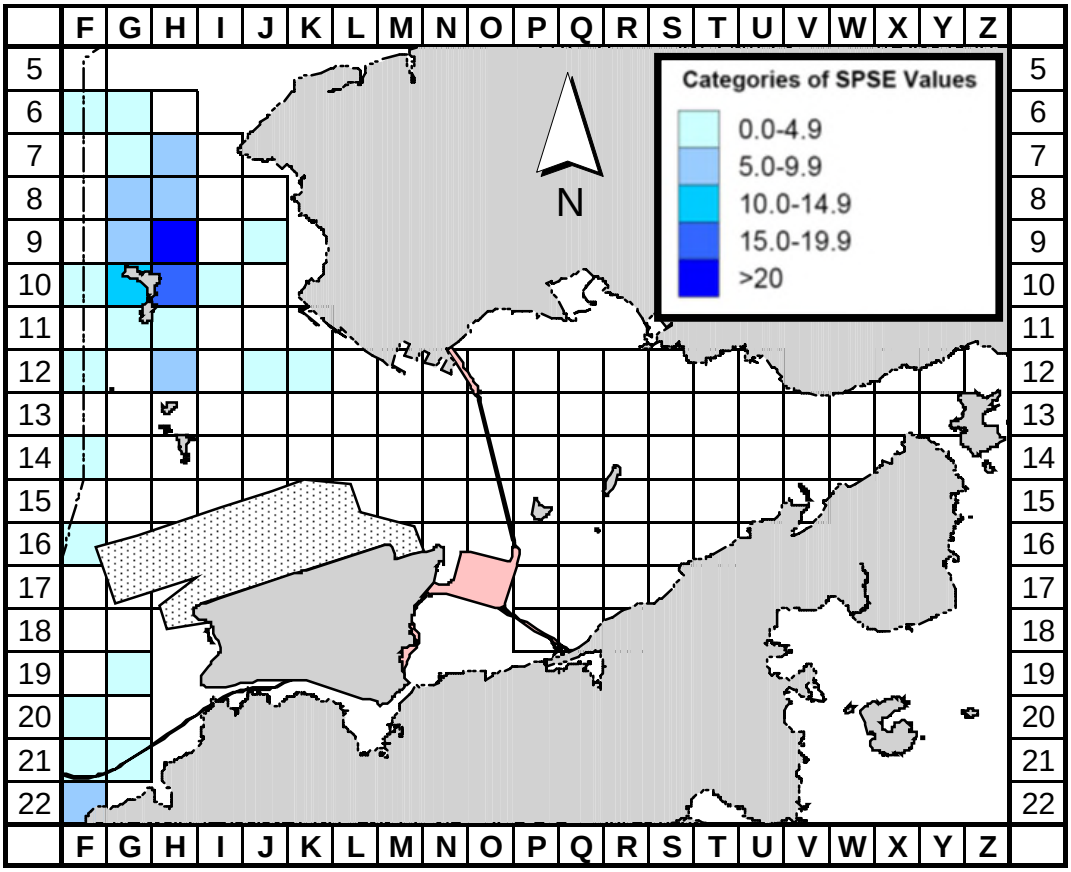


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Nov17 - Oct18) (SPSE = no. of on-effort sightings per 100 units of survey effort)

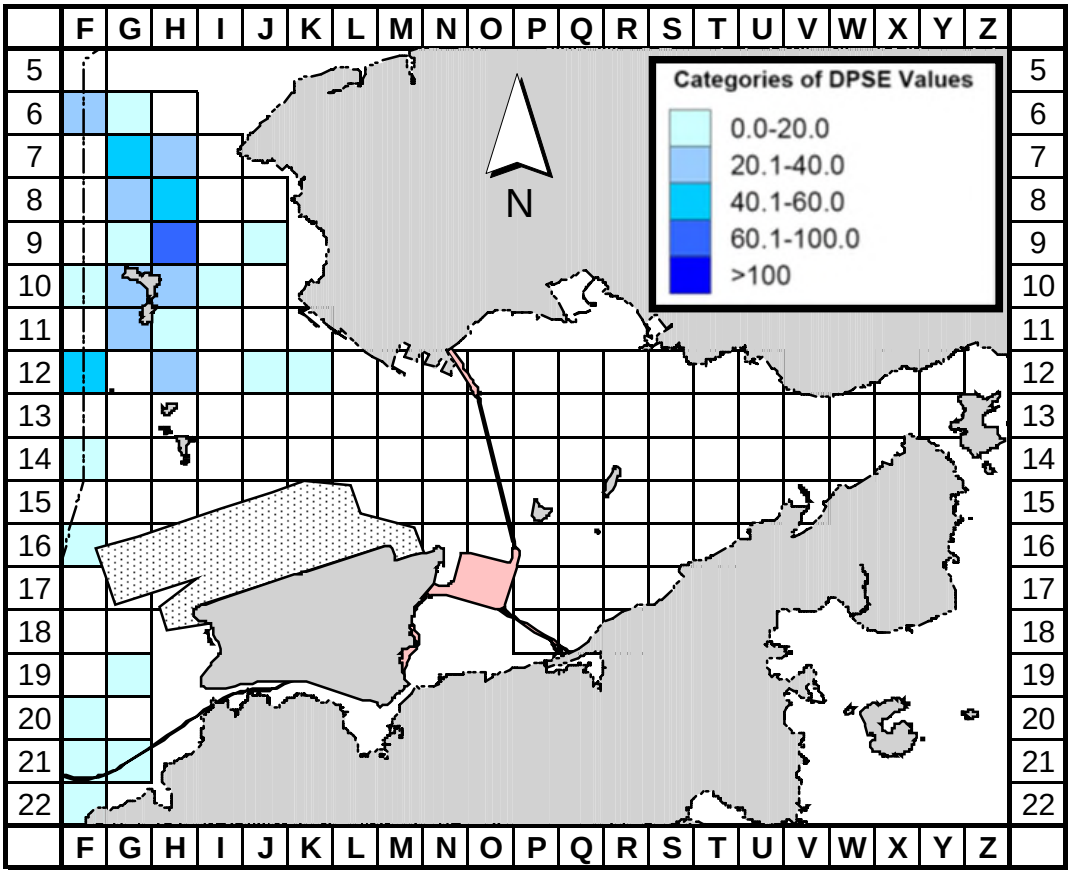


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Nov17 -Oct18) (DPSE = no. of dolphins per 100 units of survey effort)

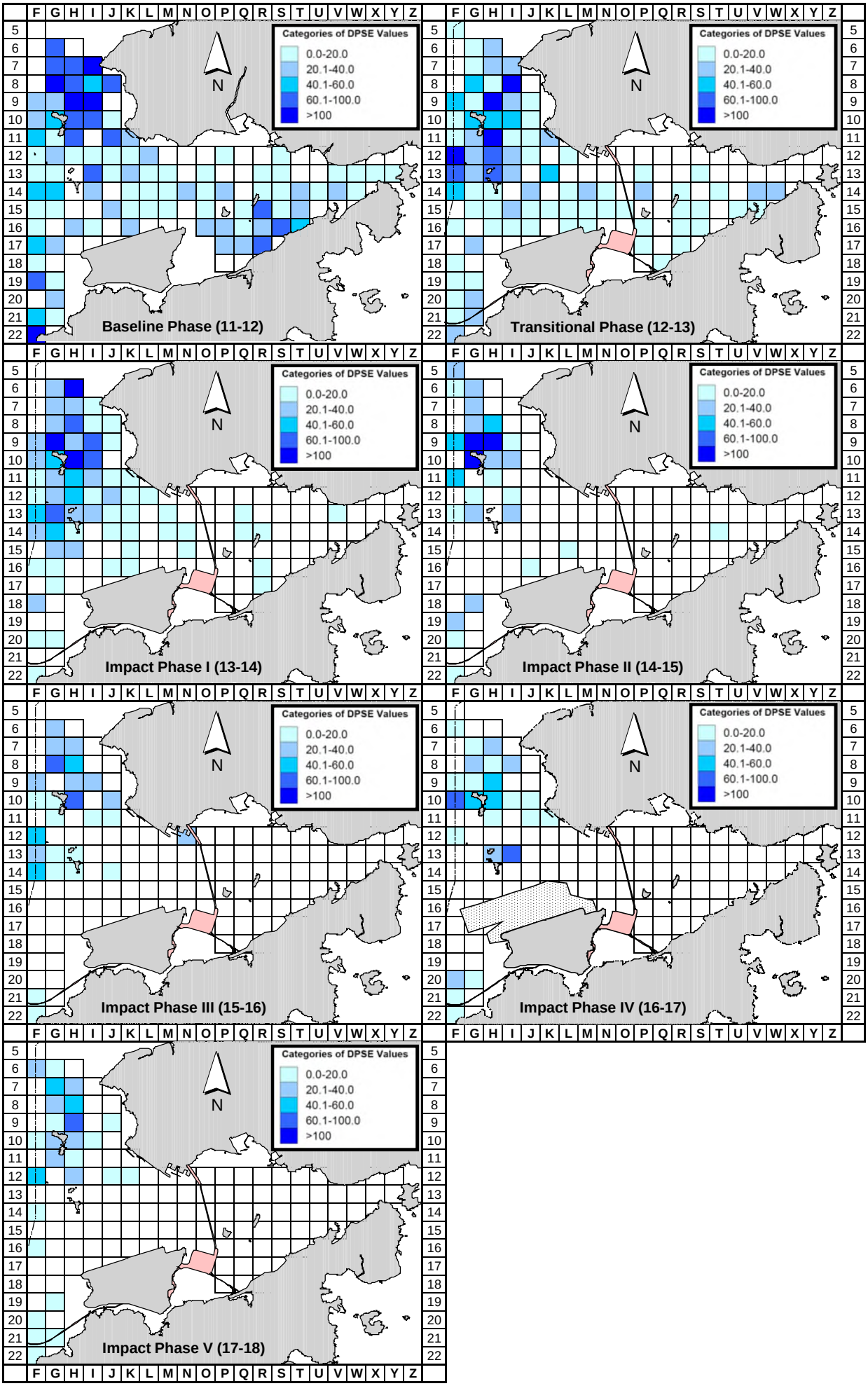


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in NWL and NEL survey areas between the five impact phases (2013-14, 2014-15, 2015-16, 2016-17 & 2017-18), transitional phase (2012-13) and baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)

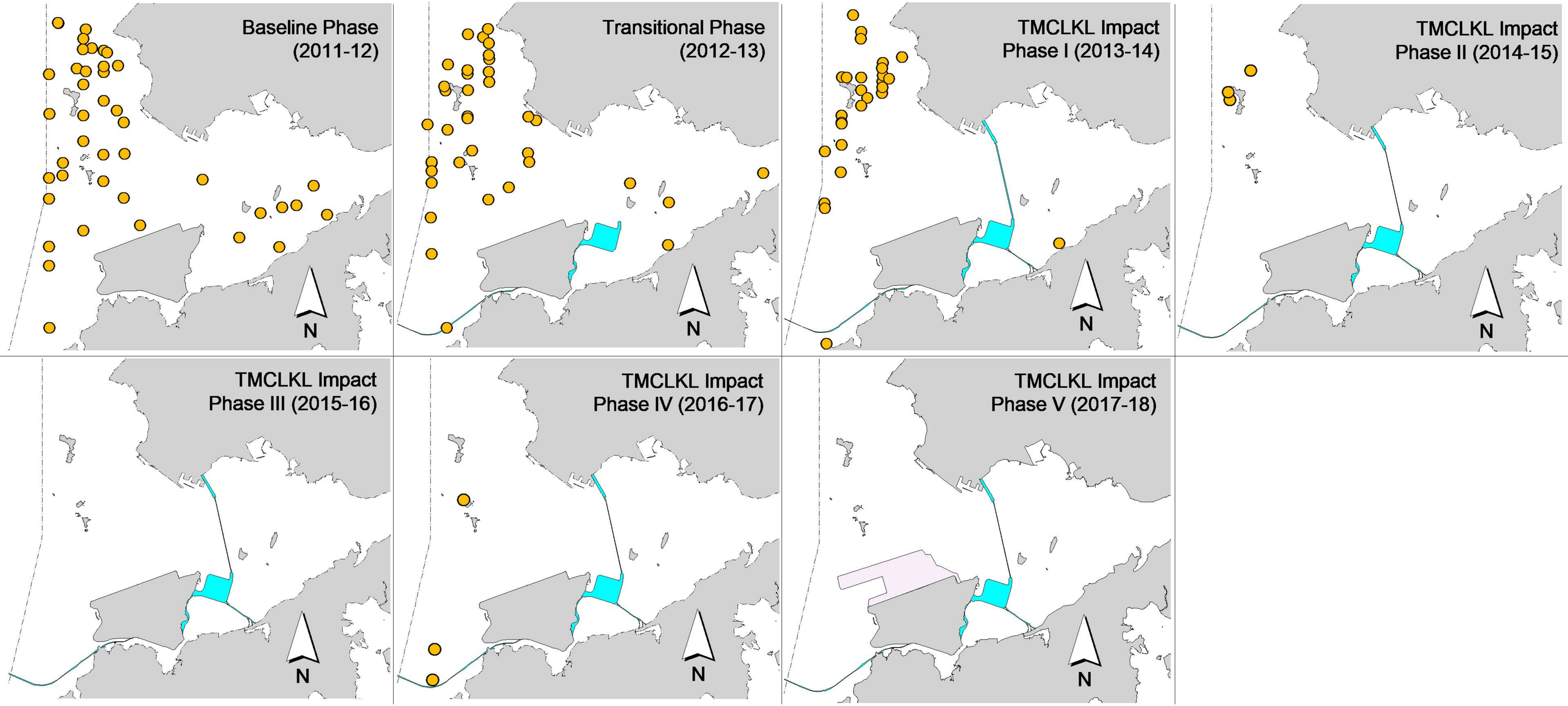


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

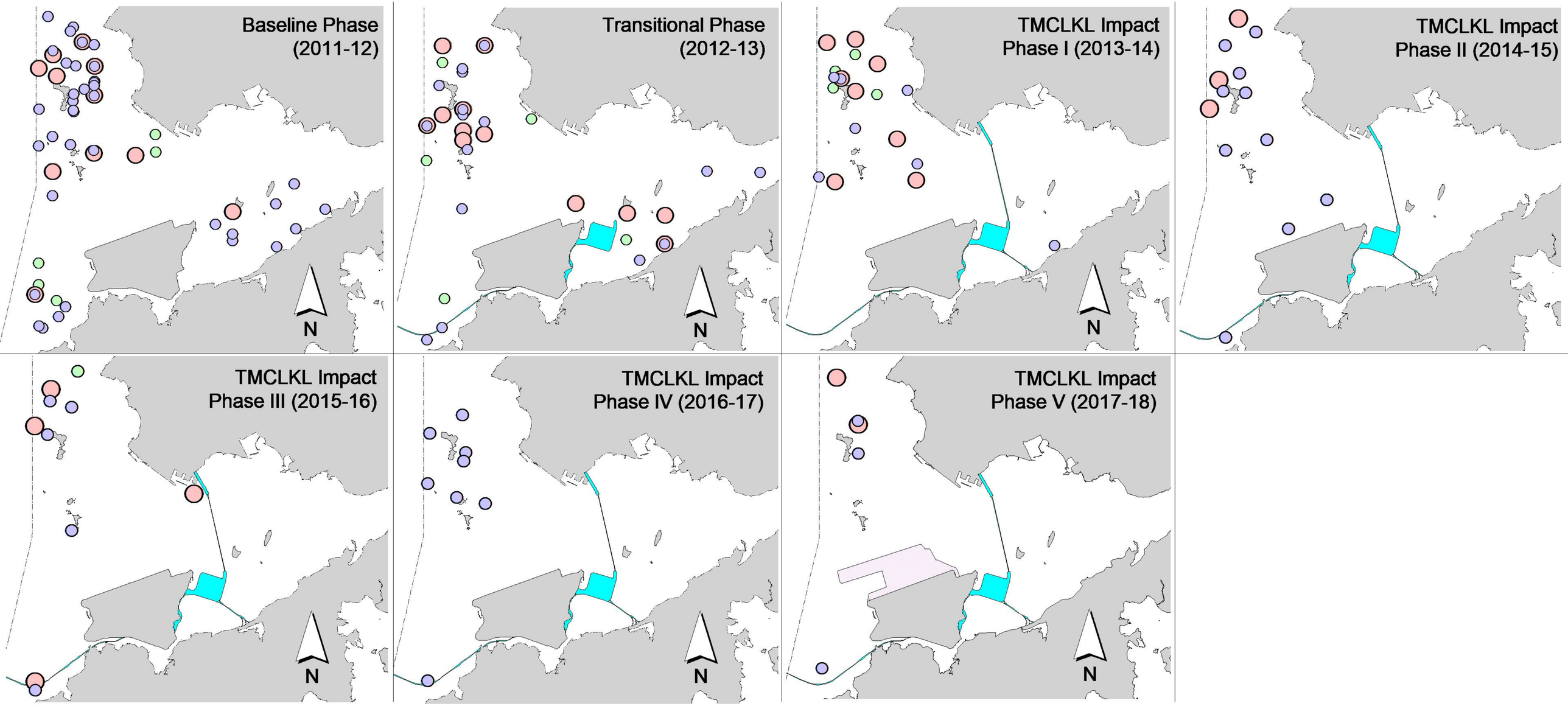


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. HKLR03 Survey Effort Database (November 2017 - October 2018)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
1-Nov-17	NW LANTAU	2	17.00	AUTUMN	STANDARD36826	HKLR	P
1-Nov-17	NW LANTAU	3	15.32	AUTUMN	STANDARD36826	HKLR	P
1-Nov-17	NW LANTAU	2	8.38	AUTUMN	STANDARD36826	HKLR	S
1-Nov-17	NW LANTAU	3	2.53	AUTUMN	STANDARD36826	HKLR	S
1-Nov-17	NE LANTAU	2	29.72	AUTUMN	STANDARD36826	HKLR	P
1-Nov-17	NE LANTAU	3	5.10	AUTUMN	STANDARD36826	HKLR	P
1-Nov-17	NE LANTAU	2	10.07	AUTUMN	STANDARD36826	HKLR	S
1-Nov-17	NE LANTAU	3	2.41	AUTUMN	STANDARD36826	HKLR	S
8-Nov-17	NW LANTAU	2	13.77	AUTUMN	STANDARD36826	HKLR	P
8-Nov-17	NW LANTAU	3	14.05	AUTUMN	STANDARD36826	HKLR	P
8-Nov-17	NW LANTAU	2	10.58	AUTUMN	STANDARD36826	HKLR	S
8-Nov-17	NW LANTAU	3	1.80	AUTUMN	STANDARD36826	HKLR	S
17-Nov-17	NW LANTAU	2	8.53	AUTUMN	STANDARD36826	HKLR	P
17-Nov-17	NW LANTAU	3	18.98	AUTUMN	STANDARD36826	HKLR	P
17-Nov-17	NW LANTAU	2	9.37	AUTUMN	STANDARD36826	HKLR	S
17-Nov-17	NW LANTAU	3	3.55	AUTUMN	STANDARD36826	HKLR	S
24-Nov-17	NW LANTAU	2	3.81	AUTUMN	STANDARD36826	HKLR	P
24-Nov-17	NW LANTAU	3	28.72	AUTUMN	STANDARD36826	HKLR	P
24-Nov-17	NW LANTAU	2	4.40	AUTUMN	STANDARD36826	HKLR	S
24-Nov-17	NW LANTAU	3	6.27	AUTUMN	STANDARD36826	HKLR	S
24-Nov-17	NE LANTAU	2	30.83	AUTUMN	STANDARD36826	HKLR	P
24-Nov-17	NE LANTAU	3	4.97	AUTUMN	STANDARD36826	HKLR	P
24-Nov-17	NE LANTAU	1	1.20	AUTUMN	STANDARD36826	HKLR	S
24-Nov-17	NE LANTAU	2	10.10	AUTUMN	STANDARD36826	HKLR	S
5-Dec-17	NW LANTAU	2	17.27	WINTER	STANDARD36826	HKLR	P
5-Dec-17	NW LANTAU	3	15.02	WINTER	STANDARD36826	HKLR	P
5-Dec-17	NW LANTAU	2	7.80	WINTER	STANDARD36826	HKLR	S
5-Dec-17	NW LANTAU	3	3.81	WINTER	STANDARD36826	HKLR	S
5-Dec-17	NE LANTAU	2	33.41	WINTER	STANDARD36826	HKLR	P
5-Dec-17	NE LANTAU	3	2.11	WINTER	STANDARD36826	HKLR	P
5-Dec-17	NE LANTAU	2	13.18	WINTER	STANDARD36826	HKLR	S
5-Dec-17	NE LANTAU	3	0.60	WINTER	STANDARD36826	HKLR	S
12-Dec-17	NW LANTAU	2	24.51	WINTER	STANDARD36826	HKLR	P
12-Dec-17	NW LANTAU	3	3.30	WINTER	STANDARD36826	HKLR	P
12-Dec-17	NW LANTAU	2	11.89	WINTER	STANDARD36826	HKLR	S
12-Dec-17	NW LANTAU	3	0.90	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NW LANTAU	1	3.85	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NW LANTAU	2	21.86	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NW LANTAU	3	2.68	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NW LANTAU	1	2.79	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NW LANTAU	2	6.92	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NW LANTAU	3	2.43	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NE LANTAU	1	11.59	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NE LANTAU	2	21.70	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NE LANTAU	3	4.60	WINTER	STANDARD36826	HKLR	P
15-Dec-17	NE LANTAU	1	3.31	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NE LANTAU	2	6.80	WINTER	STANDARD36826	HKLR	S
15-Dec-17	NE LANTAU	3	1.90	WINTER	STANDARD36826	HKLR	S
20-Dec-17	NW LANTAU	2	1.39	WINTER	STANDARD36826	HKLR	P
20-Dec-17	NW LANTAU	3	5.99	WINTER	STANDARD36826	HKLR	P
20-Dec-17	NW LANTAU	4	25.69	WINTER	STANDARD36826	HKLR	P
20-Dec-17	NW LANTAU	3	5.43	WINTER	STANDARD36826	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
20-Dec-17	NW LANTAU	4	5.50	WINTER	STANDARD36826	HKLR	S
2-Jan-18	NW LANTAU	2	27.79	WINTER	STANDARD36826	HKLR	P
2-Jan-18	NW LANTAU	3	3.97	WINTER	STANDARD36826	HKLR	P
2-Jan-18	NW LANTAU	2	10.12	WINTER	STANDARD36826	HKLR	S
2-Jan-18	NW LANTAU	3	0.60	WINTER	STANDARD36826	HKLR	S
8-Jan-18	NW LANTAU	3	3.47	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NW LANTAU	4	9.99	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NW LANTAU	5	14.91	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NW LANTAU	4	6.80	WINTER	STANDARD36826	HKLR	S
8-Jan-18	NW LANTAU	5	3.73	WINTER	STANDARD36826	HKLR	S
8-Jan-18	NE LANTAU	2	6.71	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NE LANTAU	3	29.79	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NE LANTAU	4	0.64	WINTER	STANDARD36826	HKLR	P
8-Jan-18	NE LANTAU	2	5.70	WINTER	STANDARD36826	HKLR	S
8-Jan-18	NE LANTAU	3	7.36	WINTER	STANDARD36826	HKLR	S
16-Jan-18	NW LANTAU	2	27.70	WINTER	STANDARD36826	HKLR	P
16-Jan-18	NW LANTAU	3	5.45	WINTER	STANDARD36826	HKLR	P
16-Jan-18	NW LANTAU	2	8.15	WINTER	STANDARD36826	HKLR	S
16-Jan-18	NW LANTAU	3	2.70	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NE LANTAU	2	17.96	WINTER	STANDARD36826	HKLR	P
25-Jan-18	NE LANTAU	3	18.90	WINTER	STANDARD36826	HKLR	P
25-Jan-18	NE LANTAU	2	7.54	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NE LANTAU	3	4.20	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NE LANTAU	4	1.40	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NW LANTAU	2	7.23	WINTER	STANDARD36826	HKLR	P
25-Jan-18	NW LANTAU	3	17.92	WINTER	STANDARD36826	HKLR	P
25-Jan-18	NW LANTAU	4	2.72	WINTER	STANDARD36826	HKLR	P
25-Jan-18	NW LANTAU	2	4.02	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NW LANTAU	3	6.52	WINTER	STANDARD36826	HKLR	S
25-Jan-18	NW LANTAU	4	1.95	WINTER	STANDARD36826	HKLR	S
2-Feb-18	NW LANTAU	2	2.34	WINTER	STANDARD36826	HKLR	P
2-Feb-18	NW LANTAU	3	16.30	WINTER	STANDARD36826	HKLR	P
2-Feb-18	NW LANTAU	4	15.00	WINTER	STANDARD36826	HKLR	P
2-Feb-18	NW LANTAU	2	2.86	WINTER	STANDARD36826	HKLR	S
2-Feb-18	NW LANTAU	3	6.78	WINTER	STANDARD36826	HKLR	S
2-Feb-18	NW LANTAU	4	1.12	WINTER	STANDARD36826	HKLR	S
9-Feb-18	NE LANTAU	1	4.00	WINTER	STANDARD36826	HKLR	P
9-Feb-18	NE LANTAU	2	30.78	WINTER	STANDARD36826	HKLR	P
9-Feb-18	NE LANTAU	1	1.00	WINTER	STANDARD36826	HKLR	S
9-Feb-18	NE LANTAU	2	12.02	WINTER	STANDARD36826	HKLR	S
9-Feb-18	NW LANTAU	1	5.87	WINTER	STANDARD36826	HKLR	P
9-Feb-18	NW LANTAU	2	21.20	WINTER	STANDARD36826	HKLR	P
9-Feb-18	NW LANTAU	1	2.32	WINTER	STANDARD36826	HKLR	S
9-Feb-18	NW LANTAU	2	8.91	WINTER	STANDARD36826	HKLR	S
14-Feb-18	NW LANTAU	1	2.80	WINTER	STANDARD36826	HKLR	P
14-Feb-18	NW LANTAU	2	24.71	WINTER	STANDARD36826	HKLR	P
14-Feb-18	NW LANTAU	2	12.25	WINTER	STANDARD36826	HKLR	S
14-Feb-18	NE LANTAU	1	3.84	WINTER	STANDARD36826	HKLR	P
14-Feb-18	NE LANTAU	2	22.25	WINTER	STANDARD36826	HKLR	P
14-Feb-18	NE LANTAU	3	10.09	WINTER	STANDARD36826	HKLR	P
14-Feb-18	NE LANTAU	2	12.04	WINTER	STANDARD36826	HKLR	S
14-Feb-18	NE LANTAU	3	1.28	WINTER	STANDARD36826	HKLR	S
22-Feb-18	NW LANTAU	2	11.27	WINTER	STANDARD36826	HKLR	P
22-Feb-18	NW LANTAU	3	21.56	WINTER	STANDARD36826	HKLR	P

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
22-Feb-18	NW LANTAU	2	5.32	WINTER	STANDARD36826	HKLR	S
22-Feb-18	NW LANTAU	3	5.45	WINTER	STANDARD36826	HKLR	S
8-Mar-18	NE LANTAU	2	21.56	SPRING	STANDARD36826	HKLR	P
8-Mar-18	NE LANTAU	3	13.44	SPRING	STANDARD36826	HKLR	P
8-Mar-18	NE LANTAU	2	6.79	SPRING	STANDARD36826	HKLR	S
8-Mar-18	NE LANTAU	3	4.71	SPRING	STANDARD36826	HKLR	S
8-Mar-18	NW LANTAU	2	5.20	SPRING	STANDARD36826	HKLR	P
8-Mar-18	NW LANTAU	3	17.08	SPRING	STANDARD36826	HKLR	P
8-Mar-18	NW LANTAU	4	2.40	SPRING	STANDARD36826	HKLR	P
8-Mar-18	NW LANTAU	2	3.42	SPRING	STANDARD36826	HKLR	S
8-Mar-18	NW LANTAU	3	1.60	SPRING	STANDARD36826	HKLR	S
8-Mar-18	NW LANTAU	4	5.60	SPRING	STANDARD36826	HKLR	S
12-Mar-18	NW LANTAU	1	4.88	SPRING	STANDARD36826	HKLR	P
12-Mar-18	NW LANTAU	2	30.68	SPRING	STANDARD36826	HKLR	P
12-Mar-18	NW LANTAU	1	1.00	SPRING	STANDARD36826	HKLR	S
12-Mar-18	NW LANTAU	2	12.34	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NE LANTAU	2	7.92	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NE LANTAU	3	26.28	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NE LANTAU	4	3.00	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NE LANTAU	2	4.82	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NE LANTAU	3	8.18	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NE LANTAU	4	1.30	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NW LANTAU	2	0.77	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NW LANTAU	3	6.09	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NW LANTAU	4	17.10	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NW LANTAU	5	2.10	SPRING	STANDARD36826	HKLR	P
20-Mar-18	NW LANTAU	3	3.40	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NW LANTAU	4	4.54	SPRING	STANDARD36826	HKLR	S
20-Mar-18	NW LANTAU	5	2.60	SPRING	STANDARD36826	HKLR	S
23-Mar-18	NW LANTAU	1	4.22	SPRING	STANDARD36826	HKLR	P
23-Mar-18	NW LANTAU	2	19.38	SPRING	STANDARD36826	HKLR	P
23-Mar-18	NW LANTAU	3	10.11	SPRING	STANDARD36826	HKLR	P
23-Mar-18	NW LANTAU	2	9.28	SPRING	STANDARD36826	HKLR	S
23-Mar-18	NW LANTAU	3	1.55	SPRING	STANDARD36826	HKLR	S
10-Apr-18	NW LANTAU	2	23.74	SPRING	STANDARD36826	HKLR	P
10-Apr-18	NW LANTAU	3	1.23	SPRING	STANDARD36826	HKLR	P
10-Apr-18	NW LANTAU	2	11.73	SPRING	STANDARD36826	HKLR	S
17-Apr-18	NW LANTAU	1	2.20	SPRING	STANDARD36826	HKLR	P
17-Apr-18	NW LANTAU	2	33.50	SPRING	STANDARD36826	HKLR	P
17-Apr-18	NW LANTAU	2	14.10	SPRING	STANDARD36826	HKLR	S
17-Apr-18	NE LANTAU	1	1.20	SPRING	STANDARD36826	HKLR	P
17-Apr-18	NE LANTAU	2	34.52	SPRING	STANDARD36826	HKLR	P
17-Apr-18	NE LANTAU	1	1.10	SPRING	STANDARD36826	HKLR	S
17-Apr-18	NE LANTAU	2	12.58	SPRING	STANDARD36826	HKLR	S
19-Apr-18	NW LANTAU	1	3.85	SPRING	STANDARD36826	HKLR	P
19-Apr-18	NW LANTAU	2	8.59	SPRING	STANDARD36826	HKLR	P
19-Apr-18	NW LANTAU	3	20.48	SPRING	STANDARD36826	HKLR	P
19-Apr-18	NW LANTAU	1	2.26	SPRING	STANDARD36826	HKLR	S
19-Apr-18	NW LANTAU	2	8.21	SPRING	STANDARD36826	HKLR	S
25-Apr-18	NW LANTAU	1	10.61	SPRING	STANDARD36826	HKLR	P
25-Apr-18	NW LANTAU	2	18.13	SPRING	STANDARD36826	HKLR	P
25-Apr-18	NW LANTAU	1	1.60	SPRING	STANDARD36826	HKLR	S
25-Apr-18	NW LANTAU	2	9.66	SPRING	STANDARD36826	HKLR	S
25-Apr-18	NE LANTAU	2	36.91	SPRING	STANDARD36826	HKLR	P

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
25-Apr-18	NE LANTAU	2	10.89	SPRING	STANDARD36826	HKLR	S
7-May-18	NW LANTAU	3	18.59	SPRING	STANDARD36826	HKLR	P
7-May-18	NW LANTAU	4	5.80	SPRING	STANDARD36826	HKLR	P
7-May-18	NW LANTAU	3	9.41	SPRING	STANDARD36826	HKLR	S
7-May-18	NE LANTAU	2	22.70	SPRING	STANDARD36826	HKLR	P
7-May-18	NE LANTAU	3	11.82	SPRING	STANDARD36826	HKLR	P
7-May-18	NE LANTAU	2	7.15	SPRING	STANDARD36826	HKLR	S
7-May-18	NE LANTAU	3	5.23	SPRING	STANDARD36826	HKLR	S
10-May-18	NW LANTAU	3	13.41	SPRING	STANDARD36826	HKLR	P
10-May-18	NW LANTAU	4	21.03	SPRING	STANDARD36826	HKLR	P
10-May-18	NW LANTAU	3	6.20	SPRING	STANDARD36826	HKLR	S
10-May-18	NW LANTAU	4	6.66	SPRING	STANDARD36826	HKLR	S
16-May-18	NE LANTAU	2	19.20	SPRING	STANDARD36826	HKLR	P
16-May-18	NE LANTAU	3	17.50	SPRING	STANDARD36826	HKLR	P
16-May-18	NE LANTAU	2	11.20	SPRING	STANDARD36826	HKLR	S
16-May-18	NE LANTAU	3	0.90	SPRING	STANDARD36826	HKLR	S
16-May-18	NW LANTAU	2	4.80	SPRING	STANDARD36826	HKLR	P
16-May-18	NW LANTAU	3	27.00	SPRING	STANDARD36826	HKLR	P
16-May-18	NW LANTAU	2	4.50	SPRING	STANDARD36826	HKLR	S
16-May-18	NW LANTAU	3	6.50	SPRING	STANDARD36826	HKLR	S
30-May-18	NW LANTAU	2	2.60	SPRING	STANDARD36826	HKLR	P
30-May-18	NW LANTAU	3	18.99	SPRING	STANDARD36826	HKLR	P
30-May-18	NW LANTAU	4	6.00	SPRING	STANDARD36826	HKLR	P
30-May-18	NW LANTAU	2	4.90	SPRING	STANDARD36826	HKLR	S
30-May-18	NW LANTAU	3	6.81	SPRING	STANDARD36826	HKLR	S
30-May-18	NW LANTAU	4	2.50	SPRING	STANDARD36826	HKLR	S
5-Jun-18	NW LANTAU	2	3.73	SUMMER	STANDARD36826	HKLR	P
5-Jun-18	NW LANTAU	3	28.14	SUMMER	STANDARD36826	HKLR	P
5-Jun-18	NW LANTAU	2	3.46	SUMMER	STANDARD36826	HKLR	S
5-Jun-18	NW LANTAU	3	6.03	SUMMER	STANDARD36826	HKLR	S
5-Jun-18	NE LANTAU	2	10.32	SUMMER	STANDARD36826	HKLR	P
5-Jun-18	NE LANTAU	3	25.47	SUMMER	STANDARD36826	HKLR	P
5-Jun-18	NE LANTAU	2	6.68	SUMMER	STANDARD36826	HKLR	S
5-Jun-18	NE LANTAU	3	3.77	SUMMER	STANDARD36826	HKLR	S
13-Jun-18	NW LANTAU	2	23.63	SUMMER	STANDARD36826	HKLR	P
13-Jun-18	NW LANTAU	3	3.34	SUMMER	STANDARD36826	HKLR	P
13-Jun-18	NW LANTAU	2	8.49	SUMMER	STANDARD36826	HKLR	S
13-Jun-18	NW LANTAU	3	2.64	SUMMER	STANDARD36826	HKLR	S
19-Jun-18	NW LANTAU	3	23.85	SUMMER	STANDARD36826	HKLR	P
19-Jun-18	NW LANTAU	4	3.40	SUMMER	STANDARD36826	HKLR	P
19-Jun-18	NW LANTAU	3	7.85	SUMMER	STANDARD36826	HKLR	S
19-Jun-18	NW LANTAU	4	3.20	SUMMER	STANDARD36826	HKLR	S
19-Jun-18	NE LANTAU	2	24.33	SUMMER	STANDARD36826	HKLR	P
19-Jun-18	NE LANTAU	3	11.62	SUMMER	STANDARD36826	HKLR	P
19-Jun-18	NE LANTAU	2	9.72	SUMMER	STANDARD36826	HKLR	S
19-Jun-18	NE LANTAU	3	1.87	SUMMER	STANDARD36826	HKLR	S
27-Jun-18	NW LANTAU	2	16.07	SUMMER	STANDARD36826	HKLR	P
27-Jun-18	NW LANTAU	3	12.56	SUMMER	STANDARD36826	HKLR	P
27-Jun-18	NW LANTAU	4	4.20	SUMMER	STANDARD36826	HKLR	P
27-Jun-18	NW LANTAU	2	10.57	SUMMER	STANDARD36826	HKLR	S
3-Jul-18	NW LANTAU	3	24.91	SUMMER	STANDARD36826	HKLR	P
3-Jul-18	NW LANTAU	4	10.69	SUMMER	STANDARD36826	HKLR	P
3-Jul-18	NW LANTAU	3	12.89	SUMMER	STANDARD36826	HKLR	S
3-Jul-18	NW LANTAU	4	0.81	SUMMER	STANDARD36826	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
3-Jul-18	NE LANTAU	2	28.85	SUMMER	STANDARD36826	HKLR	P
3-Jul-18	NE LANTAU	3	7.29	SUMMER	STANDARD36826	HKLR	P
3-Jul-18	NE LANTAU	2	13.36	SUMMER	STANDARD36826	HKLR	S
3-Jul-18	NE LANTAU	3	0.80	SUMMER	STANDARD36826	HKLR	S
9-Jul-18	NW LANTAU	2	4.62	SUMMER	STANDARD36826	HKLR	P
9-Jul-18	NW LANTAU	3	17.99	SUMMER	STANDARD36826	HKLR	P
9-Jul-18	NW LANTAU	4	0.98	SUMMER	STANDARD36826	HKLR	P
9-Jul-18	NW LANTAU	2	0.90	SUMMER	STANDARD36826	HKLR	S
9-Jul-18	NW LANTAU	3	7.21	SUMMER	STANDARD36826	HKLR	S
12-Jul-18	NW LANTAU	2	19.42	SUMMER	STANDARD36826	HKLR	P
12-Jul-18	NW LANTAU	3	15.11	SUMMER	STANDARD36826	HKLR	P
12-Jul-18	NW LANTAU	2	3.70	SUMMER	STANDARD36826	HKLR	S
12-Jul-18	NW LANTAU	3	7.80	SUMMER	STANDARD36826	HKLR	S
12-Jul-18	NW LANTAU	4	1.30	SUMMER	STANDARD36826	HKLR	S
12-Jul-18	NE LANTAU	2	15.65	SUMMER	STANDARD36826	HKLR	P
12-Jul-18	NE LANTAU	3	18.42	SUMMER	STANDARD36826	HKLR	P
12-Jul-18	NE LANTAU	2	10.66	SUMMER	STANDARD36826	HKLR	S
12-Jul-18	NE LANTAU	3	2.77	SUMMER	STANDARD36826	HKLR	S
20-Jul-18	NW LANTAU	1	1.50	SUMMER	STANDARD36826	HKLR	P
20-Jul-18	NW LANTAU	2	18.66	SUMMER	STANDARD36826	HKLR	P
20-Jul-18	NW LANTAU	3	4.88	SUMMER	STANDARD36826	HKLR	P
20-Jul-18	NW LANTAU	1	0.90	SUMMER	STANDARD36826	HKLR	S
20-Jul-18	NW LANTAU	2	2.82	SUMMER	STANDARD36826	HKLR	S
20-Jul-18	NW LANTAU	3	4.14	SUMMER	STANDARD36826	HKLR	S
1-Aug-18	NW LANTAU	2	28.28	SUMMER	STANDARD36826	HKLR	P
1-Aug-18	NW LANTAU	3	5.46	SUMMER	STANDARD36826	HKLR	P
1-Aug-18	NW LANTAU	2	7.13	SUMMER	STANDARD36826	HKLR	S
1-Aug-18	NW LANTAU	3	5.60	SUMMER	STANDARD36826	HKLR	S
1-Aug-18	NE LANTAU	2	34.52	SUMMER	STANDARD36826	HKLR	P
1-Aug-18	NE LANTAU	1	0.70	SUMMER	STANDARD36826	HKLR	S
1-Aug-18	NE LANTAU	2	11.98	SUMMER	STANDARD36826	HKLR	S
8-Aug-18	NW LANTAU	1	3.60	SUMMER	STANDARD36826	HKLR	P
8-Aug-18	NW LANTAU	2	14.70	SUMMER	STANDARD36826	HKLR	P
8-Aug-18	NW LANTAU	3	7.46	SUMMER	STANDARD36826	HKLR	P
8-Aug-18	NW LANTAU	2	5.34	SUMMER	STANDARD36826	HKLR	S
8-Aug-18	NW LANTAU	3	2.30	SUMMER	STANDARD36826	HKLR	S
21-Aug-18	NW LANTAU	1	1.50	SUMMER	STANDARD36826	HKLR	P
21-Aug-18	NW LANTAU	2	33.50	SUMMER	STANDARD36826	HKLR	P
21-Aug-18	NW LANTAU	2	13.30	SUMMER	STANDARD36826	HKLR	S
21-Aug-18	NE LANTAU	1	4.50	SUMMER	STANDARD36826	HKLR	P
21-Aug-18	NE LANTAU	2	27.89	SUMMER	STANDARD36826	HKLR	P
21-Aug-18	NE LANTAU	3	2.50	SUMMER	STANDARD36826	HKLR	P
21-Aug-18	NE LANTAU	1	1.10	SUMMER	STANDARD36826	HKLR	S
21-Aug-18	NE LANTAU	2	12.41	SUMMER	STANDARD36826	HKLR	S
28-Aug-18	NW LANTAU	2	21.50	SUMMER	STANDARD36826	HKLR	P
28-Aug-18	NW LANTAU	3	2.69	SUMMER	STANDARD36826	HKLR	P
28-Aug-18	NW LANTAU	2	7.60	SUMMER	STANDARD36826	HKLR	S
28-Aug-18	NW LANTAU	3	2.45	SUMMER	STANDARD36826	HKLR	S
4-Sep-18	NW LANTAU	1	7.70	AUTUMN	STANDARD36826	HKLR	P
4-Sep-18	NW LANTAU	2	24.60	AUTUMN	STANDARD36826	HKLR	P
4-Sep-18	NW LANTAU	3	3.00	AUTUMN	STANDARD36826	HKLR	P
4-Sep-18	NW LANTAU	1	4.20	AUTUMN	STANDARD36826	HKLR	S
4-Sep-18	NW LANTAU	2	7.80	AUTUMN	STANDARD36826	HKLR	S
4-Sep-18	NW LANTAU	3	1.30	AUTUMN	STANDARD36826	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
18-Sep-18	NE LANTAU	3	34.10	AUTUMN	STANDARD36826	HKLR	P
18-Sep-18	NE LANTAU	4	1.10	AUTUMN	STANDARD36826	HKLR	P
18-Sep-18	NE LANTAU	2	2.50	AUTUMN	STANDARD36826	HKLR	S
18-Sep-18	NE LANTAU	3	13.40	AUTUMN	STANDARD36826	HKLR	S
18-Sep-18	NW LANTAU	2	3.50	AUTUMN	STANDARD36826	HKLR	P
18-Sep-18	NW LANTAU	3	17.73	AUTUMN	STANDARD36826	HKLR	P
18-Sep-18	NW LANTAU	4	3.97	AUTUMN	STANDARD36826	HKLR	P
18-Sep-18	NW LANTAU	2	4.10	AUTUMN	STANDARD36826	HKLR	S
18-Sep-18	NW LANTAU	3	5.90	AUTUMN	STANDARD36826	HKLR	S
20-Sep-18	NW LANTAU	2	21.14	AUTUMN	STANDARD36826	HKLR	P
20-Sep-18	NW LANTAU	3	6.75	AUTUMN	STANDARD36826	HKLR	P
20-Sep-18	NW LANTAU	2	7.28	AUTUMN	STANDARD36826	HKLR	S
20-Sep-18	NW LANTAU	3	2.01	AUTUMN	STANDARD36826	HKLR	S
26-Sep-18	NE LANTAU	2	33.45	AUTUMN	STANDARD138716	HKLR	P
26-Sep-18	NE LANTAU	3	11.25	AUTUMN	STANDARD138716	HKLR	S
26-Sep-18	NW LANTAU	2	13.12	AUTUMN	STANDARD138716	HKLR	P
26-Sep-18	NW LANTAU	3	20.65	AUTUMN	STANDARD138716	HKLR	P
26-Sep-18	NW LANTAU	2	10.51	AUTUMN	STANDARD138716	HKLR	S
26-Sep-18	NW LANTAU	3	2.62	AUTUMN	STANDARD138716	HKLR	S
4-Oct-18	NW LANTAU	2	19.20	AUTUMN	STANDARD36826	HKLR	P
4-Oct-18	NW LANTAU	3	12.68	AUTUMN	STANDARD36826	HKLR	P
4-Oct-18	NW LANTAU	4	0.62	AUTUMN	STANDARD36826	HKLR	P
4-Oct-18	NW LANTAU	2	6.10	AUTUMN	STANDARD36826	HKLR	S
4-Oct-18	NW LANTAU	3	5.60	AUTUMN	STANDARD36826	HKLR	S
4-Oct-18	NE LANTAU	2	19.33	AUTUMN	STANDARD36826	HKLR	P
4-Oct-18	NE LANTAU	3	15.44	AUTUMN	STANDARD36826	HKLR	P
4-Oct-18	NE LANTAU	2	8.06	AUTUMN	STANDARD36826	HKLR	S
4-Oct-18	NE LANTAU	3	5.07	AUTUMN	STANDARD36826	HKLR	S
11-Oct-18	NW LANTAU	2	15.31	AUTUMN	STANDARD36826	HKLR	P
11-Oct-18	NW LANTAU	3	12.41	AUTUMN	STANDARD36826	HKLR	P
11-Oct-18	NW LANTAU	2	4.07	AUTUMN	STANDARD36826	HKLR	S
11-Oct-18	NW LANTAU	3	9.41	AUTUMN	STANDARD36826	HKLR	S
16-Oct-18	NW LANTAU	2	23.58	AUTUMN	STANDARD36826	HKLR	P
16-Oct-18	NW LANTAU	3	5.15	AUTUMN	STANDARD36826	HKLR	P
16-Oct-18	NW LANTAU	2	10.36	AUTUMN	STANDARD36826	HKLR	S
16-Oct-18	NW LANTAU	3	2.11	AUTUMN	STANDARD36826	HKLR	S
18-Oct-18	NW LANTAU	2	32.45	AUTUMN	STANDARD36826	HKLR	P
18-Oct-18	NW LANTAU	2	11.05	AUTUMN	STANDARD36826	HKLR	S
18-Oct-18	NE LANTAU	2	34.26	AUTUMN	STANDARD36826	HKLR	P
18-Oct-18	NE LANTAU	3	2.27	AUTUMN	STANDARD36826	HKLR	P
18-Oct-18	NE LANTAU	2	11.07	AUTUMN	STANDARD36826	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (November 2017 - October 2018)

(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
1-Nov-17	1	1126	6	NW LANTAU	3	371	ON	HKLR	830641	804652	AUTUMN	NONE	P
1-Nov-17	2	1152	8	NW LANTAU	2	529	ON	HKLR	827437	806499	AUTUMN	NONE	P
8-Nov-17	1	1129	2	NW LANTAU	2	317	ON	HKLR	826272	807434	AUTUMN	NONE	P
17-Nov-17	1	1155	12	NW LANTAU	2	627	ON	HKLR	829665	805381	AUTUMN	NONE	S
24-Nov-17	1	1023	2	NW LANTAU	3	21	ON	HKLR	816588	804674	AUTUMN	NONE	P
24-Nov-17	2	1155	1	NW LANTAU	3	0	ON	HKLR	826850	806436	AUTUMN	NONE	P
5-Dec-17	1	1150	5	NW LANTAU	3	155	ON	HKLR	824890	806432	WINTER	NONE	P
15-Dec-17	1	1011	1	NW LANTAU	2	7	ON	HKLR	815955	805415	WINTER	NONE	P
15-Dec-17	2	1106	6	NW LANTAU	2	151	ON	HKLR	825966	805414	WINTER	NONE	P
15-Dec-17	3	1242	1	NW LANTAU	1	176	ON	HKLR	824441	809449	WINTER	NONE	P
2-Jan-18	1	1141	8	NW LANTAU	2	93	ON	HKLR	827614	806458	WINTER	PURSE-SEINE	P
2-Jan-18	2	1204	8	NW LANTAU	2	285	ON	HKLR	828301	806418	WINTER	NONE	P
8-Jan-18	1	1105	2	NW LANTAU	5	42	ON	HKLR	827107	805345	WINTER	NONE	P
16-Jan-18	1	1137	1	NW LANTAU	2	309	ON	HKLR	825178	806453	WINTER	NONE	P
25-Jan-18	1	1440	1	NW LANTAU	3	237	ON	HKLR	827516	805356	WINTER	NONE	P
2-Feb-18	1	1134	1	NW LANTAU	3	33	ON	HKLR	824048	806286	WINTER	NONE	S
9-Feb-18	1	956	1	NW LANTAU	1	ND	OFF	HKLR	816739	806756	WINTER	NONE	
9-Feb-18	2	1013	1	NW LANTAU	1	99	ON	HKLR	817306	805490	WINTER	NONE	P
9-Feb-18	3	1031	2	NW LANTAU	2	687	ON	HKLR	820619	804662	WINTER	NONE	P
9-Feb-18	4	1116	2	NW LANTAU	1	387	ON	HKLR	828225	805491	WINTER	NONE	S
14-Feb-18	1	1052	1	NW LANTAU	2	55	ON	HKLR	826276	805353	WINTER	NONE	P
14-Feb-18	2	1107	3	NW LANTAU	2	1047	ON	HKLR	828037	805429	WINTER	NONE	P
22-Feb-18	1	1040	1	NW LANTAU	3	137	ON	HKLR	827222	808537	WINTER	NONE	P
12-Mar-18	1	1207	3	NW LANTAU	1	149	ON	HKLR	827547	806417	SPRING	NONE	P
23-Mar-18	1	1046	4	NW LANTAU	3	705	ON	HKLR	822867	804739	SPRING	NONE	P
23-Mar-18	2	1055	12	NW LANTAU	2	96	ON	HKLR	824284	804721	SPRING	NONE	P
23-Mar-18	3	1122	2	NW LANTAU	2	251	ON	HKLR	826377	804684	SPRING	NONE	P
23-Mar-18	4	1322	2	NW LANTAU	1	515	ON	HKLR	828400	806542	SPRING	NONE	P
23-Mar-18	5	1328	3	NW LANTAU	2	486	ON	HKLR	827846	806510	SPRING	NONE	P
10-Apr-18	1	1125	1	NW LANTAU	2	24	ON	HKLR	829507	806966	SPRING	NONE	S
19-Apr-18	1	1133	2	NW LANTAU	3	363	ON	HKLR	826075	806486	SPRING	NONE	P
19-Apr-18	2	1146	1	NW LANTAU	3	208	ON	HKLR	827093	806426	SPRING	NONE	P

Appendix II. (cont'd)

(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
13-Jun-18	1	1123	5	NW LANTAU	2	83	ON	HKLR	829917	806493	SUMMER	NONE	S
27-Jun-18	1	1144	2	NW LANTAU	2	73	ON	HKLR	826551	806435	SUMMER	NONE	P
12-Jul-18	1	1125	4	NW LANTAU	3	156	ON	HKLR	829186	806430	SUMMER	NONE	P
1-Aug-18	1	1009	1	NW LANTAU	2	55	ON	HKLR	814838	804712	SUMMER	NONE	P
1-Aug-18	2	1015	3	NW LANTAU	2	234	ON	HKLR	815923	804662	SUMMER	NONE	P
1-Aug-18	3	1131	1	NW LANTAU	2	79	ON	HKLR	831204	805435	SUMMER	NONE	S
21-Aug-18	1	1012	1	NW LANTAU	1	ND	OFF	HKLR	814661	804753	SUMMER	NONE	
26-Sep-18	1	1433	2	NW LANTAU	2	258	ON	HKLR	826241	806517	AUTUMN	NONE	P
11-Oct-18	1	1222	4	NW LANTAU	3	362	ON	HKLR	826265	805415	AUTUMN	NONE	S
18-Oct-18	1	1232	2	NW LANTAU	2	145	ON	HKLR	824310	808501	AUTUMN	NONE	P

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in November 2017-October 2018

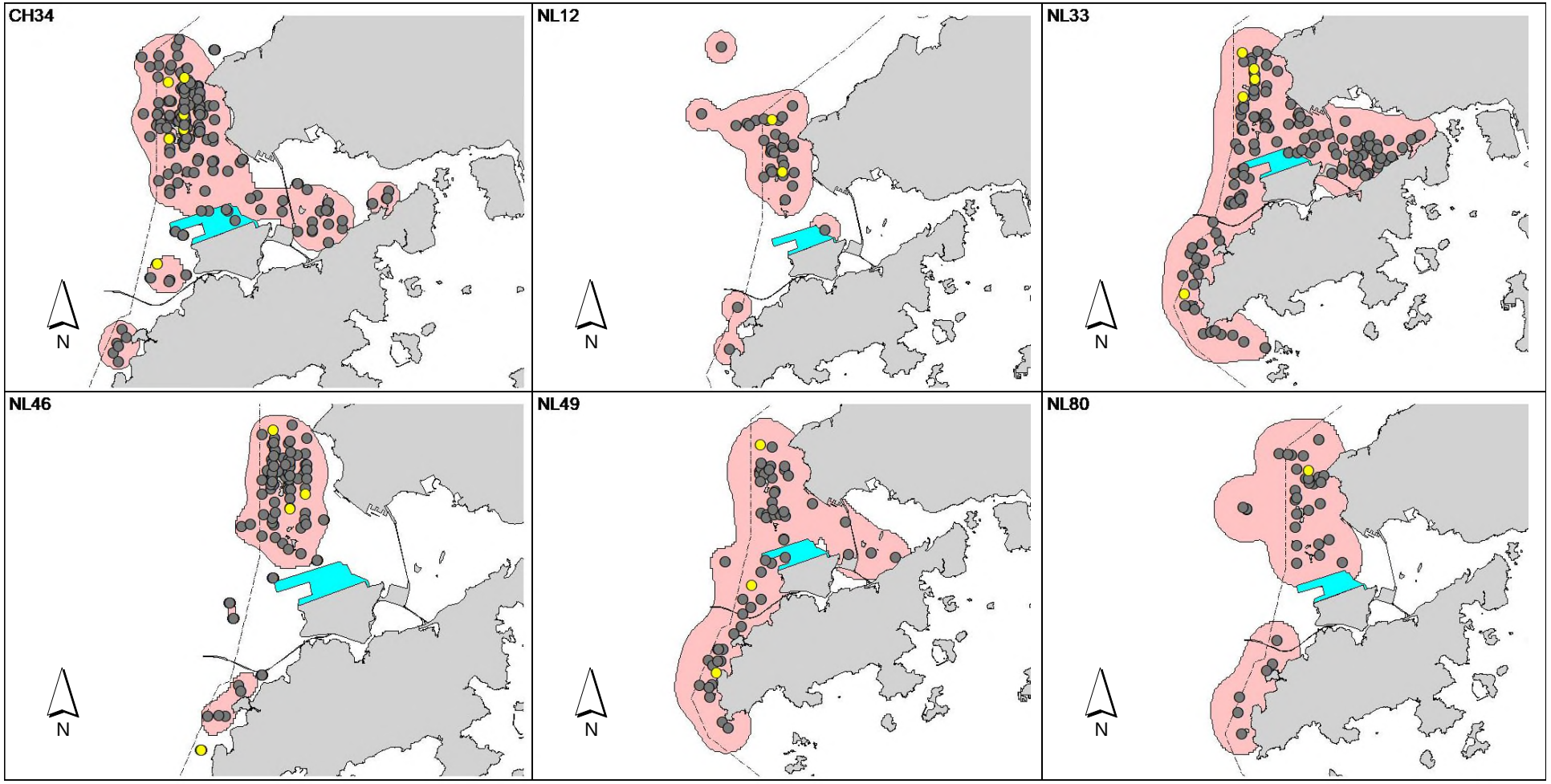
ID#	DATE	STG#	AREA
CH34	01/11/17	2	NW LANTAU
	17/11/17	1	NW LANTAU
	15/12/17	2	NW LANTAU
	12/03/18	1	NW LANTAU
	13/06/18	1	NW LANTAU
	27/06/18	1	NW LANTAU
NL12	27/06/18	1	NW LANTAU
	01/08/18	3	NW LANTAU
NL33	01/11/17	2	NW LANTAU
	17/11/17	1	NW LANTAU
	15/12/17	2	NW LANTAU
	02/01/18	2	NW LANTAU
NL46	17/11/17	1	NW LANTAU
	05/12/17	1	NW LANTAU
NL49	17/11/17	1	NW LANTAU
NL80	13/06/18	1	NW LANTAU
NL98	02/01/18	1	NW LANTAU
	23/03/18	2	NW LANTAU
NL104	01/08/18	2	NW LANTAU
NL120	23/03/18	2	NW LANTAU
NL123	02/01/18	2	NW LANTAU
	25/01/18	1	NW LANTAU
NL136	01/11/17	2	NW LANTAU
	08/11/17	1	NW LANTAU
	15/12/17	2	NW LANTAU
	02/01/18	1	NW LANTAU
	12/03/18	1	NW LANTAU
	11/10/18	1	NW LANTAU
	18/10/18	1	NW LANTAU
NL145	17/11/17	1	NW LANTAU
	01/08/18	1	NW LANTAU
	21/08/18	1	NW LANTAU

ID#	DATE	STG#	AREA
NL182	01/11/17	2	NW LANTAU
	24/11/17	2	NW LANTAU
	15/12/17	2	NW LANTAU
	02/01/18	1	NW LANTAU
	22/02/18	1	NW LANTAU
	12/03/18	1	NW LANTAU
	19/04/18	2	NW LANTAU
	26/09/18	1	NW LANTAU
	11/10/18	1	NW LANTAU
NL202	01/11/17	2	NW LANTAU
	09/02/18	4	NW LANTAU
	13/06/18	1	NW LANTAU
NL210	01/11/17	2	NW LANTAU
NL226	02/01/18	1	NW LANTAU
	23/03/18	2	NW LANTAU
	19/04/18	1	NW LANTAU
NL233	12/07/18	1	NW LANTAU
NL242	05/12/17	1	NW LANTAU
NL261	17/11/17	1	NW LANTAU
	15/12/17	2	NW LANTAU
	19/04/18	1	NW LANTAU
	11/10/18	1	NW LANTAU
NL269	05/12/17	1	NW LANTAU
	02/01/18	1	NW LANTAU
	23/03/18	2	NW LANTAU
NL272	17/11/17	1	NW LANTAU
	02/01/18	1	NW LANTAU
	16/01/18	1	NW LANTAU
	11/10/18	1	NW LANTAU
NL286	01/11/17	2	NW LANTAU
	17/11/17	1	NW LANTAU
	02/01/18	2	NW LANTAU
	09/02/18	4	NW LANTAU
	10/04/18	1	NW LANTAU

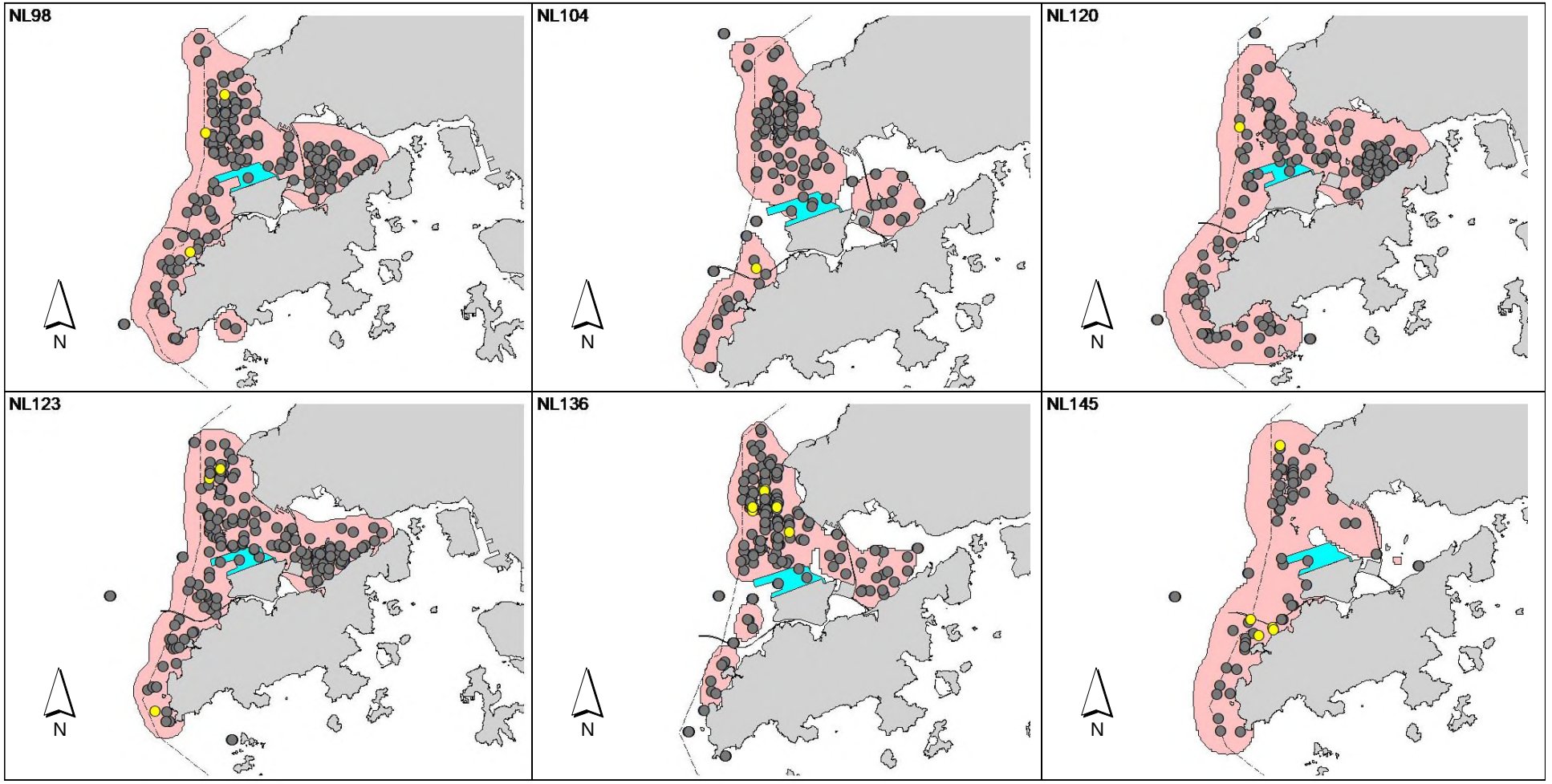
Appendix III. (cont'd)

ID#	DATE	STG#	AREA
NL296	05/12/17	1	NW LANTAU
NL301	13/06/18	1	NW LANTAU
NL302	01/08/18	2	NW LANTAU
NL311	02/01/18	1	NW LANTAU
NL317	12/07/18	1	NW LANTAU
NL320	01/11/17	2	NW LANTAU
	17/11/17	1	NW LANTAU
NL322	01/11/17	2	NW LANTAU
	17/11/17	1	NW LANTAU
	15/12/17	2	NW LANTAU
	02/01/18	2	NW LANTAU
NL327	01/08/18	2	NW LANTAU
NL328	08/11/17	1	NW LANTAU
	17/11/17	1	NW LANTAU
	18/10/18	1	NW LANTAU
NL329	23/03/18	2	NW LANTAU
	12/07/18	1	NW LANTAU
WL05	17/11/17	1	NW LANTAU
WL11	14/02/18	1	NW LANTAU
WL28	09/02/18	3	NW LANTAU
WL62	15/12/17	3	NW LANTAU
WL124	23/03/18	2	NW LANTAU
WL145	24/11/17	1	NW LANTAU
	23/03/18	2	NW LANTAU
WL179	23/03/18	2	NW LANTAU
WL188	12/07/18	1	NW LANTAU
WL251	02/01/18	2	NW LANTAU
WL273	05/12/17	1	NW LANTAU
WL276	23/03/18	2	NW LANTAU
WL288	09/02/18	3	NW LANTAU

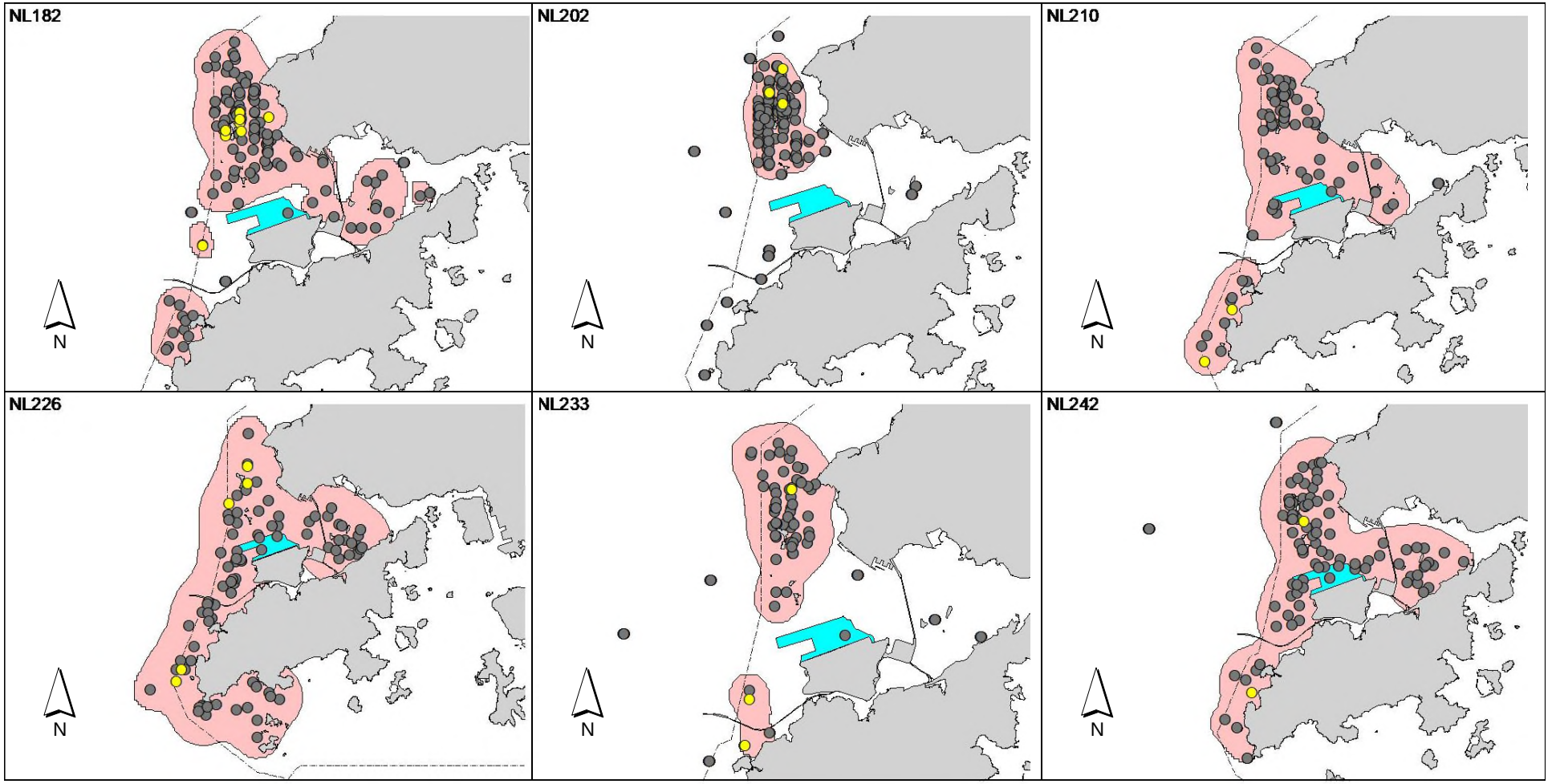
Appendix IV. Ranging patterns (95% kernel ranges) of 44 individual dolphins that were sighted during the fourth year of TMCLKL construction works, utilizing the HKLR03 monitoring data with supplement of HKLR09 monitoring data in West Lantau (note: yellow dots indicates sightings made in November 2017 to October 2018)



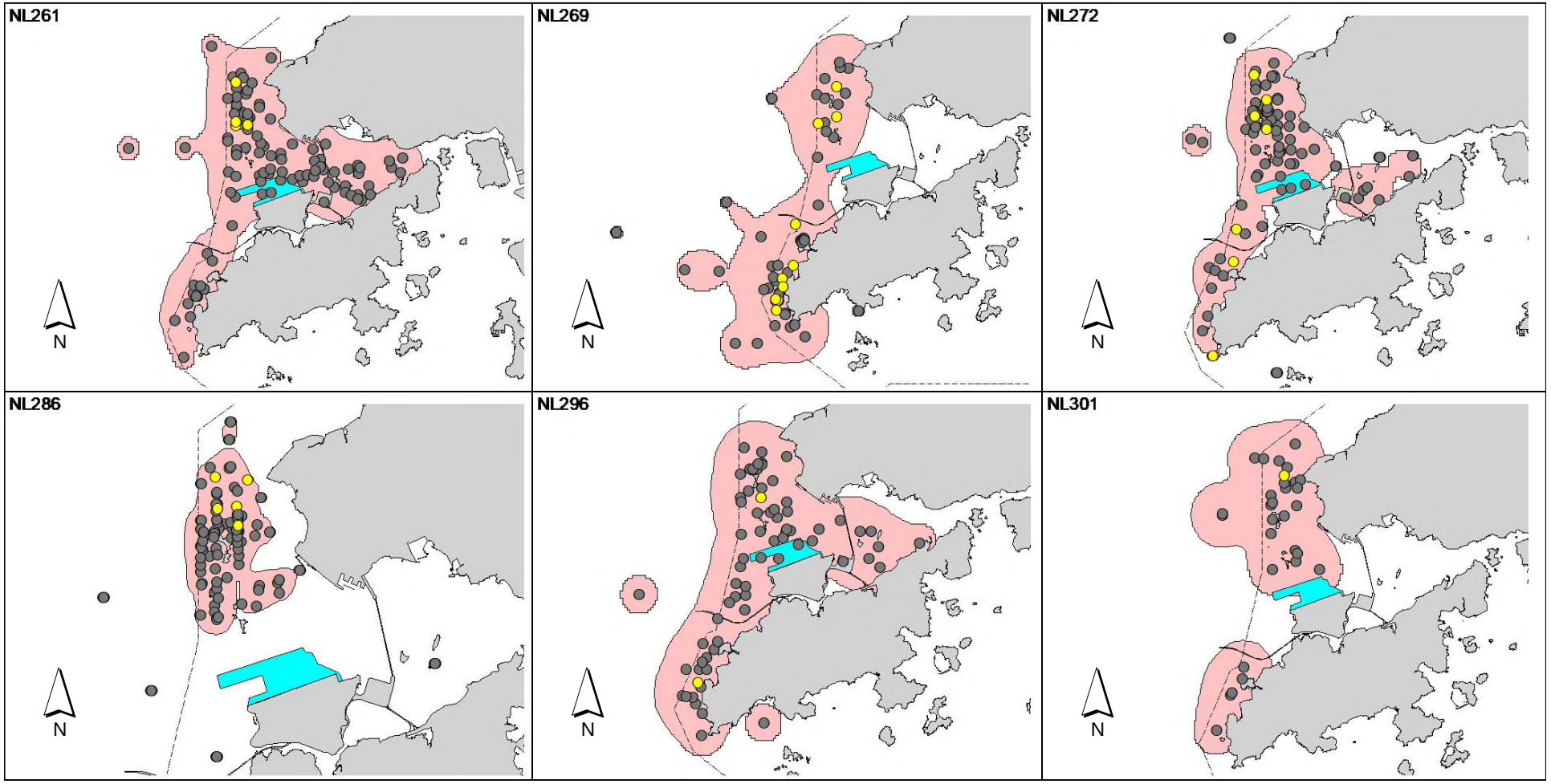
Appendix IV. (cont'd)



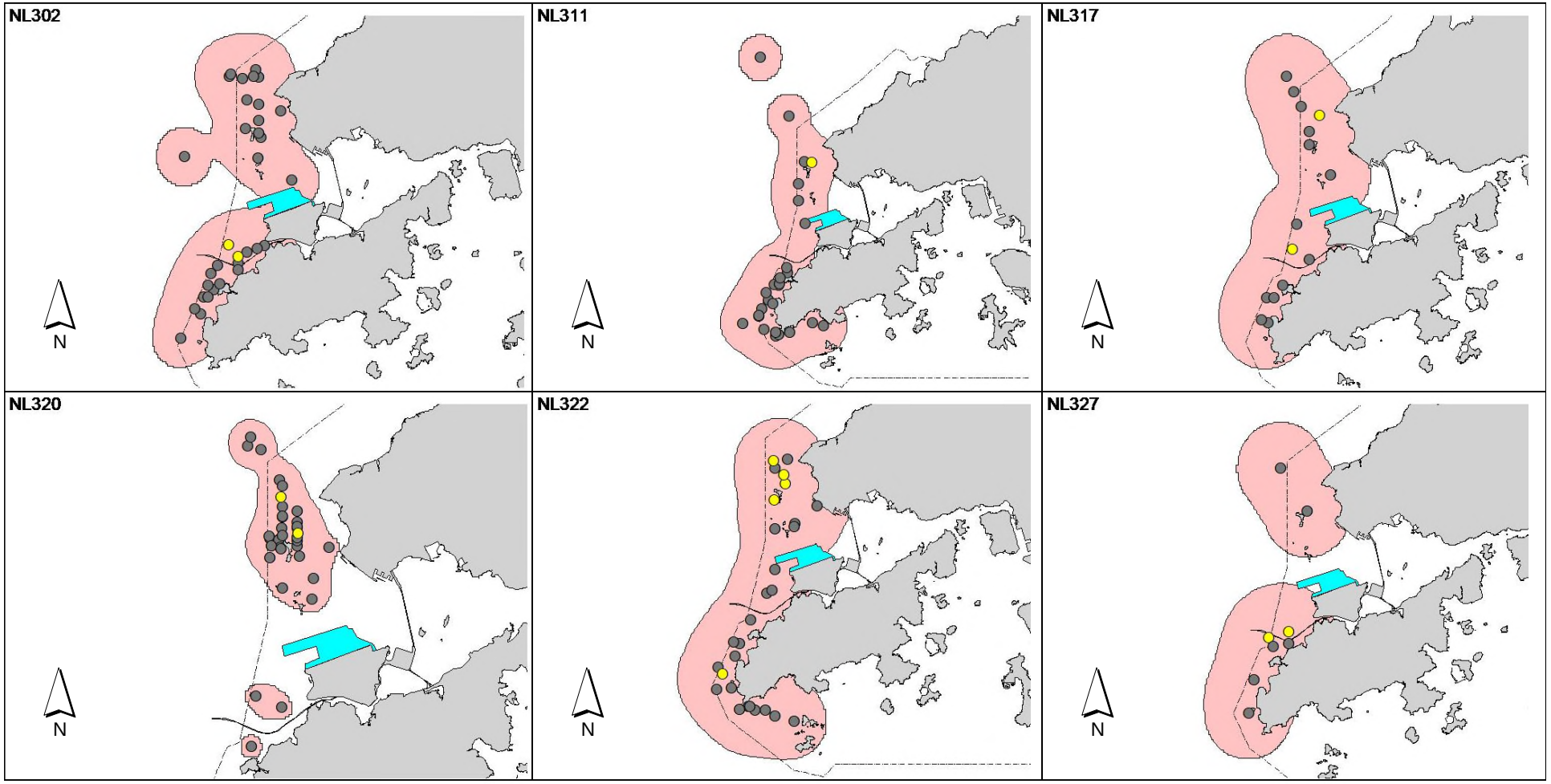
Appendix IV. (cont'd)



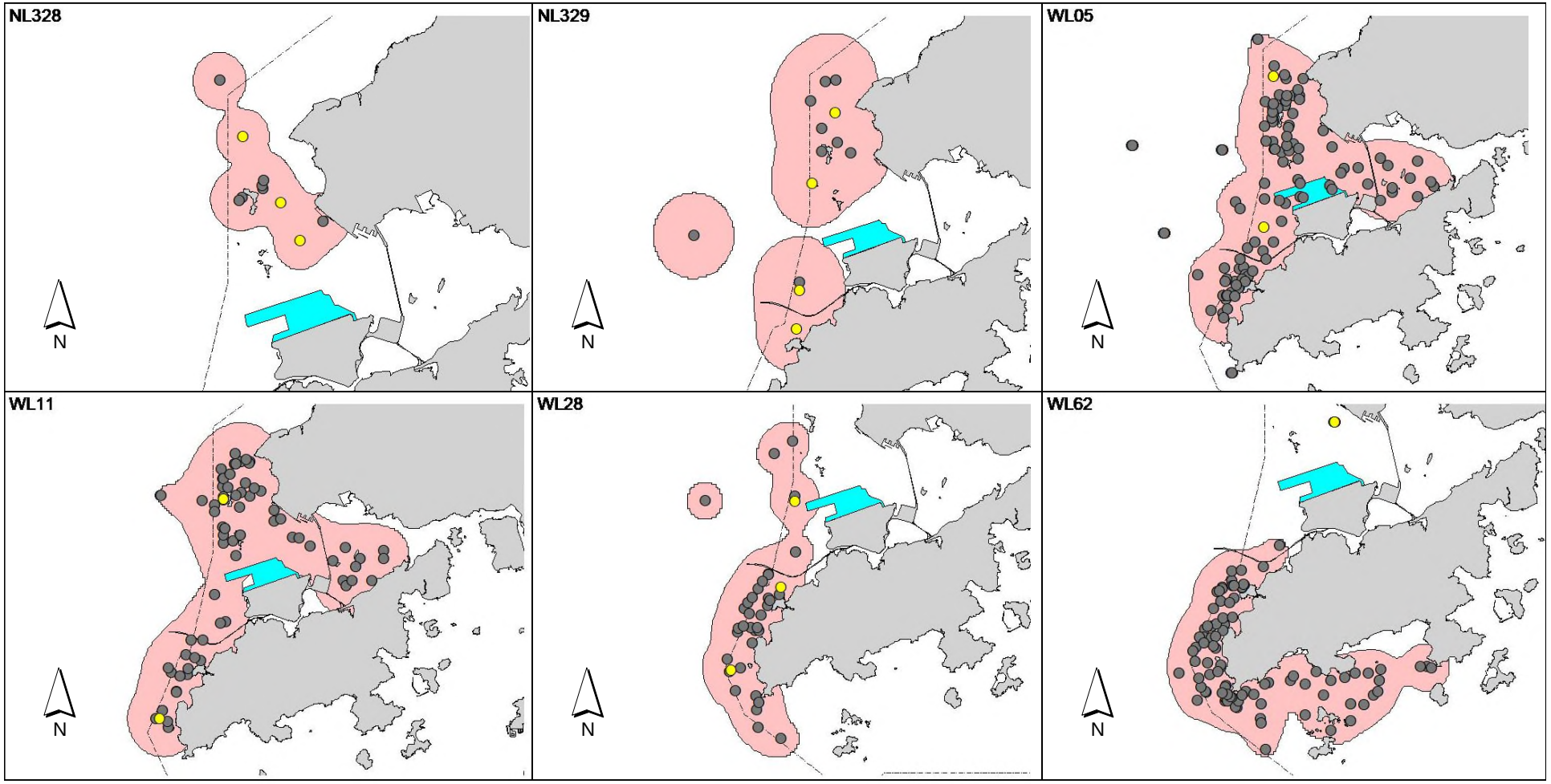
Appendix IV. (cont'd)



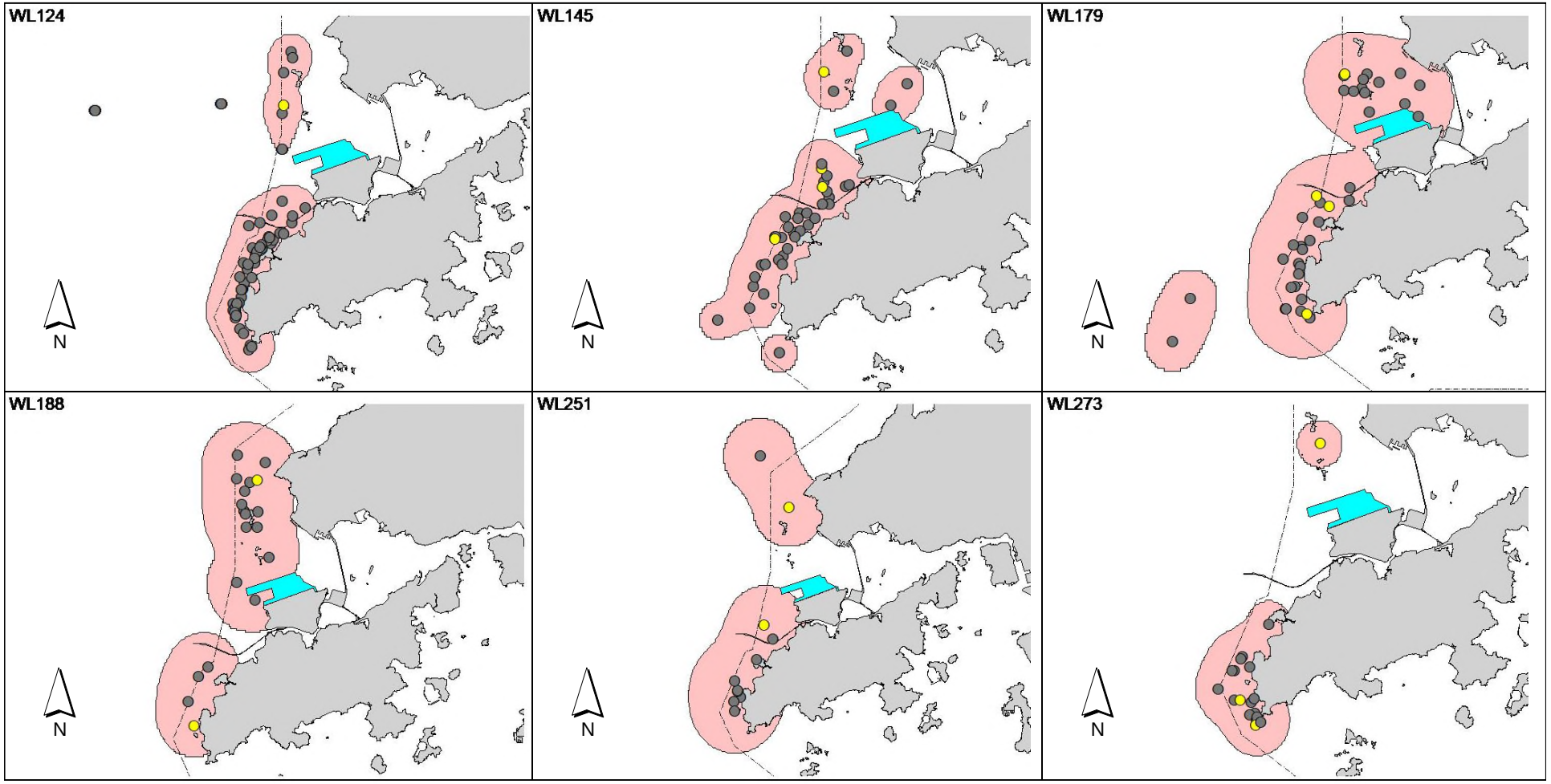
Appendix IV. (cont'd)



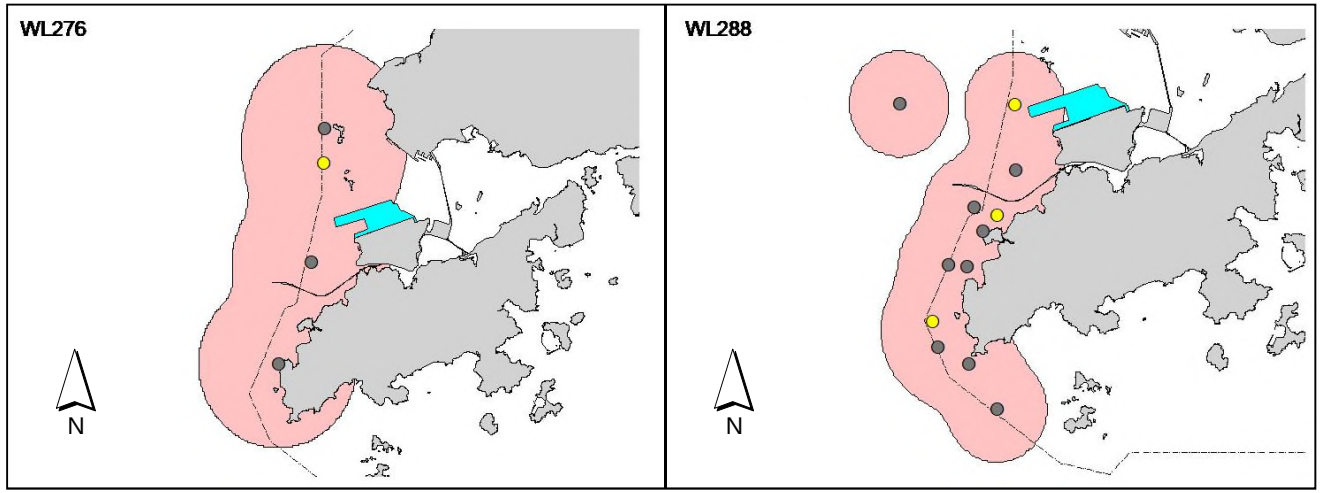
Appendix IV. (cont'd)

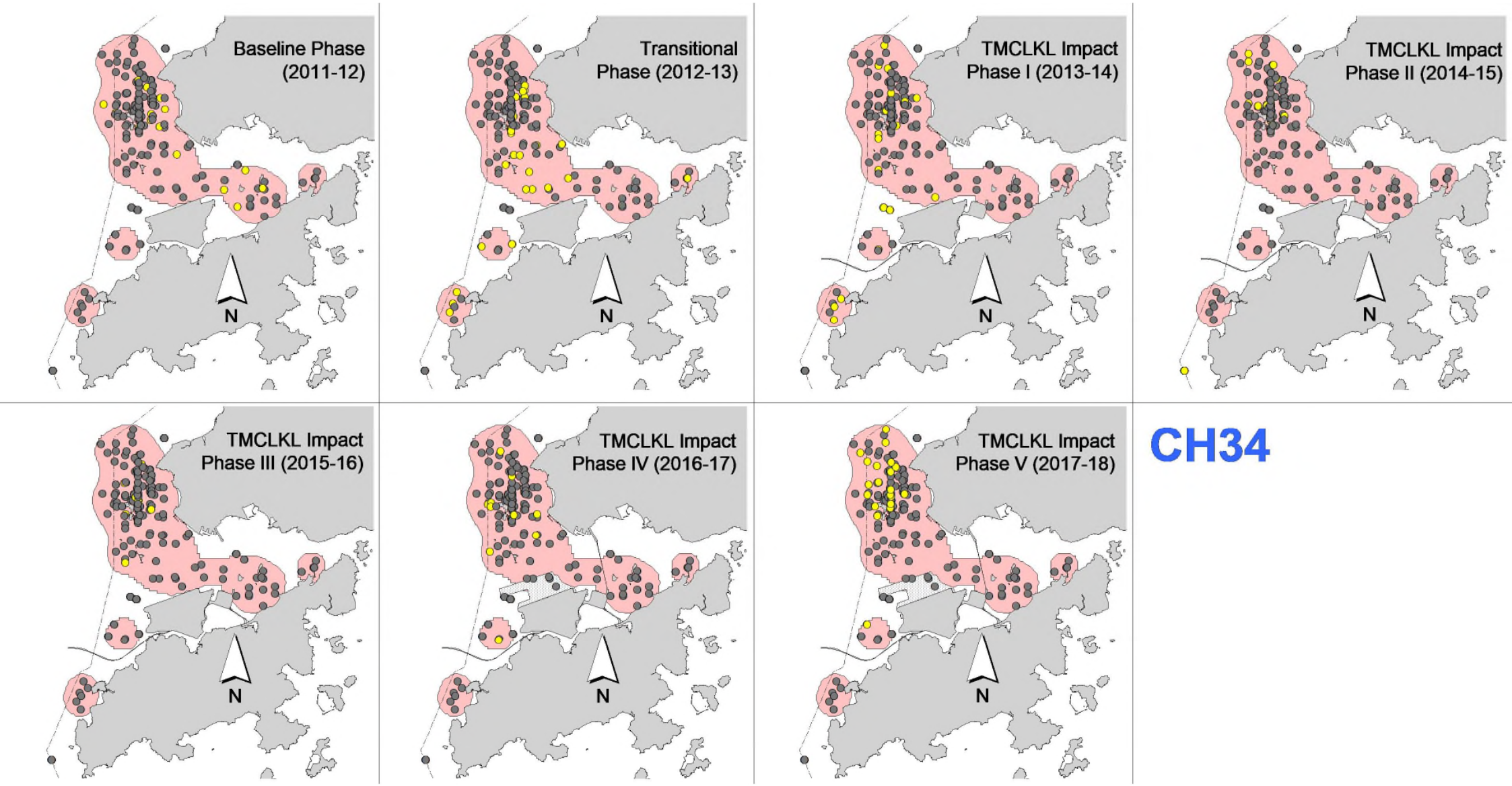


Appendix IV. (cont'd)

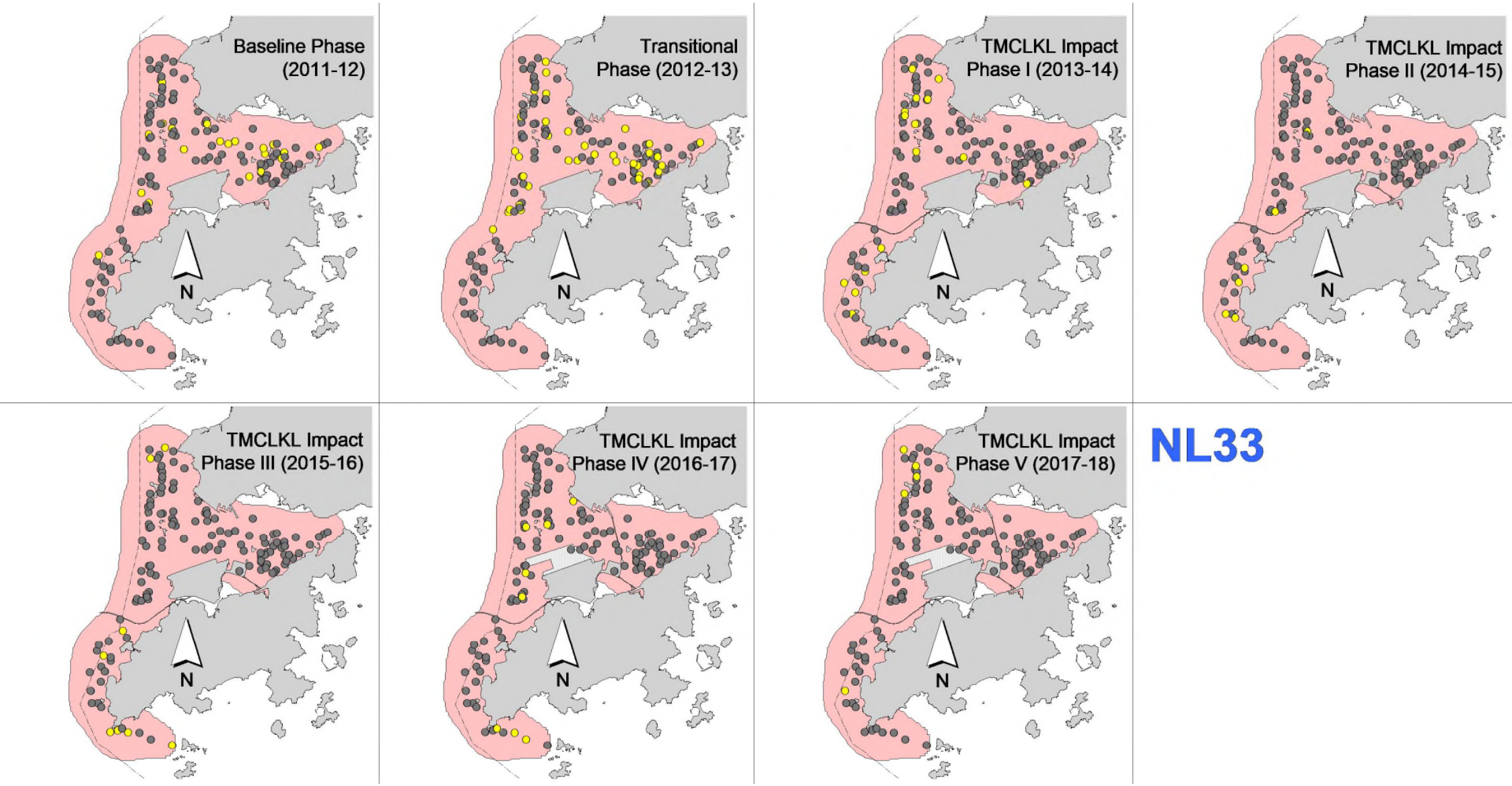


Appendix IV. (cont'd)

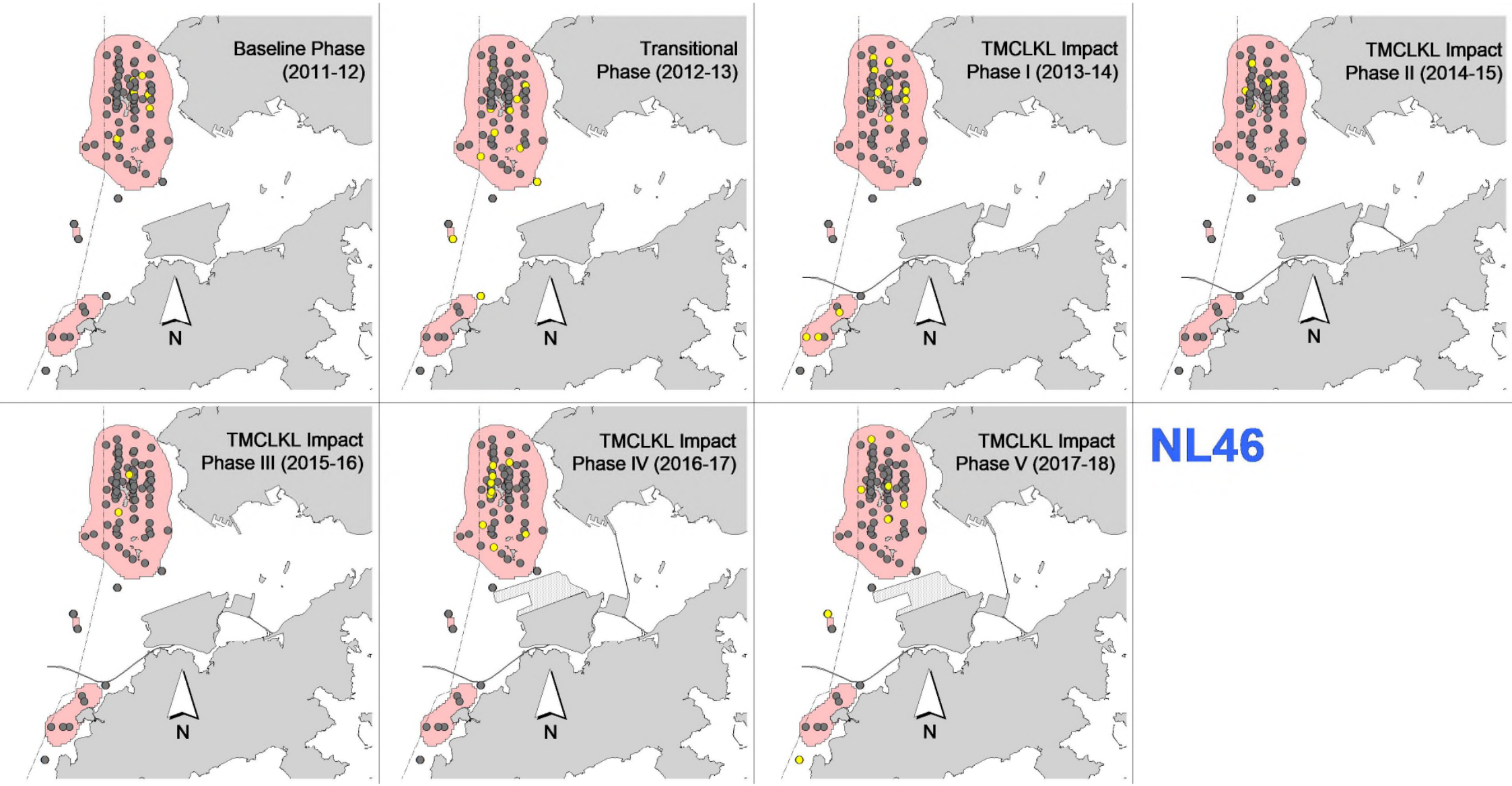




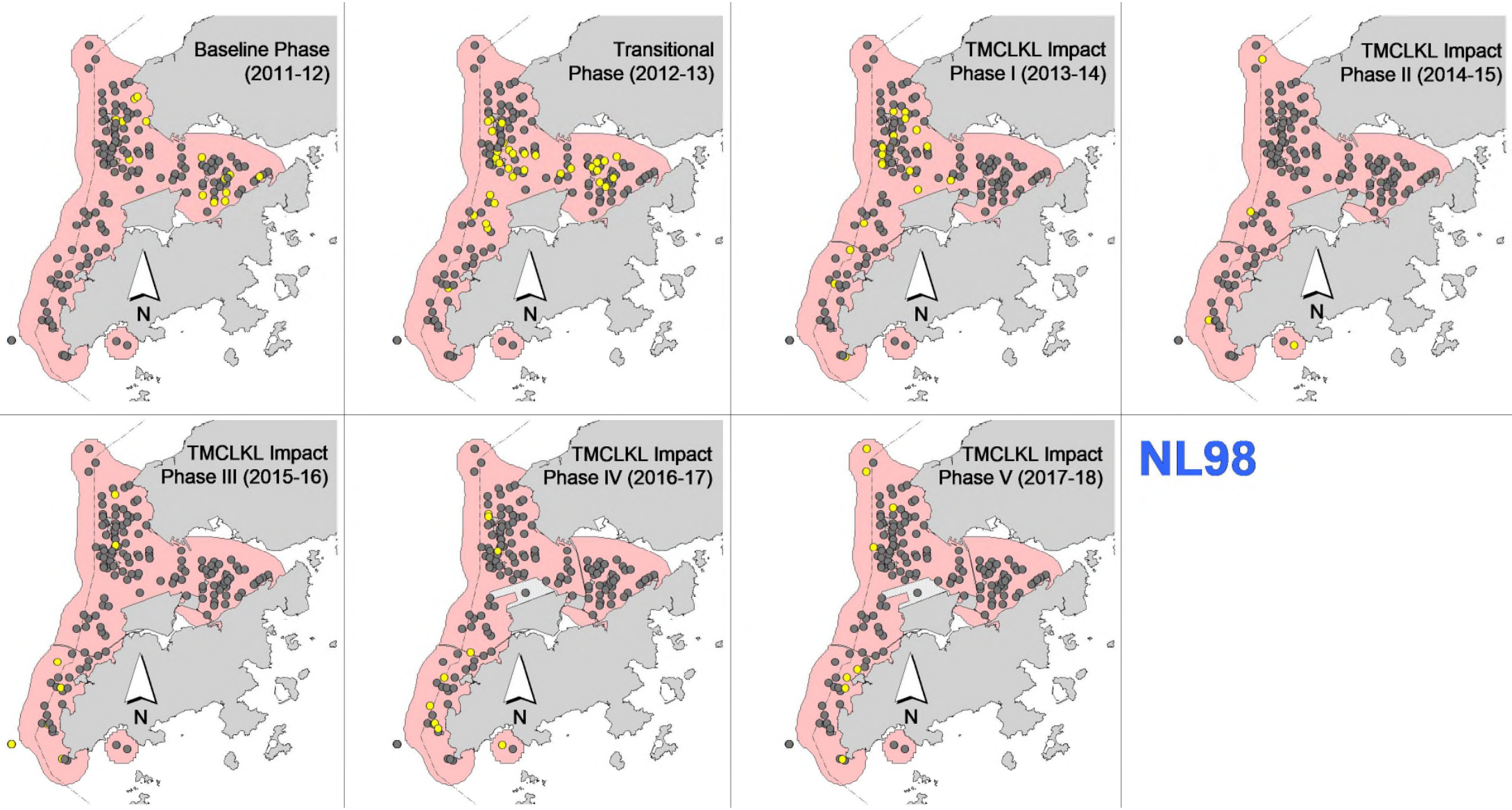
Appendix V. Temporal changes in range use patterns of 13 individual dolphins during baseline, transitional & five impact phases of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)



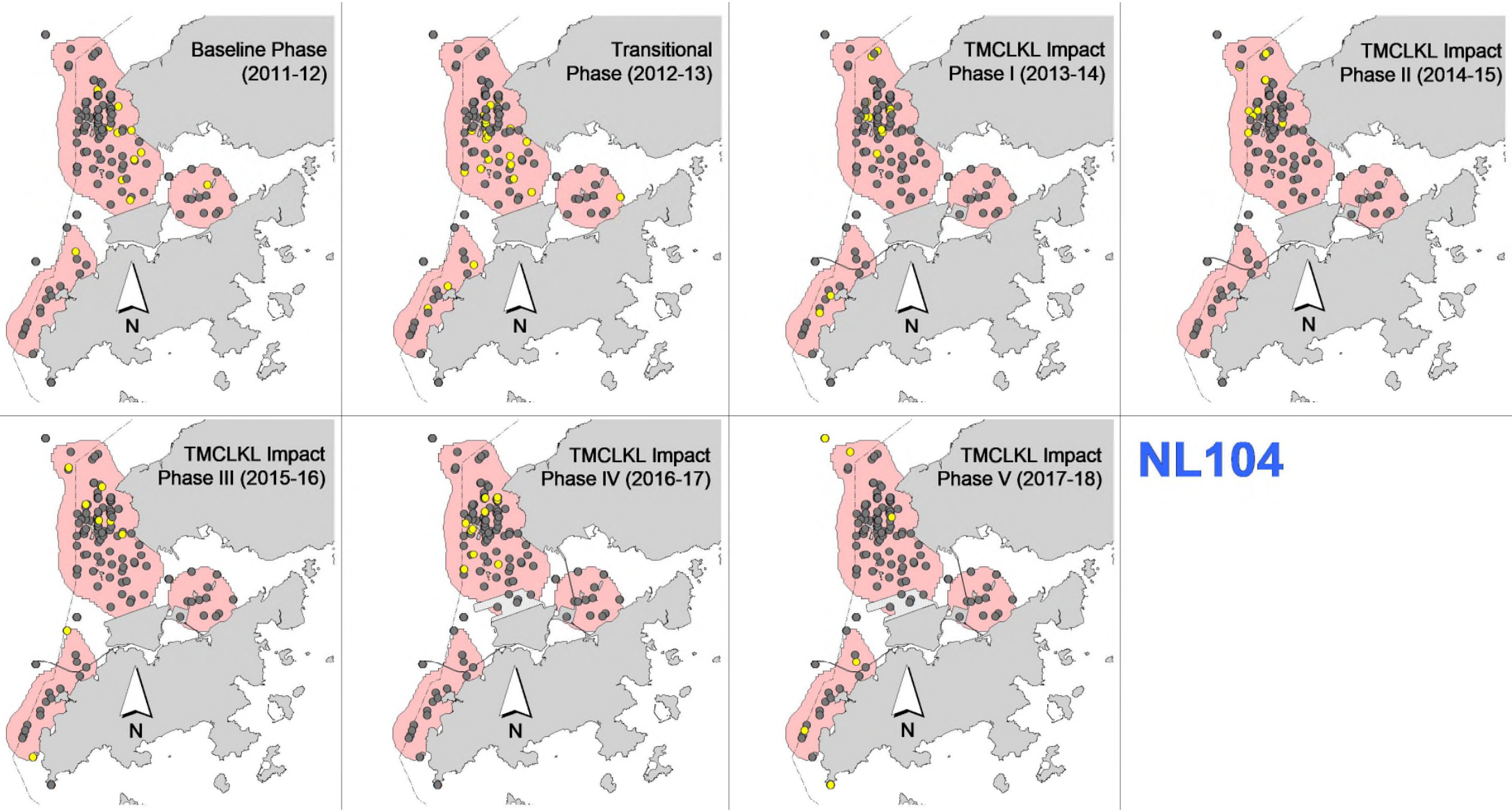
Appendix V. (cont'd)



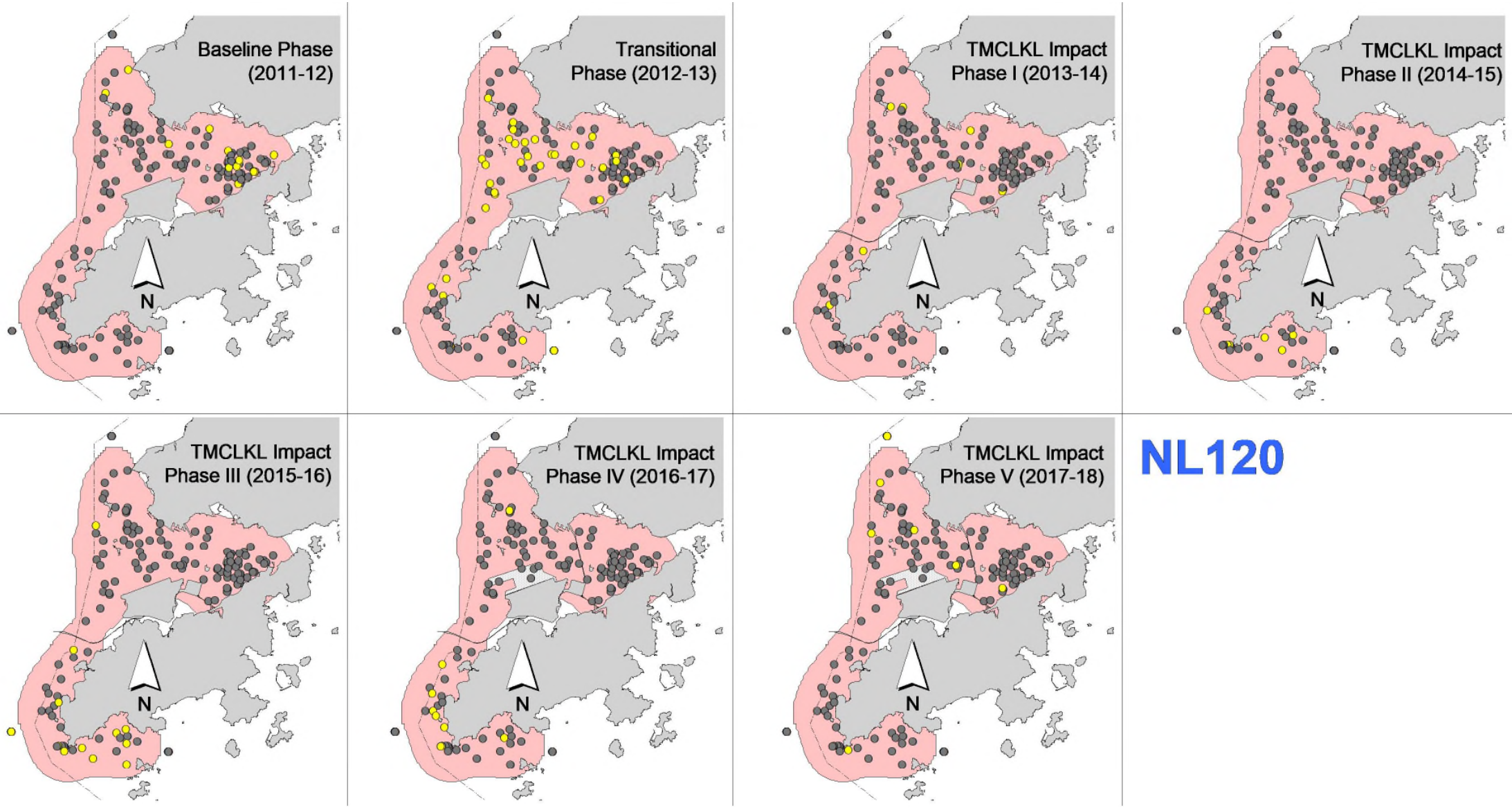
Appendix V. (cont'd)



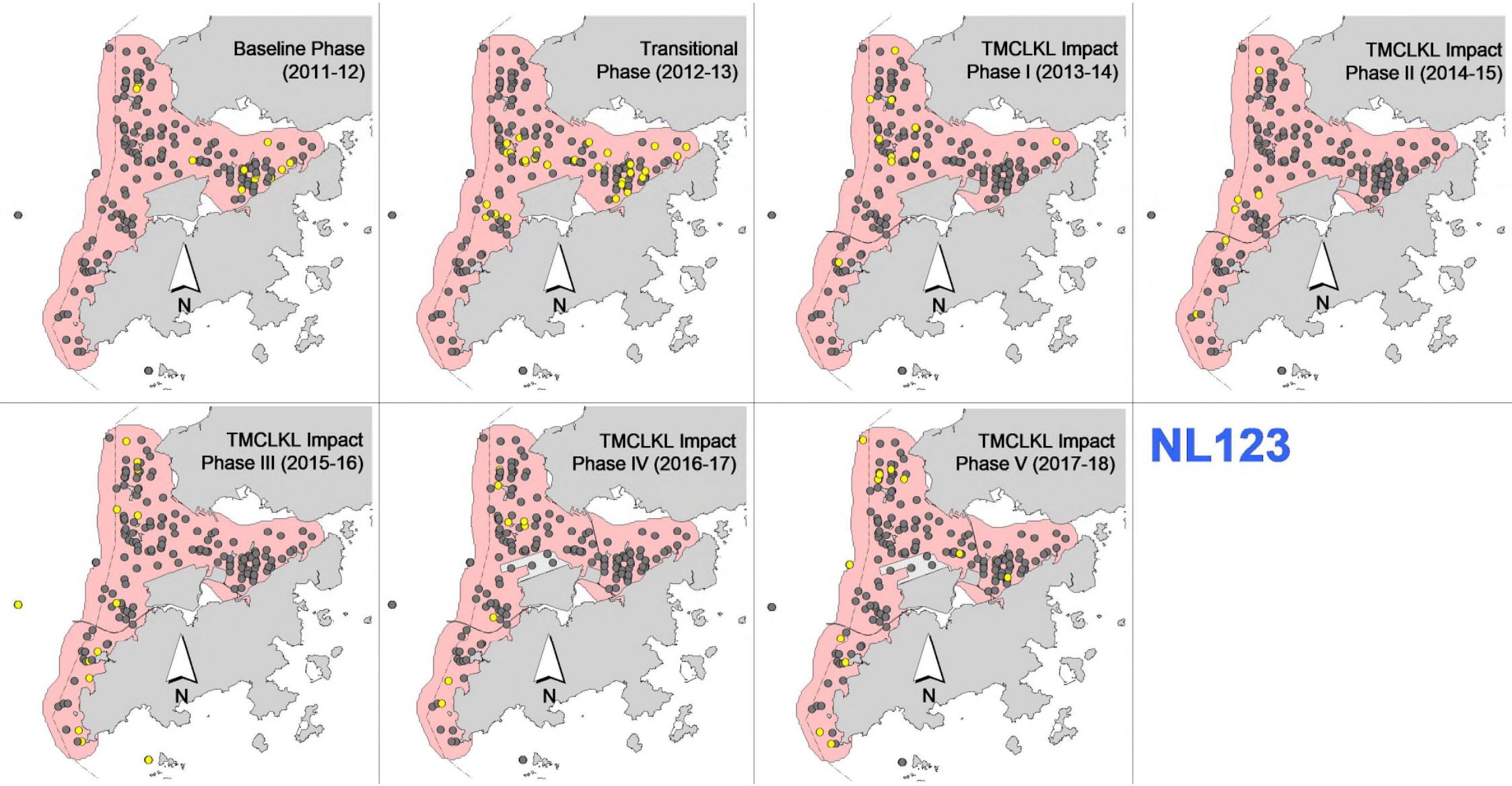
Appendix V. (cont'd)



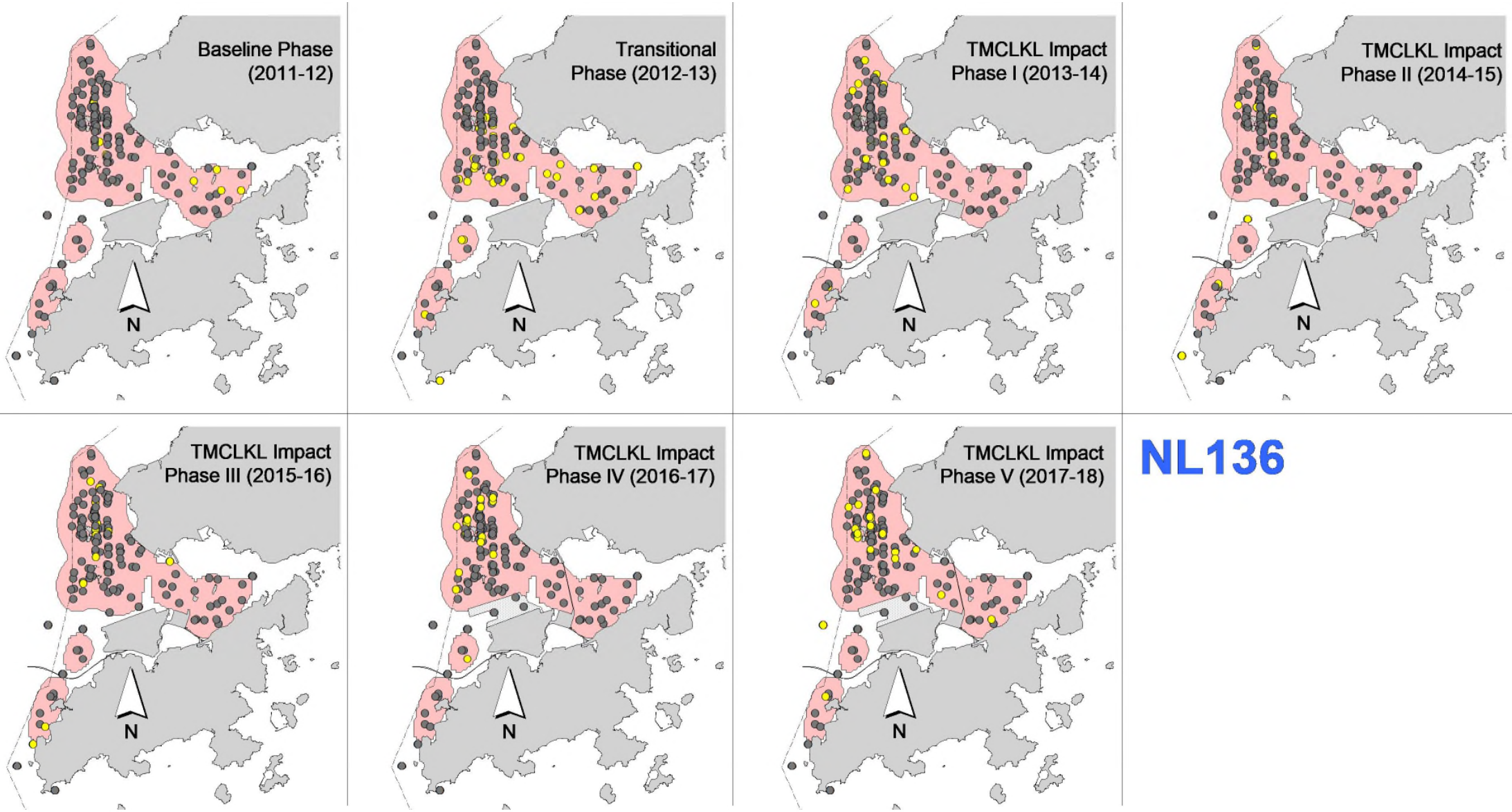
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



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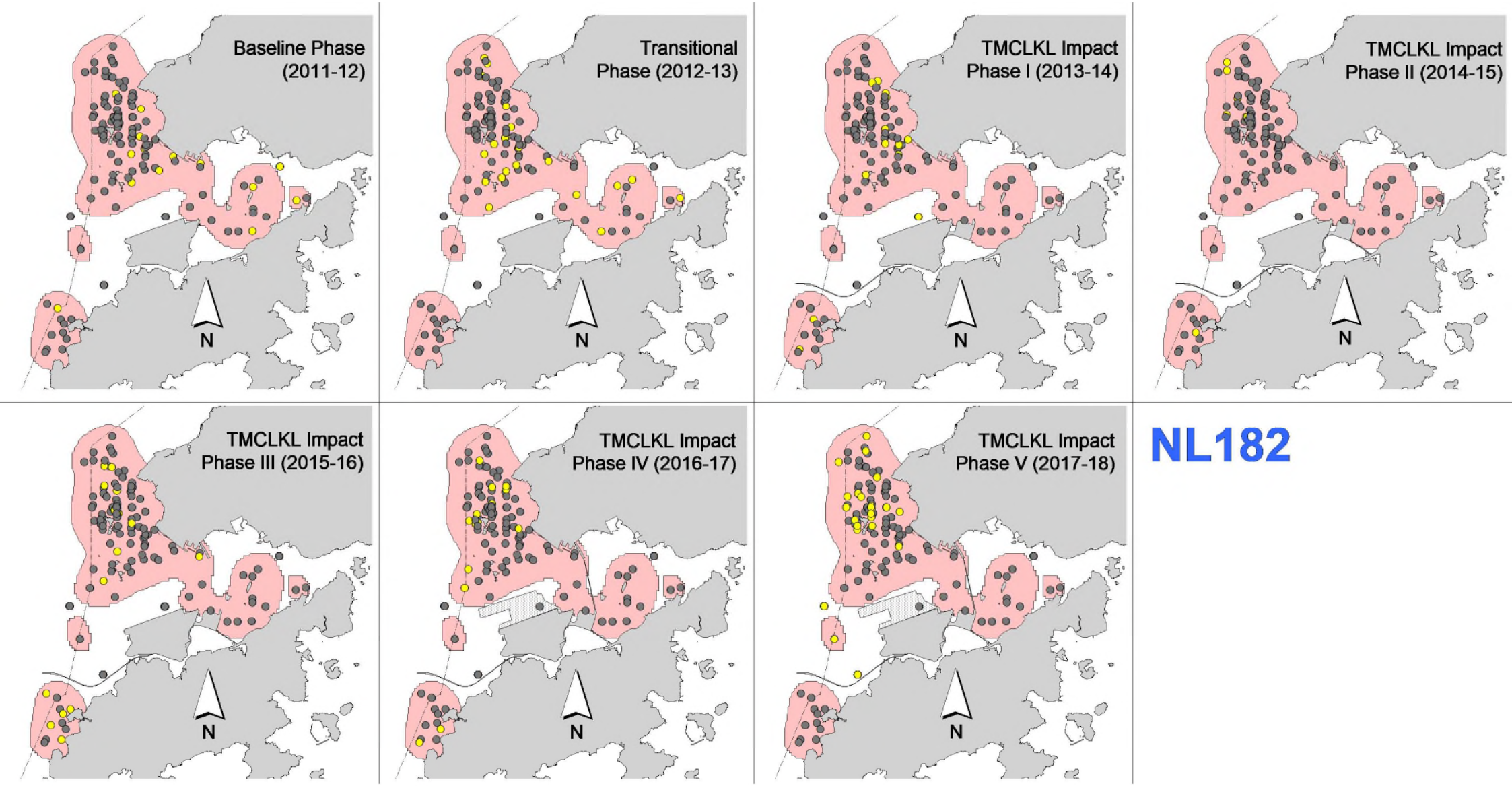
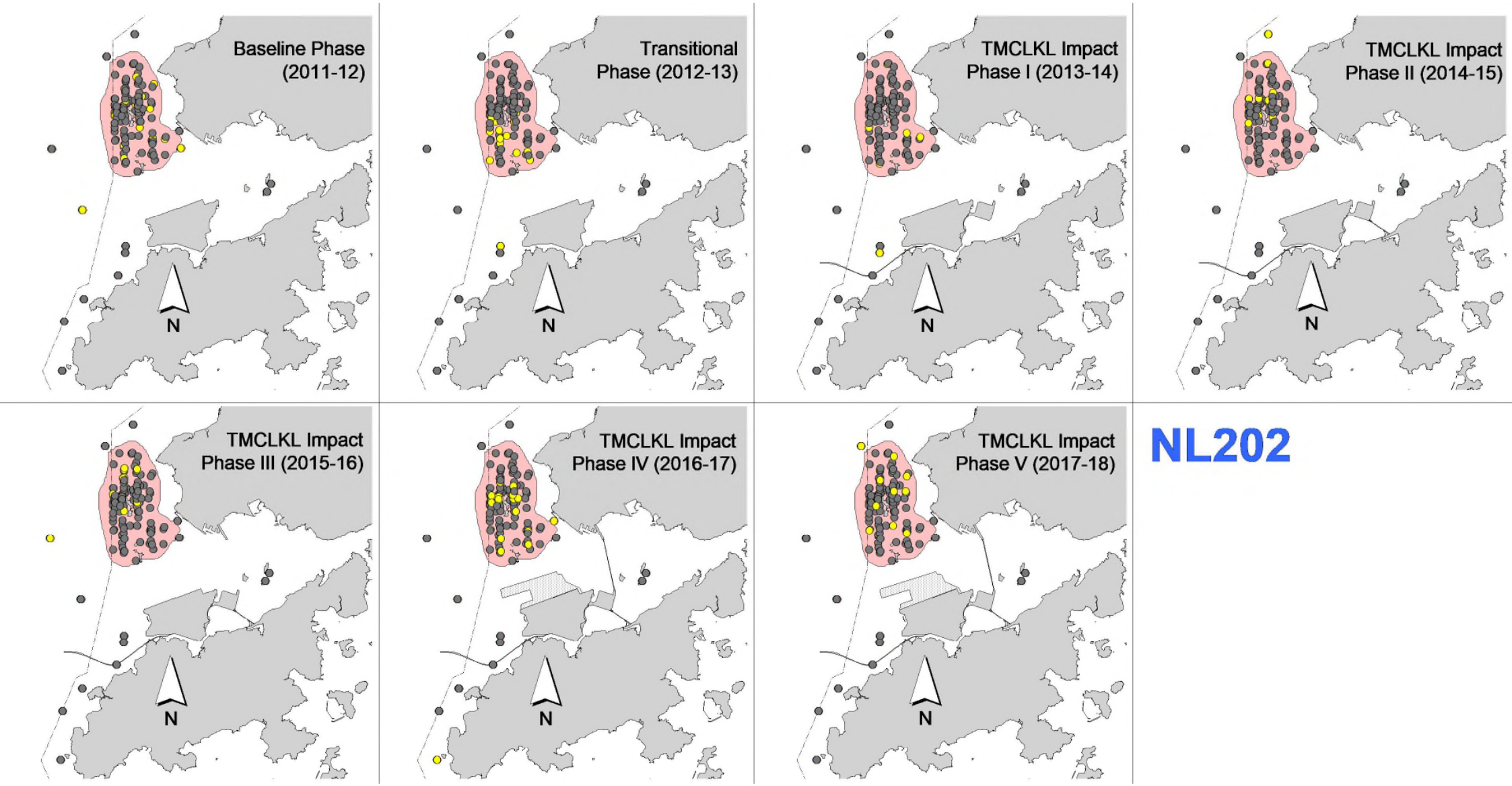
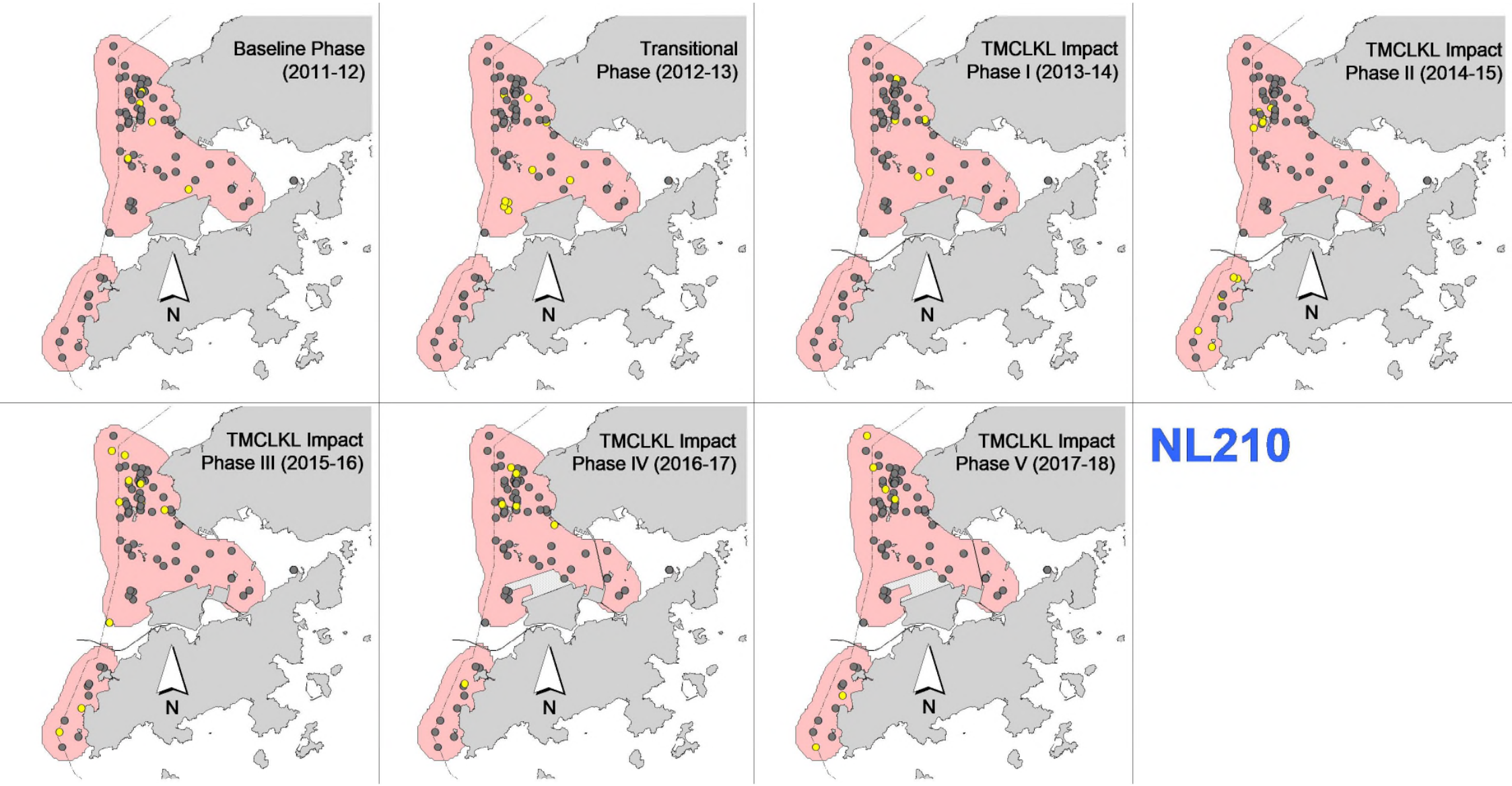


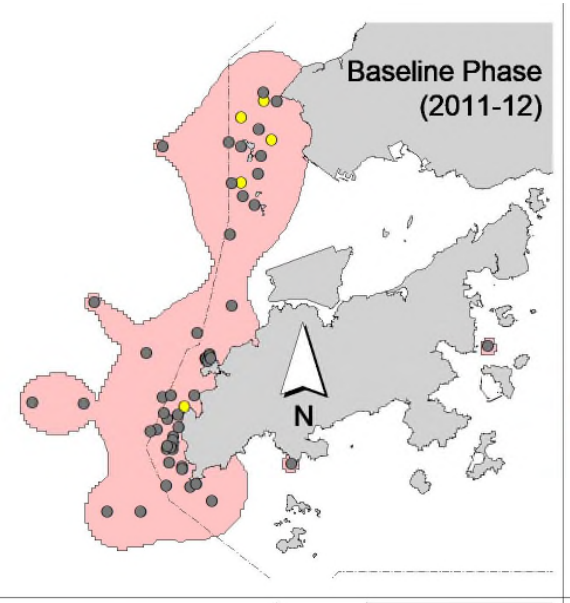
Appendix V. (cont'd)

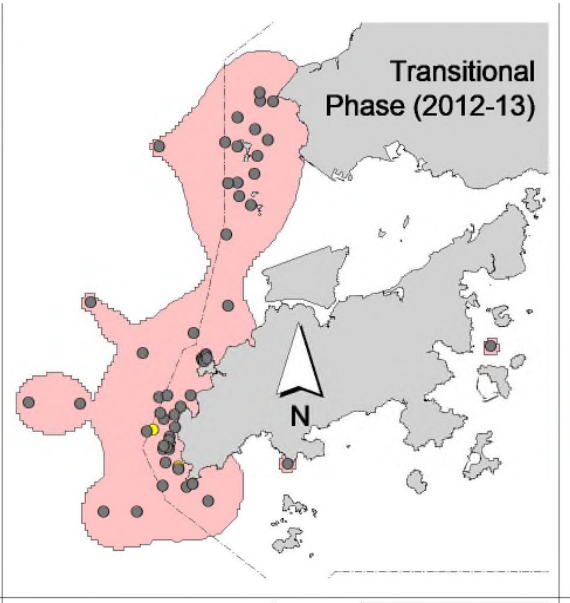


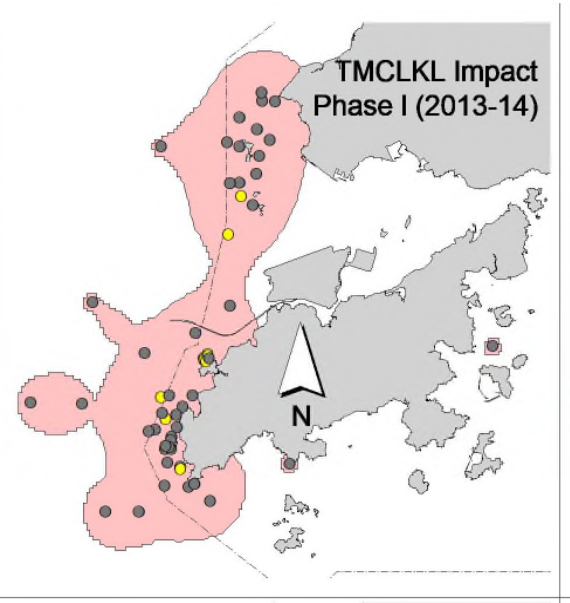
Appendix V. (cont'd)

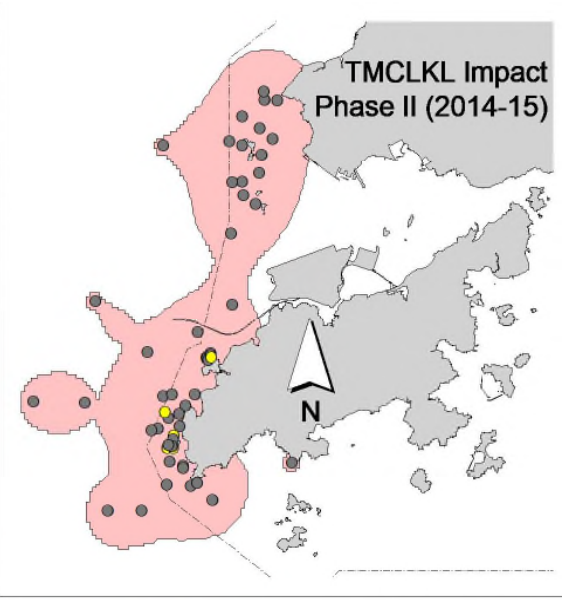


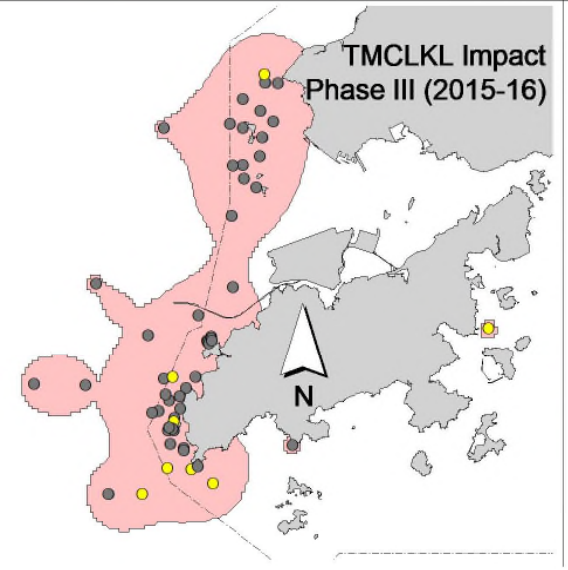
Appendix V. (cont'd)

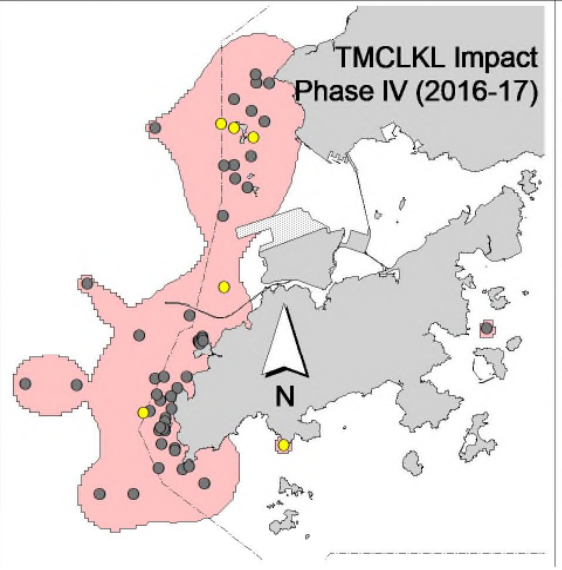


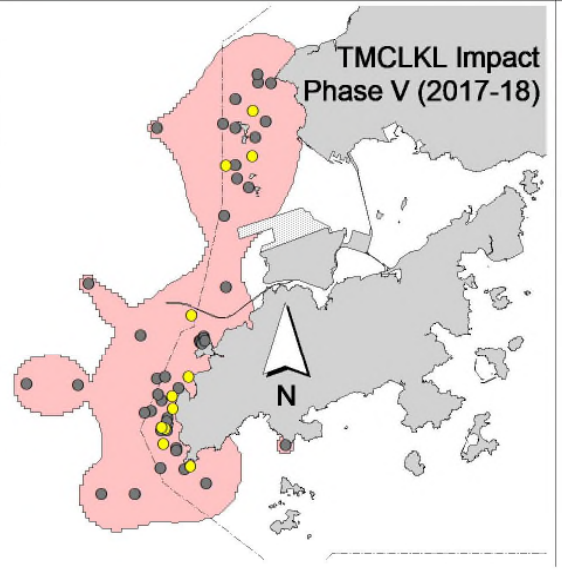






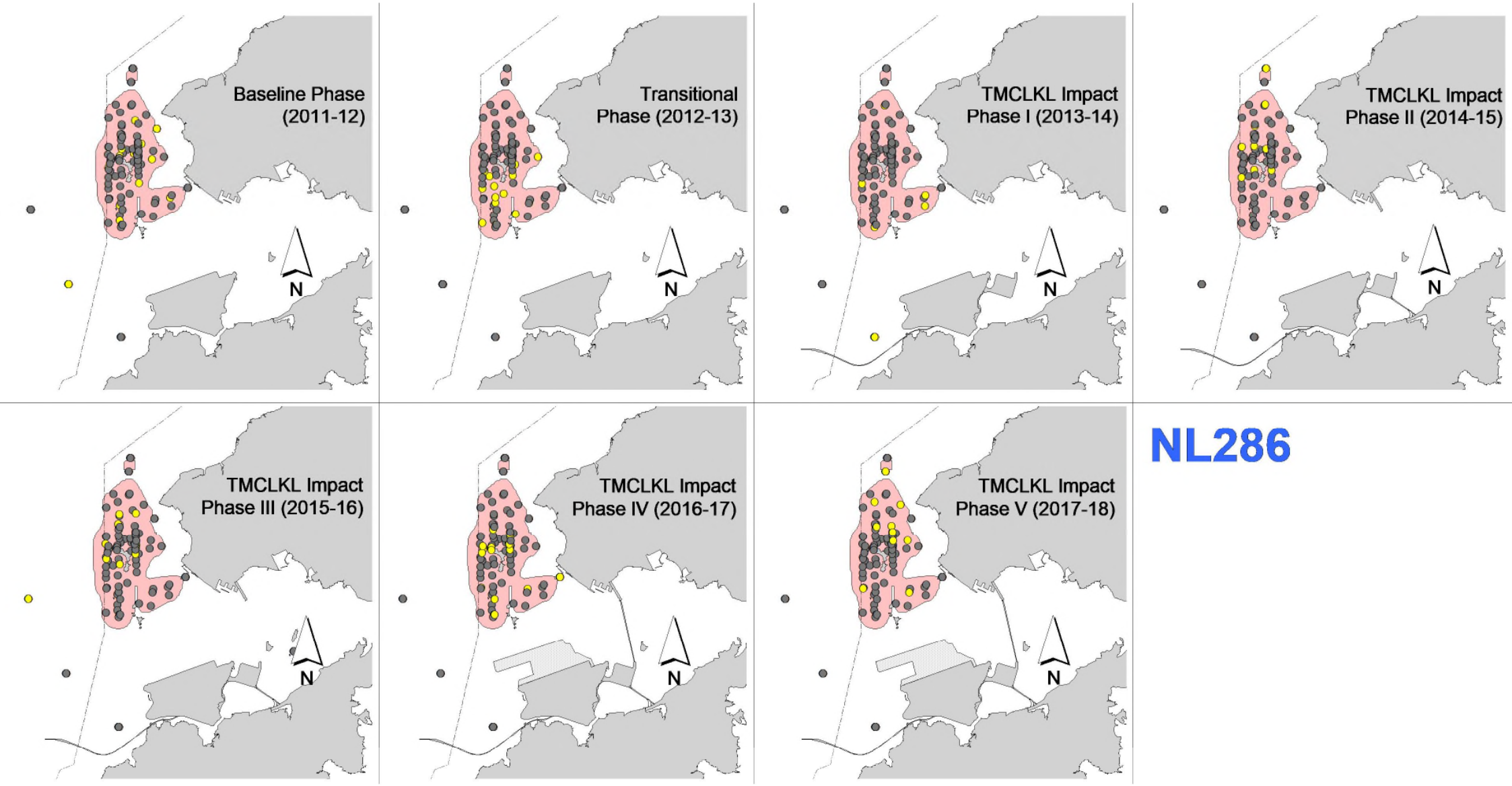






NL269

Appendix V. (cont'd)



Appendix V. (cont'd)

Appendix H

Event Action Plan

AppendixH1 Event/ Action Plan for Air Quality

	ACTION			
EVENT	**ET [(1)]**	**IEC [(1)]**	**SOR[(1)]**	**Contractor**
Action Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the IEC and the SOR. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	1. Identify the source. 2. Inform the IEC and the SOR. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Discuss with the IEC and the Contractor on remedial actions required. 6. If exceedance continues, arrange meeting with the IEC and the SOR. 7. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial actions to IEC within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate

	ACTION			
EVENT	**ET** [(1)]	**IEC** [(1)]	**SOR** [(1)]	**Contractor**
Limit Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the SOR and the DEP. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 5. Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures are properly implemented.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Notify the IEC, the SOR, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 6. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 7. Assess effectiveness of the Contractor's remedial actions	1. Discuss amongst the SOR, ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 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.	1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

and keep the IEC, the DEP and the SOR informed of the results. 8. If the exceedance stops, cease additional monitoring.	

Appendix H2 Event/ Action Plan for Construction Noise

	ACTION			
EVENT	**ET**	**IEC**	**SOR**	**Contractor**
Action Level	1. Notify the IEC and the Contractor. 2. Carry out investigation. 3. Report the results of investigation to the IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC 2. Implement noise mitigation proposals
Limit Level	1. Notify the IEC, the SOR, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurement to confirm findings. 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform the IEC, the SOR and the DEP the causes & actions taken for the exceedances. 7. 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 additional monitoring.	1. Discuss amongst the SOR, the ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 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.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Appendix H3 Event/ Action Plan for Water Quality

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

Event	ET Leader	IEC	SOR	Contractor
	2. Identify source(s) of impact; 3. Inform IEC, contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor;	2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly.	2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to review the working methods.	2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 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 sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days;	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. 5. Ensure mitigation measures are properly implemented; 6. 7. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	1. Take immediate action to avoid further exceedance; 2. Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR; 3. Implement the agreed mitigation measures; 4. Resubmit proposals of mitigation measures if problem still not under control; 5. 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 H4 Implementation of Event-Action Plan for Dolphin Monitoring

Event	ET Leader	IEC	SOR	Contractor
Action Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SOR and Contractor; 5. Check monitoring data. 6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor.	1. Discuss monitoring with the IEC and any other measures proposed by the ET; 2. If SOR is satisfied with the proposal of any other measures, SOR to signify the agreement in writing on the measures to be implemented.	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.

Event	ET Leader	IEC	SOR	Contractor
Limit Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, ER/SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary; 7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor; 3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures; 4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise ER/SOR of the results and findings accordingly; 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.	1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures; 2. If ER/SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures; 3. Supervise the implementation of additional monitoring and/or any other mitigation measures.	1. Inform the ER/SOR and confirm notification of the non- compliance in writing; 2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures; 3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary; 4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.

Appendix H5 Event and Action Plan on Dolphin Acoustic Behaviour

EVENT	ACTION			
	ET Leader	**IEC**	**SO**	**Contractor**
Action Level With the numerical values presented in *Table 5.7* of *Baseline Monitoring Report*, 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 *Table 5.8* of *Baseline Monitoring Report*), 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	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SO and Contractor; 5. Check monitoring data; 6. Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring with the ET and the Contractor;	1. Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; 2. Make agreement on measures to be implemented.	1. Inform the SO and confirm notification of the non- compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SO; 3. Implement the agreed measures.

EVENT	ACTION			
	ET Leader	**IEC**	**SO**	**Contractor**
Limit Level With the numerical values presented in Table 5.7 of *Baseline Monitoring Report*, 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 Table 5.8 of *Baseline Monitoring Report*), 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	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data to ascertain if differences are as a result of natural variation or seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SO and Contractor; 5. Check monitoring data; 6. Carry out audit to ensure all dolphin protective measures are implemented fully and additional measures be proposed if necessary 7. 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.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring with the ET and the Contractor; 3. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise ER accordingly.	1. Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; 2. Make agreement on measures to be implemented.	1. Inform the SO and confirm notification of the non- compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SO; 3. Implement the agreed measures.

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

Appendix I

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 2017 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation						Actual Quantities of Recyclables Generation			
	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
	sub-total	sub-total	sub-total	sub-total	sub-total	sub-total										
Location																
Density (ton/m^3)															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	4.591	0.717	0.474	-	4.118	-	-	-	-	-	3.521	99.840	-	-	0.140	-
Feb	5.034	1.585	0.166	-	4.869	-	0.857	-	-	-	-	127.720	-	-	0.091	-
Mar	6.575	0.937	0.498	-	6.077	-	0.771	-	-	-	6.000	87.910	-	-	0.077	-
Apr	5.467	0.791	1.058	-	4.409	-	-	-	-	-	-	130.680	-	5.170	0.063	-
May	4.960	0.537	0.826	-	4.134	-	0.672	-	-	-	-	171.870	-	-	0.056	-
Jun	4.491	0.567	0.098	-	4.394	-	-	-	-	-	-	148.600	-	-	0.063	-
SUB-TOTAL	**31.118**	**5.133**	**3.118**	**-**	**28.000**	**0.000**	**2.300**	**-**	**-**	**-**	**9.521**	**766.620**	**-**	**5.170**	**0.490**	**-**
Jul	5.618	0.426	0.696	0.002	4.921	-	1.056	-	-	-	0.800	159.980	-	-	0.091	-
Aug	3.897	0.232	-	-	3.897	-	-	-	-	-	-	159.230	-	-	0.056	-
Sep	3.142	0.676	-	-	3.142	-	1.517	1.047	-	0.127	-	185.420	-	18.030	0.070	-
Oct	3.239	0.385	0.559	-	2.680	-	-	-	-	-	-	172.690	-	-	0.063	-
Nov	3.354	0.814	0.023	-	3.331	-	-	-	-	-	5.400	159.650	-	5.840	0.028	-
Dec	3.054	0.755	0.160	0.004	2.890	-		-	-	-	2.400	181.710	-	15.580	0.056	-
TOTAL	**53.422**	**8.422**	**4.555**	**0.006**	**48.861**	**-**	**4.873**	**1.047**	**-**	**0.127**	**18.121**	**1,785.300**	**-**	**44.620**	**0.854**	**-**

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 2018 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation						Actual Quantities of Recyclables Generation			
	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	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	-	0.000	-	-	-	-	-	-	-	-			-			-
Dec	-	0.000	-	-	-	-	-	-	-	-			-			-
TOTAL	**35.040**	**6.234**	**7.153**	**0.233**	**18.762**	**8.893**	**-**	**-**	**-**	**-**	**11.200**	**4,094.200**	**-**	**91.920**	**0.644**	**-**

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.

Appendix J

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

Appendix J1 Cumulative Statistics on Exceedances

		Total No. recorded in this reporting period	**Total No. recorded since contract commencement**
1-Hr TSP	Action	0	0
	Limit	1	1
24-Hr TSP	Action	0	2
	Limit	0	0
Noise	Action	0	0
	Limit	0	0
Water Quality	Action	96	224
	Limit	9	24
Impact Dolphin Monitoring	Action	2	11
	Limit	4	13

Appendix J2 Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	**Cumulative Statistics**		
	Complaints	Notifications of Summons	Successful Prosecutions
This Reporting Period (Nov 2017 – Oct 2018)	4	0	0
Total No. received since contract commencement	14	0	0