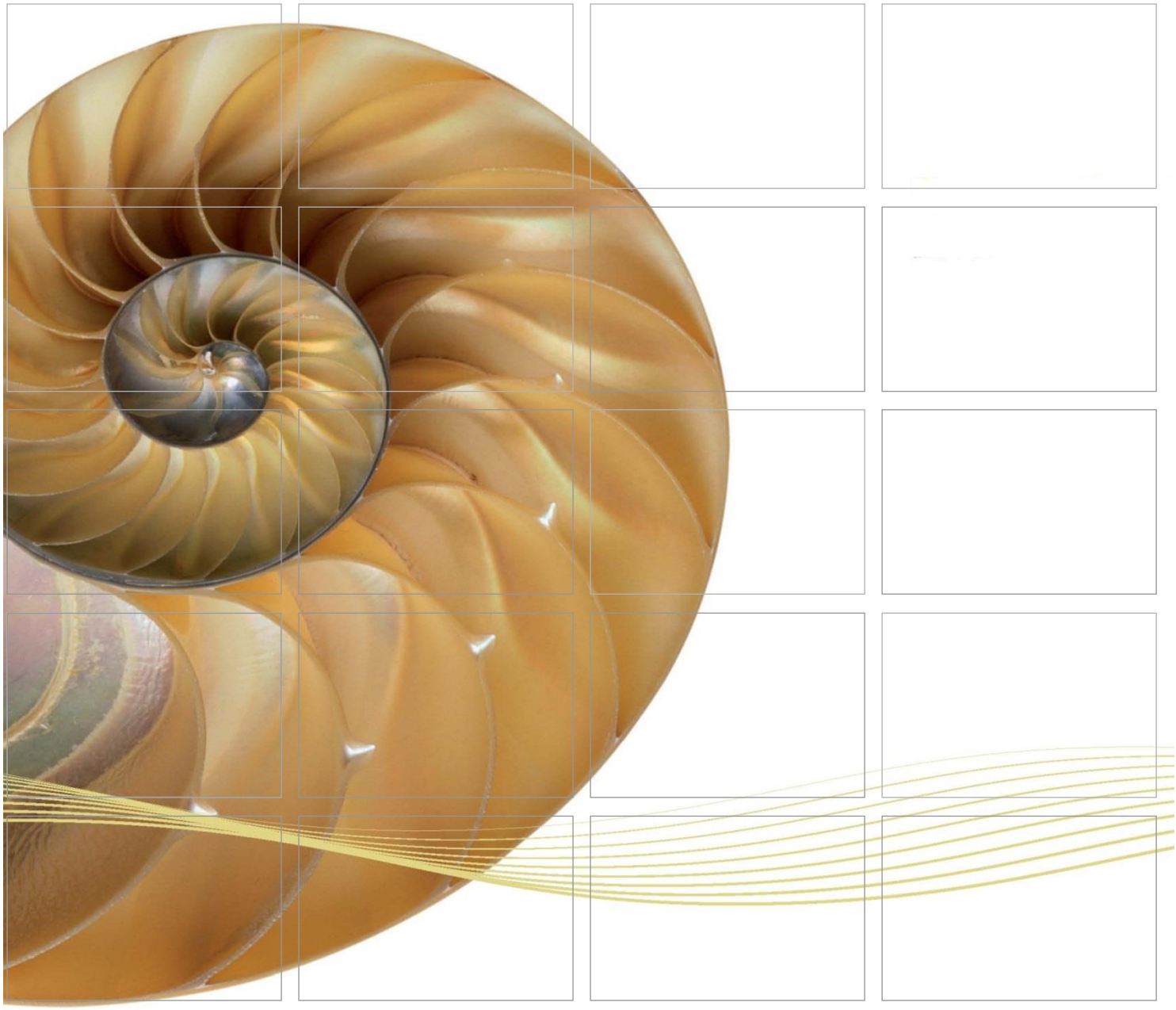
Report



Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

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

18 May 2017

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

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The business of sustainability

RAMBOLL ENVIRON

Ref.: HYDHZMBEEM00_0_5396L.17 19 May 2017

AECOM By Fax (2293 6300) and By Post
Supervising Officer Representative's Office
No.8 Mong Fat Street, Tuen Mun,
New Territories, Hong Kong

Attention: Messrs. Andy Westmoreland / Roger Man

Dear Sirs,

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/2012/08 TM-CLKL Northern Connection Sub-sea Tunnel Section
Second Annual EM&A Report

Reference is made to the Second Annual Environmental Monitoring and Audit (EM&A) Report (Nov. 2014 – Oct. 2015) (ET's ref.: "*0212330_2nd Annual EM&A_20170518.doc*" dated 18 May 2017) certified by the ET Leader and provided to us via e-mail on 18 May 2017.

Please be informed that we have no further comments on the captioned Report. However, as mentioned in our letter for the First Annual EM&A Report (our ref. HYDHZMBEEM00_0_4359L.16), 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.

Yours sincerely,

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

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\2017\HYDHZMBEEM00_0_5396L.17.docx

Ramboll Environ 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-Environ.com

RAMBOLL ENVIRON

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Vico Cheung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Dragages – Bouygues JV - Mr. C. F. Kwong (By Fax: 2293 7499)

Internal: DY, YH, PSC, ENPO Site

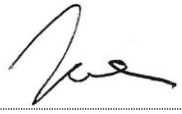
Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

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

Document Code: 0212330_2nd Annual EM&A_20170518.doc

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:
DBJV	0212330
Summary:	Date: 18 May 2017
This document presents the Second Annual EM&A Report for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.	Approved by:  *Mr Craig Reid* *Partner*
	Certified by:  *Mr Jovy Tam* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	2nd Annual EM&A Report	VAR	JT	CAR	18/05/17

Distribution

☐ Internal

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OHSAS 18001:2007 Certificate No. OHS 515956

ISO 9001 : 2008 Certificate No. FS 32515

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Under *Contract No. HY/2012/08*, Dragages – Bouygues Joint Venture (DBJV) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Northern Connection Sub-sea Tunnel 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) in accordance with *Environmental Permit No. EP-354/2009/A*. Ramboll Environ Hong Kong Limited was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO). Subsequent applications for variation of environmental permits (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 construction phase of the Project commenced on 1 November 2013 and will tentatively be completed by the end of 2018. The impact monitoring of the EM&A programme, including air quality, water quality, marine ecological monitoring and environmental site inspections, were commenced on 1 November 2013.

This is the Second Annual EM&A report presenting the EM&A works carried out during the period from 1 November 2014 to 31 October 2015 for the *Contract No. HY/2012/08 Northern Connection Sub-sea Tunnel Section* (the "Project") in accordance with the Updated EM&A Manual of the TM-CLK Link Project. As informed by the Contractor, the major activities in the reporting year included:

Construction Activities Undertaken
Marine-based Works
Marine Works Area – Portion N-A • Marine Sheet Piling for Box Culvert extension; and • Rock Bund Deposition for Marine Sheet Pile Remedial Works. Marine Works Area – Portion N-C • Reclamation filling; • Construction of Vertical Seawall and Sloping Seawall; and • TBM Tunnel Works.

Construction Activities Undertaken
Land-based Works
Works Area – Portion N-A • Excavation for North Launching Shaft; • Land Bored Piling Works; • Construction of temporary access; • Diaphragm Wall Construction; • TBM Platform Construction; • Formwork and Metal Scaffolding works; • Delivery & Assembly of TBM; • Land-based Sheet Piling Works; • Box Culvert Extension; and • Startup of TBM. Works Area – Portion N-B • TBM Tunnel Works. Works Area – Portion N-C • Surcharge set up; • Set up of Slurry Treatment Plant; • Surcharge Removal; • Diaphragm Wall Construction for Ventilation Shaft; • Excavation for Ventilation Shaft; • Construction of capping beam and base slab for Ventilation Shaft; • Installation of Tower Crane; and • Modification and Maintenance Works for Slurry Treatment Plant.

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

24-hour TSP Monitoring	121 sessions
1-hour TSP Monitoring	121 sessions
Impact Water Quality Monitoring	91 sessions
Impact Dolphin Monitoring	24 sessions
Joint Environmental Site Inspection	52 sessions

Implementation of Marine Mammal Exclusion Zone

Daily marine mammal exclusion zone was in effect during the period of dredging, reclamation or marine sheet piling works in open waters under this Contract. During daylight hours, monitoring was undertaken by dolphin observers using visual observation. Passive Acoustic Monitoring (PAM) was also implemented for the detection of marine mammal when dredging, reclamation or marine sheet piling works were carried out outside the daylight hours under this Contract. On 10 November 2014, night time marine works for first phase reclamation was completed. Thus, PAM was discontinued from 10 November 2014. As inform by the Contractor, dredging and filling works for Phase-I reclamation of Northern Landfall has been completed on 8 December 2014 and the rock bund deposition for marine

sheet pile remedial works was completed on 28 February 2015. Thus, the day-time monitoring of Dolphin Exclusion Zone (DEZ) by dolphin observers was suspended from 28 February 2015.

Summary of Breaches of Action/Limit Levels

Breaches of Action and Limit Levels for Air Quality

Four (4) Action Level exceedances for 1-hr TSP were recorded from the air quality monitoring in this reporting period. The exceedances were considered to be due to the sporadic events from cumulative anthropogenic activities in this area of Hong Kong.

Breaches of Action and Limit Levels for Water Quality

No Action Level or Limit Level exceedances were recorded from the water quality monitoring in this reporting period.

Dolphin Monitoring

Whilst two (2) Action Level exceedances and three (3) Limit Level exceedances were recorded for four (4) sets of quarterly dolphin monitoring data between September 2014 and August 2015, no unacceptable impact from the construction activities of the TM-CLKL Northern Connection Sub-sea Tunnel Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting period.

Environmental Complaints, Non-compliance & Summons

No non-compliance with EIA recommendations, EP conditions and other requirements associated with the construction of this Contract was recorded in this reporting period.

Two (2) environmental complaint cases were received in this reporting period. The interim reports were submitted to EPD and reported in the subsequent EM&A reports. The investigation findings showed that the cases were considered not related to the works under this Contract and were thus invalid.

No environmental summons was received in this reporting period.

Review of EM&A programme

The EM&A requirements have been reviewed and were considered as adequate and effective. No change to the requirements was considered to be necessary. The recommended environmental mitigation measures were also considered to be effective and efficient in reducing the potential environmental impacts associated with the construction of the Project. No change was thus considered necessary.

Overall, the EM&A results indicated that the Project has not caused unacceptable environmental impacts. This is in agreement with the assessment presented in the EIA Report.

1 INTRODUCTION

1.1 BACKGROUND

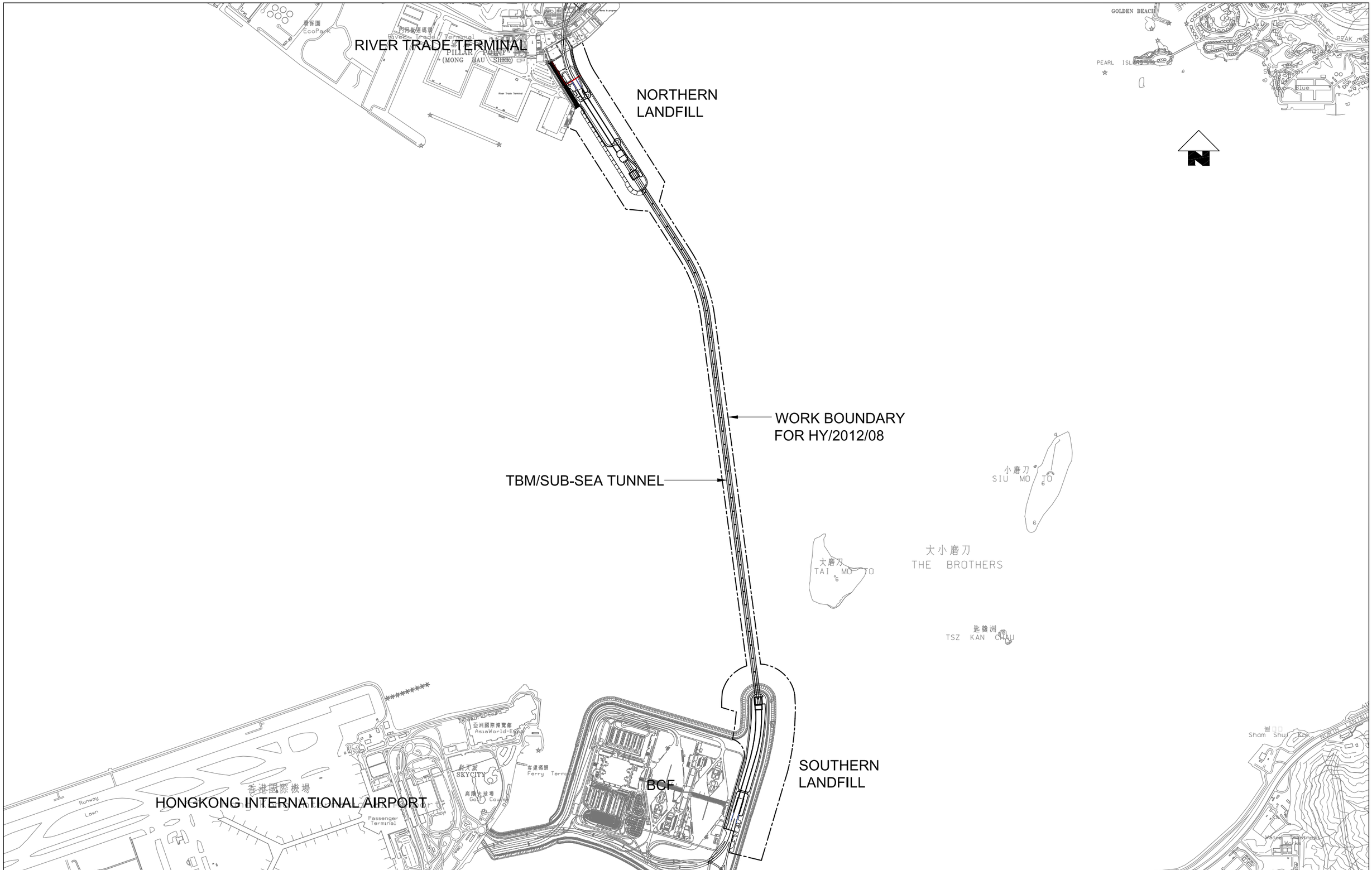
According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated 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 (VEP) (EP-354/2009A) was issued on 8 December 2010. Subsequent applications for variation of environmental permits (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

Under *Contract No. HY/2012/08*, Dragages – Bouygues Joint Venture (DBJV) is commissioned by the Highways Department (HyD) to undertake the design and construction of the Northern Connection Sub-sea Tunnel Section of TM-CLKL 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). ENVIRON Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

Layout of the Contract components is presented in *Figure 1.1*.

The construction phase of the Contract commenced on 1 November 2013 and will tentatively be completed by 2018. The impact monitoring phase of the EM&A programme, including air quality, water quality, marine ecological monitoring and environmental site inspections, were commenced on 1 November 2013.



Rev.	Description	Date	Checked
A	FIRST ISSUE	11SEP13	PKV

Designed By: PKV
Drawn By: DAI
Approved By: SPo PP
Date: 11SEP2013

Main Contractor: Dragages - Bouygues Joint Venture 實嘉 - 布依格聯營

Client: 路政署 HIGHWAYS DEPARTMENT

Contractor's Designer: ARUP Ove Arup & Partners Hong Kong Limited

Project: Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link -
Northern Connection Sub-Sea Tunnel Section

Drawing Title: **Figure 1.1**

Drawing no.: TMCLKL8-DBJ-GEN-DWG-00174
Scale: 1:25000 @ A3
CADD Ref.: TMCLKL8-DBJ-GEN-DWG-00174-DFT-A
Issue Status: DFT (DRAFT)
Revision: A

1.2 SCOPE OF REPORT

This is the Second Annual EM&A Report under the *Contract No. HY/2012/08 Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section*. This report presents a summary of the environmental monitoring and audit works from 1 November 2014 to 31 October 2015.

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
Highways Department	Engr 16/HZMB	Kenneth Lee	2762 4996	3188 6614
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Edwin Ching	2293 6388	2293 6300
		Andrew Westmoreland	2293 6360	2293 6300
ENPO / IEC (Ramboll Environ Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Dr F.C. Tsang	3465 2851	3465 2899
Contractor (Dragages – Bouygues Joint Venture)	Environmental Manager	C.F. Kwong	2293 7322	2293 7499
	Environmental Officer	Bryan Lee	2293 7323	2293 7499
	24-hour complaint hotline	Rachel Lam	2293 7330	
ET (ERM-HK)	ET Leader	Jovy Tam	2271 3113	2723 5660

1.4 SUMMARY OF CONSTRUCTION WORKS

With reference to DBJV's information, details of major construction works carried out in this reporting period are summarized in *Table 1.2*.

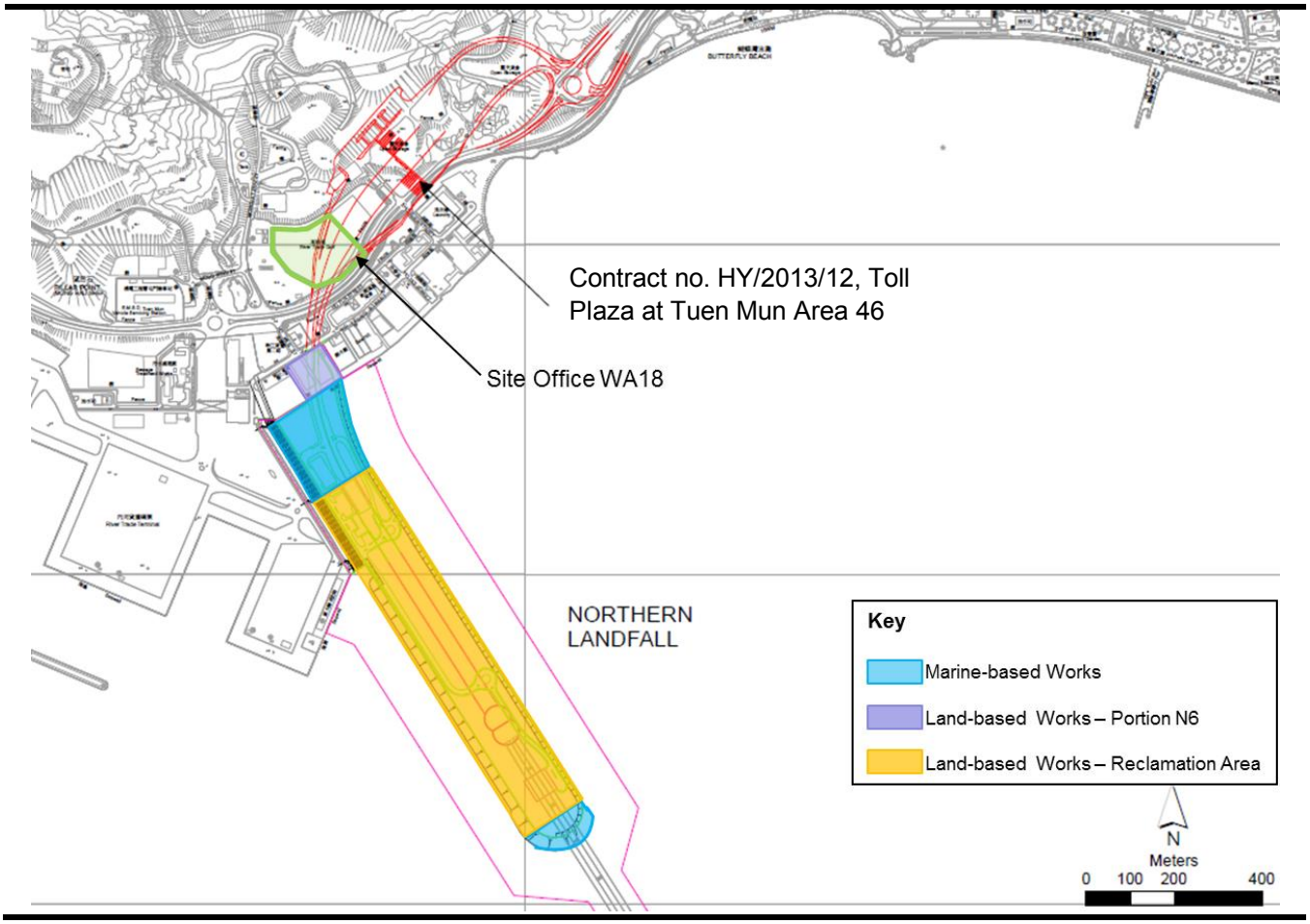
The general layout plan of the site showing the detailed works areas is shown in *Figure 1.2*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.3*.

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

Table 1.2 Summary of Construction Activities Undertaken during the Reporting Period

Construction Activities Undertaken
Marine-based Works
Marine Works Area – Portion N-A • Marine Sheet Piling for Box Culvert extension; and • Rock Bund Deposition for Marine Sheet Pile Remedial Works. Marine Works Area – Portion N-C • Reclamation filling; and • Construction of Vertical Seawall and Sloping Seawall.
Land-based Works
Works Area – Portion N-A • Excavation for North Launching Shaft; • Land Bored Piling Works; • Construction of temporary access; • Diaphragm Wall Construction; • TBM Platform Construction; • Formwork and Metal Scaffolding works; • Delivery & Assembly of TBM; • Land-based Sheet Piling Works; • Box Culvert Extension; and • Startup of TBM. Works Area – Portion N-B • TBM Tunnel Works. Works Area – Portion N-C • Surcharge set up; • Set up of Slurry Treatment Plant; • Surcharge Removal; • Diaphragm Wall Construction for Ventilation Shaft; • Excavation for Ventilation Shaft; • Construction of capping beam and base slab for Ventilation Shaft; • Installation of Tower Crane; and • Modification and Maintenance Works for Slurry Treatment Plant.

Figure 1.2 Locations of Construction Activities – November 2014 to October 2015



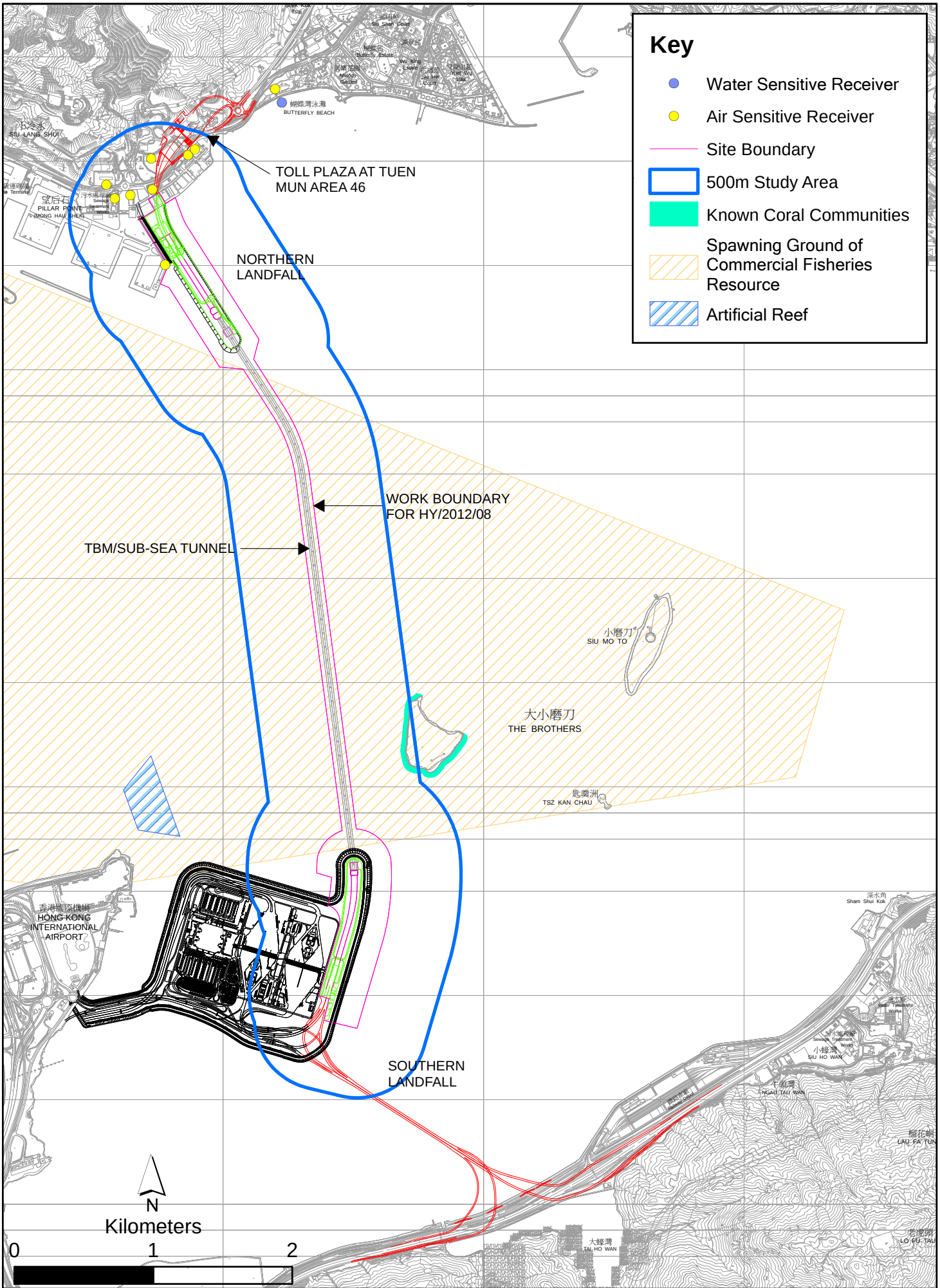


Figure 1.3 Environmental Sensitive Receivers in the vicinity of Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section

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Date: 15/4/2014

Environmental Resources Management

2 EM&A RESULTS

The EM&A programme required environmental monitoring for air quality, 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

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the *Enhanced TSP Monitoring Plan* [1], 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-hr and 24-hr TSP monitoring frequency was increased to three times per day every three days and daily every three days respectively as excavation works for launching shaft commenced on 24 October 2014.

High volume samplers (HVSs) were used to carry out the 1-hour and 24-hour TSP monitoring in the reporting period at the five (5) air quality monitoring stations in accordance with the requirements stipulated in the Updated EM&A Manual (*Figure 2.1*; *Table 2.1*). Wind anemometer was installed at the rooftop of ASR5 for logging wind speed and wind direction. Details of the equipment deployed are provided in *Table 2.2*.

(1) ERM (2013) Enhanced TSP Monitoring Plan. Submitted on 28 October 2013 and subsequently approved by EPD on 1 November 2013.

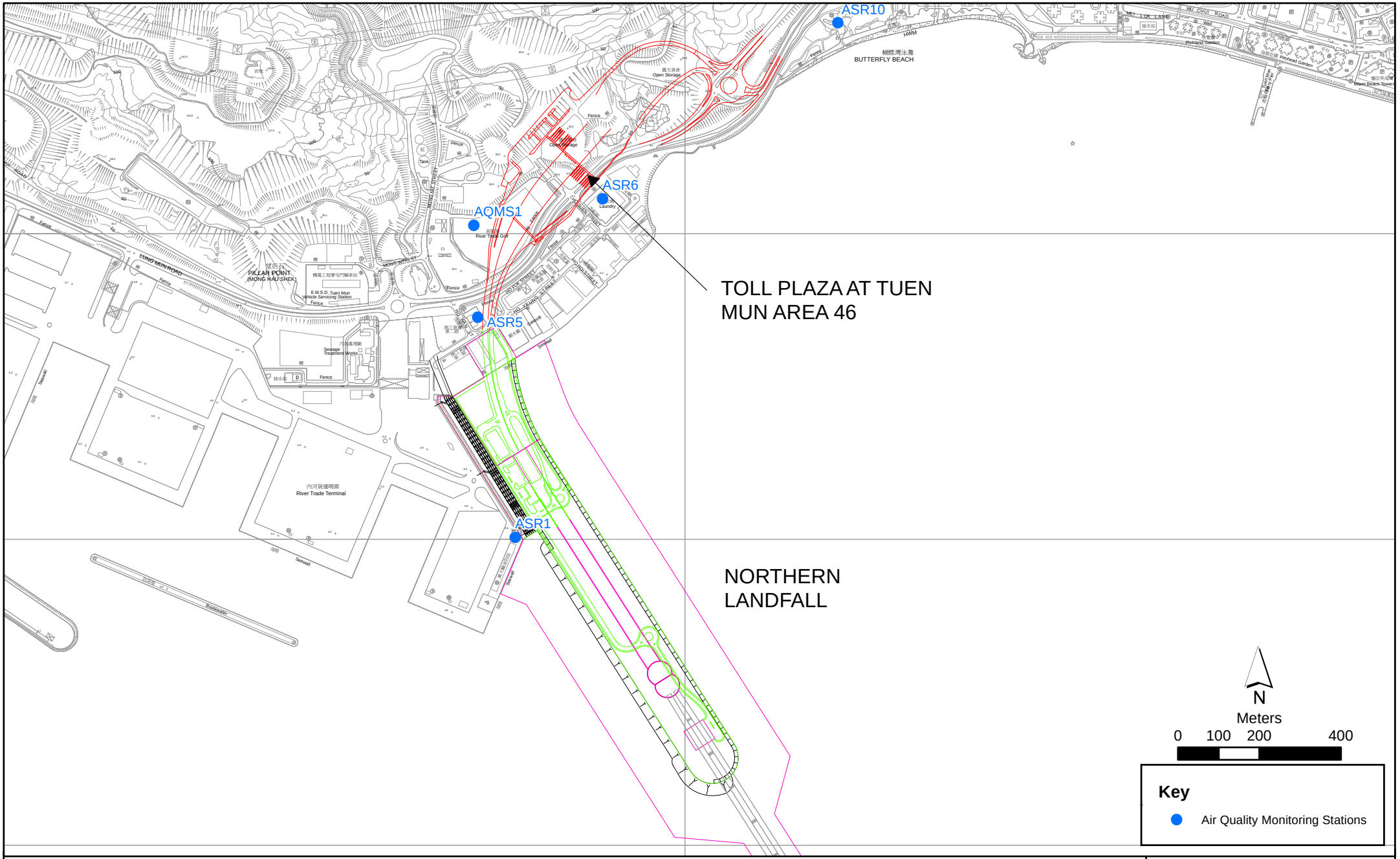

Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

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Date: 21/2/2014

Environmental Resources Management

ERM

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

Monitoring Station	Location	Description	Parameters & Frequency
ASR1	Tuen Mun Fireboat Station	Office	TSP monitoring • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 6 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 6 days Enhanced TSP monitoring (commenced on 24 October 2014) • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 3 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 3 days
ASR5	Pillar Point Fire Station	Office	
AQMS1	Previous River Trade Golf	Bare ground	
AQMS2/ASR6	Bare ground at Ho Suen Street /Butterfly Beach Laundry	Bare ground/Office	
ASR10	Butterfly Beach Park	Recreational uses	

*Notes: AQMS2 was relocated and HVS was re-installed at ASR6 (Butterfly Beach Laundry) on 17 January 2014. AQMS2 was then superseded by ASR6 for the impact air quality monitoring. Impact air quality monitoring at ASR6 commenced on 21 January 2014.

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 Meter	MetPak (Model: MetPak II (S/N: 13130002)
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 and Action plan is presented in *Appendix G*.

2.1.3 Results and Observations

Impact air quality monitoring was conducted at all designated monitoring stations in the reporting period under favourable weather conditions. The major dust sources in the reporting period include construction activities under the Contract and *Contract No. HY/2013/12* as well as nearby traffic emissions.

The monitoring results for 1-hour TSP and 24-hour TSP are summarized in *Tables 2.3* and *2.4*, respectively. Baseline and impact monitoring results are presented graphically in *Appendix D*. The detailed impact air quality monitoring data and meteorological information were reported in the *Thirteen* to *Twenty-four Monthly EM&A Report*.

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

Month/Year	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
November 2014 to October 2015	ASR 1	140	48 – 404	331	500
	ASR 5	162	52 - 346	340	500
	AQMS1	124	49 – 348	335	500
	ASR6	130	44 – 309	338	500
	ASR10	88	42 – 251	337	500

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

Month/Year	Station	Average (μg/m³)	Range (μg/m³)	Action Level (μg/m³)	Limit Level (μg/m³)
November 2014 to October 2015	ASR 1	84	42 – 162	213	260
	ASR 5	91	45 – 151	238	260
	AQMS1	78	45 – 155	213	260
	ASR6	77	43 - 133	238	260
	ASR10	64	41 – 130	214	260

In this reporting period, a total of 121 monitoring events were undertaken in which four (4) Action Level exceedances for 1-hr TSP; no Action or Limit Level exceedances for 24-hr TSP were recorded. Summary of exceedances for Air Quality Impact Monitoring in this reporting period is detailed in *Table 2.24*.

As shown in *Table 2.5*, the annual average 24-hour TSP level in the reporting period were generally lower than the corresponding average levels of baseline at most monitoring stations, whilst the annual average 1-hour TSP level in the reporting period was generally lower than the corresponding average level of baseline at most monitoring station, except for ASR 1 and ASR 5.

In order to determine any significant air quality impacts caused by construction activities from this Contract, one-way ANOVA (with setting α at 0.05) was conducted to examine whether the observed differences are significant between reporting period and baseline monitoring. For 1-hour TSP, the average results of monitoring stations ASR10 and ASR5 in the reporting period were significantly lower than the average results of baseline monitoring while there were no significant differences for other stations (AQMS1: $F_{1, 403} = 0.66$, $p = 0.42$, ASR6: $F_{1, 403} = 0.41$, $p = 0.52$, ASR1: $F_{1, 403} = 1.90$, $p = 0.17$, ASR10: $F_{1, 403} = 63.8$, $p < 0.01$ and ASR5: $F_{1, 403} = 7.43$, $p < 0.01$). For 24-hour TSP, the average results of all monitoring stations in the reporting period were significantly lower than the average results of baseline monitoring (AQMS1: $F_{1, 133} = 50.41$, $p < 0.01$, ASR6: $F_{1, 133} = 221.99$, $p < 0.01$, ASR1: $F_{1, 133} = 28.49$, $p < 0.01$, ASR10: $F_{1, 133} = 133.92$, $p < 0.01$ and ASR5: $F_{1, 133} = 106.02$, $p < 0.01$). In the reporting period, 1-hour and 24-hour TSP were varied across sampling months (see *Appendix D*) and these variations were however not consistent throughout the reporting period.

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

Monitoring Station	Average Baseline Monitoring	Average Impact Monitoring
ASR1(1-hour TSP)	125	140
ASR1(24-hour TSP)	128	84
ASR5(1-hour TSP)	138	162
ASR5(24-hour TSP)	167	91
AQMS1(1-hour TSP)	131	124
AQMS1(24-hour TSP)	127	78
ASR6(1-hour TSP)	135	130
ASR6(24-hour TSP)	166	77
ASR10(1-hour TSP)	134	88
ASR10(24-hour TSP)	129	64

Further to the One-way ANOVA, Linear Regression was conducted to examine any relationship between TSP levels and time (i.e. number of days after construction works commencement) 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 2.6*, results of the regression analysis indicated that there was no significant ($r^2 < 0.60$) 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 since commencement of constructions works.

Table 2.6 ***Linear Regression Result of TSP Monitoring***

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
1-hour TSP	AQMS1	0.267	$F_{1,361} = 131.2$	<0.001	263.7	-0.255
	AQMS2 / ASR6	0.053	$F_{1,361} = 20.2$	<0.001	190.4	-0.110
	ASR1	0.232	$F_{1,361} = 109.1$	<0.001	315.5	-0.321
	ASR10	0.155	$F_{1,361} = 66.3$	<0.001	160.2	-0.132
	ASR5	0.179	$F_{1,361} = 78.7$	<0.001	289.1	-0.232
24-hour TSP	AQMS1	0.355	$F_{1,119} = 65.4$	<0.001	149.9	-0.132

Parameter	Station	R^2	F-ratio	p-value	Intercept	Coefficient
	AQMS2 / ASR6	0.128	$F_{1,119} = 17.4$	<0.001	112.8	-0.065
	ASR1	0.241	$F_{1,119} = 37.7$	<0.001	155.6	-0.132
	ASR10	0.201	$F_{1,119} = 30.0$	<0.001	106.6	-0.077
	ASR5	0.195	$F_{1,119} = 28.8$	<0.001	144.0	-0.096

Note:
1. Dependent variable is set as TSP levels (in $\mu g/m^3$) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.

3. By setting α at 0.01, insignificant coefficient is underlined.

2.2 *WATER QUALITY MONITORING*

The baseline water quality monitoring undertaken by the Hong Kong – Zhuhai – Macao Bridge Hong Kong Projects (HKZMB) between 6 and 31 October 2011 included all monitoring stations for the Project. Thus, the baseline monitoring results and Action/Limit Levels presented in HKZMB Baseline Monitoring Report (1) are adopted for this Project.

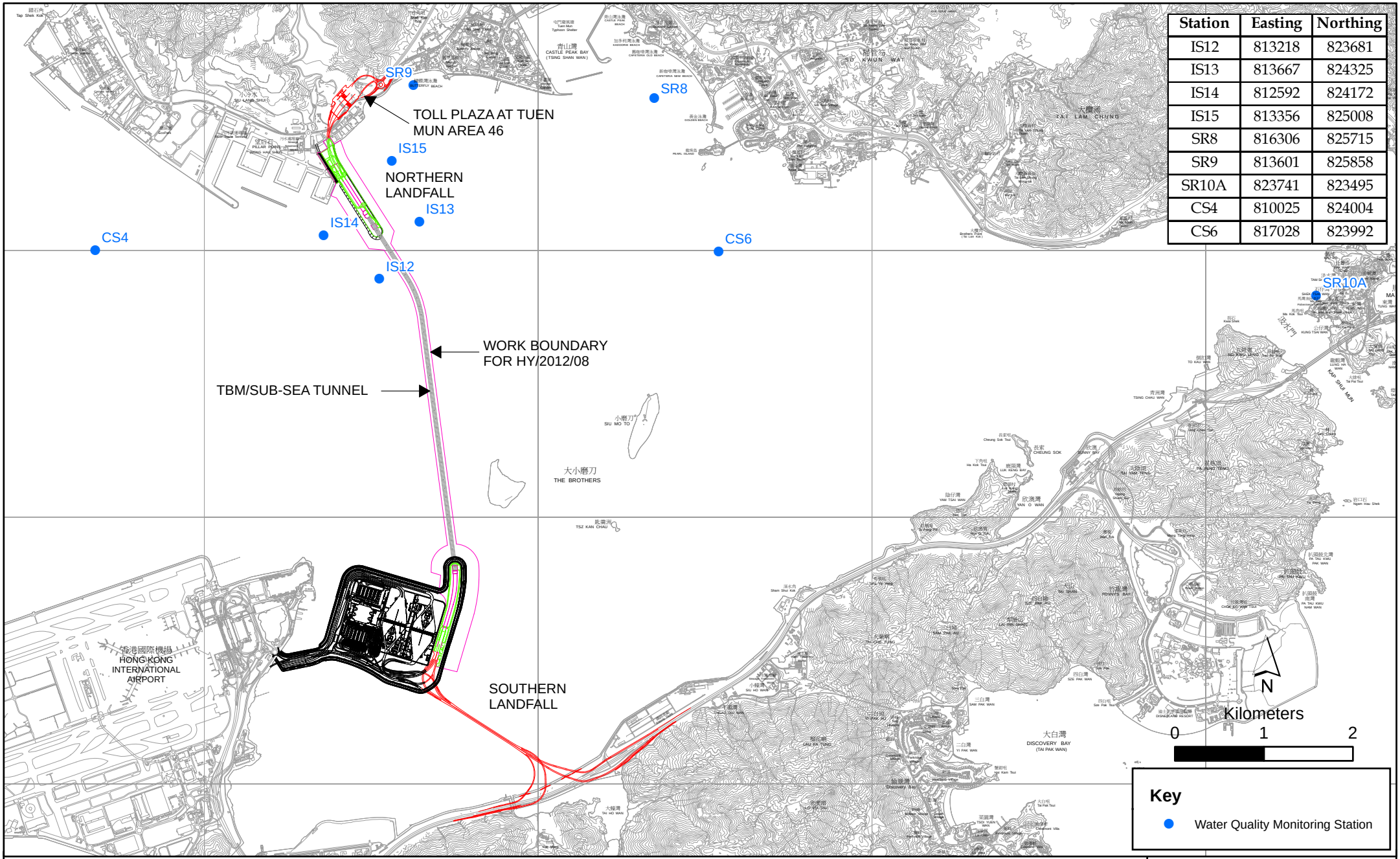
2.2.1 *Monitoring Requirements & Equipment*

In accordance with the Updated EM&A Manual, impact water quality monitoring was carried out three (3) days per week during the construction period at nine (9) water quality monitoring stations (*Figure 2.2*; *Table 2.7*).

Table 2.7 Locations of Water Quality Monitoring Stations and the Corresponding Monitoring Requirements

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
		Easting	Northing			
IS12	Impact Station	813218	823681	• Temperature(°C)	3 water depths: 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.	Impact monitoring: 3 days per week, at mid-flood and mid-ebb tides during the construction period of the Contract.
IS13	Impact Station	813667	824325	• pH(pH unit)		
IS14	Impact Station	812592	824172	• Turbidity (NTU)		
IS15	Impact Station	813356	825008	• Water depth (m)		
CS4	Control / Far Field Station	810025	824004	• Salinity (ppt) • DO (mg/L and % of saturation)		
CS6	Control / Far Field Station	817028	823992			
SR8	Sensitive receiver (Gazettal beaches in Tuen Mun)	816306	825715	• SS (mg/L)		
SR9	Sensitive receiver (Butterfly Beach)	813601	825858			

(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.



Station	Easting	Northing
IS12	813218	823681
IS13	813667	824325
IS14	812592	824172
IS15	813356	825008
SR8	816306	825715
SR9	813601	825858
SR10A	823741	823495
CS4	810025	824004
CS6	817028	823992

Figure 2.2

Water Quality Monitoring Station

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Date: 15/11/2013

Environmental Resources Management

ERM

Station ID	Type	Coordinates		*Parameters, unit	Depth	Frequency
SR10A	Sensitive receiver (Ma Wan FCZ)	823741	823495			

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

Table 2.8 summarizes the equipment used in the impact water quality monitoring programme.

Table 2.8 Water Quality Monitoring Equipment

Equipment	Model	Qty.
Water Sampler	Kahlsico Water-Bottle Model 135DW 150	1
Dissolved Oxygen Meter	YSI Pro 2030	1
pH Meter	HANNA HI 8314	1
Turbidity Meter	HACH 2100Q	1
Monitoring Position Equipment	"Magellan" Handheld GPS Model explorist GC	4
	DGPS Koden KGP913MK2 (1)	1

2.2.2 Action & Limit Levels

The Action and Limit Levels of the water quality monitoring is provided in *Appendix C*. The Event and Action plan is presented in *Appendix G*.

2.2.3 Results and Observations

During this reporting period, major marine works included reclamation filling and rock bund deposition for marine sheet pile remedial works. In addition, reclamation filling was undertaken between the 200 m of leading seawalls using filling materials specified in the EP and the approved EIA Report with a single layer silt curtain being deployed as a precautionary measure to reduce dispersion of suspended solids. It is useful to note that heavy marine traffic (not associated with the Project) was commonly observed nearby the Project site and its vicinity. On 20 November 2014, seawall (+2.5mPD) at Northern Landfall has been fully enclosed and marine sheet pile has also been completed. There will be no dredging, reclamation or marine sheet piling works in open waters at this stage. On 28 February 2015, rock bund deposition for marine sheet pile remedial works was fully completed.

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting period under favourable weather conditions. Baseline and impact monitoring results are presented graphically in *Appendix E* and detailed impact water quality monitoring data were reported in the *Thirteen* to *Twenty-four Monthly EM&A Report*. Water Quality Monitoring was suspended from 6 June 2015 effectively and will resume when Phase II Reclamation commences in the fourth quarter of 2016 tentatively.

In this reporting period, a total of 91 monitoring events were undertaken in which no Action Level or Limit Level exceedances were recorded from the water quality monitoring in this reporting period. Summary of exceedances

for Water Quality Impact Monitoring in this reporting period is detailed in *Table 2.25*.

In order to determine any significant water quality impacts caused by construction activities from this Contract, One-way ANOVA (with setting α at 0.05) was conducted to examine whether there was significant difference in DO, turbidity and SS between reporting period and baseline monitoring period. The annual average levels and statistical analysis results are presented in *Tables 2.9 to 2.11* and *Tables 2.12 to 2.14*, respectively. In general, the DO levels recorded during the reporting period were significantly higher than the results obtained during the baseline monitoring period. The annual depth-averaged turbidity recorded in the reporting period were significantly lower than the average levels in baseline monitoring, except for SR10A and SR9 in mid-ebb tide and SR10A in mid-flood tide in which turbidity levels during this reporting period were comparable to the corresponding average baseline levels. The SS levels recorded during the reporting period were significantly lower than the results obtained during the baseline monitoring period, except for SR9 in both mid-ebb and mid-flood tide in which the SS levels recorded during the baseline monitoring period were comparable to the corresponding average baseline levels. Whilst DO, turbidity and suspended solids levels were varied across sampling months (see *Appendix E*) these variations were, however, not consistent throughout the reporting period.

Table 2.9 ***Summary of Average DO Level of Baseline Monitoring and the Reporting Period (in mg/L)***

Tide	Station	Depth	Average DO of baseline monitoring	Average DO of reporting period
Mid-ebb	IS12	Surface	6.1	7.0
	IS13	Surface	6.1	7.0
	IS14	Surface	6.1	6.9
	IS15	Surface	6.1	6.9
	SR10A	Surface	6.0	6.9
	SR8	Surface	6.2	6.9
	SR9	Surface	6.0	6.9
Mid-flood	IS12	Surface	6.1	7.1
	IS13	Surface	6.1	7.0
	IS14	Surface	6.1	7.0
	IS15	Surface	6.2	7.0
	SR10A	Surface	6.0	7.0
	SR8	Surface	6.2	7.0
	SR9	Surface	6.0	7.0
Mid-ebb	IS12	Middle	5.9	6.9
	IS13	Middle	6.0	6.9
	IS14	Middle	6.0	6.9
	IS15	Middle	6.0	6.9
	SR10A	Middle	5.9	6.8
Mid-flood	IS12	Middle	5.9	7.0
	IS13	Middle	6.0	7.0
	IS14	Middle	5.9	6.9
	IS15	Middle	6.1	6.9
	SR10A	Middle	5.9	6.9
Mid-ebb	IS12	Bottom	5.9	6.8
	IS13	Bottom	5.9	6.7
	IS14	Bottom	5.9	6.7

Tide	Station	Depth	Average DO of baseline monitoring	Average DO of reporting period
	IS15	Bottom	5.9	6.7
	SR10A	Bottom	5.7	6.7
	SR8	Bottom	6.0	6.8
	SR9	Bottom	5.8	6.8
Mid-flood	IS12	Bottom	5.9	6.8
	IS13	Bottom	5.9	6.8
	IS14	Bottom	5.9	6.8
	IS15	Bottom	6.0	6.8
	SR10A	Bottom	5.8	6.8
	SR8	Bottom	5.8	6.8
	SR9	Bottom	5.9	6.9

Table 2.10 Summary of Average Depth-averaged Turbidity Level of Baseline Monitoring and the Reporting Period (in NTU)

Tide	Station	Average depth-averaged turbidity of baseline monitoring	Average depth-averaged turbidity of reporting period
Mid-ebb	IS12	10.7	6.6
	IS13	9.2	6.6
	IS14	9.3	6.7
	IS15	9.8	6.7
	SR10A	7.1	6.5
	SR8	11.0	6.5
	SR9	7.2	6.6
Mid-flood	IS12	9.8	6.5
	IS13	9.5	6.6
	IS14	9.4	6.6
	IS15	9.8	6.5
	SR10A	7.0	6.4
	SR8	10.1	6.4
	SR9	8.5	6.5

Table 2.11 Summary of Average Depth-averaged SS Level of Baseline Monitoring and the Reporting Period (in mg/L)

Tide	Station	Average depth-averaged SS of baseline monitoring	Average depth-averaged SS of reporting period
Mid-ebb	IS12	9.2	7.7
	IS13	10.0	7.7
	IS14	10.4	7.8
	IS15	9.6	7.7
	SR10A	10.3	7.6
	SR8	10.1	7.6
	SR9	8.8	7.6
Mid-flood	IS12	9.5	7.7
	IS13	10.5	7.7
	IS14	9.7	7.7
	IS15	11.0	7.6
	SR10A	10.2	7.5
	SR8	11.3	7.5
	SR9	9.9	7.5

Table 2.12 One-way ANOVA Results for DO Comparison between Impact and Baseline Periods

Tide	Station	Depth	F ratio	p-value
Mid-ebb	IS12	Surface	$F_{1,101} = 22.4$	**<0.01**
Mid-ebb	IS13	Surface	$F_{1,101} = 24.2$	**<0.01**
Mid-ebb	IS14	Surface	$F_{1,101} = 18.9$	**<0.01**
Mid-ebb	IS15	Surface	$F_{1,101} = 26.9$	**<0.01**
Mid-ebb	SR10A	Surface	$F_{1,101} = 26.4$	**<0.01**
Mid-ebb	SR8	Surface	$F_{1,101} = 11.2$	**<0.01**
Mid-ebb	SR9	Surface	$F_{1,101} = 22.7$	**<0.01**
Mid-flood	IS12	Surface	$F_{1,101} = 33.9$	**<0.01**
Mid-flood	IS13	Surface	$F_{1,101} = 30.7$	**<0.01**
Mid-flood	IS14	Surface	$F_{1,101} = 28.0$	**<0.01**
Mid-flood	IS15	Surface	$F_{1,101} = 27.0$	**<0.01**
Mid-flood	SR10A	Surface	$F_{1,101} = 46.4$	**<0.01**
Mid-flood	SR8	Surface	$F_{1,101} = 23.0$	**<0.01**
Mid-flood	SR9	Surface	$F_{1,101} = 40.7$	**<0.01**
Mid-ebb	IS12	Middle	$F_{1,101} = 26.1$	**<0.01**
Mid-ebb	IS13	Middle	$F_{1,101} = 21.3$	**<0.01**
Mid-ebb	IS14	Middle	$F_{1,101} = 22.3$	**<0.01**
Mid-ebb	IS15	Middle	$F_{1,101} = 26.8$	**<0.01**
Mid-ebb	SR10A	Middle	$F_{1,101} = 25.4$	**<0.01**
Mid-flood	IS12	Middle	$F_{1,101} = 36.5$	**<0.01**
Mid-flood	IS13	Middle	$F_{1,101} = 29.8$	**<0.01**
Mid-flood	IS14	Middle	$F_{1,101} = 32.0$	**<0.01**
Mid-flood	IS15	Middle	$F_{1,101} = 27.1$	**<0.01**
Mid-flood	SR10A	Middle	$F_{1,101} = 50.3$	**<0.01**
Mid-ebb	IS12	Bottom	$F_{1,101} = 23.8$	**<0.01**
Mid-ebb	IS13	Bottom	$F_{1,101} = 24.0$	**<0.01**
Mid-ebb	IS14	Bottom	$F_{1,101} = 16.7$	**<0.01**
Mid-ebb	IS15	Bottom	$F_{1,101} = 30.4$	**<0.01**
Mid-ebb	SR10A	Bottom	$F_{1,101} = 34.2$	**<0.01**
Mid-ebb	SR8	Bottom	$F_{1,101} = 13.5$	**<0.01**
Mid-ebb	SR9	Bottom	$F_{1,101} = 31.3$	**<0.01**
Mid-flood	IS12	Bottom	$F_{1,101} = 31.8$	**<0.01**
Mid-flood	IS13	Bottom	$F_{1,101} = 31.0$	**<0.01**
Mid-flood	IS14	Bottom	$F_{1,101} = 29.1$	**<0.01**
Mid-flood	IS15	Bottom	$F_{1,101} = 25.9$	**<0.01**
Mid-flood	SR10A	Bottom	$F_{1,101} = 40.0$	**<0.01**
Mid-flood	SR8	Bottom	$F_{1,101} = 39.7$	**<0.01**
Mid-flood	SR9	Bottom	$F_{1,101} = 31.0$	**<0.01**

Note:
By setting α at 0.05, significant differences (p-value < 0.05) are bold.

Table 2.13 One-way ANOVA Results for Depth-averaged Turbidity Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS12	$F_{1,101} = 54.01$	**<0.01**
Mid-ebb	IS13	$F_{1,101} = 28.25$	**<0.01**
Mid-ebb	IS14	$F_{1,101} = 20.09$	**<0.01**
Mid-ebb	IS15	$F_{1,101} = 34.69$	**<0.01**
Mid-ebb	SR10A	$F_{1,101} = 2.22$	**0.14**
Mid-ebb	SR8	$F_{1,101} = 59.64$	**<0.01**
Mid-ebb	SR9	$F_{1,101} = 2.05$	**0.16**
Mid-flood	IS12	$F_{1,101} = 30.33$	**<0.01**
Mid-flood	IS13	$F_{1,101} = 22.12$	**<0.01**

Tide	Station	F ratio	p-value
Mid-flood	IS14	$F_{1,101} = 27.73$	**<0.01**
Mid-flood	IS15	$F_{1,101} = 34.38$	**<0.01**
Mid-flood	SR10A	$F_{1,101} = 1.71$	**0.19**
Mid-flood	SR8	$F_{1,101} = 33.21$	**<0.01**
Mid-flood	SR9	$F_{1,101} = 17.13$	**<0.01**

Note:
By setting α at 0.05, significant differences (*p*-value < 0.05) are bold.

Table 2.14 One-way ANOVA Results for Depth-averaged SS Comparison between Impact and Baseline Periods

Tide	Station	F ratio	p-value
Mid-ebb	IS12	$F_{1,101} = 8.92$	**<0.01**
Mid-ebb	IS13	$F_{1,101} = 23.15$	**<0.01**
Mid-ebb	IS14	$F_{1,101} = 20.27$	**<0.01**
Mid-ebb	IS15	$F_{1,101} = 11.83$	**<0.01**
Mid-ebb	SR10A	$F_{1,101} = 27.55$	**<0.01**
Mid-ebb	SR8	$F_{1,101} = 28.43$	**<0.01**
Mid-ebb	SR9	$F_{1,101} = 5.13$	**0.03**
Mid-flood	IS12	$F_{1,101} = 8.92$	**<0.01**
Mid-flood	IS13	$F_{1,101} = 23.15$	**<0.01**
Mid-flood	IS14	$F_{1,101} = 20.27$	**<0.01**
Mid-flood	IS15	$F_{1,101} = 11.83$	**<0.01**
Mid-flood	SR10A	$F_{1,101} = 27.55$	**<0.01**
Mid-flood	SR8	$F_{1,101} = 28.43$	**<0.01**
Mid-flood	SR9	$F_{1,101} = 5.13$	**0.03**

Note:
By setting α at 0.05, significant differences (p-value < 0.05) are bold.

In addition, linear regression was conducted to examine any relationship between DO / Turbidity / SS levels and time (i.e. number of days after construction works commencement) during this yearly monitoring period at each monitoring station. The method of data interpretation followed the same method as indicated in *Section 2.1.3* for TSP monitoring. As shown in *Tables 2.15 to 2.17*, results of the regression analysis indicated that there was no significant ($r^2 < 0.60$) relationship between DO / 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 DO / Turbidity / SS level since commencement of constructions works.

Table 2.15 Linear Regression Result of DO

Parameter	Station	R^2	$F_{1,89}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb	IS12	0.202	22.6	<0.001	4.881	0.004
Surface DO	IS13	0.223	25.6	<0.001	4.906	0.004
	IS14	0.287	35.8	<0.001	4.537	0.004
	IS15	0.206	23.9	<0.001	5.300	0.004
	SR10A	0.220	25.2	<0.001	5.025	0.004
	SR8	0.183	19.9	<0.001	4.834	0.004
	SR9	0.179	19.5	<0.001	5.112	0.004
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood	IS12	0.173	18.6	<0.001	5.433	0.003
surface DO	IS13	0.226	26.0	<0.001	5.260	0.003

Parameter	Station	R^2	$F_{1,89}$	p-value	Intercept	Coefficient of days of construction
	IS14	0.310	40.0	<0.001	4.756	0.004
	IS15	0.158	16.7	<0.001	5.667	0.003
	SR10A	0.227	26.2	<0.001	5.361	0.004
	SR8	0.199	22.0	<0.001	5.162	0.004
	SR9	0.205	22.9	<0.001	5.470	0.003
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-ebb middle DO	IS12	0.181	19.7	<0.001	5.067	0.004
	IS13	0.179	19.4	<0.001	5.074	0.004
	IS14	0.253	30.1	<0.001	4.760	0.004
	IS15	0.145	15.1	<0.001	5.479	0.003
	SR10A	0.176	19.1	<0.001	5.027	0.004
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood middle DO	IS12	0.135	13.9	<0.001	5.558	0.003
	IS13	0.135	13.9	<0.001	5.551	0.003
	IS14	0.254	30.2	<0.001	4.948	0.004
	IS15	0.081	7.88	<0.001	5.945	0.002
	SR10A	0.205	22.9	<0.001	5.312	0.003
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-ebb bottom DO	IS12	0.153	16.1	<0.001	5.142	0.003
	IS13	0.179	19.4	<0.001	5.131	0.003
	IS14	0.187	20.5	<0.001	4.895	0.004
	IS15	0.096	9.42	<0.001	5.636	0.002
	SR10A	0.167	17.9	<0.001	5.061	0.003
	SR8	0.171	18.4	<0.001	4.766	0.004
	SR9	0.208	23.4	<0.001	4.989	0.004
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood bottom DO	IS12	0.113	11.4	<0.001	5.536	0.003
	IS13	0.131	13.4	<0.001	5.536	0.003
	IS14	0.170	18.3	<0.001	5.221	0.003
	IS15	0.059	5.59	<0.001	5.990	0.002
	SR10A	0.183	19.9	<0.001	5.316	0.003
	SR8	0.195	21.5	<0.001	5.030	0.004
	SR9	0.219	25.0	<0.001	5.195	0.003

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 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

Table 2.16 Linear Regression Result of Turbidity

Parameter	Station	R^2	$F_{1,89}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth -average turbidity	IS12	0.005	0.49	<0.001	5.958	0.001
	IS13	0.007	0.63	<0.001	5.868	0.002
	IS14	0.019	1.68	<0.001	5.420	0.003
	IS15	0.002	0.17	<0.001	6.264	0.001
	SR10A	0.031	2.87	<0.001	6.047	0.003
	SR8	0.008	0.71	<0.001	5.751	0.002
	SR9	0.028	2.60	<0.001	5.015	0.003
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**

Parameter	Station	R^2	$F_{1,89}$	p-value	Intercept	Coefficient of days of construction
Mid-flood depth -average turbidity	IS12	0.014	1.30	<0.001	5.563	0.002
	IS13	0.007	0.63	<0.001	5.873	0.001
	IS14	0.029	2.66	<0.001	5.190	0.003
	IS15	0.002	0.14	<0.001	6.213	0.001
	SR10A	0.018	1.64	<0.001	5.222	0.002
	SR8	0.014	1.30	<0.001	5.469	0.002
	SR9	0.041	3.82	<0.001	4.695	0.004

Note:
1. Dependent variable is set as Turbidity (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

Table 2.17 Linear Regression Result of SS

Parameter	Station	R^2	$F_{1,89}$	p-value	Intercept	Coefficient of days of construction
Mid-ebb depth -average SS	IS12	0.01	0.80	<0.001	6.913	0.002
	IS13	0.01	1.22	<0.001	6.750	0.002
	IS14	0.03	2.91	<0.001	6.158	0.004
	IS15	0.002	0.19	<0.001	7.326	0.001
	SR10A	0.02	2.14	<0.001	6.244	0.003
	SR8	0.01	0.91	<0.001	6.734	0.002
	SR9	0.03	2.43	<0.001	6.125	0.003
Parameter	**Station**	**R^2**	**$F_{1,89}$**	**p-value**	**Intercept**	**Coefficient of days of construction**
Mid-flood depth -average SS	IS12	0.01	0.90	<0.001	6.876	0.002
	IS13	0.01	0.52	<0.001	7.066	0.001
	IS14	0.03	2.72	<0.001	6.305	0.003
	IS15	0.01	0.608	<0.001	6.969	0.001
	SR10A	0.03	2.87	<0.001	6.047	0.003
	SR8	0.02	1.95	<0.001	6.293	0.002
	SR9	0.05	5.02	<0.001	5.560	0.004

Note:
1. Dependent variable is set as Turbidity (in mg/L) and independent variable is set as number of day of construction works.
2. R^2 <0.6 and p-value >0.01 (i.e. showing the regression insignificant) are underlined.
3. By setting α at 0.01, insignificant coefficient is underlined.

2.3 DOLPHIN MONITORING

2.3.1 Monitoring Requirements

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

2.3.2 *Monitoring Equipment*

Table 2.18 summarises the equipment used for the impact dolphin monitoring.

Table 2.18 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

2.3.3 *Monitoring Parameter, Frequencies & Duration*

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

2.3.4 *Monitoring Location*

The impact dolphin monitoring was carried out in the NEL and NWL along the line transect as depicted in *Figure 2.3*. The co-ordinates of all transect lines are shown in *Table 2.19* below.

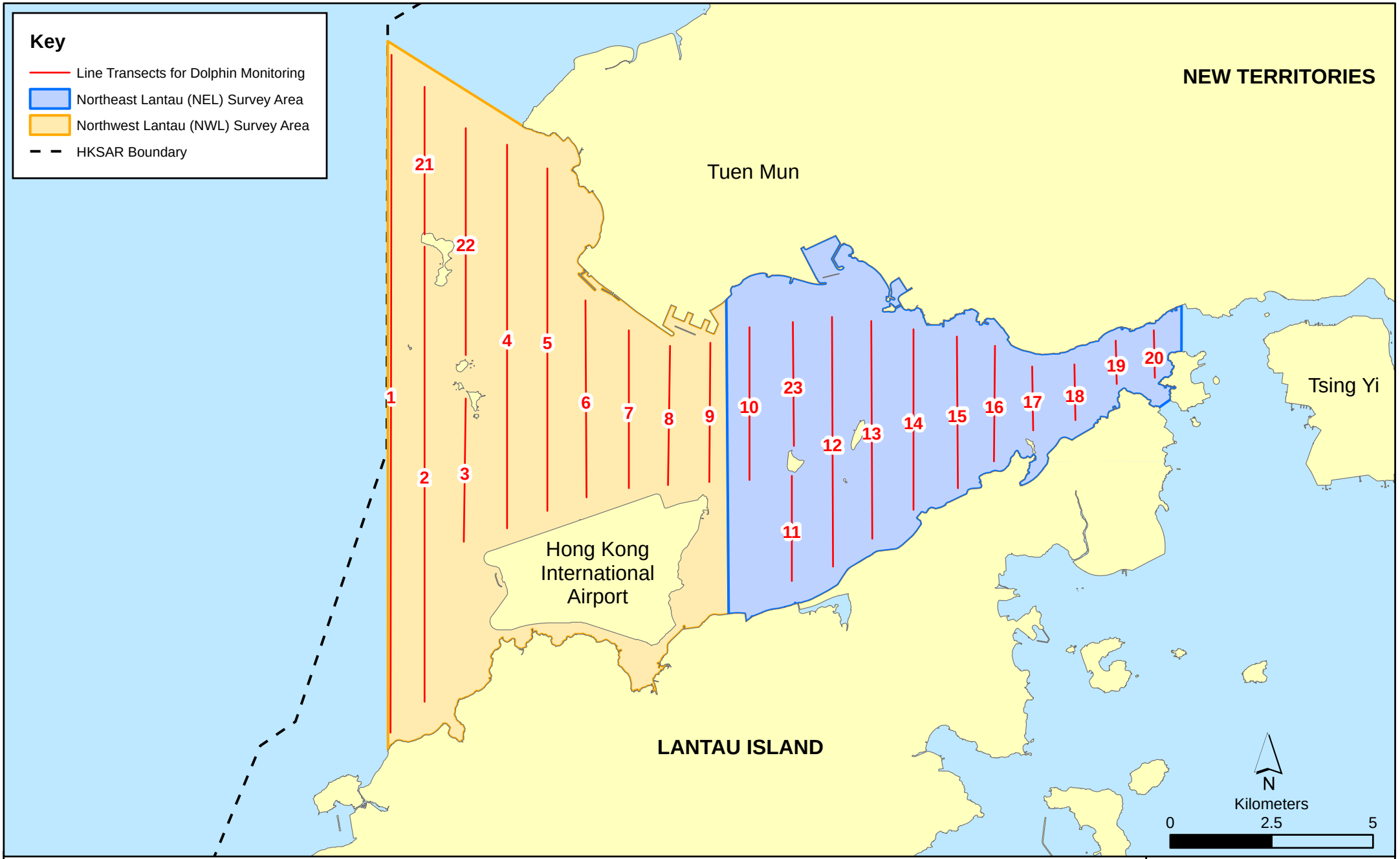

Figure 2.3

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

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Table 2.19 Impact Dolphin Monitoring Line Transect Co-ordinates

Line No.		Easting	Northing	Line No.		Easting	Northing
1	Start Point	804671	814577 (815456)	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805475	815457 (815913)	14	Start Point	817537	820220
2	End Point	805477	826654	14	End Point	817537	824613
3	Start Point	806464	819435	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	819771	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	820220	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	820466	18	Start Point	821504	822371
6	End Point	809490	825352	18	End Point	821504	823761
7	Start Point	810499	820690 (820880)	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	820847 (821123)	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	820892 (821303)	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	820872	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818449 (818853)	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807				
12	End Point	815542	824882				

Note:

Northing co-ordinates in bracket are the adjusted co-ordinates since August 2015 due to obstruction of permanent structures associated with construction works. Approval of the adjustments from EPD was received in July 2015.

2.3.5 Action & Limit Levels

The Action and Limit levels of dolphin impact monitoring are shown in *Appendix C*. The Event and Action plan is presented in *Appendix G*.

2.3.6 Results & Observations

A total of 3,589.91 km of survey effort was collected, with 97.0% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in this reporting year. Amongst the two areas, 1,381.43 km and 2,208.48 km of survey effort were collected from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 2,612.04 km and 977.87 km, respectively. The survey efforts are summarized in *Appendix F*.

A total of 54 groups of 229 Chinese White Dolphin sightings were recorded during the 24 sets of surveys in this reporting year. All except four (4) sighting were made during on-effort search. Forty-four (44) on-effort sightings were made on primary lines, while six (6) other on-effort sightings were made on secondary lines. During this reporting year, almost all dolphin groups were sighted in NWL, only one (1) dolphin being sighted in NEL.

Dolphin sighting distribution of the present impact phase monitoring period (November 2014 to October 2015) was compared to the ones during the baseline phase (February 2011 to January 2012) and transitional phase (November 2012 to October 2013). As TMCLKL construction works commenced in November 2013, a 12-month period between baseline phase and impact phase is defined as transitional phase.

In this 12-month period, 99.5% of the dolphin sightings were made in NWL, while only one (1) dolphin was sighted in NEL. The majority of dolphin sightings made in the 12-month period were concentrated in the northwestern end of the North Lantau region.

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 and transitional phases as shown in *Table 2.20*.

Table 2.20 Average Daily 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 (2014-2015)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04
Impact Phase (2013-2014)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-2013)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-2012)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

Note: Comparison of average daily dolphin encounter rates from impact phase (November 2014 –October 2015), 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 one to thirteen (1-13) individuals per group in North Lantau region during November 2014 - October 2015. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline and transitional phases, as shown in *Table 2.21*.

Table 2.21 Comparison of Average Dolphin Group Sizes from Impact Monitoring Period and Baseline Monitoring Period

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2014-2015)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase (2013-2014)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-2013)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-2012)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

Note: Comparison of average dolphin group sizes from impact phase (November 2014 –October 2015), transitional phase (November 2012 – October 2013) and baseline phase monitoring periods (February 2011 – January 2012). (± denotes the standard deviation of the average value)

Whilst two (2) Action Level exceedances for Northeast Lantau and Northwest Lantau was both recorded in the reporting period respectively, three (3) Limit Level exceedances were observed for the quarterly dolphin monitoring data between November 2014 and October 2015. In this reporting period, 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.

2.3.7 *Implementation of Marine Mammal Exclusion Zone*

Daily marine mammal exclusion zone was in effect during the period of dredging, reclamation or marine sheet piling works in open waters under this Contract. During daylight hours, monitoring was undertaken by dolphin observers using visual observation. Passive Acoustic Monitoring (PAM) was also implemented for the detection of marine mammal when dredging, reclamation or marine sheet piling works were carried out outside the daylight hours under this Contract.

2.4 *EM&A SITE INSPECTION*

Site inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. Fifty-two (52) site inspections were carried out in the reporting period. Key observations were summarized in the *Thirteen to Twenty-four Monthly EM&A Reports*.

2.5 *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), imported fill, recyclable materials, chemical wastes and marine sediments. 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 2.22*.

Table 2.22 Quantities of Different Waste Generated in the Reporting Period

Month/Year	Inert Construction Waste [a] (tonnes)	Imported Fill (tonnes)	Inert Construction Waste Re-used (tonnes)	Non-inert Construction Waste [b] (tonnes)	Recyclable Materials [c] (kg)	Chemical Wastes (kg)	Marine Sediment (m^3)	
							Category L	Category M
November 2014	595	240,167	0	50	0	0	2,320	0
December 2014	10,151	108,279	0	49	0	0	0	0
January 2015	30,877	0	0	80	0	0	0	0
February 2015	4152	0	0	74	0	0	0	0
March 2015	36,718	0	0	115	0	0	0	0
April 2015	62,847	0	0	91	0	0	0	0
May 2015	121,436	0	0	108	0	0	0	0
June 2015	247,282	0	0	120	0	0	0	0
July 2015	233,422	0	0	172	0	0	0	0
August 2015	62,367	0	0	246	300	0	0	0

Month/Year	Inert Construction Waste [a] (tonnes)	Imported Fill (tonnes)	Inert Construction Waste Re-used (tonnes)	Non-inert Construction Waste [b] (tonnes)	Recyclable Materials [c] (kg)	Chemical Wastes (kg)	Marine Sediment (m^3)	
							Category L	Category M
September 2015	9,555	0	0	195	520	0	0	0
October 2015	1,979	0	0	177	300	0	0	0
Total	**821,381**	**348,446**	**0**	**1477**	**1,120**	**0**	**2,320**	**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.

2.6 ENVIRONMENTAL LICENSES AND PERMITS

The status of environmental licensing and permit is summarized in *Table 2.23* below.

Table 2.23 Summary of Environmental Licensing and Permit Status

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Environmental Permit	EP-354/2009/D	13 March 2015	Throughout the Contract	HyD	
Construction Dust Notification	363510	19 August 2013	Throughout the Contract	DBJV	-
Chemical Waste Registration	5213-422-D2516-01	10 September 2013	Throughout the Contract	DBJV	-
Construction Waste Disposal Account	7018108	28 August 2013	Throughout the Contract	DBJV	Waste disposal in Contract HY/2012/08
Waste Water Discharge License	WT00017707-2013	18 November 2013	30 November 2018	DBJV	For works in site WA18
Waste Water Discharge License	WT00019248-2014	5 June 2014	30 June 2019	DBJV	For site Portion N6 and Reclamation Area E
Waste Water Discharge License	WT00018433-2014	6 March 2014	31 March 2019	DBJV	For works in site Portion N6
Construction Noise Permit	GW-RS0362-14	11 May 2014	10 May 2015	DBJV	For site WA23
Construction Noise Permit	GW-RW0706-14	29 September 2014	28 March 2015	DBJV	For Portion N6
Construction Noise Permit	GW-RW0550-14	25 July 2014	24 January 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0674-14	18 September 2014	17 March 2015	DBJV	For GI Works at Southern Landfall
Construction Noise Permit	GW-RW0970-14	17 December 2014	14 May 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RS0847-14	11 May 2014	10 May 2015	DBJV	For works in site WA23
Construction Noise Permit	GW-RW0350-15	14 July 2015	13 December 2015	DBJV	For site WA23
Construction Noise Permit	GW-RW0847-14	11 November 2014	10 May 2015	DBJV	For site WA23
Construction Noise Permit	GW-RW0123-15	20 March 2015	19 May 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0150-15	1 April 2015	30 September 2015	DBJV	For GI Works at Southern Landfall
Construction Noise Permit	GW-RW0204-15	11 May 2015	10 November 2015	DBJV	For site WA23
Construction Noise Permit	GW-RW0216-15	20 May 2015	19 July 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW0140-15	29 March 2015	28 September 2015	DBJV	For Portion N6
Construction Noise Permit	GW-RW0311-15	20 July 2015	19 October 2015	DBJV	For Dredging and Reclamation Works
Construction Noise Permit	GW-RW1007-15	16 September 2015	13 March 2016	DBJV	For GI Works at Southern Landfall
Construction Noise Permit	GW-RW0474-15	29 September 2015	28 March 2016	DBJV	For Portion N6
Construction Noise Permit	GW-RW0512-15	20 October 2015	19 January 2016	DBJV	For Dredging and Reclamation Works
Marine Dumping Permit	EP/MD/15-100	20 October 2014	19 November 2015	DBJV	For Type 1 (Dedicated site) and Type 2 (Confined Marine Disposal)
Marine Dumping Permit	EP/MD/15-142	7 November 2014	31 January 2015	DBJV	For Type 1 (Open Sea Disposal)

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Notes: HyD = Highways Department DBJV = Dragages – Bouygues Joint Venture VEP = Variation of Environmental Permit					

2.7 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

In response to the EM&A site audit findings mentioned in *Section 2.4* of this report, the Contractor has carried out the corrective actions.

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in *Appendix B*. The necessary mitigation measures relevant to this Contract were implemented properly.

2.8 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

In this reporting period, a total of 121 air quality monitoring events were undertaken in which there were four (4) Action Level exceedances for 1-hr TSP; no Action or Limit level exceedances for 24-hr TSP were recorded. (*Table 2.24*). Further to the investigation, the recorded exceedance for air quality monitoring was considered to be sporadic event from the cumulative anthropogenic activities (eg traffic emissions from River Trade Terminal) in this area of Hong Kong. The investigation findings are detailed in *the Thirteen* to *Twenty-four Monthly EM&A Report*

Table 2.24 Summary of Exceedances for Air Quality Impact Monitoring in this Reporting Year

Station	Exceedance Level	Date of Exceedances		Number of Exceedances	
		1-hr TSP	24-hr TSP	1-hr TSP	24-hr TSP
AQMS1	Action Level	2014-12-17	-	1	0
	Limit Level	-	-	0	0
ASR1	Action Level	2014-11-14		2	0
	Limit Level	-	-	0	0
ASR5	Action Level	2014-12-02		1	0
	Limit Level		-	0	0
AQMS2/ASR6	Action Level	-	-	0	0
	Limit Level	-	-	0	0
ASR10	Action Level	-	-	0	0
	Limit Level	-	-	0	0
	Total number of Action level Exceedances:			4	0
	Total number of Limit level Exceedances:			0	0

For marine water quality impact monitoring, a total of 91 monitoring events were undertaken in which no Action Level or Limit Level exceedances were recorded (*Table 2.25*).

Table 2.25 Summary of Exceedances for Marine Water Quality Impact Monitoring in this Reporting Period

Station	Exceedance Level [(a)]	DO (Surface and Middle)		DO (Bottom)		Turbidity (depth-averaged)		SS (depth-averaged)	
		Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS4	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
CS6	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS12	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS13	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS14	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
IS15	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
SR8	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
SR9	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
SR10	AL	-	-	-	-	-	-	-	-
	LL	-	-	-	-	-	-	-	-
	Total AL Exceedances:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total LL Exceedances:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Notes:
(a) AL = Action Level; LL = Limit Level

There were a total of five (5) Action and Limit Levels exceedances for impact dolphin monitoring in the reporting period, whereas both NEL and NWL regions each recorded one (1) Action Level exceedance, and three (3) Limit Level exceedances for the whole monitoring region were recorded. No unacceptable impact from the construction activities of the TM-CLKL Northern Connection Sub-sea Tunnel Section on Chinese White Dolphins was noticeable from general observations during the dolphin monitoring in this reporting period. Detailed investigation findings are presented in *the Fourth to Seventh Quarterly EM&A Report*.

Cumulative statistics are provided in *Appendix H*.

2.9 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

The Environmental Complaint Handling Procedure is provided in *Figure 2.4*.

No non-compliance event was recorded during the reporting period.

Two (2) environmental complaint cases were received in this reporting period. The interim reports were submitted to EPD and reported in the subsequent EM&A reports. The investigation findings showed that the cases were considered not related to the works under this Contract and were thus invalid.

No summons/ prosecution was received during the reporting period.

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

2.10 COMPARISON OF EM&A DATA WITH EIA PREDICTIONS

Findings of the EM&A activities undertaken during the period from 1 November 2014 to 31 October 2015 were compared with the relevant EIA predictions where appropriate to provide a review of the validity of the EIA predictions and identify potential shortcomings in the EIA recommendations.

2.10.1 *Air Quality*

Based on the findings presented in TM-CLKL EIA study, the major sources of dust nuisance arising from the Northern Connection are related to excavation, wind erosion from reclaimed areas, open sites and stockpiling areas. Therefore, during these construction activities, the TSP monitoring frequency will be increased at all air quality monitoring stations such that any deteriorating air quality can be readily detected and timely action taken to rectify the situation. Comparison of EIA prediction, average baseline monitoring and average impact monitoring results of TSP is presented in *Table 2.26*.

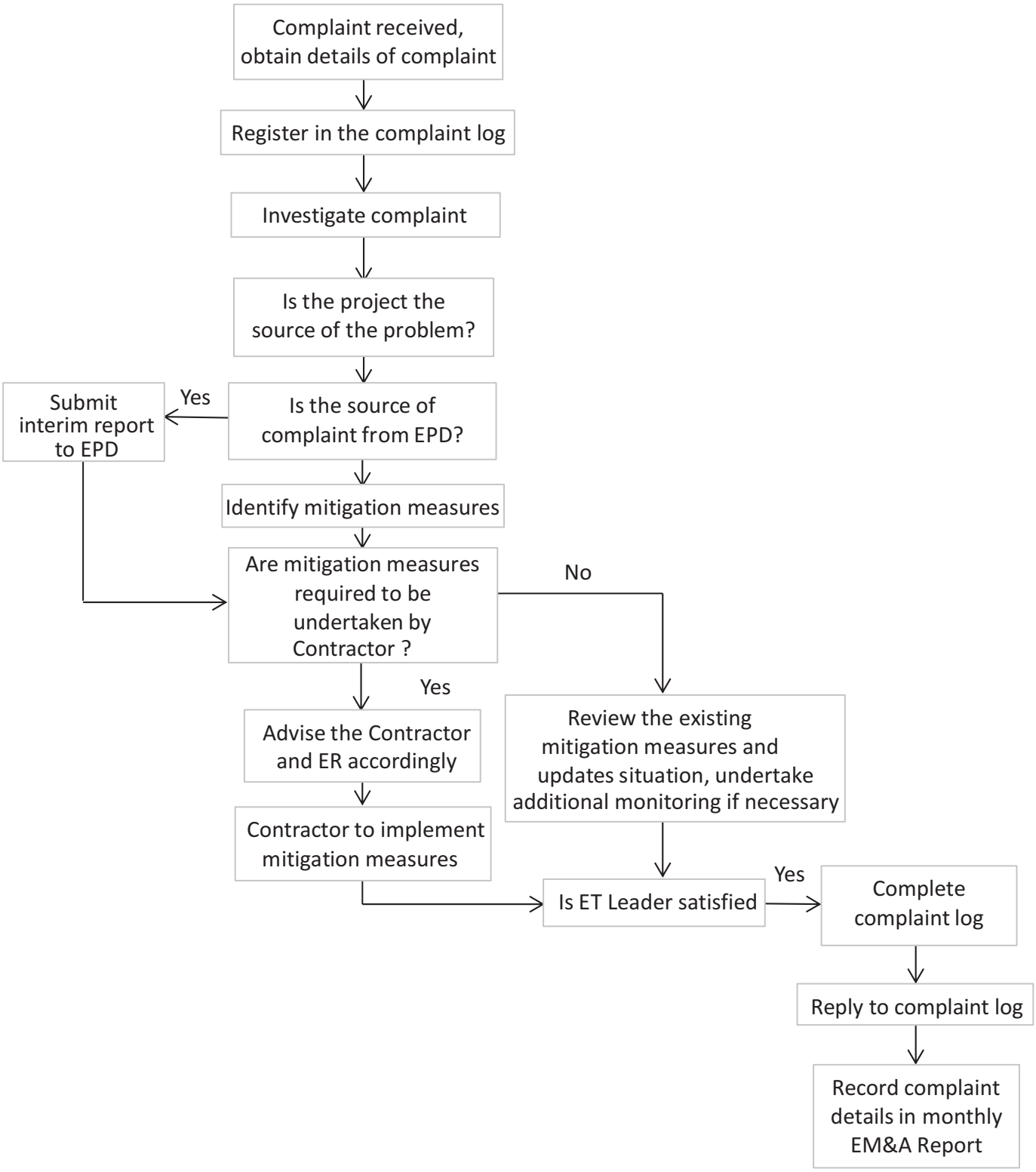

Figure 2.4 Environmental Complaint Handling Procedure

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Table 2.26 Comparison of EIA prediction and EM&A Results on Air Quality

Station	EIA Predicted Maximum	Maximum Impact Monitoring	Average Impact Monitoring	Maximum Baseline Monitoring	Average Baseline Monitoring
ASR1 (1-hour)	195	404	140	182	125
ASR1 (24-hour)	148	162	84	173	128
ASR5 (1-hour)	235	346	162	211	138
ASR5 (24-hour)	133	151	91	249	167
AQMS1 (1-hour)	N/A	348	124	196	131
AQMS1 (24-hour)	N/A	155	78	211	127
AQMS2/ASR6 (1-hour)	226	309	130	226	135
AQMS2/ASR6 (24-hour)	153	133	77	221	166
ASR10 (1-hour)	189	251	88	215	134
ASR10 (24-hour)	112	130	64	181	129

As shown in *Table 2.26*, maximum 1-hour and 24-hour TSP impact monitoring levels at ASR1, ASR5 and ASR10 were higher than their corresponding EIA predicted maximum levels. In baseline monitoring, maximum baseline levels of 1-hour TSP at ASR10 and 24-hour TSP at ASR1, ASR5, ASR6 and ASR10 were also higher than EIA maximum prediction. These recorded maximum monitoring values during both impact and baseline monitoring periods are thus considered as sporadic events and fluctuation of regional air quality. Overall, most of the monitoring results were within EIA predicted levels during impact monitoring period. It thus appeared that the construction activities of the Contract did not cause significant impact on air quality with similar average TSP levels between the baseline and impact monitoring. The EIA has concluded that no adverse residual construction dust impacts will occur after implementation of mitigation measures. Thus, the monitoring results are considered to be in line with the EIA prediction.

2.10.2 Water Quality

As identified in the EIA Report, key water quality issues during construction phase may be caused by dredging and filling works for the reclamation of the Project. Thus, marine water quality monitoring should be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity or unacceptable decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action could be taken to rectify the situation.

According to the EIA prediction, no SS exceedance is anticipated from this Project at the water sensitive receivers in the vicinity of the Contract works area (WSR 12, WSR 13 and WSR 47a). There is in-line with the monitoring

results that no Action Level or Limit Level exceedances were recorded from the water quality monitoring in this reporting period. In addition, the annual mean values of depth-averaged SS recorded in this reporting period were compared with the relevant concerned mean values, which were defined as 30% above baseline levels. Results showed that the annual mean values of depth-averaged SS at all monitoring stations were well below the concerned mean values (*Table 2.27*), thus the impact monitoring results are considered to in line with the EIA prediction.

DO levels from surface, mid-depth and bottom waters were generally similar amongst Control, Impact stations and Sensitive Receivers, and DO levels were variable throughout the reporting period which represented natural background fluctuation in water quality. Similar to DO levels, turbidity and SS levels were generally comparable amongst Control, Impact stations and Sensitive Receivers and variable throughout the monitoring period. High levels of turbidity and SS were occasionally recorded during both mid-ebb and mid-flood tides. Such fluctuations were also observed during baseline monitoring and are considered to be sporadic events and characteristic of water quality in this area of Hong Kong.

The annual means of DO levels during impact period were higher than the means of DO levels measured during baseline period. The annual means of depth-averaged SS and Turbidity during impact period were lower than the means of depth-averaged SS and Turbidity measured during baseline period. One way Analysis of Variance (ANOVA) was conducted to test for the differences between the baseline and impact monitoring data of Dissolved Oxygen, Turbidity and SS at the designated water quality monitoring locations. The detailed graphical and statistical results, as presented in *Section 2.2.3* and *Appendix E* respectively, show that depth-averaged SS and Turbidity levels were significantly lower during impact period than baseline period whilst DO levels were higher during impact period than baseline period. No deterioration trend on water quality was detected in the reporting period when comparing to baseline data. Thus, the impact monitoring results are considered to in line with the EIA prediction.

Table 2.27 ***Comparison between Annual Mean and Ambient Mean Values of Depth-averaged Suspended Solids (mg/L)***

Station	**Baseline Mean**		**Ambient Mean [(a)]**		**Annual Mean (November 2014 to October 2015)**	
	Mid-ebb	**Mid-flood**	**Mid-ebb**	**Mid-flood**	**Mid-ebb**	**Mid-flood**
CS4	10.2	9.0	13.3	11.7	7.8	7.7
CS6	10.9	11.7	14.1	15.2	7.6	7.5
IS12	9.2	9.5	12.0	12.3	7.7	7.7
IS13	10.0	10.5	13.0	13.7	7.7	7.7
IS14	10.4	9.7	13.5	12.6	7.8	7.7
IS15	9.6	11.0	12.5	14.2	7.7	7.6
SR10A	10.3	10.2	13.3	13.3	7.6	7.5
SR8	10.1	11.3	13.1	14.7	7.6	7.5
SR9	8.8	9.9	11.4	12.8	7.6	7.5
Grand Total	**10.0**	**10.3**	**13.0**	**13.4**	**7.7**	**7.6**

Notes:

2.10.3 Marine Ecology

Impact monitoring on marine ecology was undertaken during the monitoring period. According to the baseline results in the *Appendix F* of the approved EIA Report, the dolphin groups were largely sighted near Lung Kwu Chau and the waters between Lung Kwu Chau and Black Points and infrequently 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 and impact periods. Although the STG and ANI in impact monitoring period were lower than that before the commencement of this Contract (see *Section 2.3.6*), the distribution pattern was similar between the impact monitoring period and before the commencement (i.e. transition period in 2012 – 2013) of this Contract. In addition, the habitat use pattern between impact monitoring in this reporting period and before the commencement of this contract is largely similar, in which dolphins are observed heavily utilized area 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 dredging and reclamation activities 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.

2.10.4 Waste Management

For wastes generated from the construction activities including C&D materials (inert and non-inert), chemical wastes, recyclable materials and marine sediments (both categories L and M), the types of wastes generated were in line with the EIA predictions. For dredged sediment, the quantity of sediments generated was in line with CEDD's allocated disposal volumes as per the marine dumping permit (see *Table 2.22*). The wastes were also disposed of in accordance with the recommendations of the EIA

2.11 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 change to the monitoring programme was considered 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.

2.12 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 necessary.

3 REVIEW OF EM&A PROGRAMME

3.1 SITE INSPECTIONS & AUDITS

Weekly joint environmental site inspections have been conducted in the reporting period to assess the effectiveness of the environmental controls established by the Contractor and the implementation of the environmental mitigation measures recommended in the EIA Report. Findings of the site inspections confirmed that the environmental mitigation measures recommended in the EIA Report were properly implemented by the Contractor, and the recommended mitigation measures have been working effectively. There was no non-compliance recorded during the site inspections and environmental performance complied with environmental requirements.

The requirements for site inspections and audits have been reviewed and were considered as adequate. No change to the requirements was considered to be necessary.

The recommended environmental mitigation measures are also considered to be effective and efficient in reducing the potential environmental impacts associated with the construction phase of the Project. No change was thus considered necessary.

3.2 AIR QUALITY MONITORING

Construction phase air quality monitoring was conducted during this reporting period when land-based construction works were undertaken. Whilst occasional exceedances of Action and Limit Levels for air quality were recorded, following the review of monitoring data and construction works details in accordance with the procedures stipulated in the Event and Action Plan of Updated EM&A Manual, all exceedances were unlikely to be due to the Project's construction works.

The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements was considered to be necessary.

3.3 MARINE WATER QUALITY MONITORING

Construction phase water quality monitoring was conducted during this reporting period when dredging and reclamation works were undertaken. No Action Level or Limit Level exceedances for water quality were recorded from the water quality monitoring in this reporting period.

The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements

was considered to be necessary. Water Quality Monitoring was suspended from 6 June 2015 effectively and will resume when Phase II Reclamation commences in the fourth quarter of 2016 tentatively.

3.4 WASTE MANAGEMENT

The waste inspection and audit programme has been implemented during this reporting period. Wastes generated from construction activities have been managed in accordance with the recommendations in the EIA Report, the EM&A Manual, the WMP and other relevant legislative 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.

3.5 MARINE ECOLOGY MONITORING

Daily marine mammal exclusion zone monitoring and dolphin monitoring during the reporting period were conducted. The monitoring programme has been reviewed and was considered to be adequate to cater for the nature of works. No change to the requirements was considered to be necessary.

3.6 SUMMARY OF RECOMMENDATIONS

Findings of the EM&A programme indicate that the recommended mitigation measures have been properly implemented and working effectively. The EM&A programme has been reviewed and was considered as adequate and effective. No change to the EM&A 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.

4 CONCLUSIONS

This Second Annual EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 November 2014 to 31 October 2015, in accordance with the Updated EM&A Manual and the requirements of *EP-354/2009/D*.

Air quality (including 1-hour TSP and 24-hour TSP), marine water quality and dolphin monitoring were carried out in the reporting period. Four Action Level exceedances for 1-hr TSP were recorded during the reporting period. No Action Level or Limit Level exceedances were recorded in marine water quality impact monitoring during the reporting period. Investigation findings suggested that the observed exceedances for air quality monitoring were considered to be sporadic event from the cumulative anthropogenic activities (eg traffic emissions from River Trade Terminal) in this area of Hong Kong. The review of water quality monitoring data suggested that no unacceptable impact was resulting from the construction activities under this Contract in the reporting period. Nevertheless, the Contractor was reminded to ensure that all dust mitigation measures are provided at the construction sites.

A total of 54 groups of 229 Chinese White Dolphin (CWDs) were sighted. Whilst two (2) Action Level exceedances and three (3) Limit Level exceedances were recorded for 4 sets of quarterly dolphin monitoring data between September 2014 and August 2015, no unacceptable impact from the activities of this Contract on Chinese White Dolphins was noticeable from the general observations. 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.

Fifty-two weekly environmental site inspections were carried out in the reporting period. Recommendations on remedial actions provided for the deficiencies identified during the site audits were properly implemented by the Contractor. No non-compliance event was recorded during the reporting period.

Two (2) environmental complaint cases were received in this reporting period. The interim reports were submitted to EPD and reported in the subsequent EM&A reports. The investigation findings showed that the cases were considered not related to the works under this Contract and is thus invalid.

No summons/ prosecution was received during the reporting period.

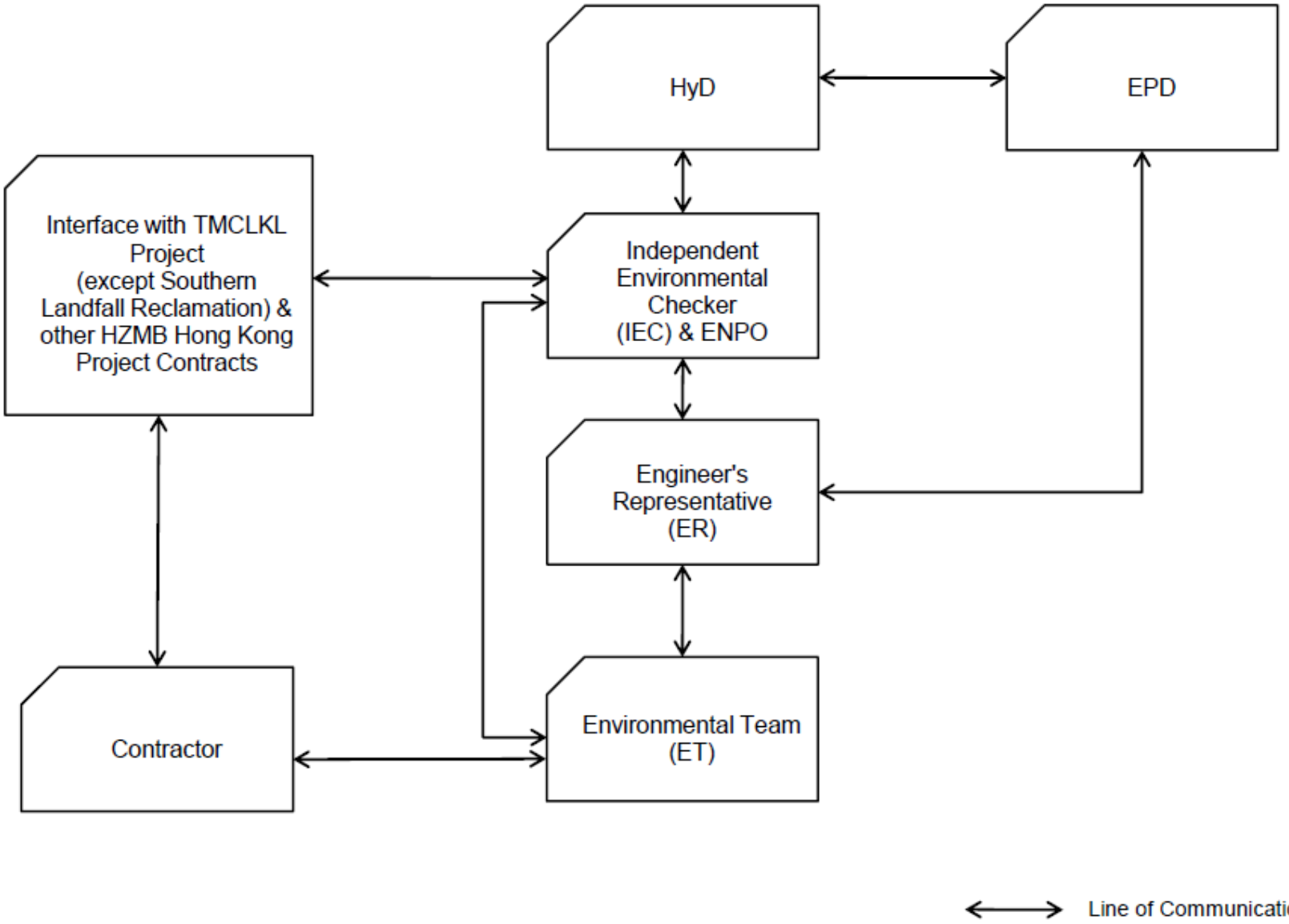
The review of monitoring data suggested that the construction works under this Contract have proceeded in an environmentally acceptable manner in this reporting period.

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 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/2012/08 Northern Connection Sub-sea Tunnel Section
Project Organization

DATE: 06/03/2013

Environmental Resources Management

ERM

Appendix B

Environmental Mitigation and Enhancement Measure Implementation Schedules

Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Environmental Mitigation and Enhancement Measure Implementation Schedule

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 twice 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	Watering of the construction sites in Lantau for 8 times/day and in Tuen Mun for 12 times/day to reduce dust emissions by 87.5% and 91.7% respectively and shall be undertaken.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		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		✓

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

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	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		✓
WATER QUALITY									
Marine Works (Sequence A)									
6.1 Figure 6.2a Appendix D6a	Annex A	Construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. The protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2a and detailed in Appendix D6a. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation;	All areas/ prior to dredging and backfilling works	Contractor	TM-EIAO		Y		✓
6.1	-	a maximum of 50% public fill to be used for all seawall filling below +2.5mPD for TM-CLKL southern and northern landfalls.	TM-CLKL seawall filling	Contractor	TM-EIAO		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	a maximum of 30% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL southern landfall	TM-CLKL southern landfall reclamation filling	Contractor	TM-EIAO		Y		N/A
6.1	-	a maximum of 100% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL northern landfall	TM-CLKL northern landfall reclamation filling	Contractor	TM-EIAO		Y		✓
6.1	-	Use of cage type silt curtains round allgrab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works.	All areas dredging works	Contractor	TM-EIAO		Y		✓
	Figure 1.1 of Annex C	A layer of floating type silt curtain will be applied when dredging and reclamation works are being undertaken at Portion N-a as shown in Figure 1.1 of Annex C of the EM&A Manual.	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
6.1	-	Trailer suction hopper dredgers shall not allow mud to overflow.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	The use of Lean Material Overboard (LMOB) systems shall be prohibited.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1 Figure 6.2b Appendix D6b	Annex A	For other parts of the reclamation works construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. It should be noted that the protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2b and detailed in Appendices D6b. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation; - Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and	TM-CLKL northern landfall, Portion D of HKBCF and HKLR	Contractor	TM-EIAO		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
		- Reclamation dredging and filling for Portion 1 of HKLR;							
6.1	-	The filling material for the other parts of the works are the same as Sequence A;	All other areas/backfilling works	Contractor	TM-EIAO		Y		N/A
6.1	5.7	Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM- CLKL southern reclamation. Cage type silt curtains will be applied round all grab dredgers at other works area.	HKBCF, HKLR and TM-CLKL grab dredging	Contractor	TM-EIAO		Y		✓
6.1	Annex A	A layer of floating type silt curtain will be applied around all works as defined in Appendix D6b.	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
6.1	-	TM-CLKL northern landfall: - Reclamation filling shall not proceed until at least 200m section of leading seawall at both the east and west sides of the reclamation are formed above +2.5 mPD, except for 100m gaps for marine access;	All areas/ through out marine works	Contractor	TM-EIAO		Y		✓
General Marine Works									
6.1	-	Use of TMB for the construction of the submarine tunnel.	Tunnel works / Construction phase	Contractor	TM-EIAO		Y		N/A
6.1	-	Export dredged spoils from NWWCZ.	All areas as much as possible / dredging activities	Contractor	DASO Permit conditions		Y		✓
6.1	-	Where public fill is proposed for filling below +2.5mPD, the fine content in the public fill will be controlled to 25%	All areas/ backfilling works	Contractor	TM-EIAO		Y		N/A
6.1	-	Where sand fill is proposed for filling below +2.5mPD, the fine content in the sand fill will be controlled to 5%.	All areas/ backfilling works	Contractor	TM-EIAO		Y		N.A
6.1	-	Mechanical grabs shall be designed and maintained to avoid spillage and should seal tightly while being lifted.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		✓
6.1	-	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		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
					Guidelines. DASO permit conditions.				
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		N/A
6.1	-	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		N/A
6.1	-	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		Y		<>

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
					conditions.				
6.1	5.2	Silt curtain shall have proved effectiveness from the producer and shall be fully maintained throughout the works by the contractor.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.1	-	The daily maximum production rates shall not exceed those assumed in the water quality assessment.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	The dredging and filling works shall be scheduled to spread the works evenly over a working day.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
Land Works									
6.1	-	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		✓
6.1	-	Sewage effluent and discharges from on- site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	Storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		<>
6.1	-	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		<>
6.1	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.1	-	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		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	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		<>
6.1	-	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		✓
6.1	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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 off site disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		N/A

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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		✓
6.1	-	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	✓
6.1	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									
6.1	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									

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
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	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All dredging and reclamation areas/Detailed Design/during all reclamation and dredging 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	N/A. To be implemented by AFCD.
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for dredging and reclamation works	All areas/ Detailed Design/during dredging and reclamation works	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
8.15	6.5	Audit coral translocation success	Post translocation	Contractor	TMEIA		Y		✓
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA		Y		N/A.
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		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
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	The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2)	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	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		N/A
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	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	N/A
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (OM6)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	N/A
WASTE									
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓

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

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 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	The surplus surcharge should be transferred to a fill bank	Reclamation areas / after surcharge works	Contractor	TMEIA		Y		N/A
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		✓

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

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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			✓
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	Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.	Reclamation areas / throughout dredging works	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		✓

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

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

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

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
		entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and - Incompatible materials are adequately separated.							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A
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 hardstanding;	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, aluminium cans, plastic bottles, etc should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		✓

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

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	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		✓

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

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
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

*** Remarks:**

✓	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

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

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	ASR1 = 213 ASR5 = 238 AQMS1 = 213 ASR6 = 238 ASR10 = 214	260
1 Hour TSP Level in μg /m³	ASR1 = 331 ASR5 = 340 AQMS1 = 335 ASR6 = 338 ASR10 = 337	500

Table C2 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

(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 C3 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 C4 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	NEL = [STG < 2.4 & ANI <8.9] and NWL = [STG < 3.9 & ANI <17.9]	

Appendix D

Impact Air Quality Monitoring Results

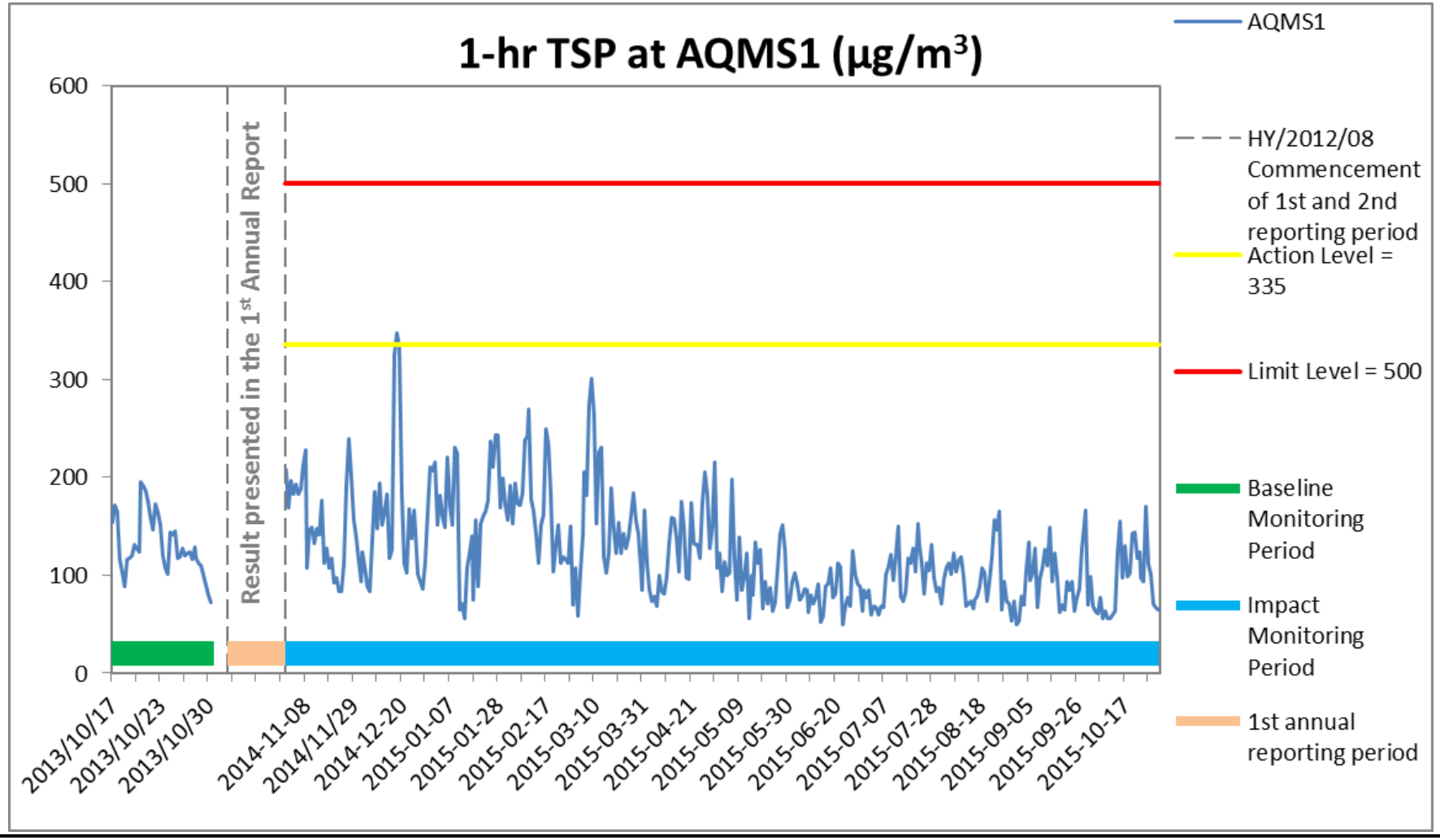


Figure D.1 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at AQMS1 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

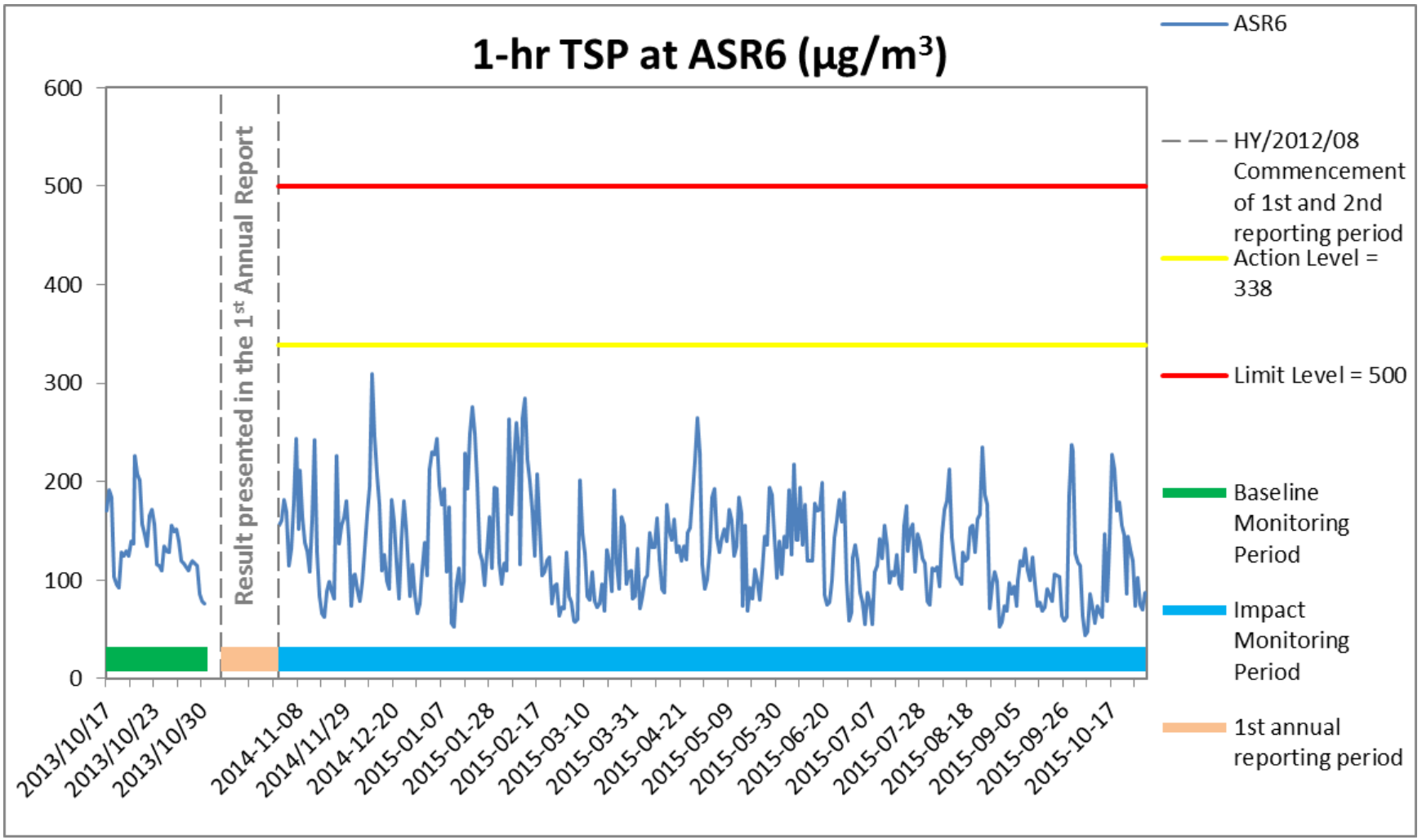


Figure D.2 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at AQMS2/ASR6 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

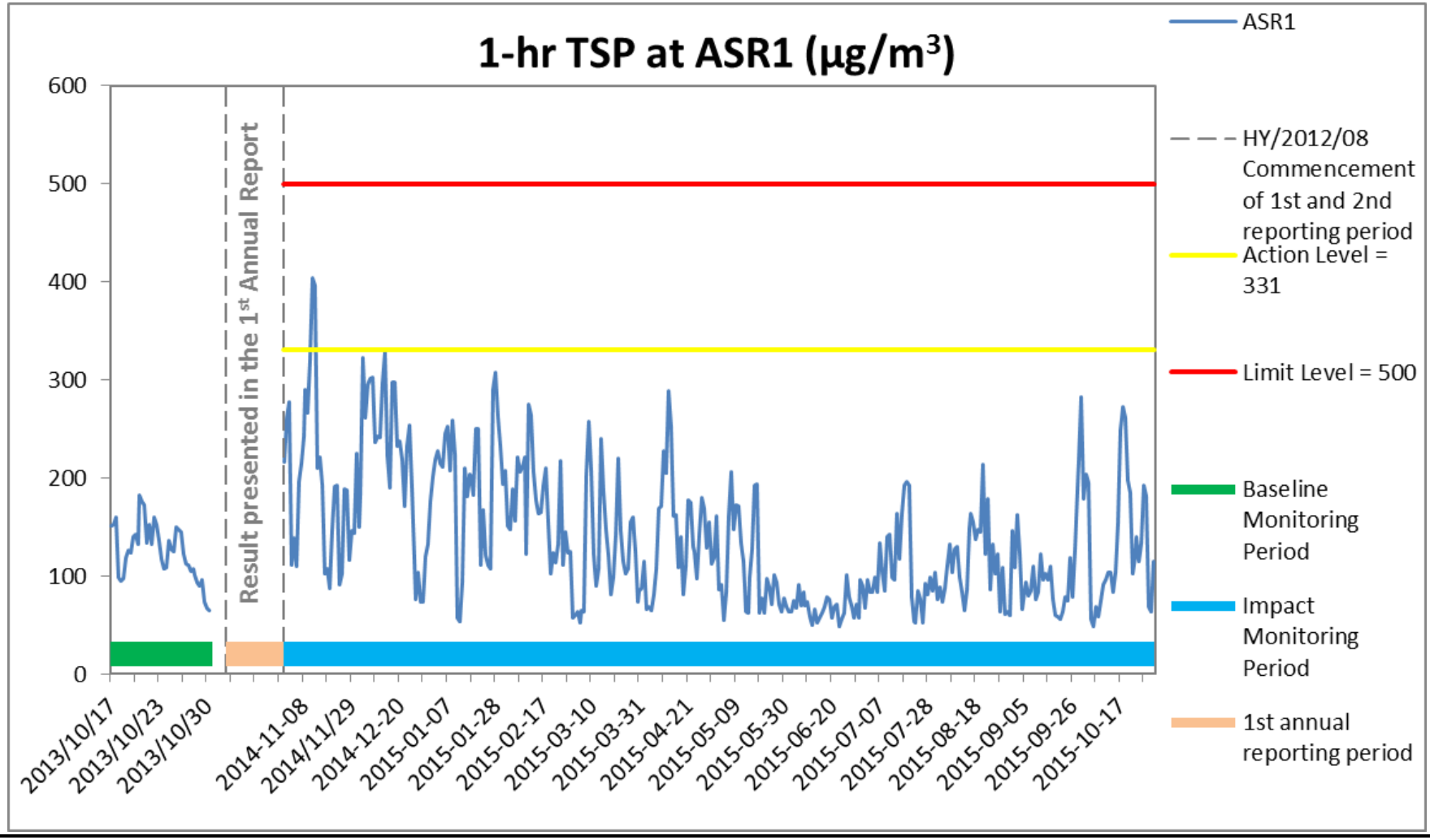


Figure D.3 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR1 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

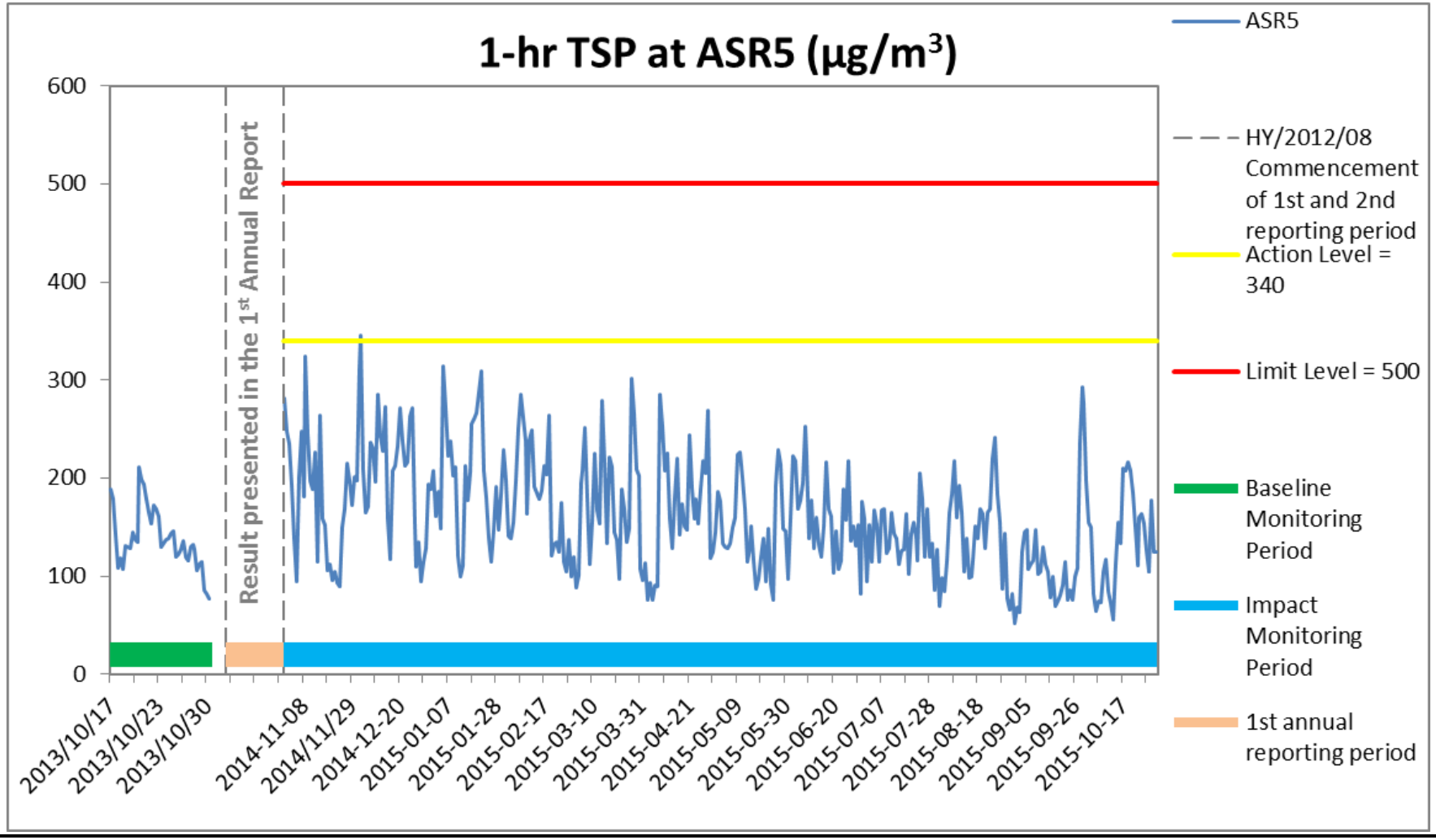


Figure D.4 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR5 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

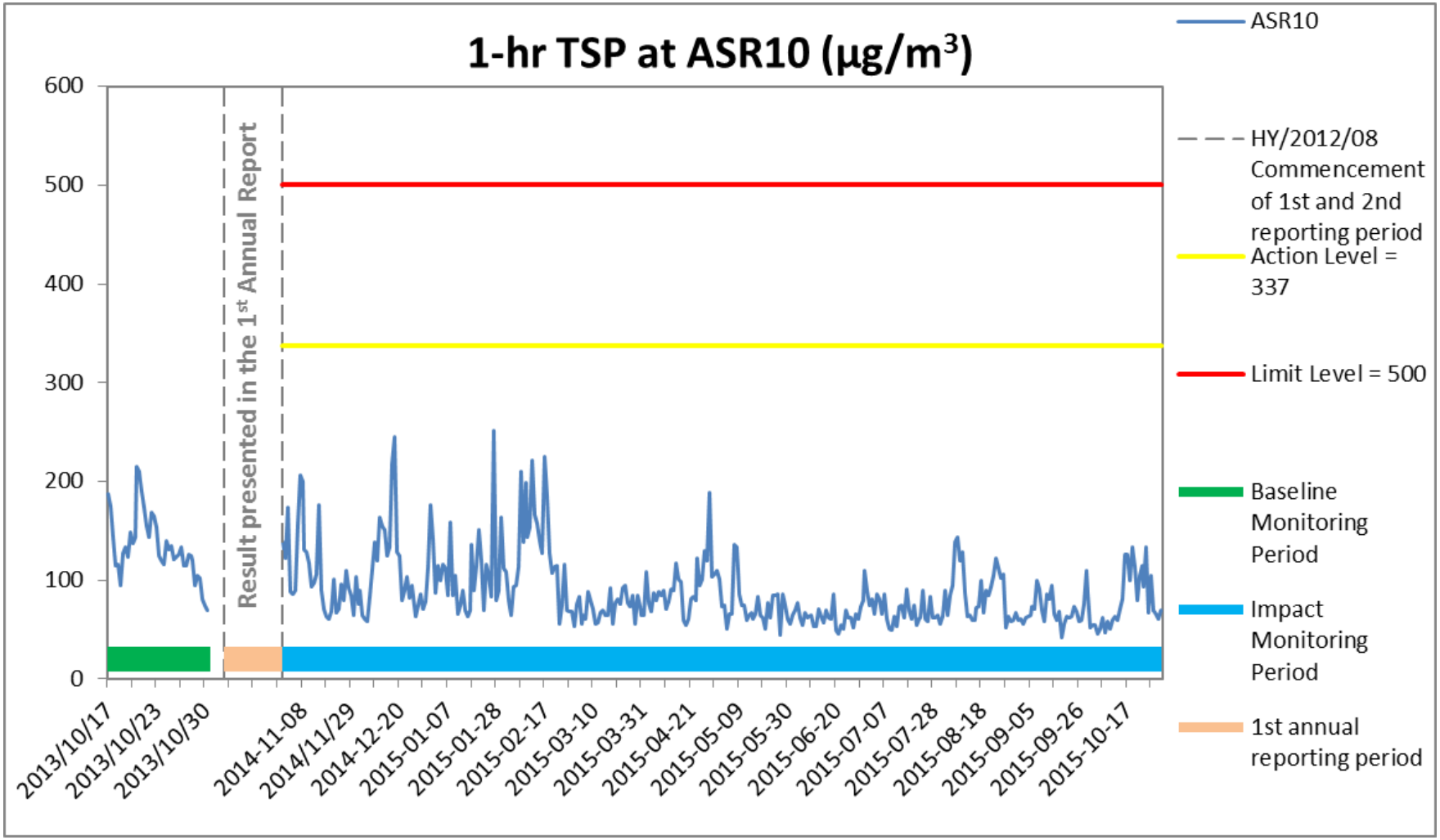


Figure D.5 Baseline & Impact Monitoring – 1-hour Total Suspended Particulates (µg/m³) at ASR10 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

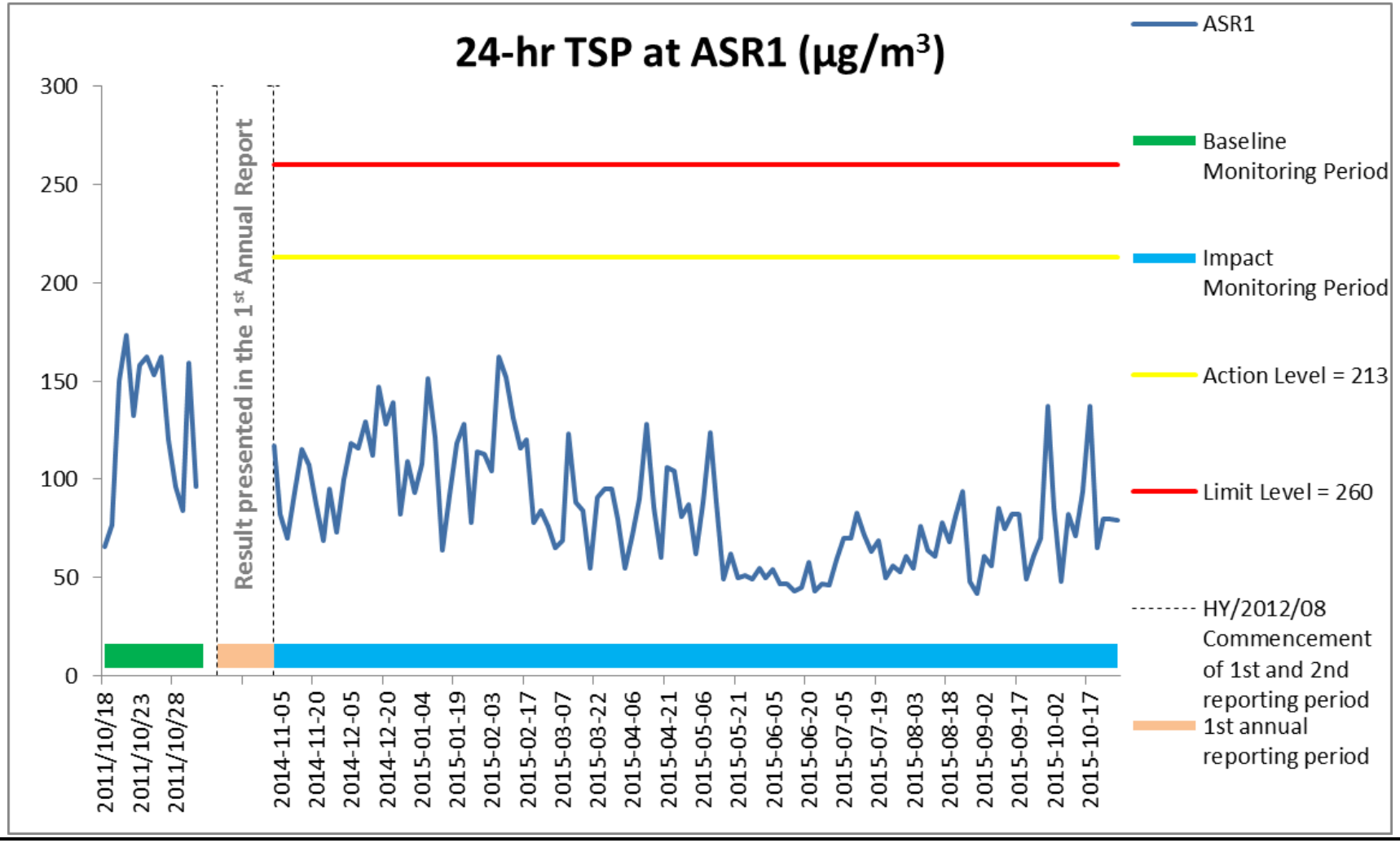


Figure D.6 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR1 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

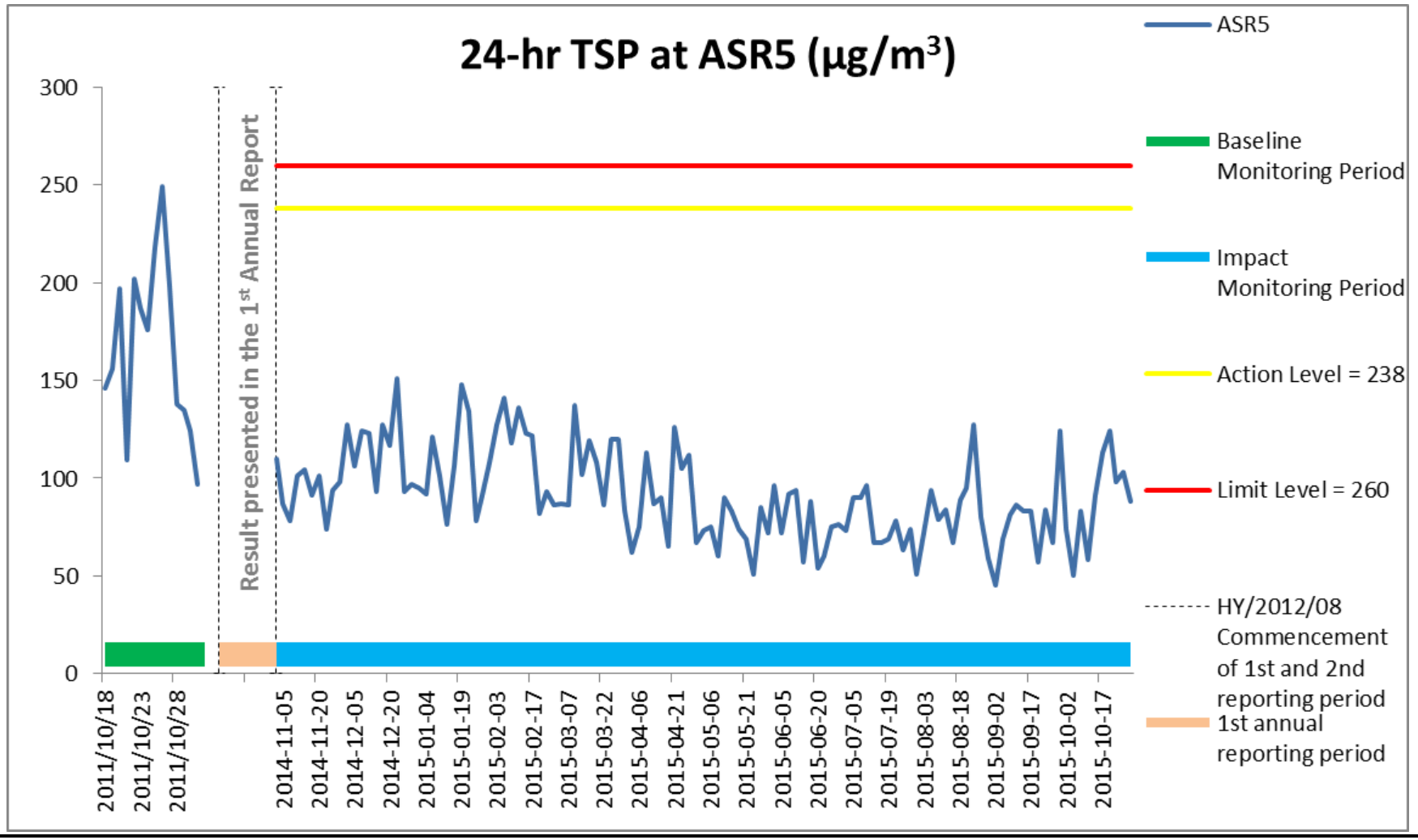


Figure D.7 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR5 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

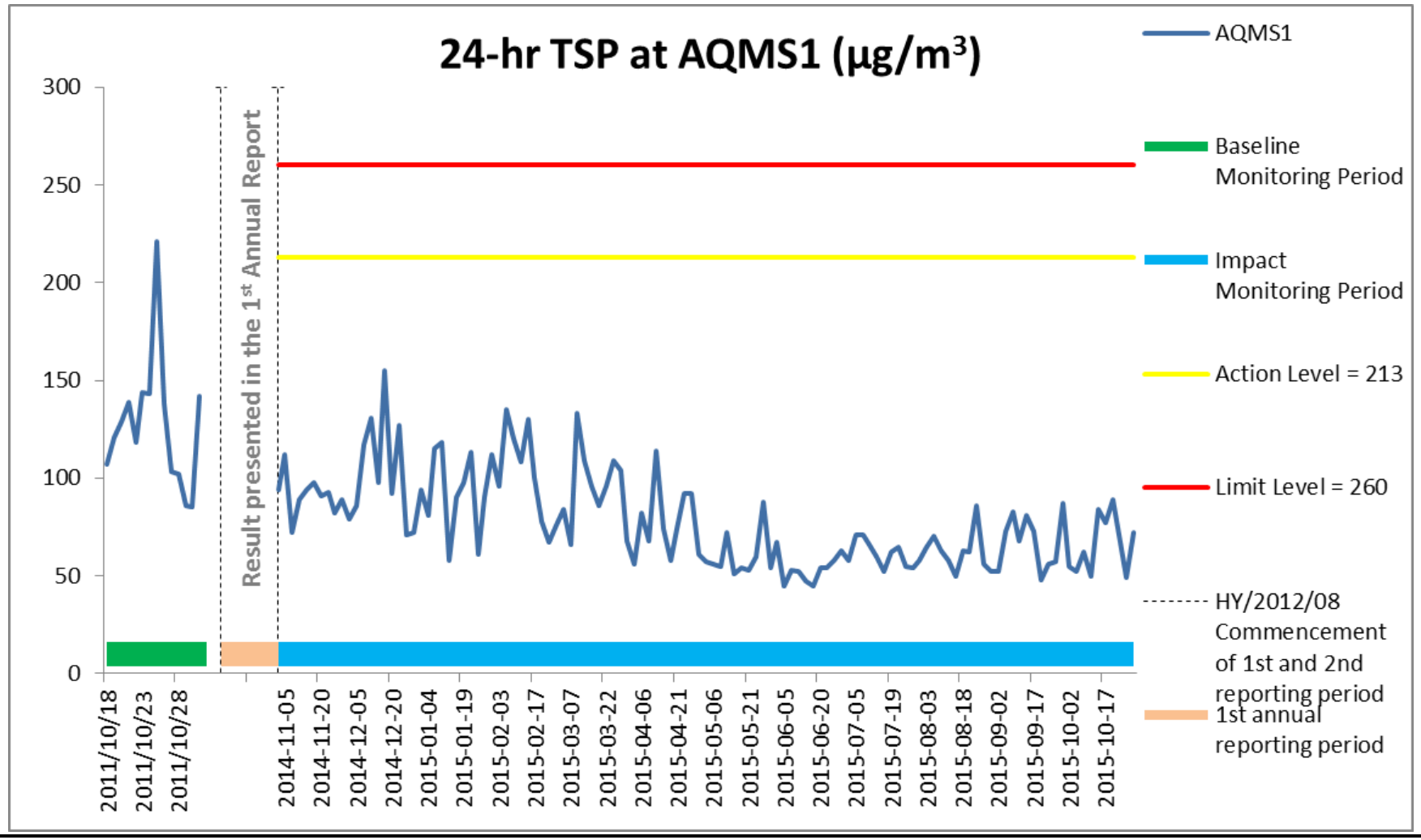


Figure D.8 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at AQMS1 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

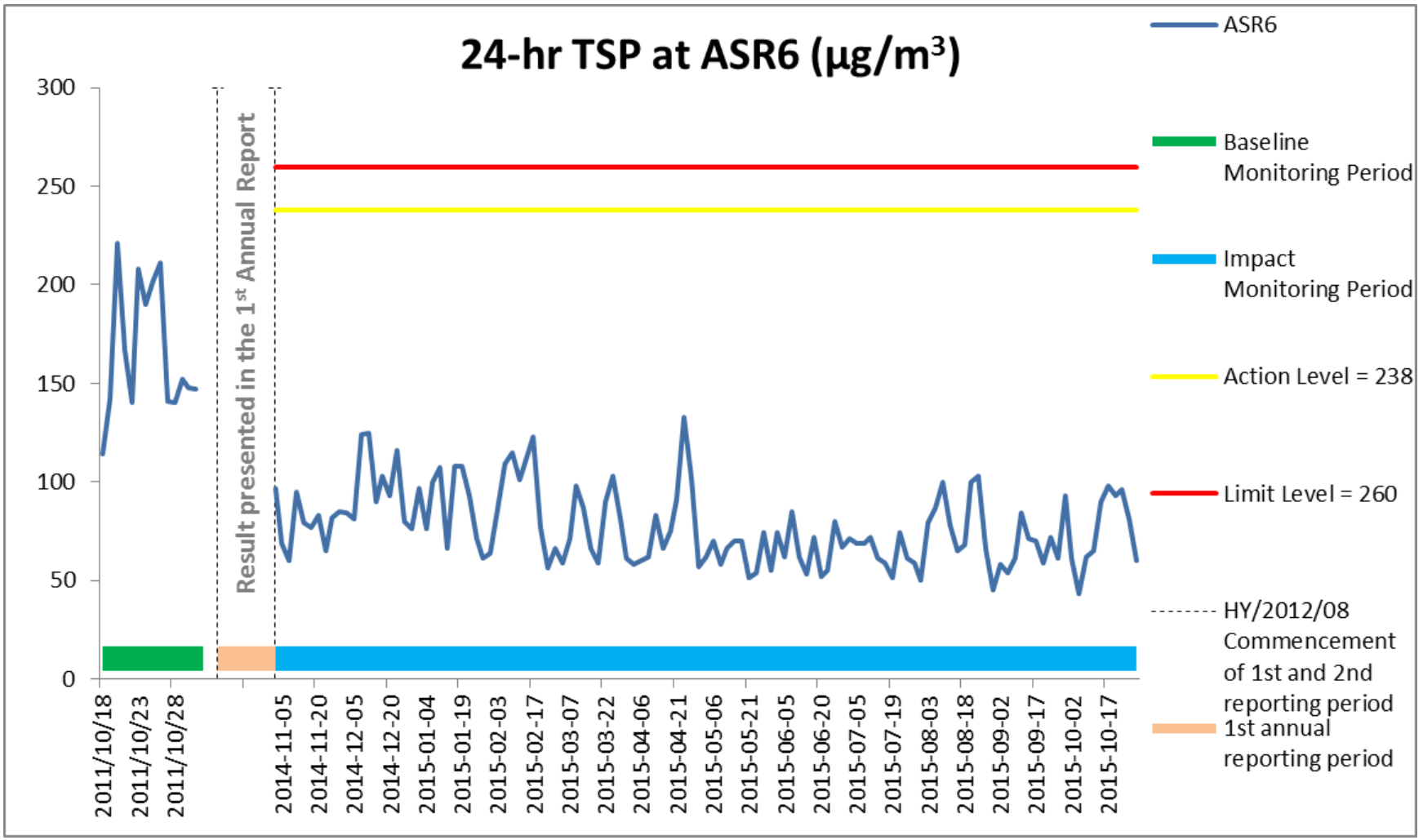


Figure D.9 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at AQMS2/ASR6 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

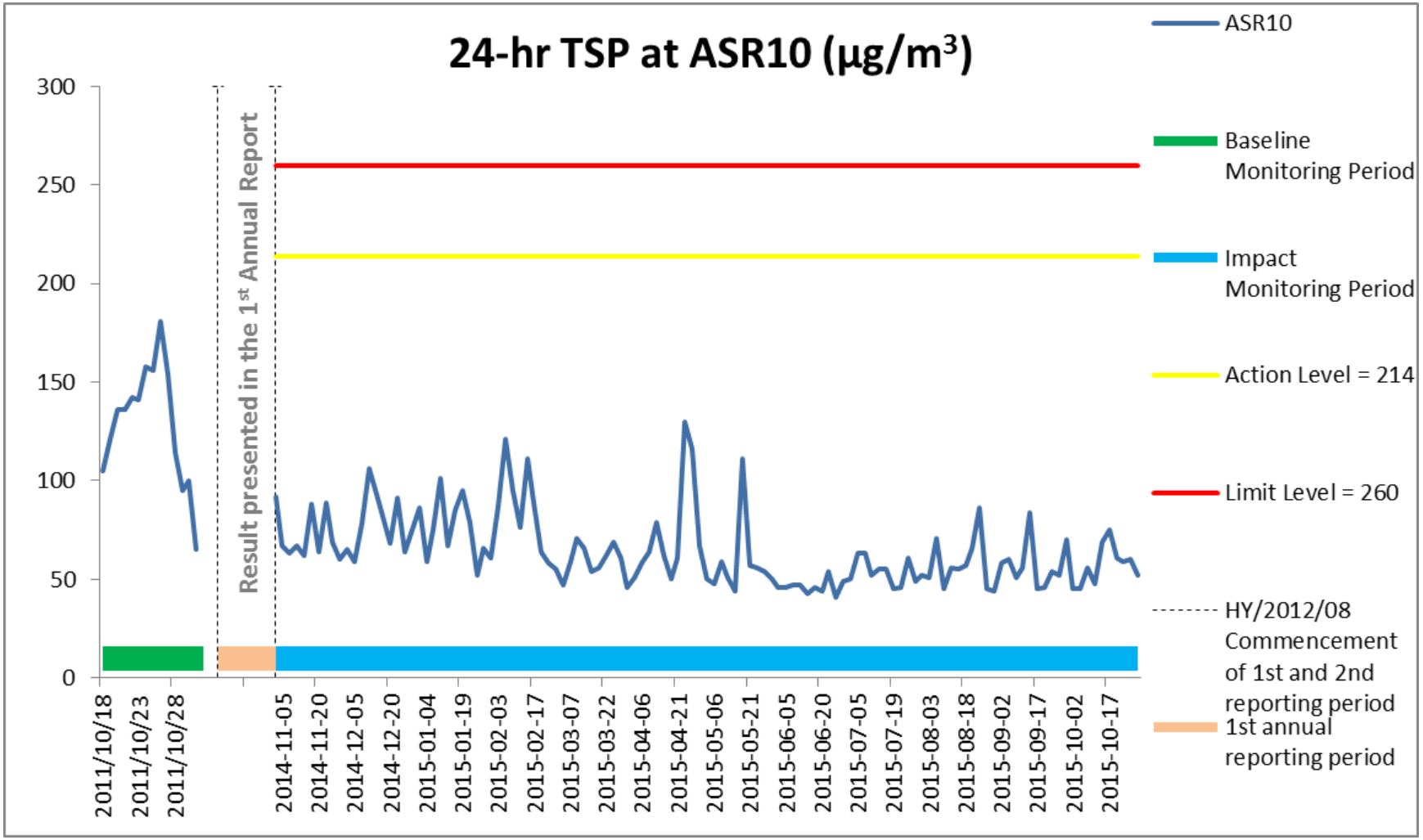
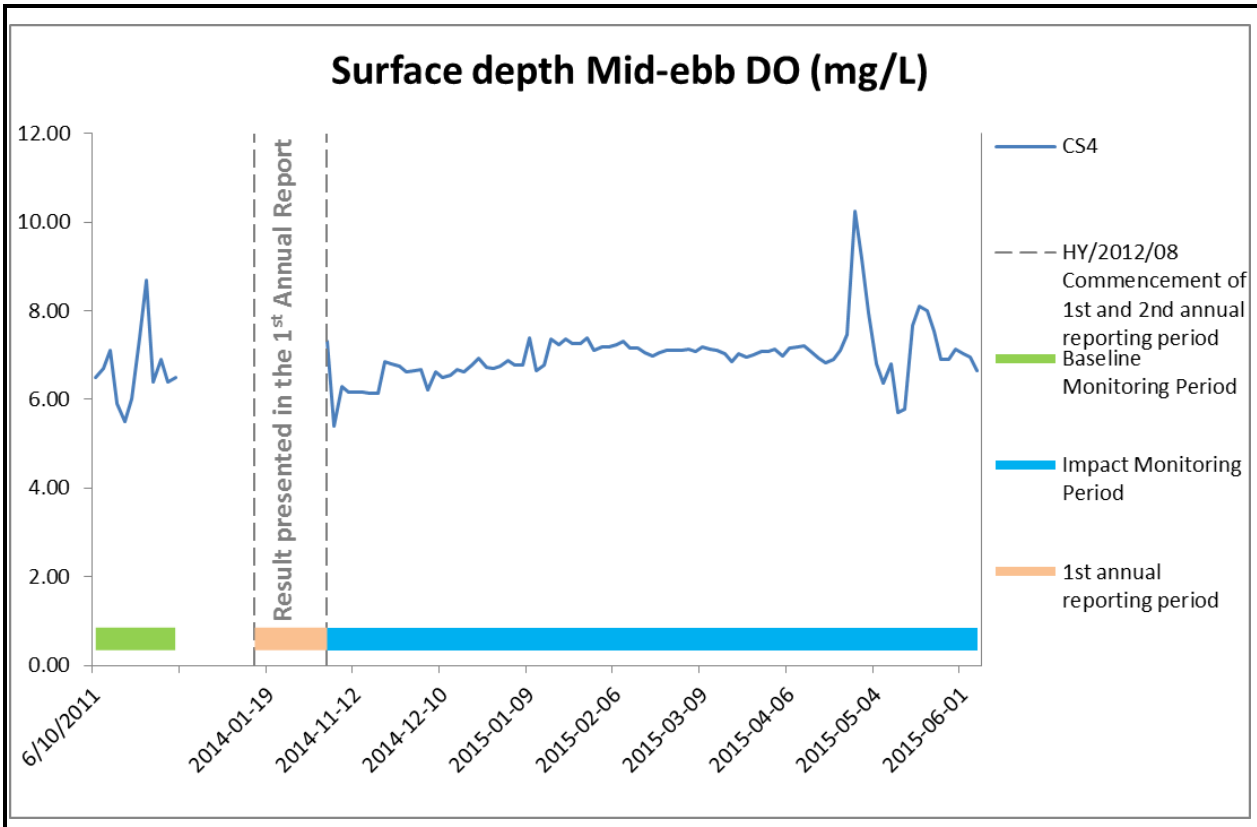


Figure D.10 Baseline & Impact Monitoring – 24-hour Total Suspended Particulates (µg/m³) at ASR10 between 17 October 2013 and 31 October 2015 during Baseline & Impact Monitoring period. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major land-based construction activities included: Excavation for North Launching Shaft, Diaphragm Wall Construction, Land-based Sheet Piling Works, Box Culvert Extension, Construction of temporary access, TBM Platform Construction & Start-up of TBM. *Ref: 0212330_Impact AQM graphs_2ndAnnual_REV a.xlsx*

ERM

Appendix E

Impact Water Quality Monitoring Results



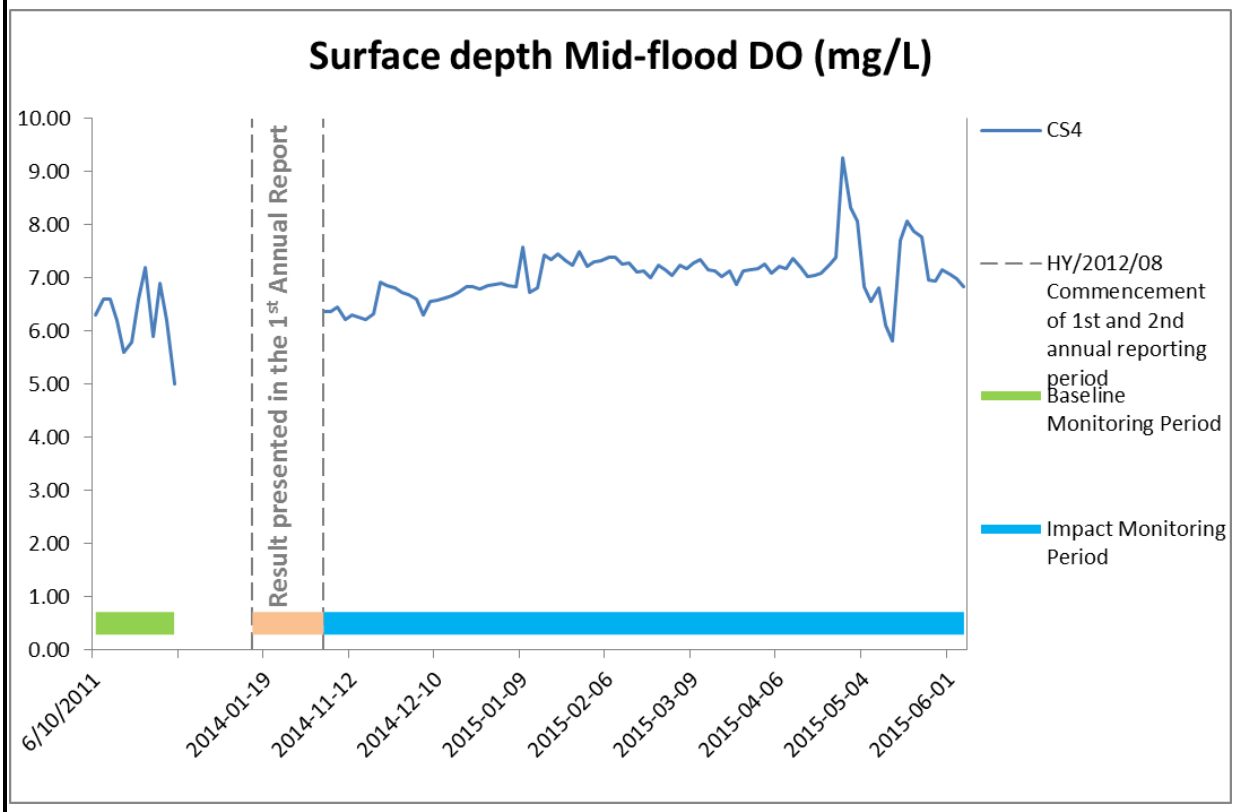
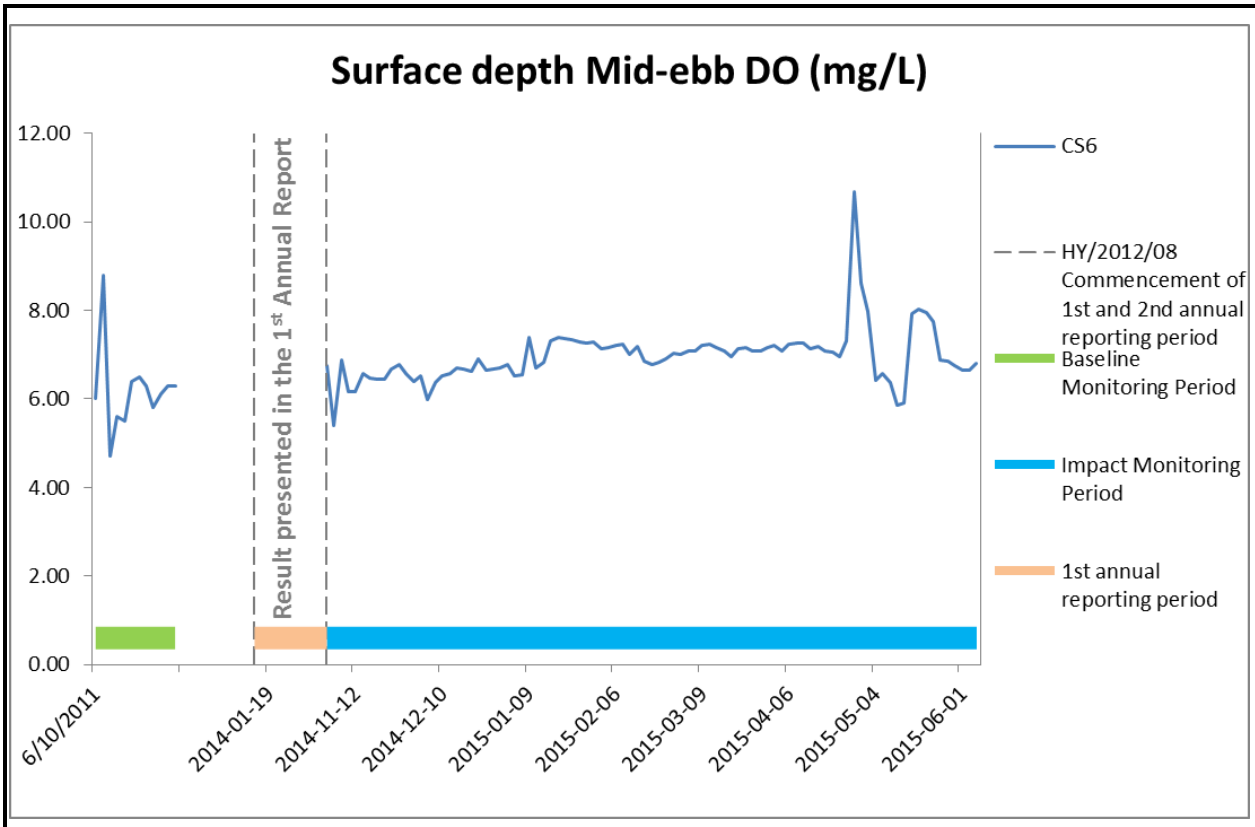


Figure E1 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref: 0212330_Impact-WQM_2nd annual.xlsx*



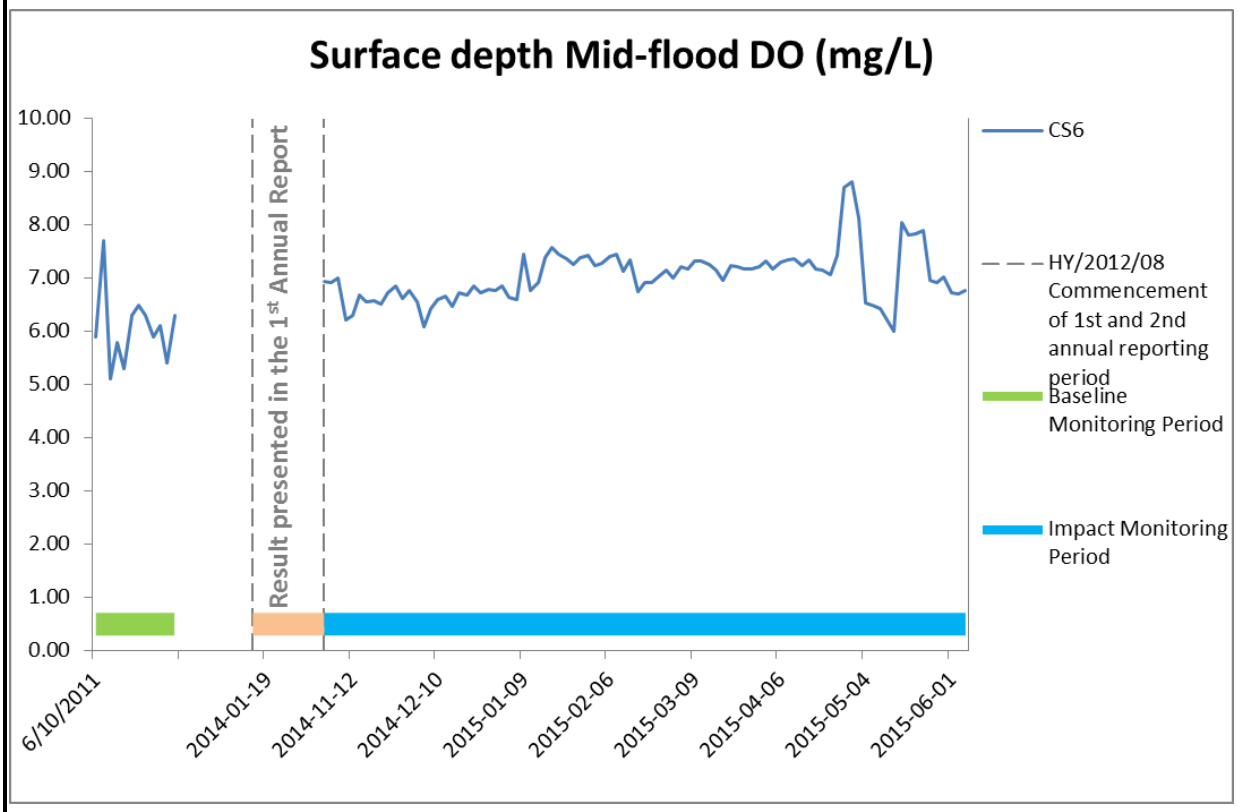
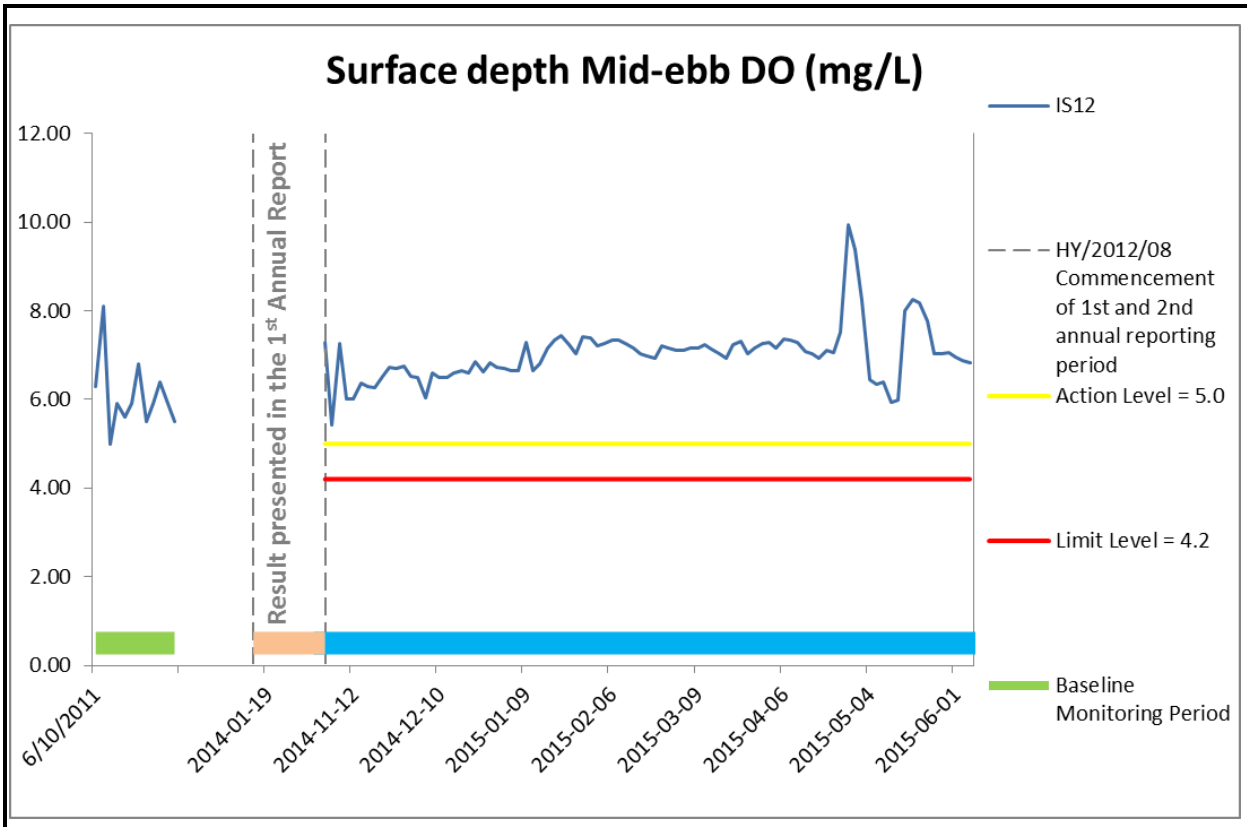


Figure E2 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



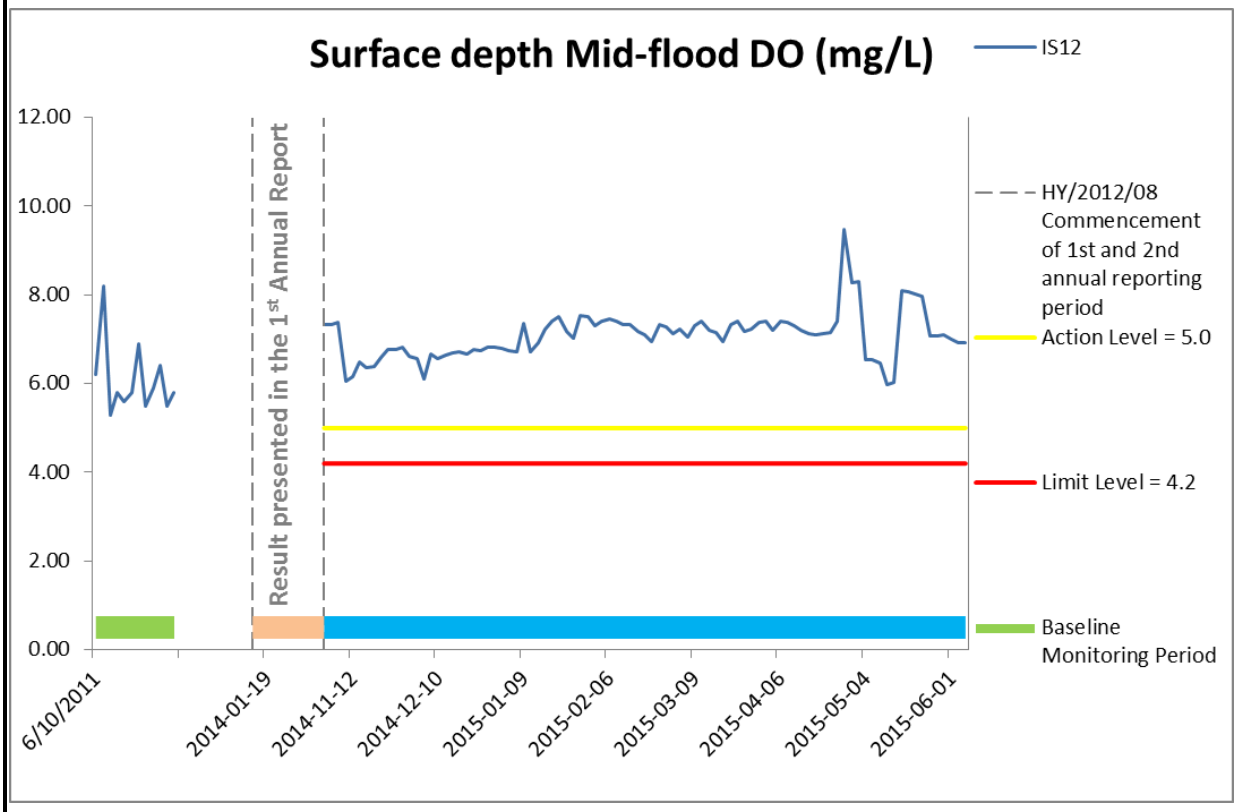
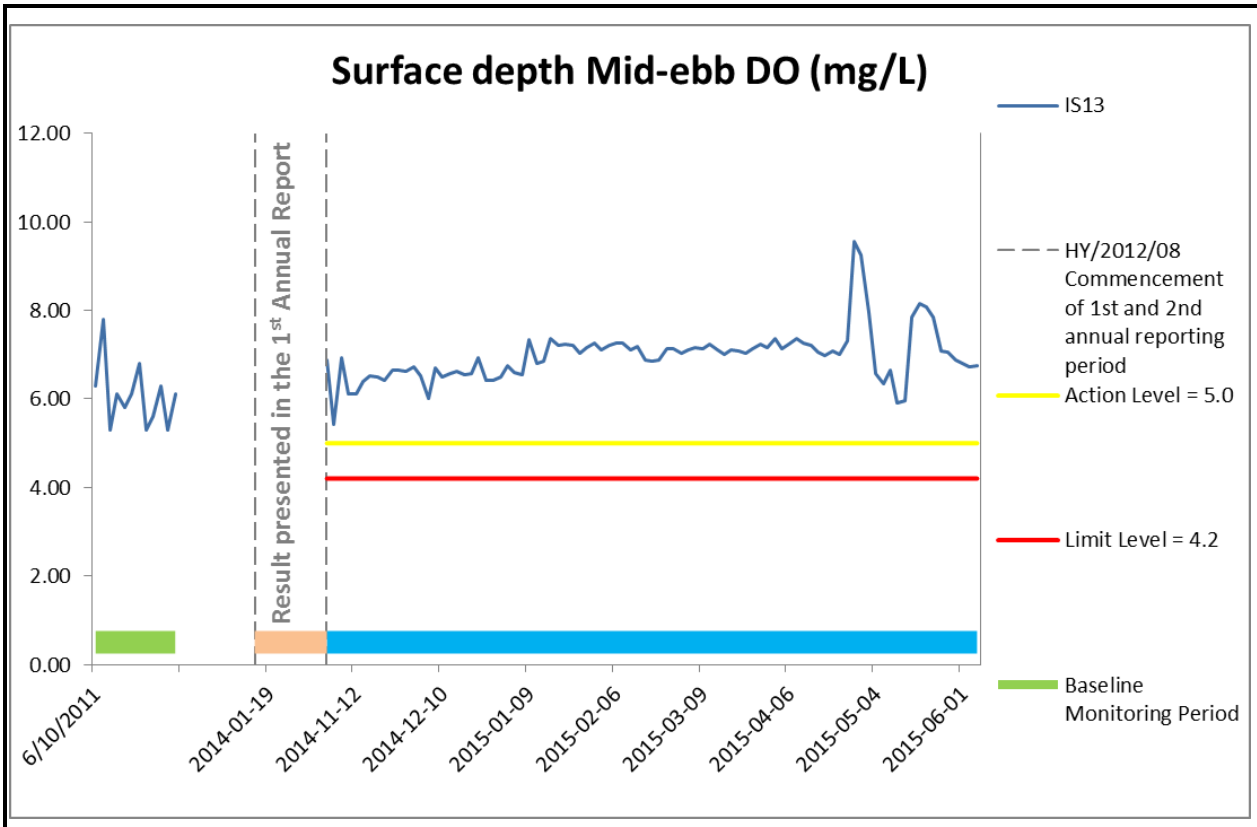


Figure E3 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref: 0212330_Impact-WQM_2nd annual.xlsx*



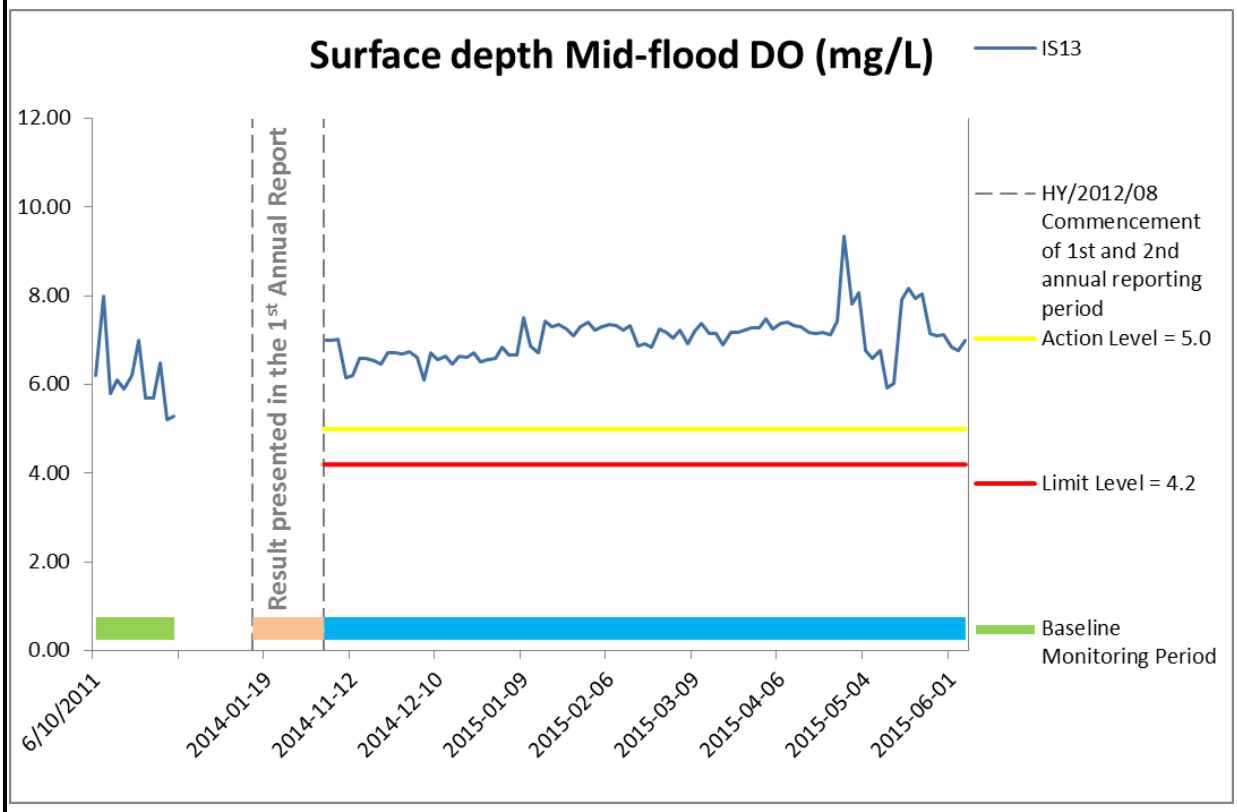


Figure E4 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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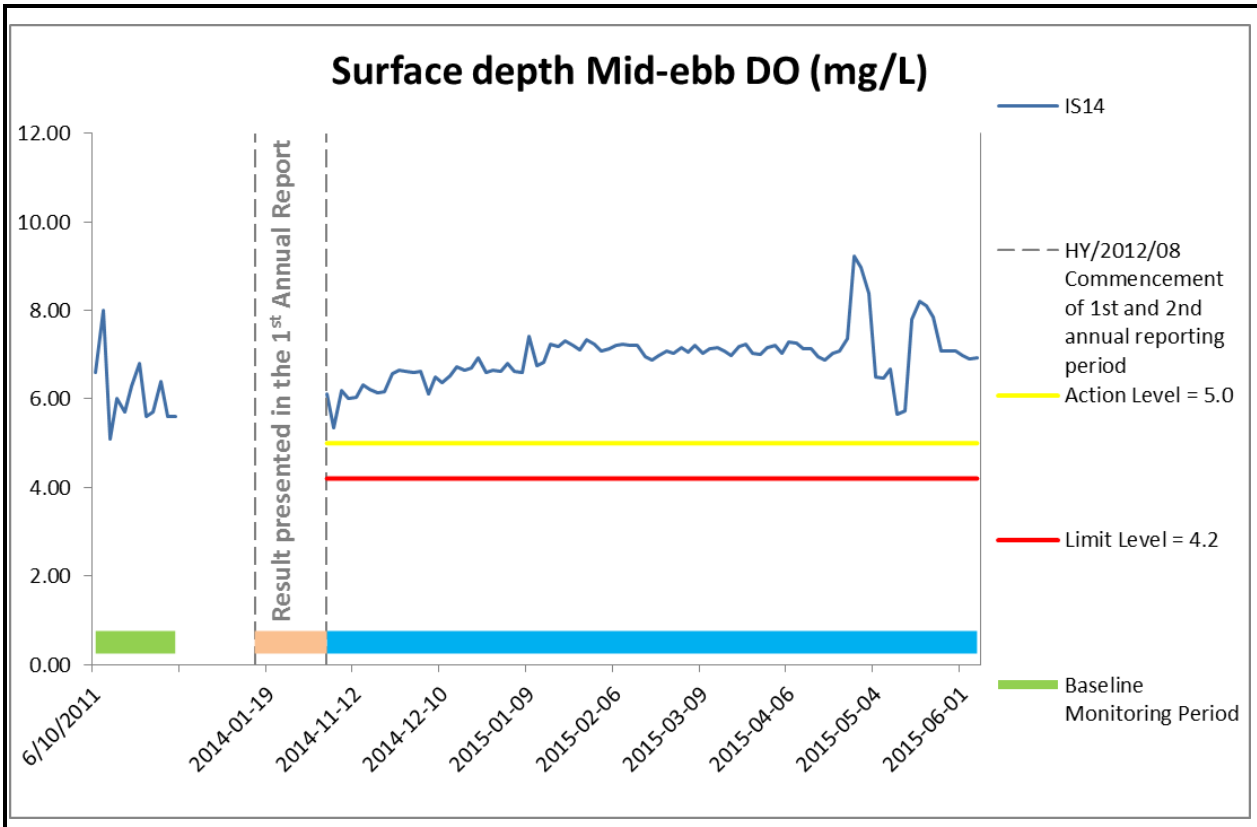


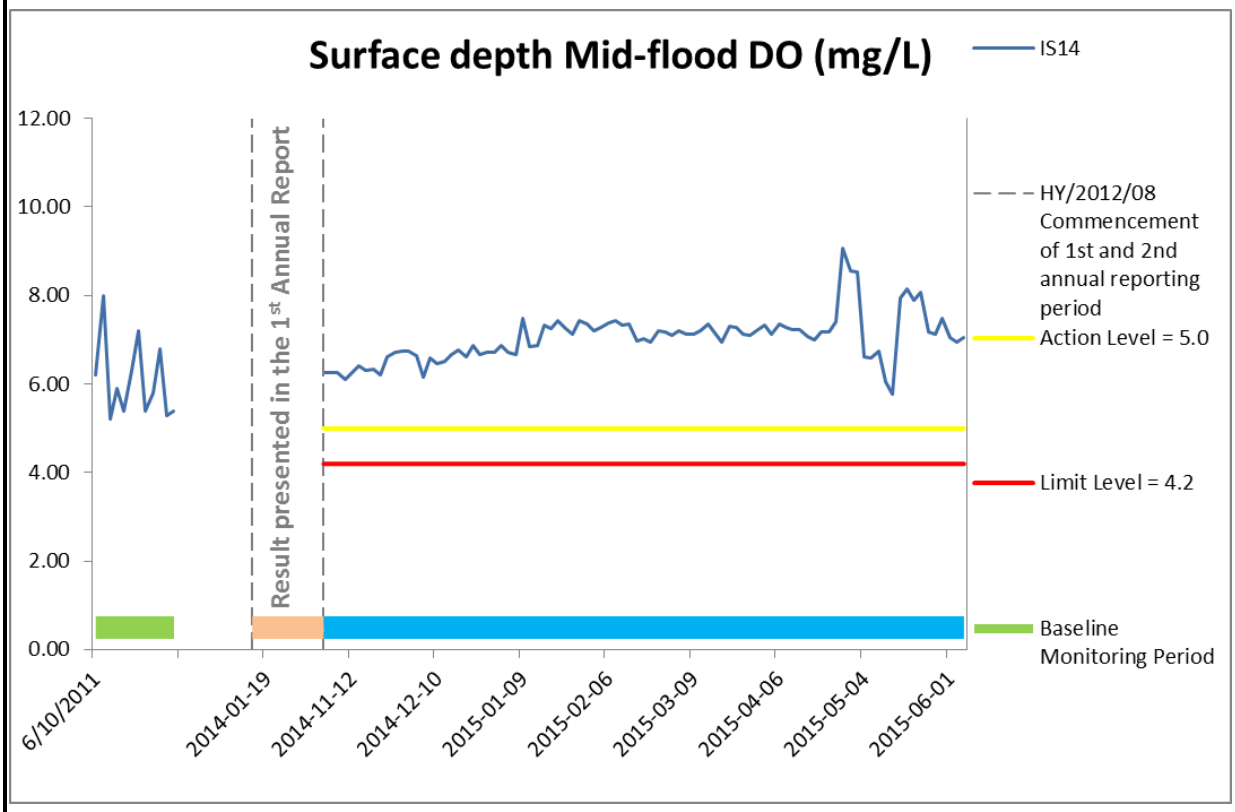
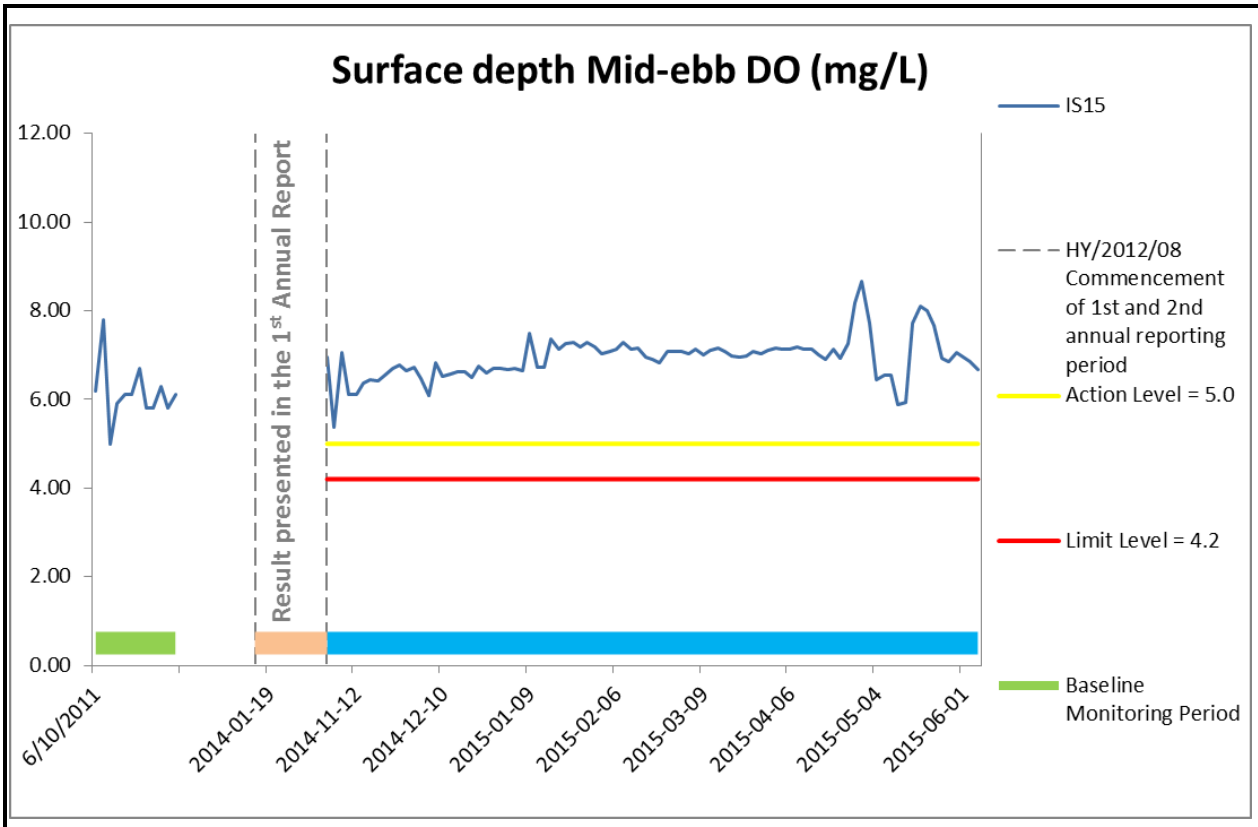


Figure E5 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



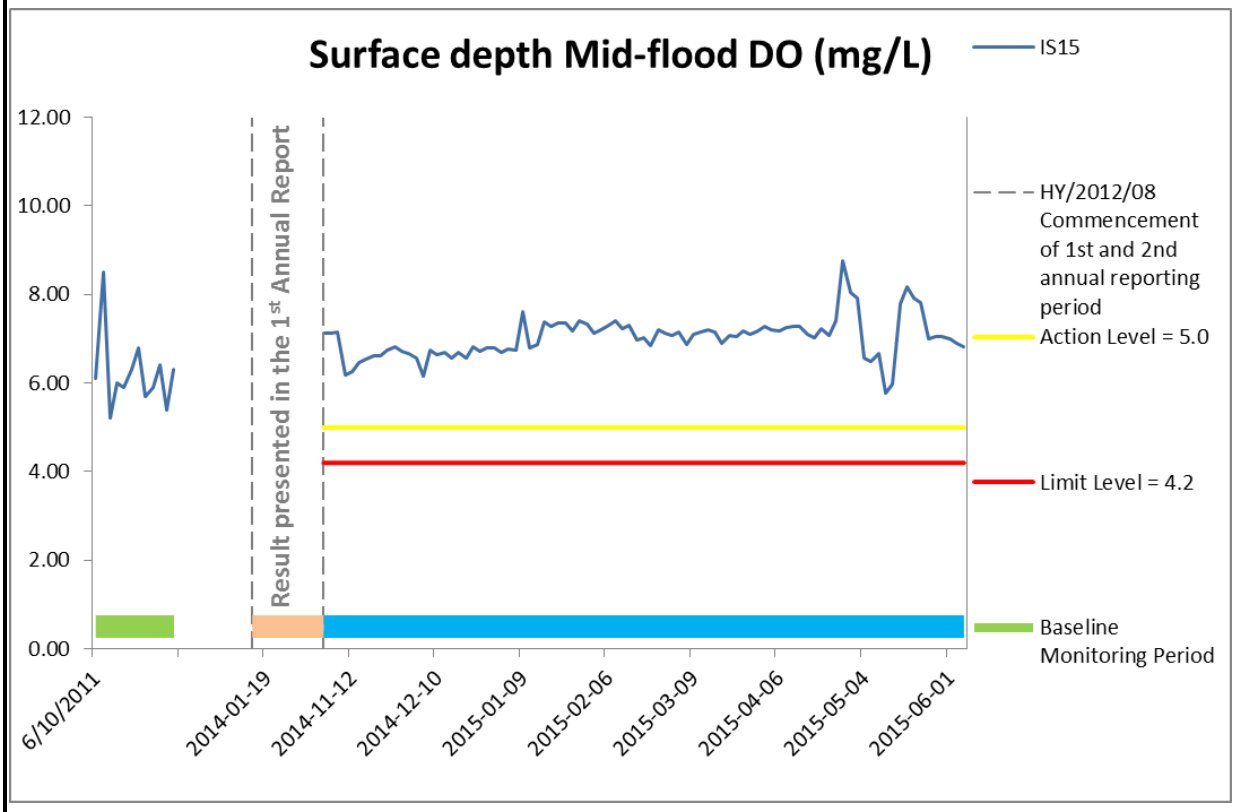
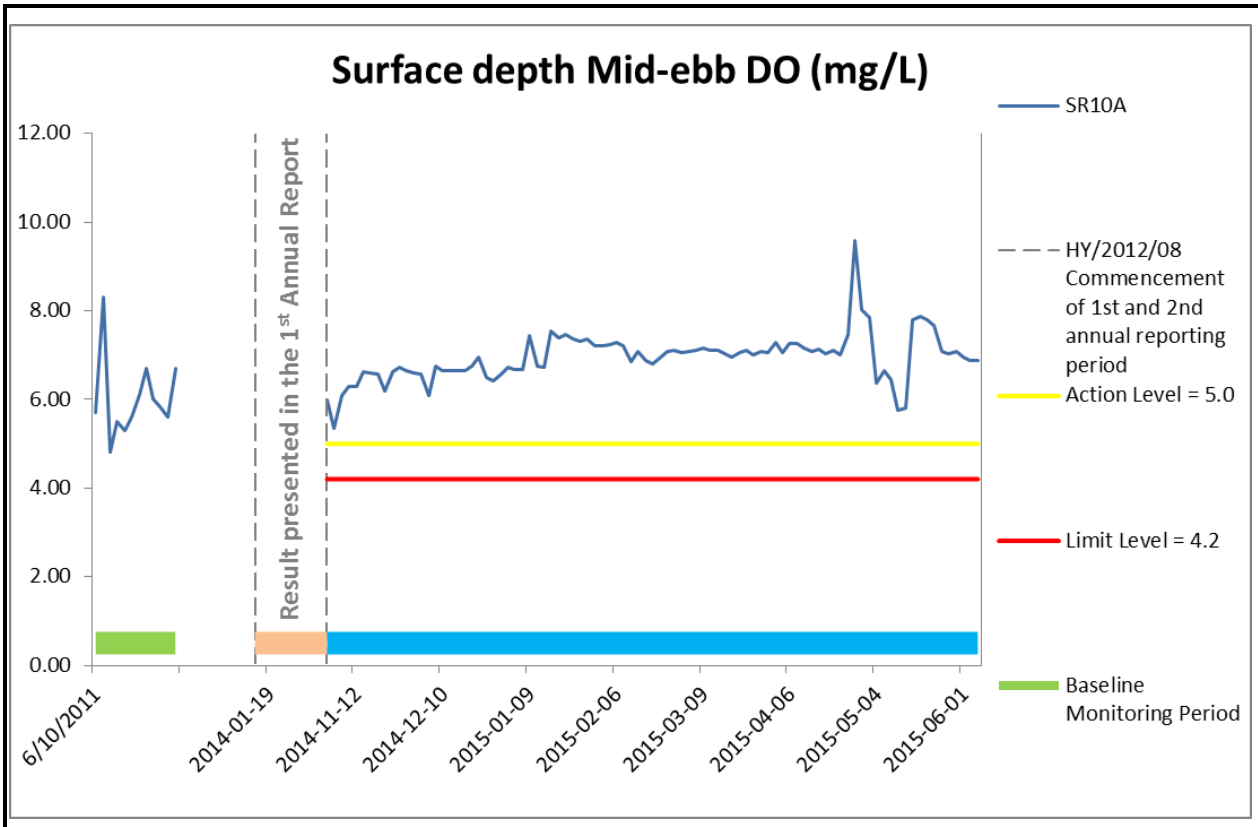


Figure E6 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



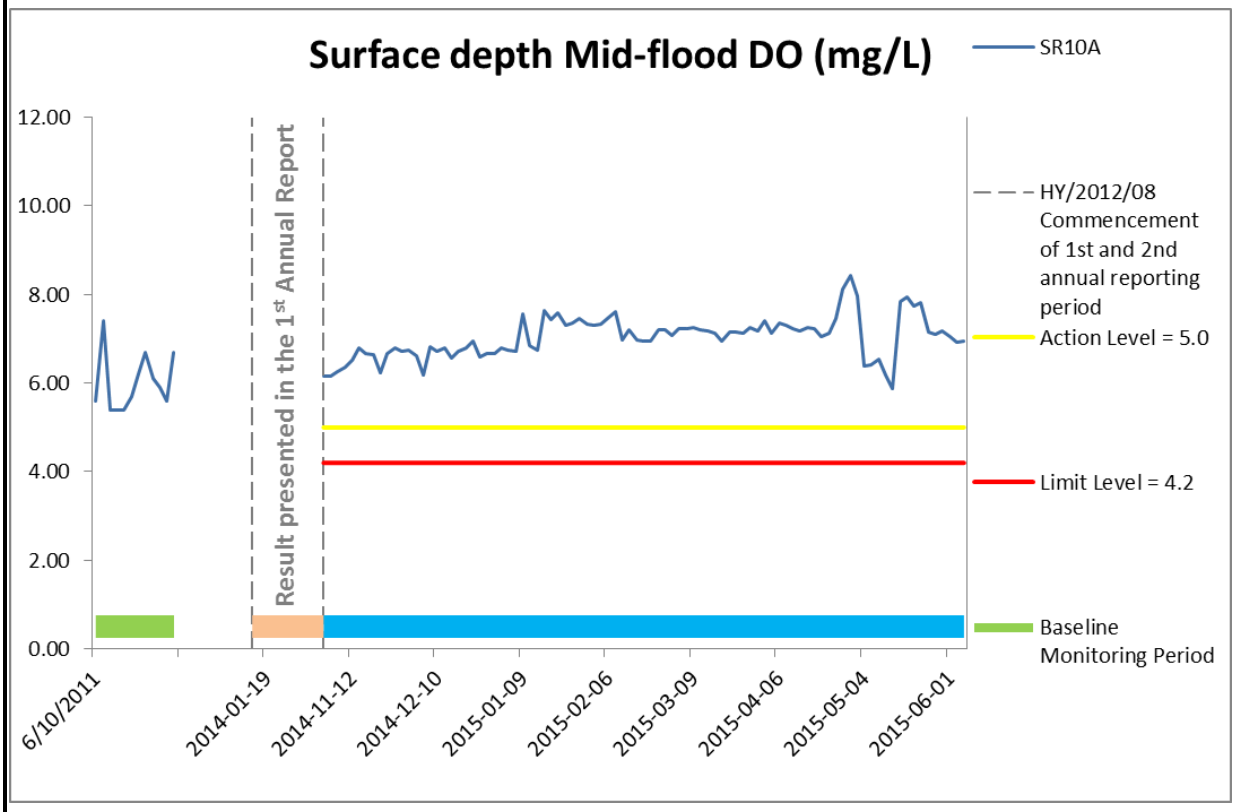
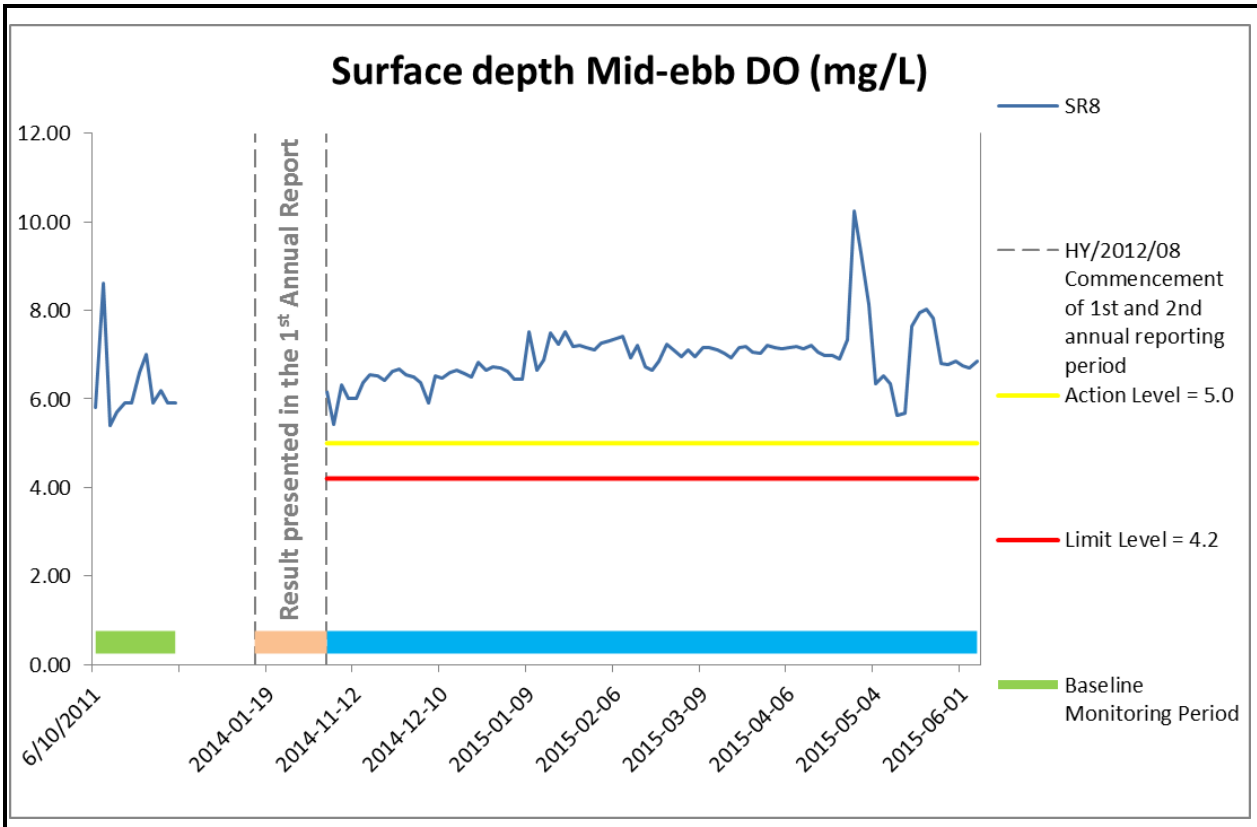


Figure E7 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



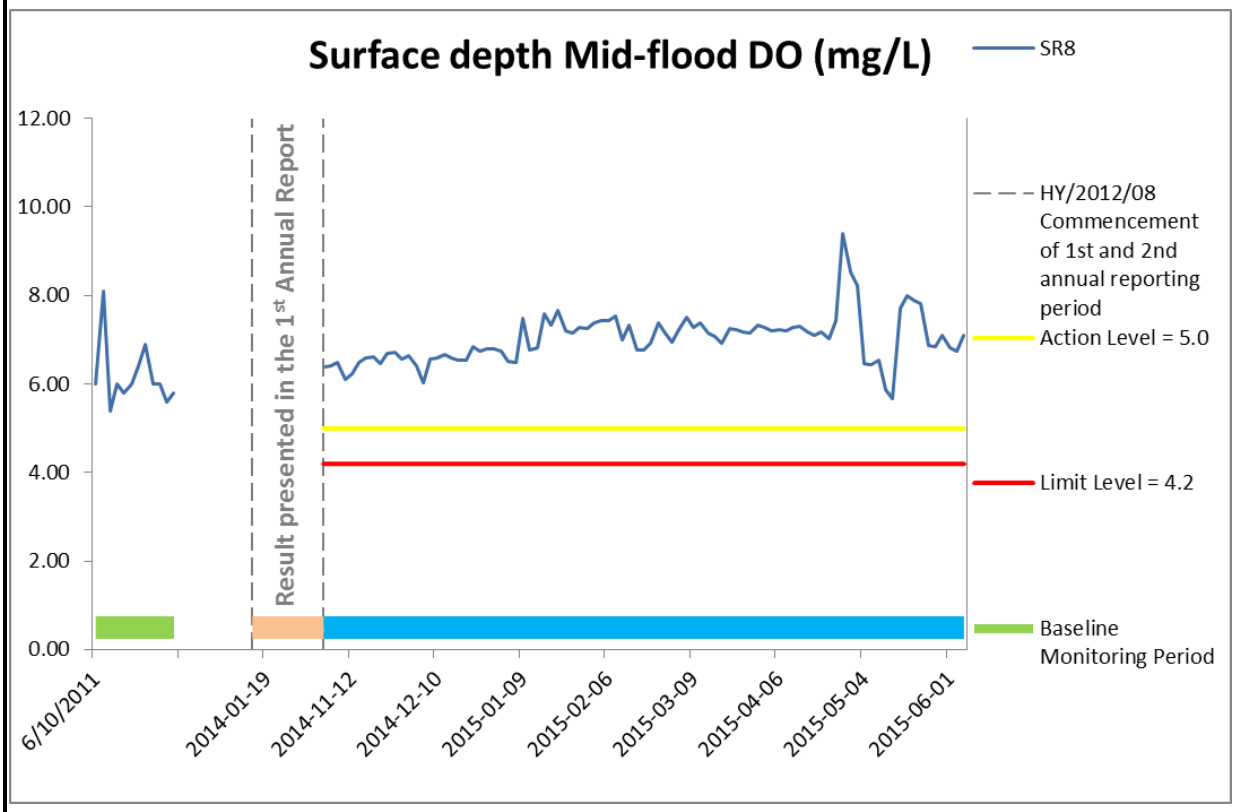
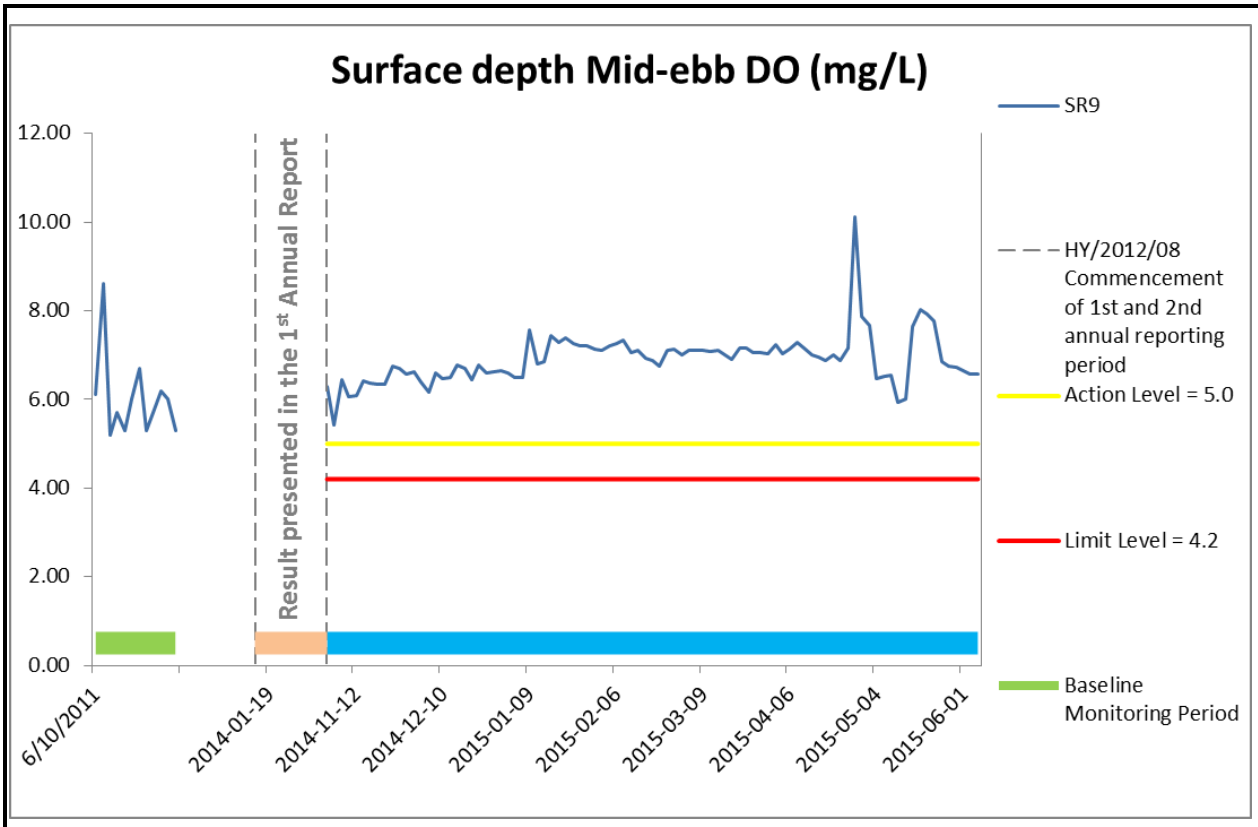


Figure E8 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



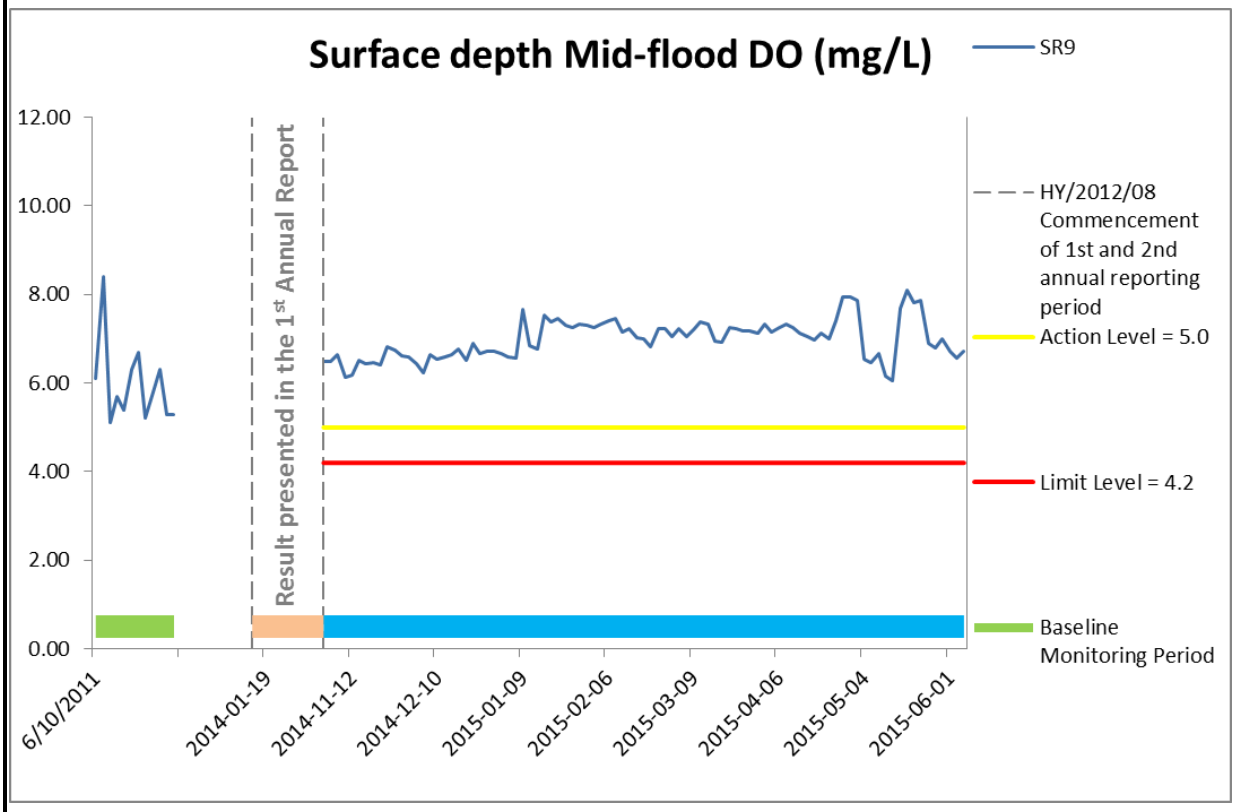
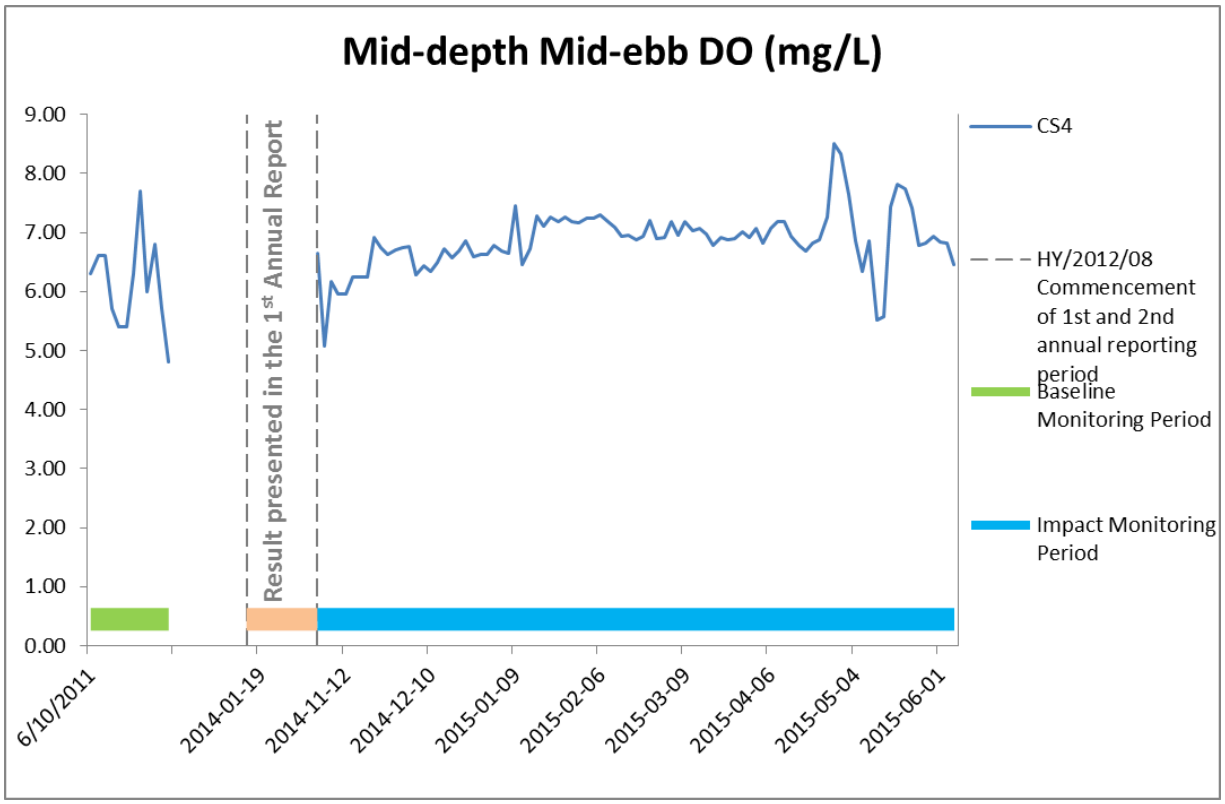
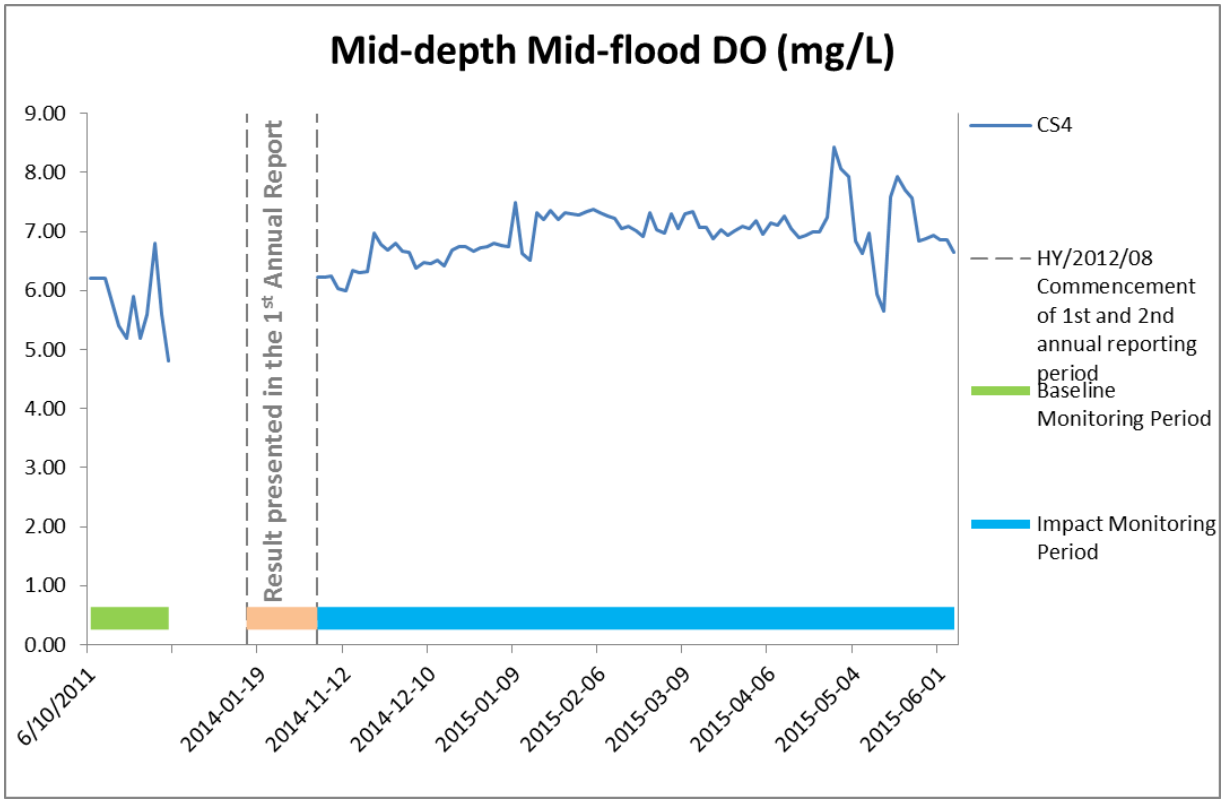


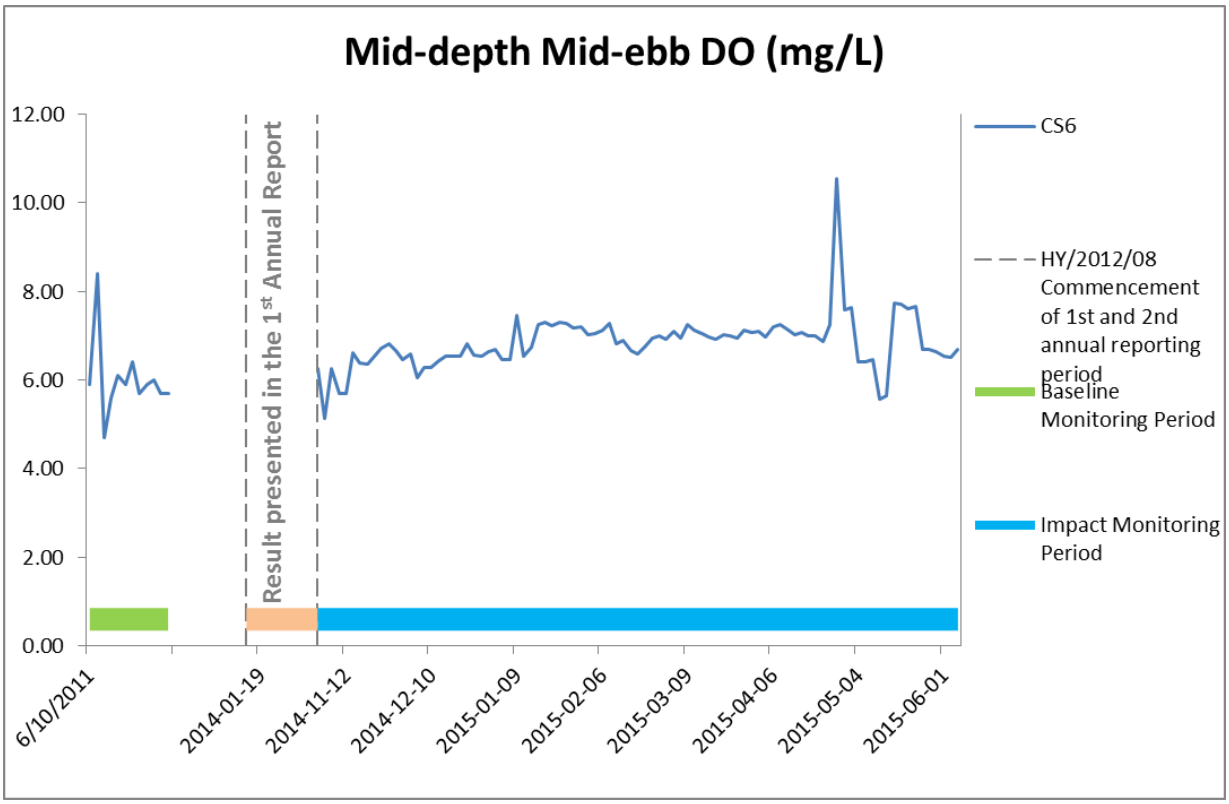
Figure E9 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in surface waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

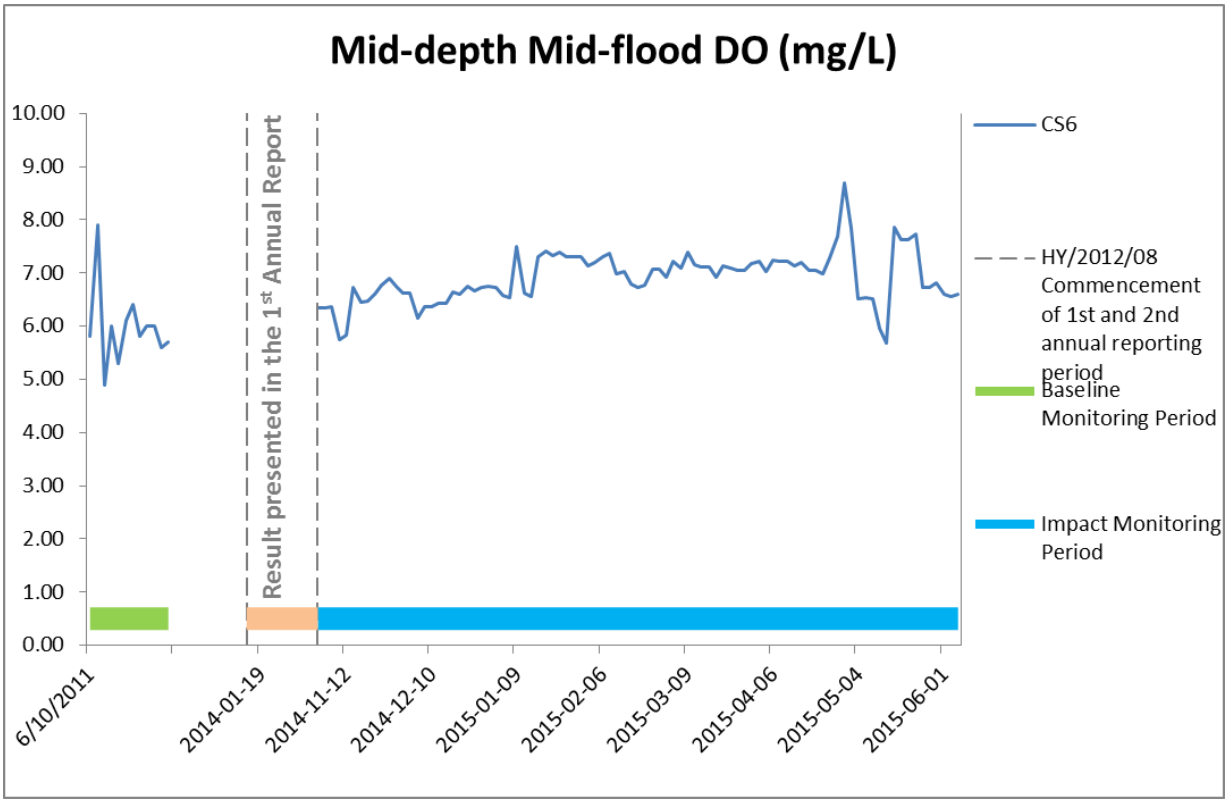




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

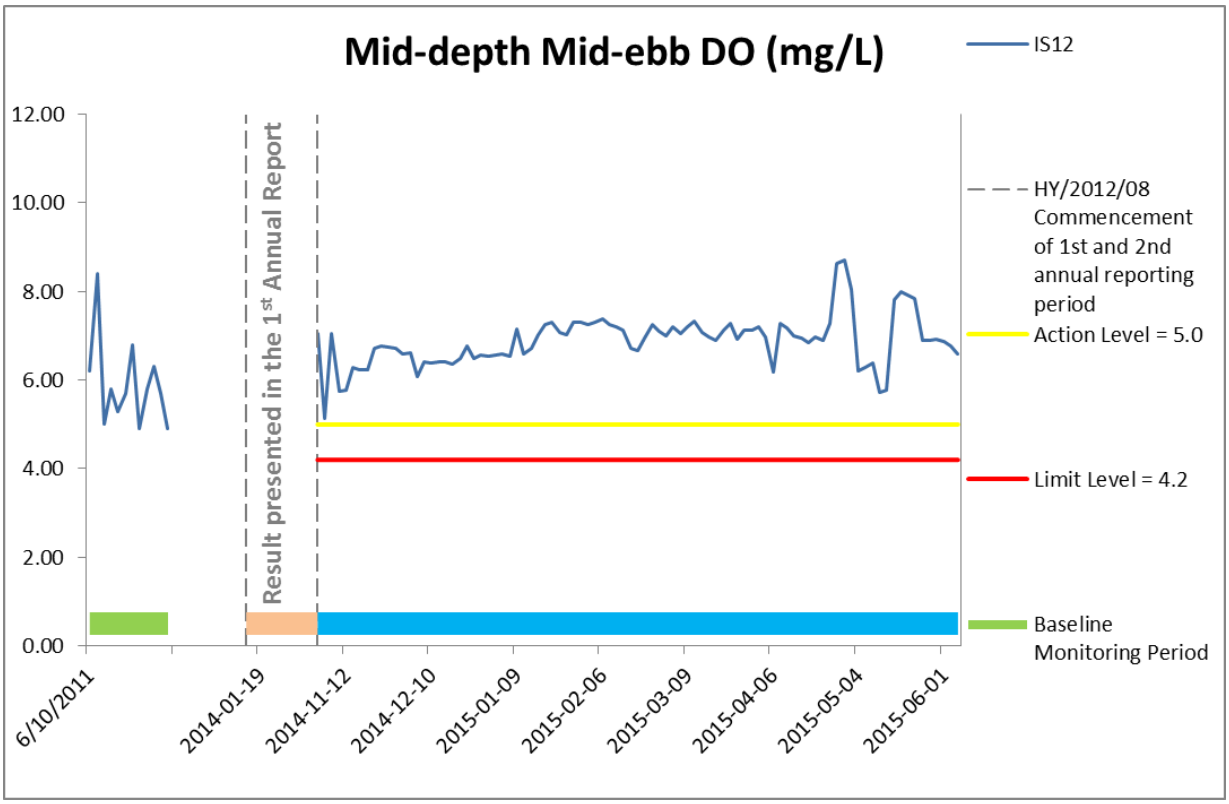
Figure E10 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

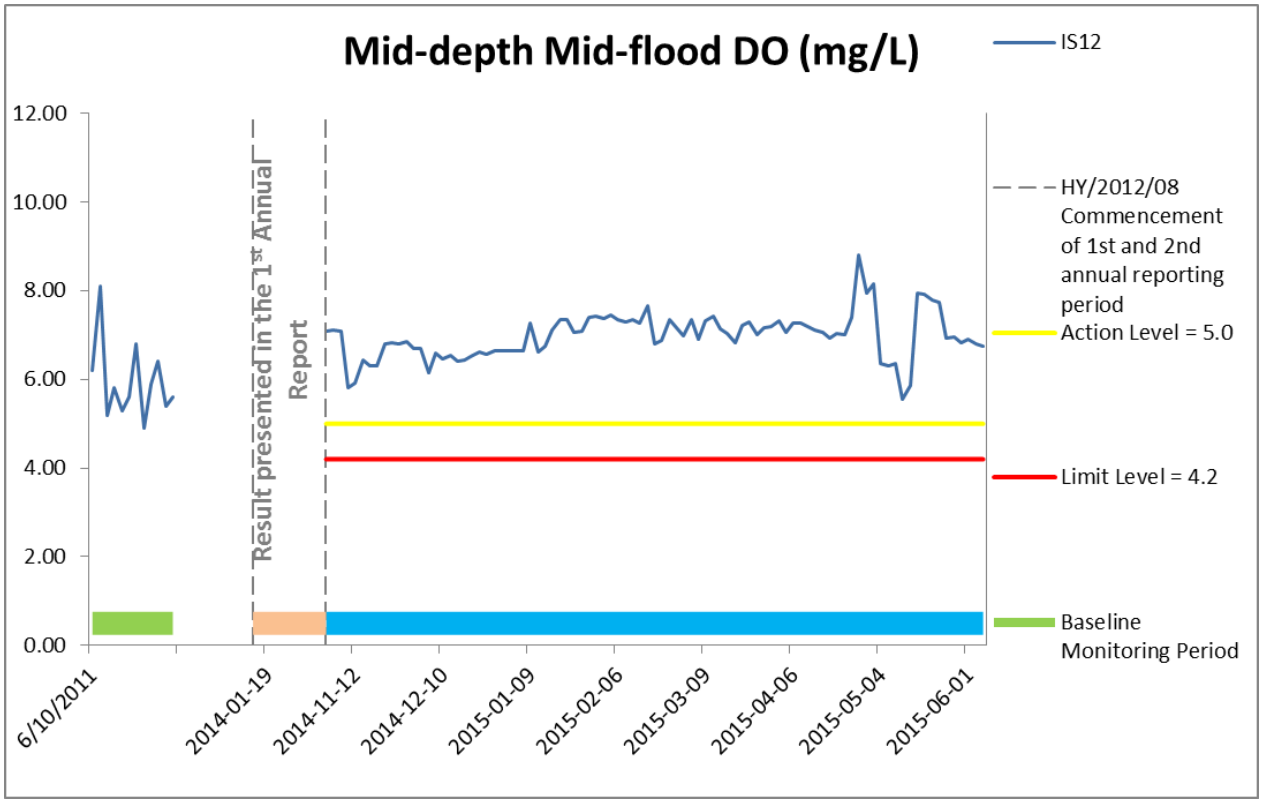




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

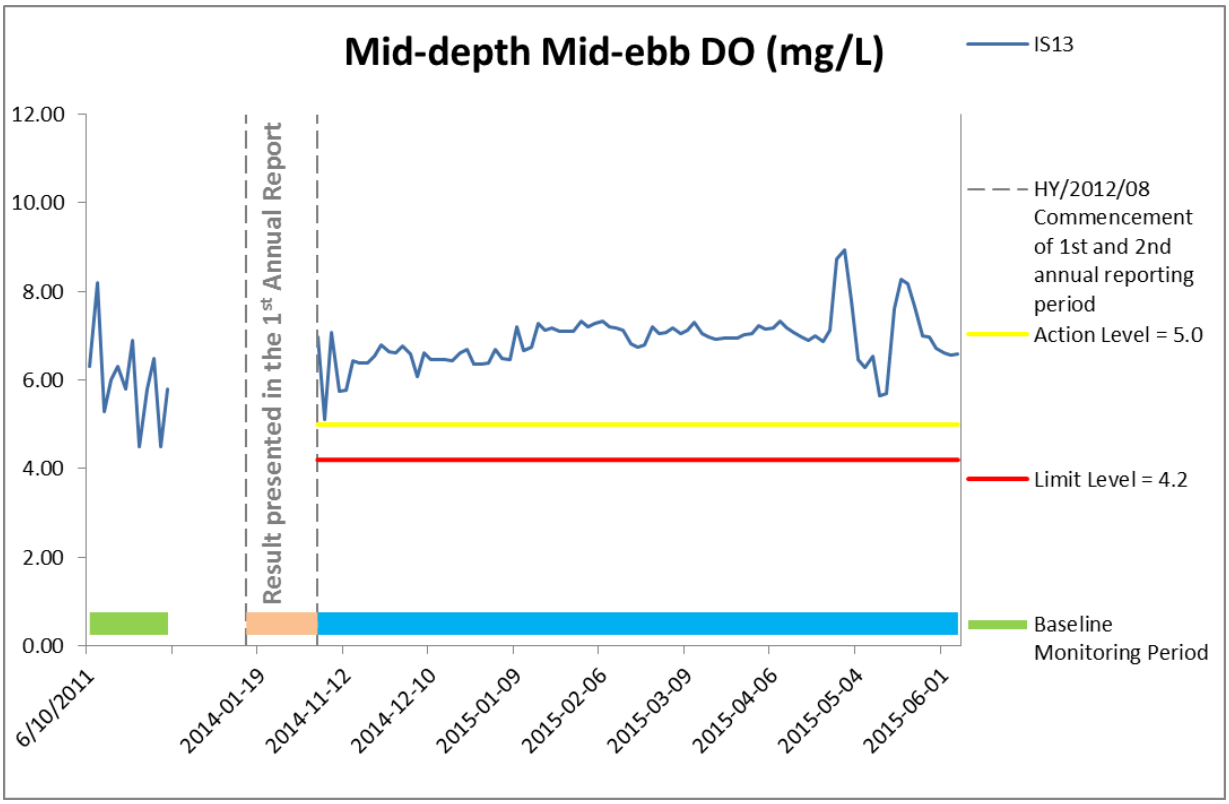
Figure E11 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

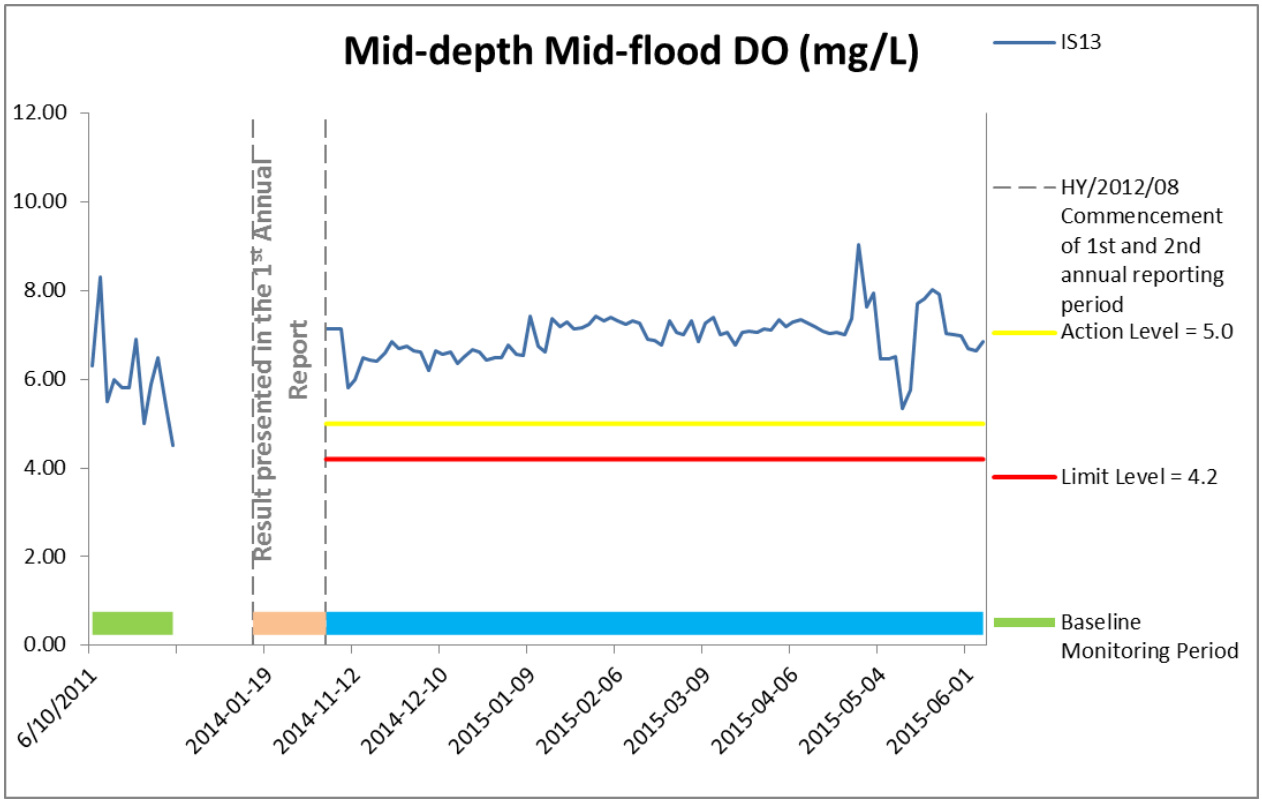




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

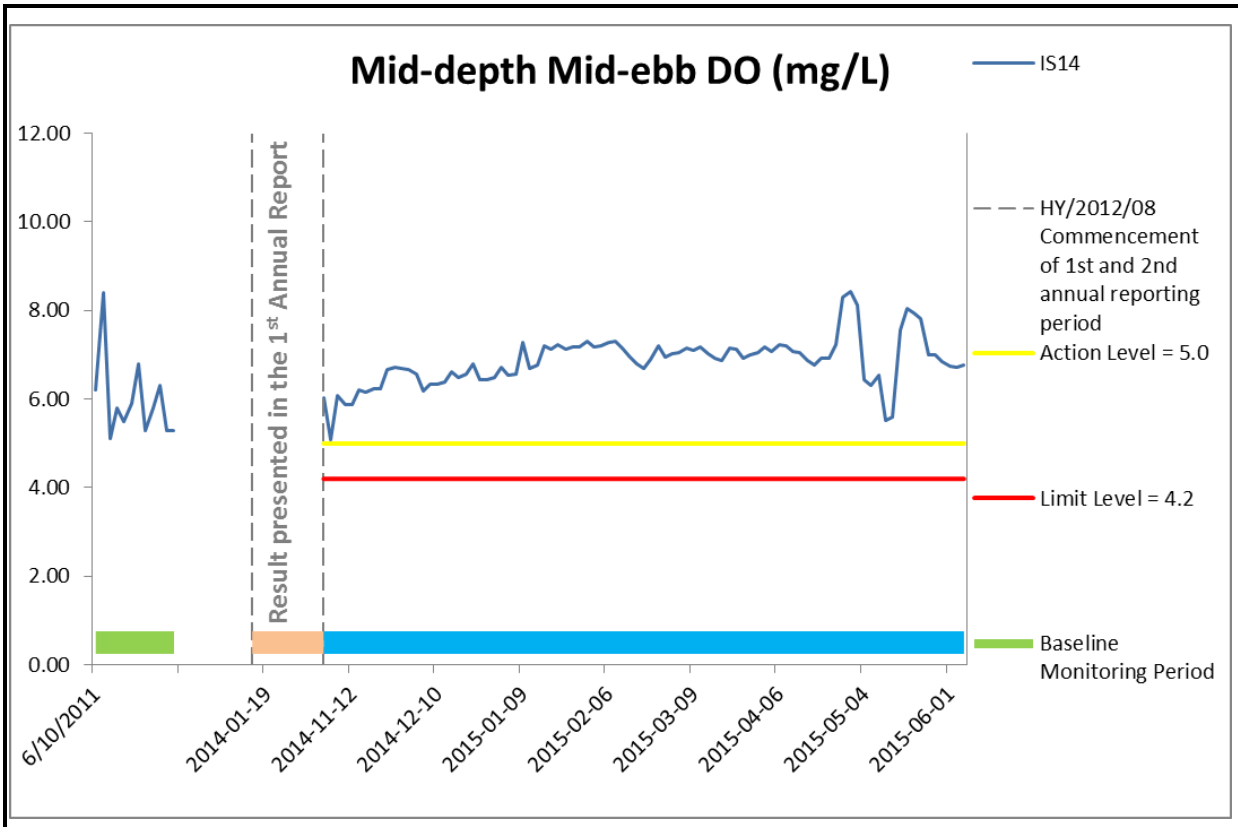
Figure E12 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

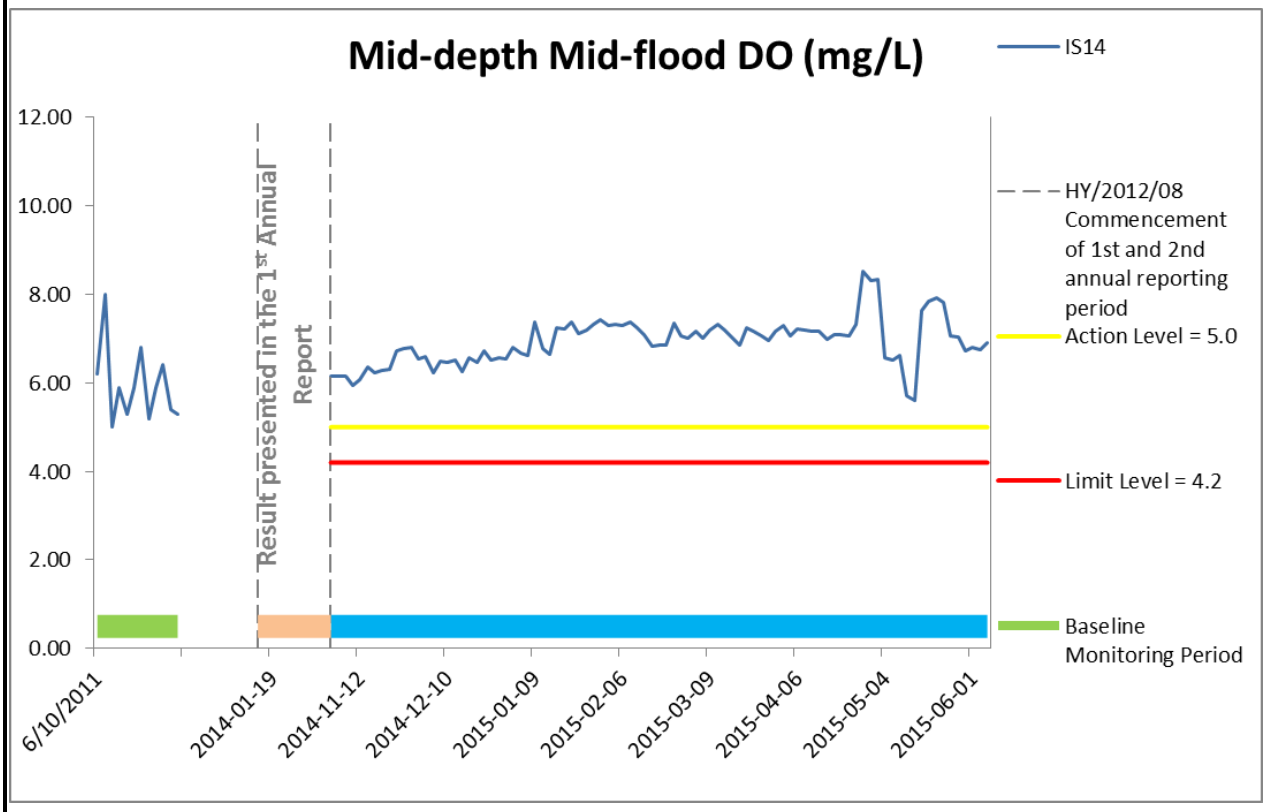




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E13 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*





*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E14 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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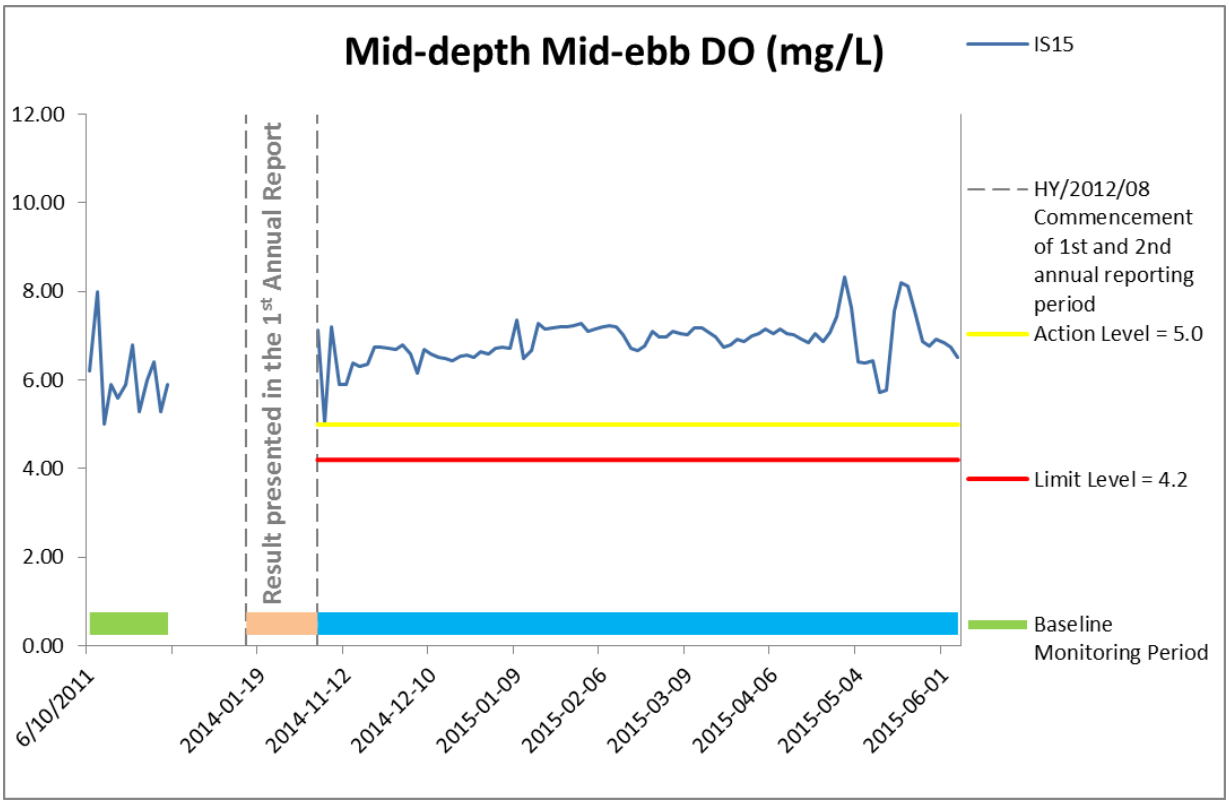
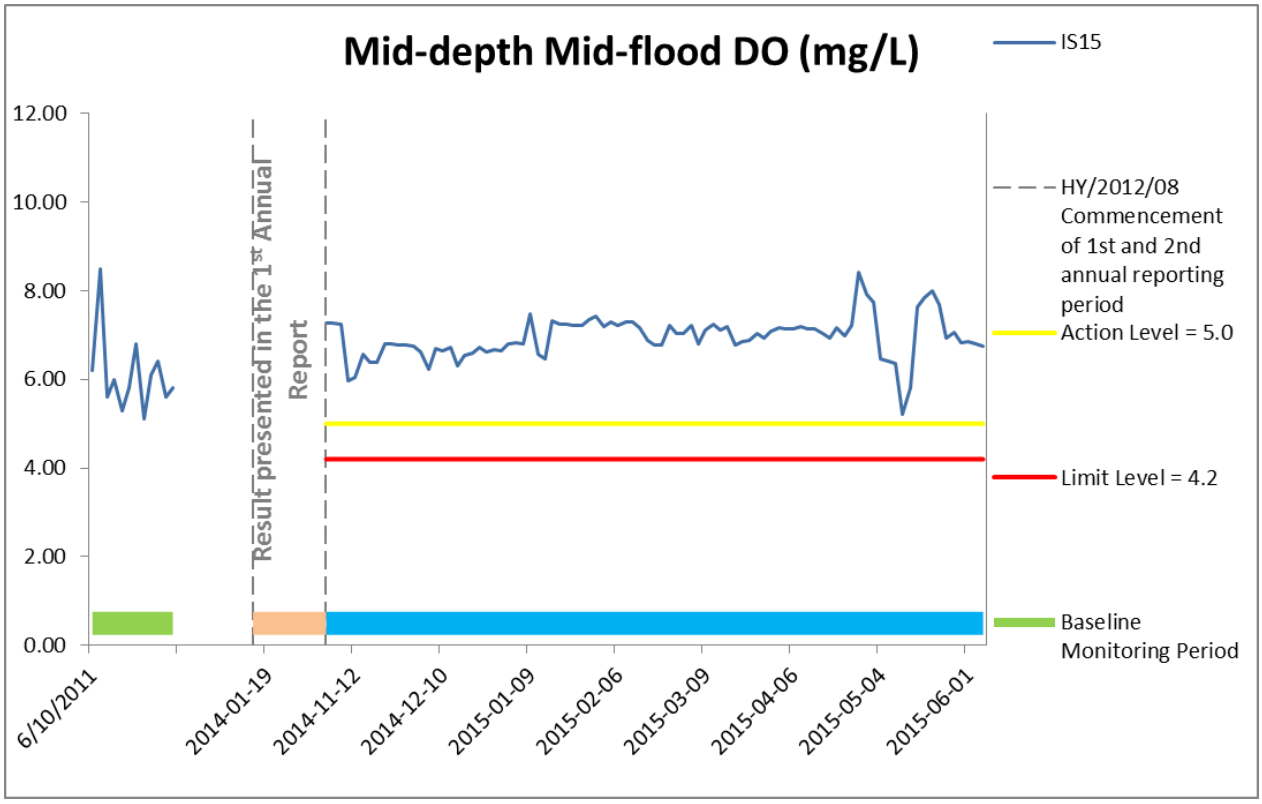
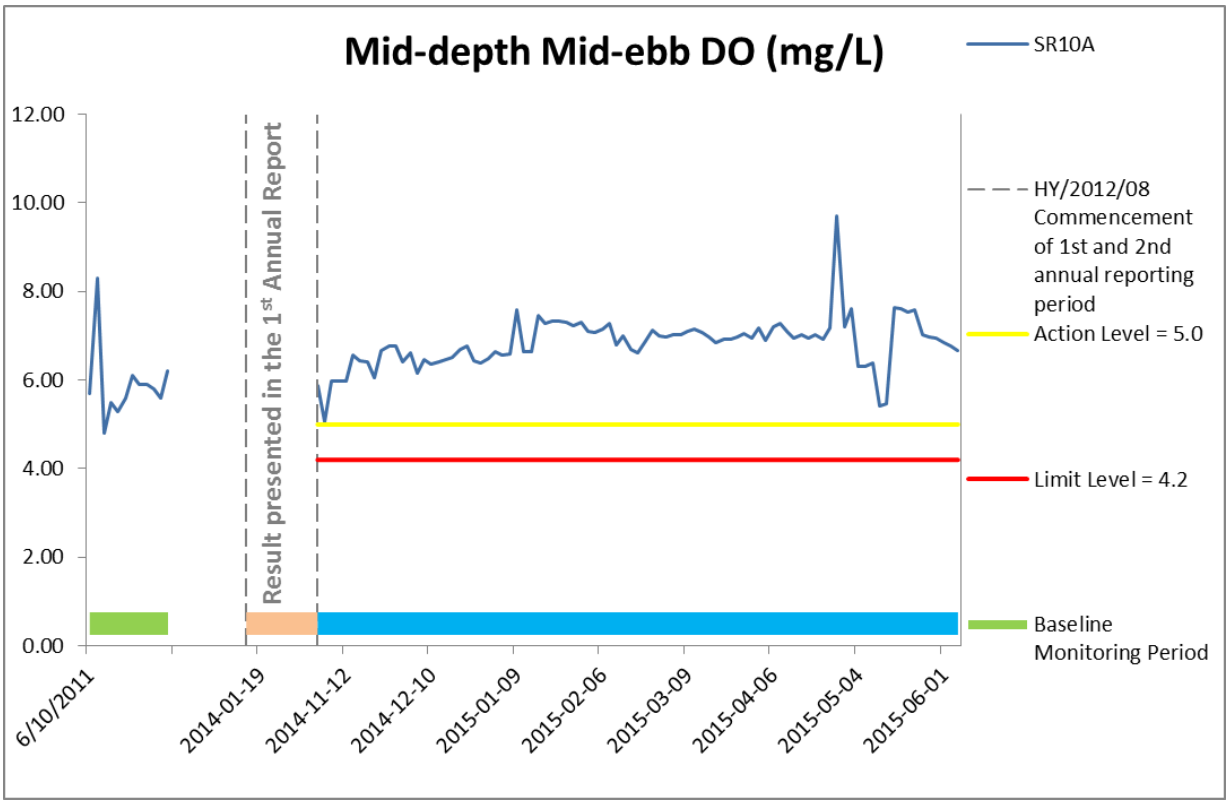
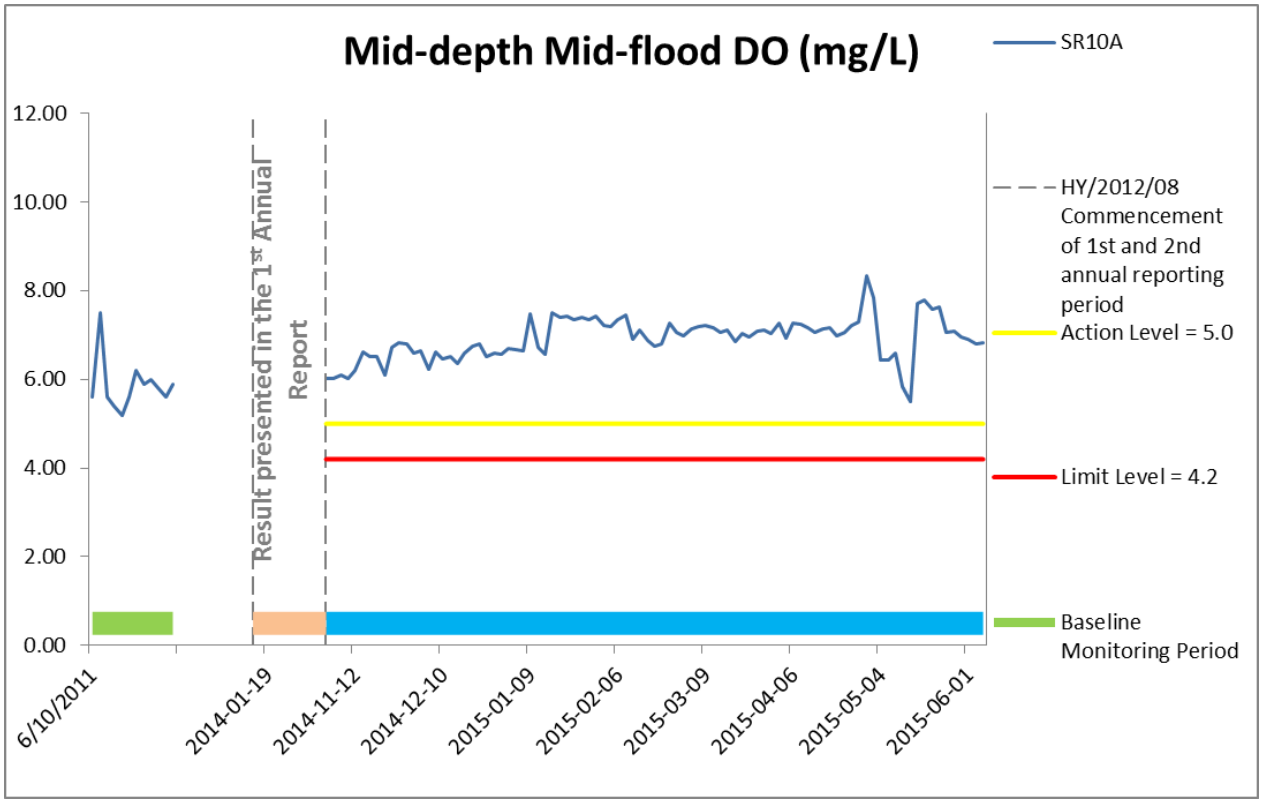




*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

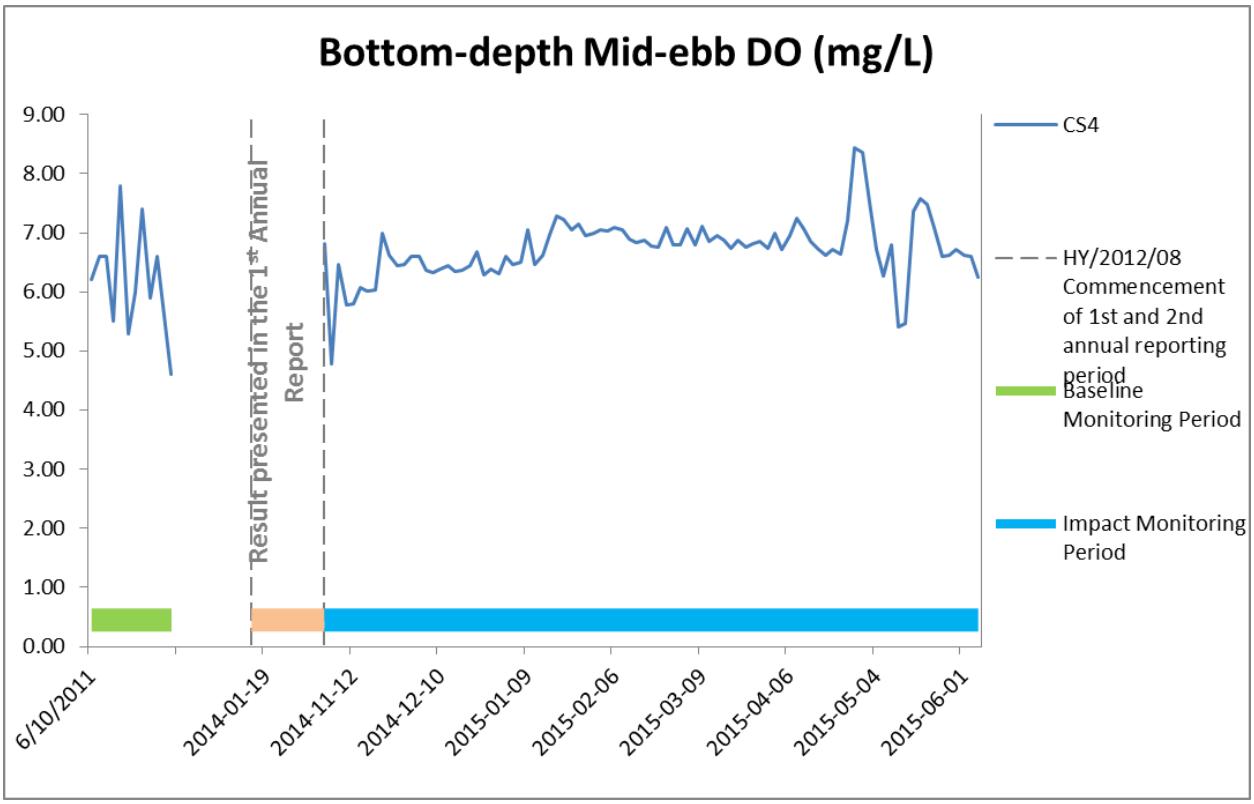
Figure E15 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*





*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

Figure E16 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



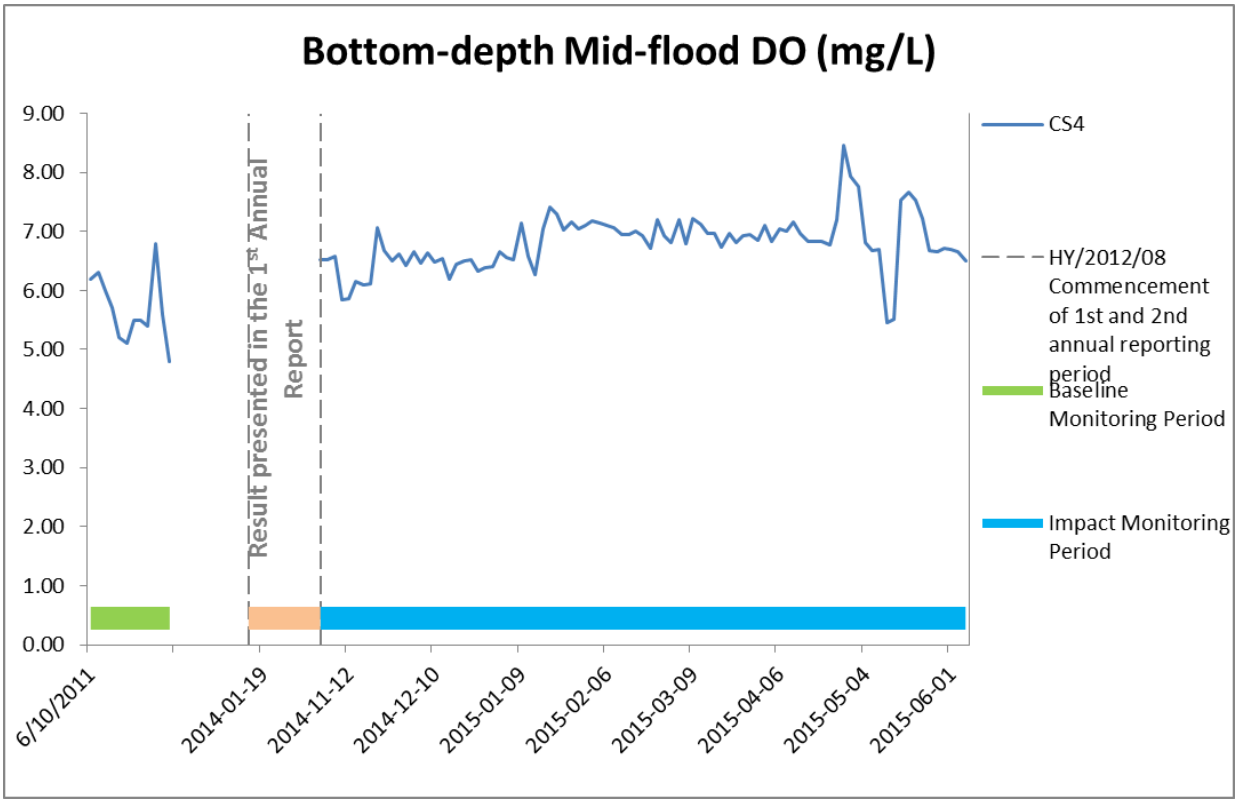
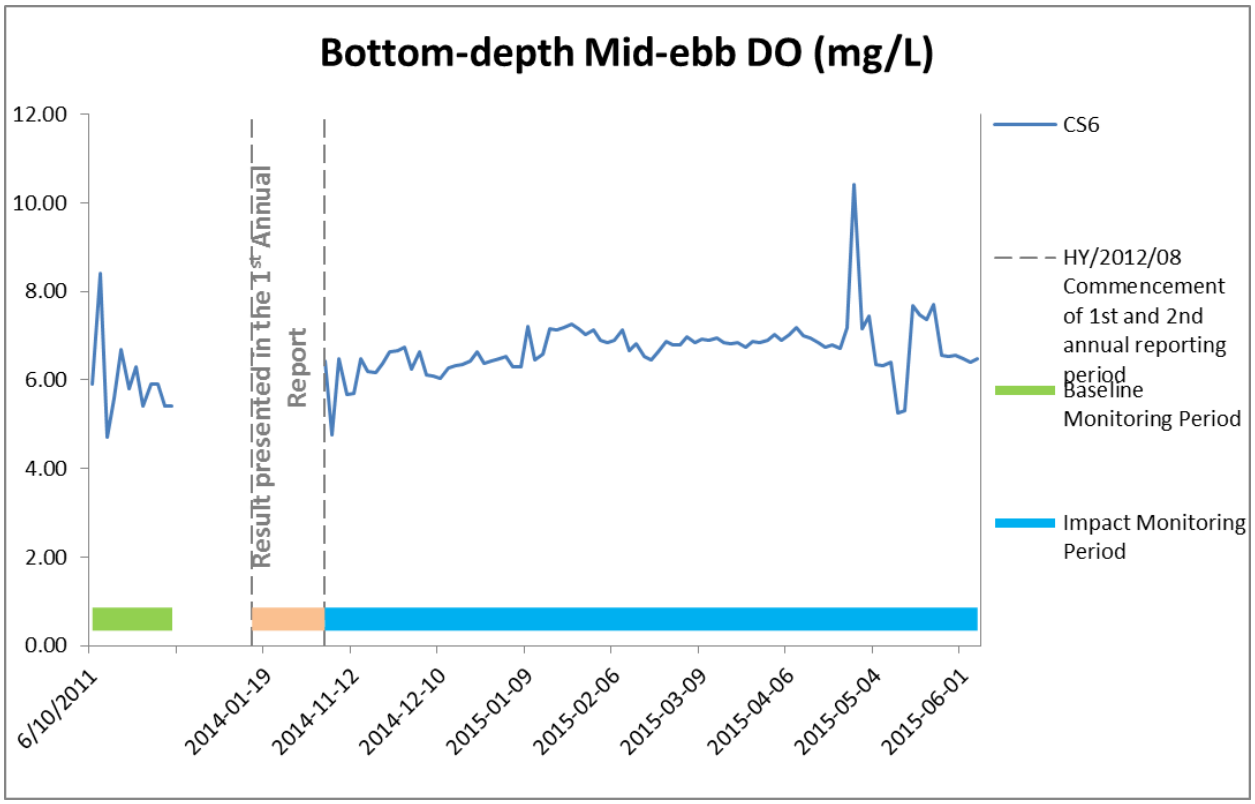


Figure E17 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



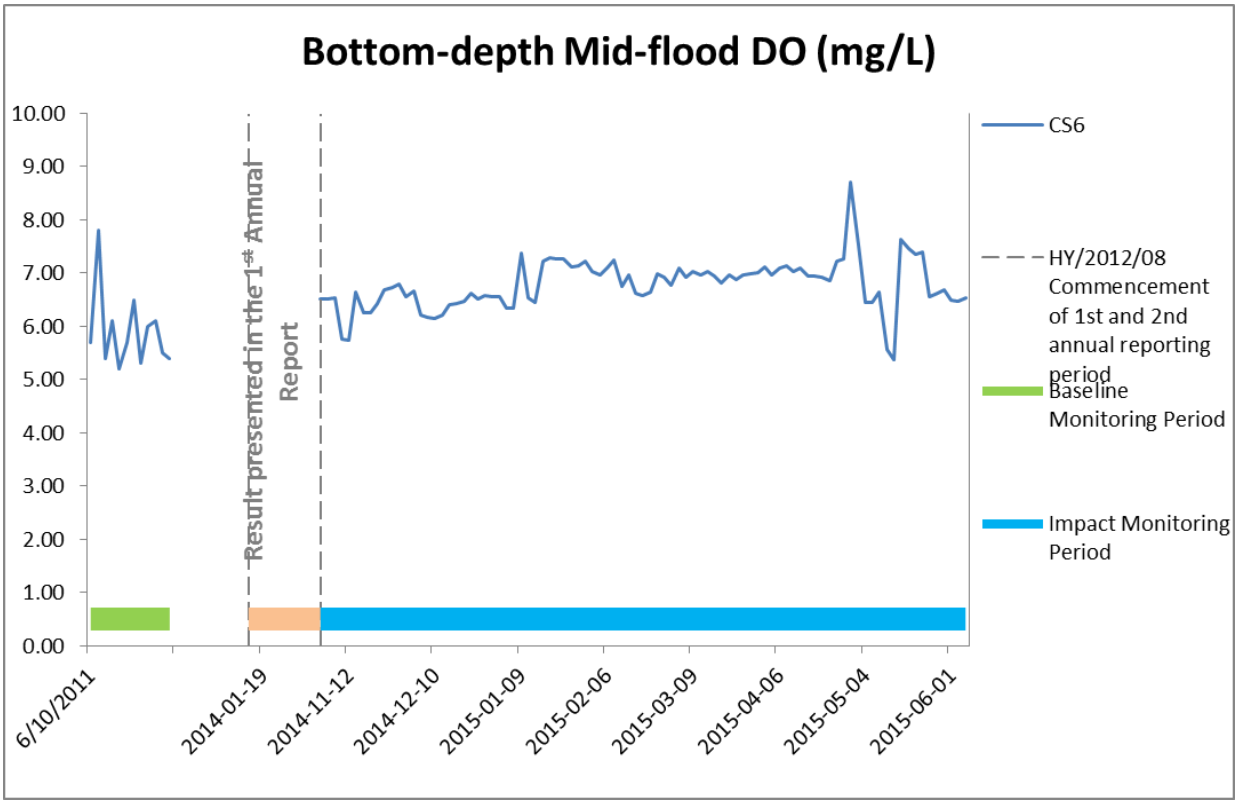
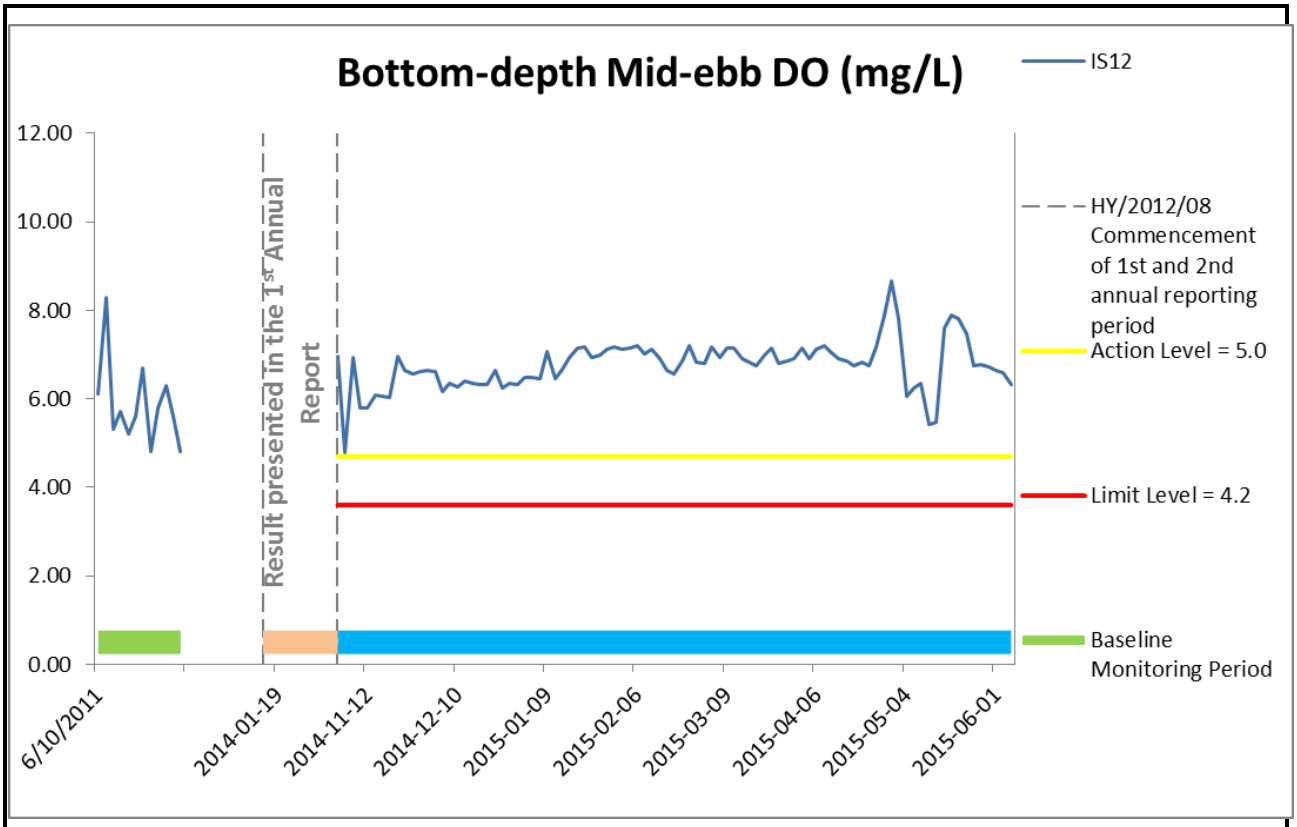


Figure E18 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



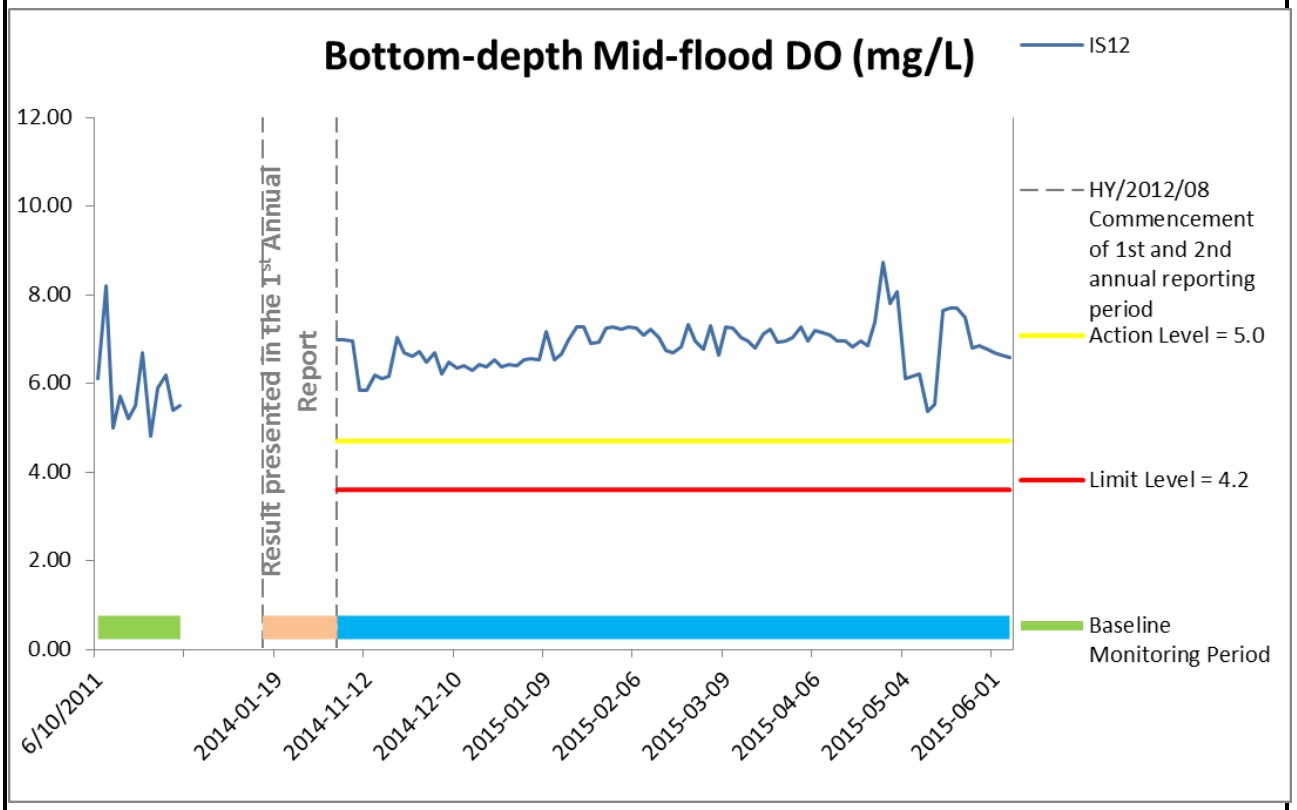
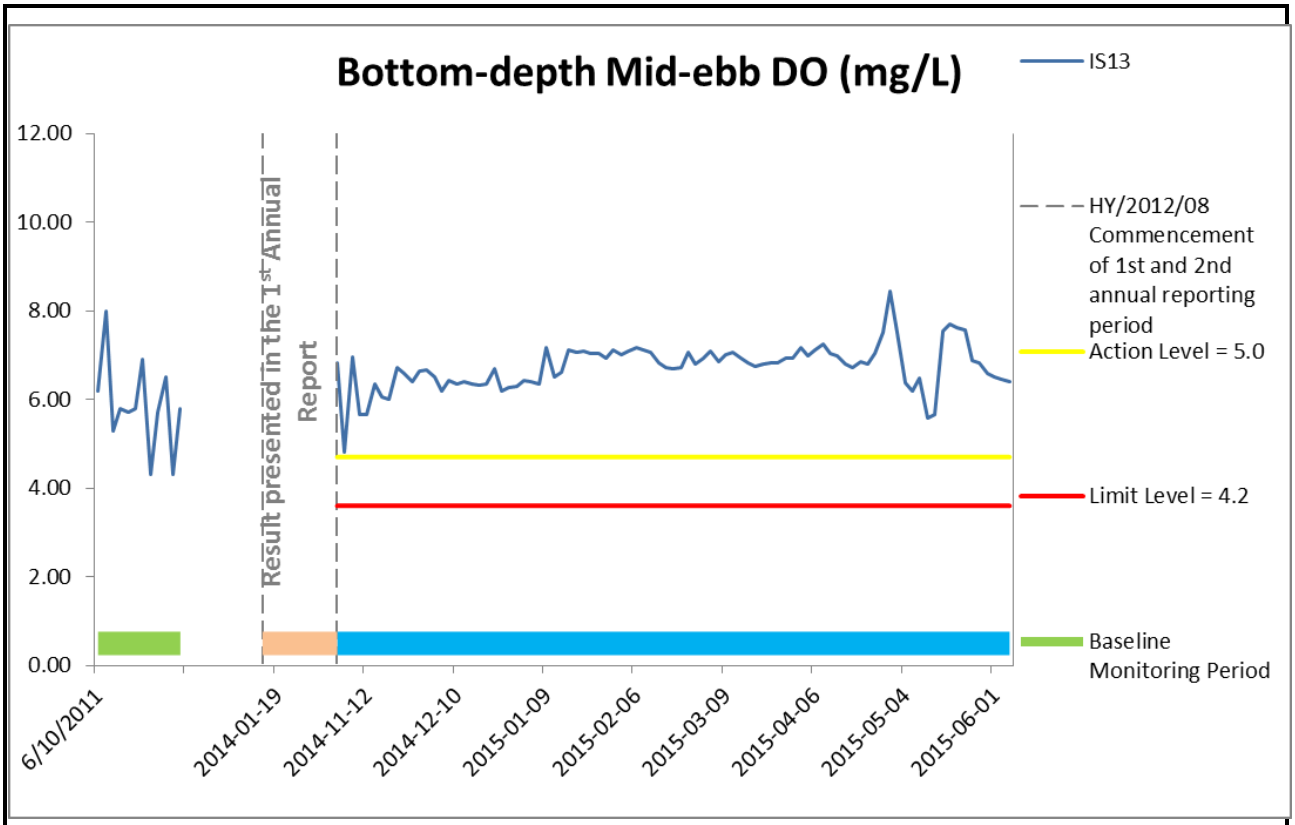


Figure E19 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



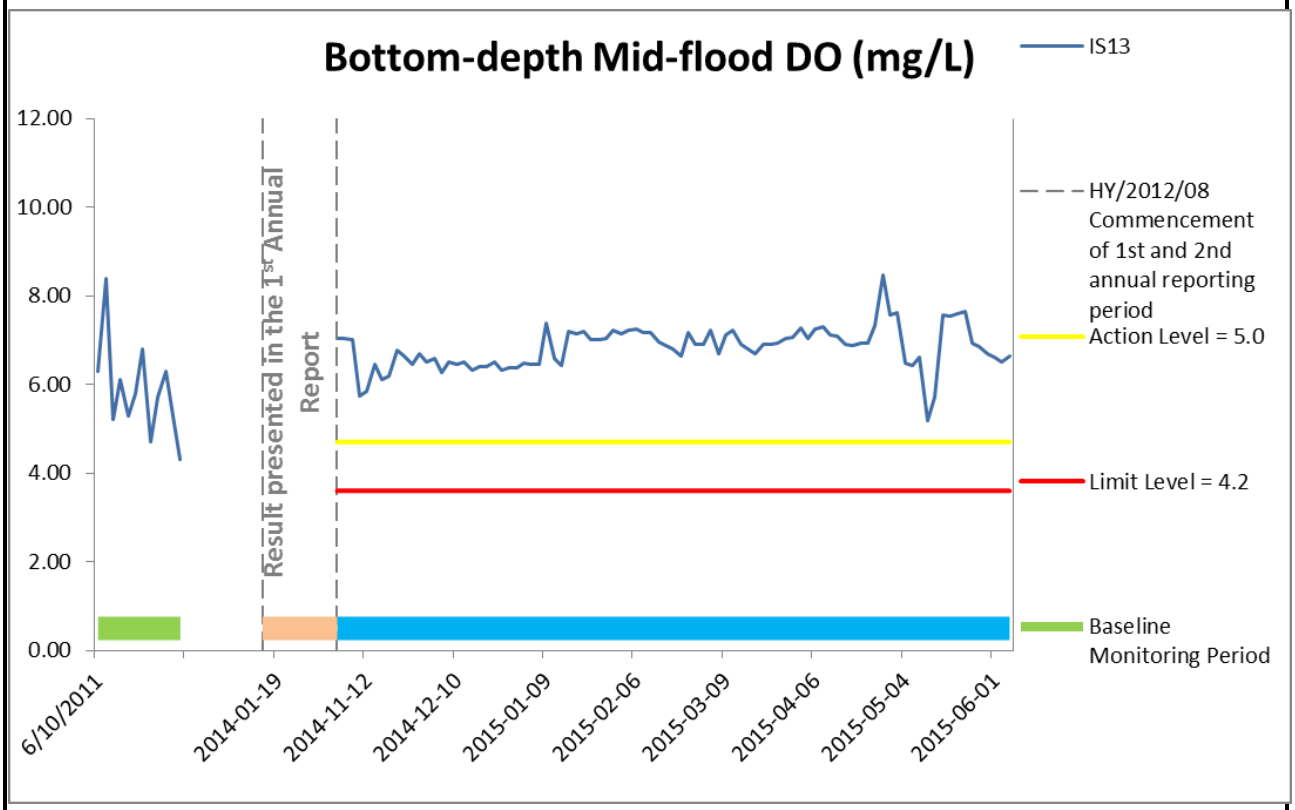
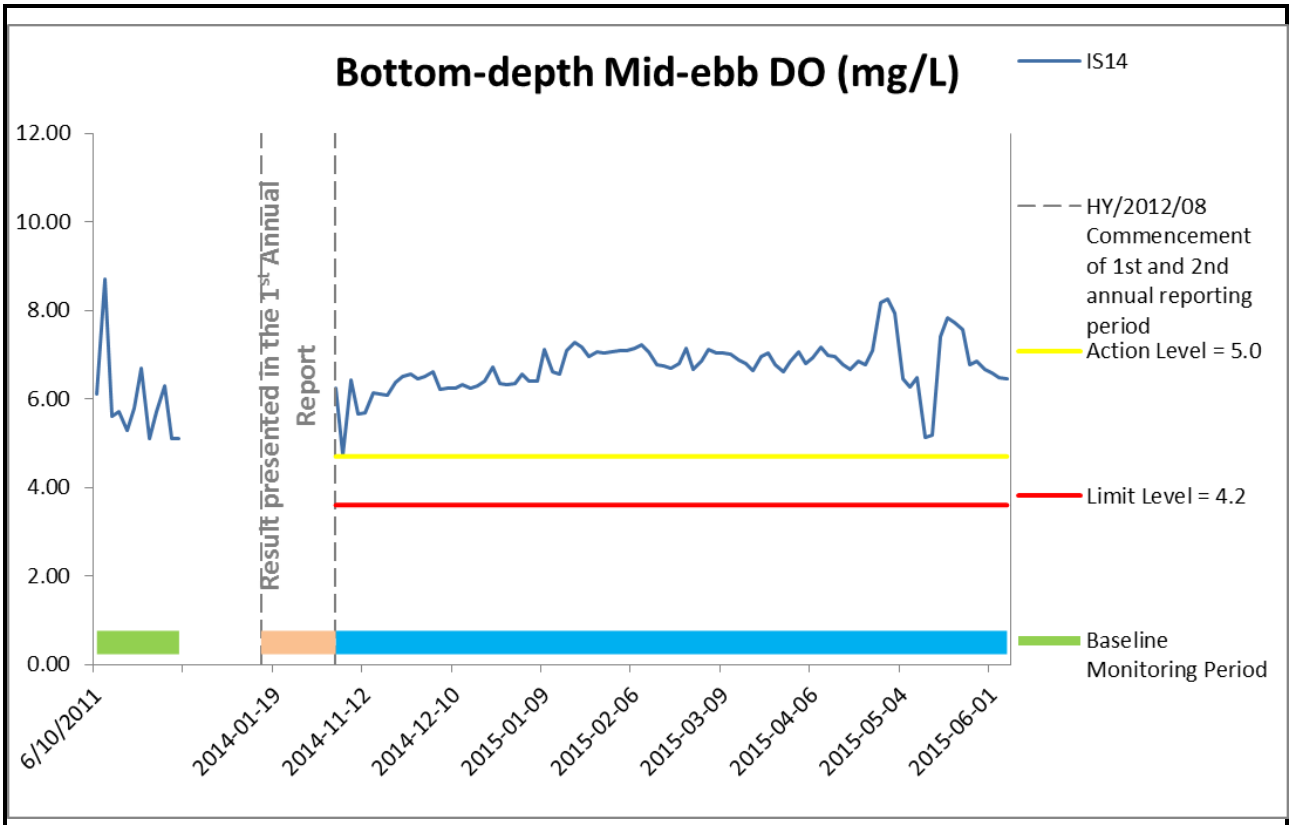


Figure E20 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



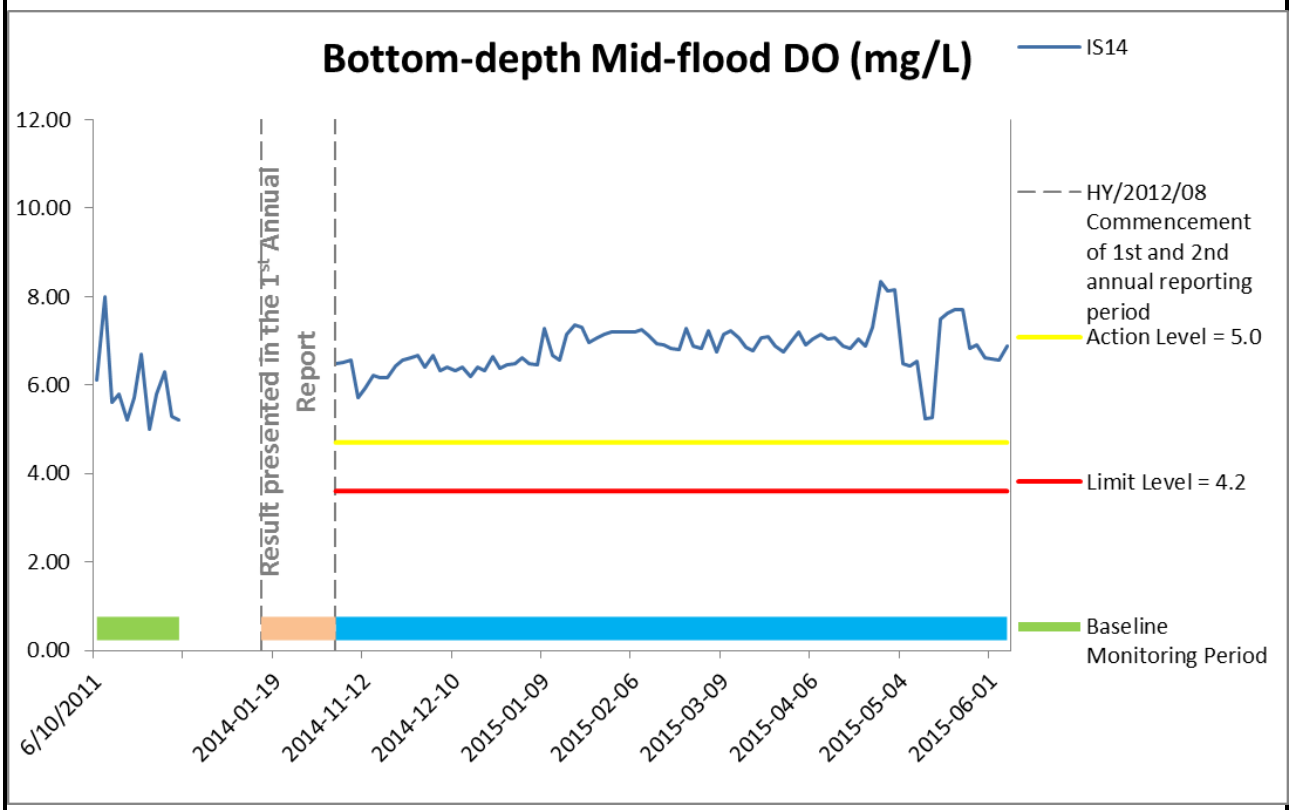


Figure E21 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

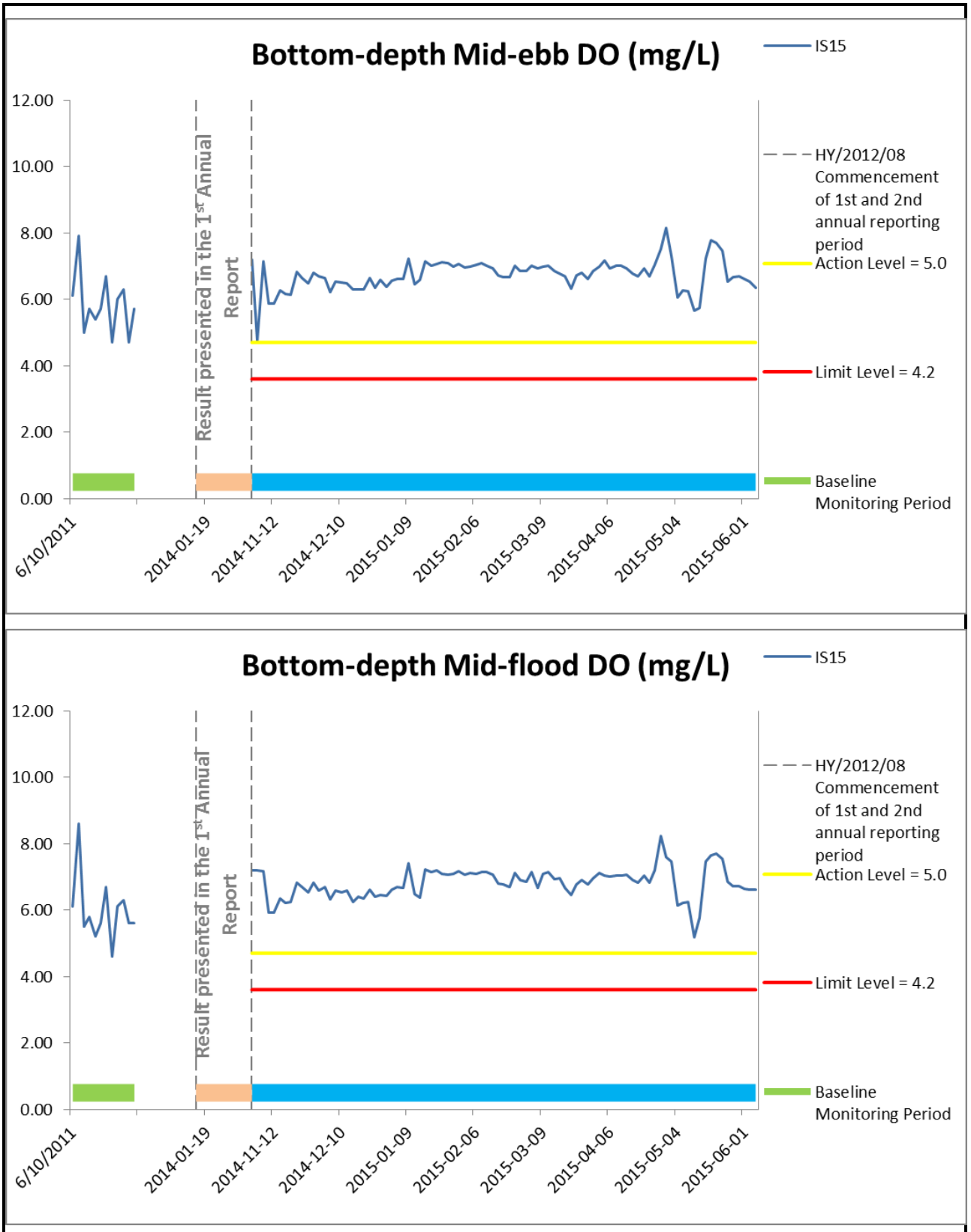


Figure E22 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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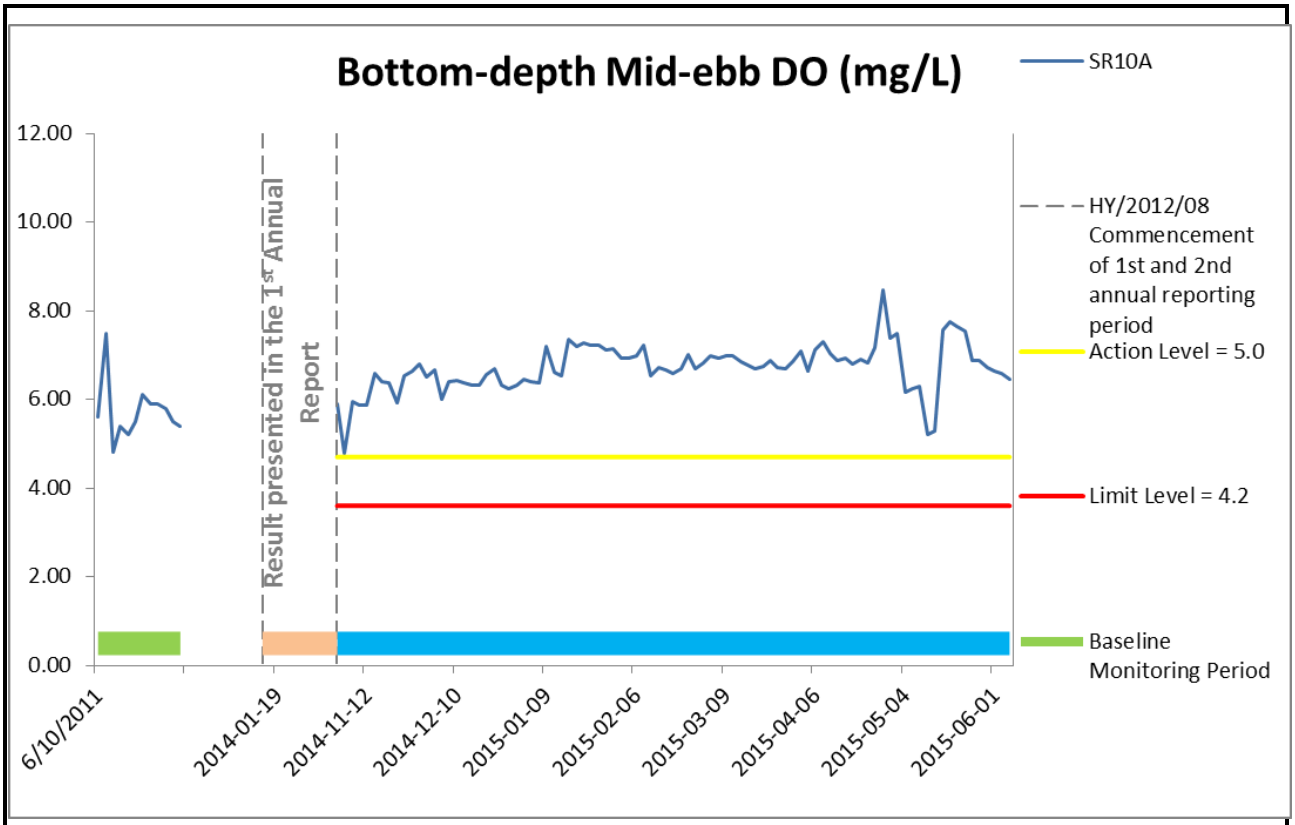


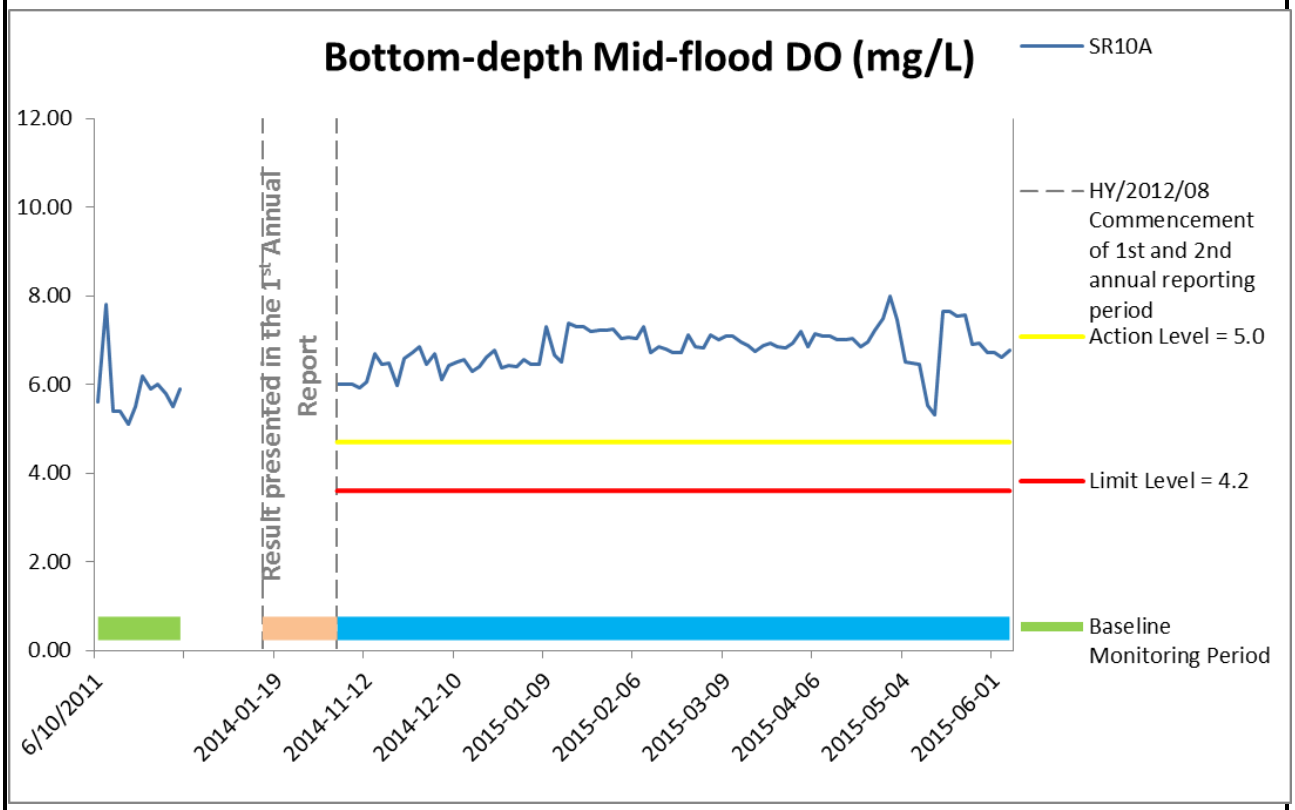
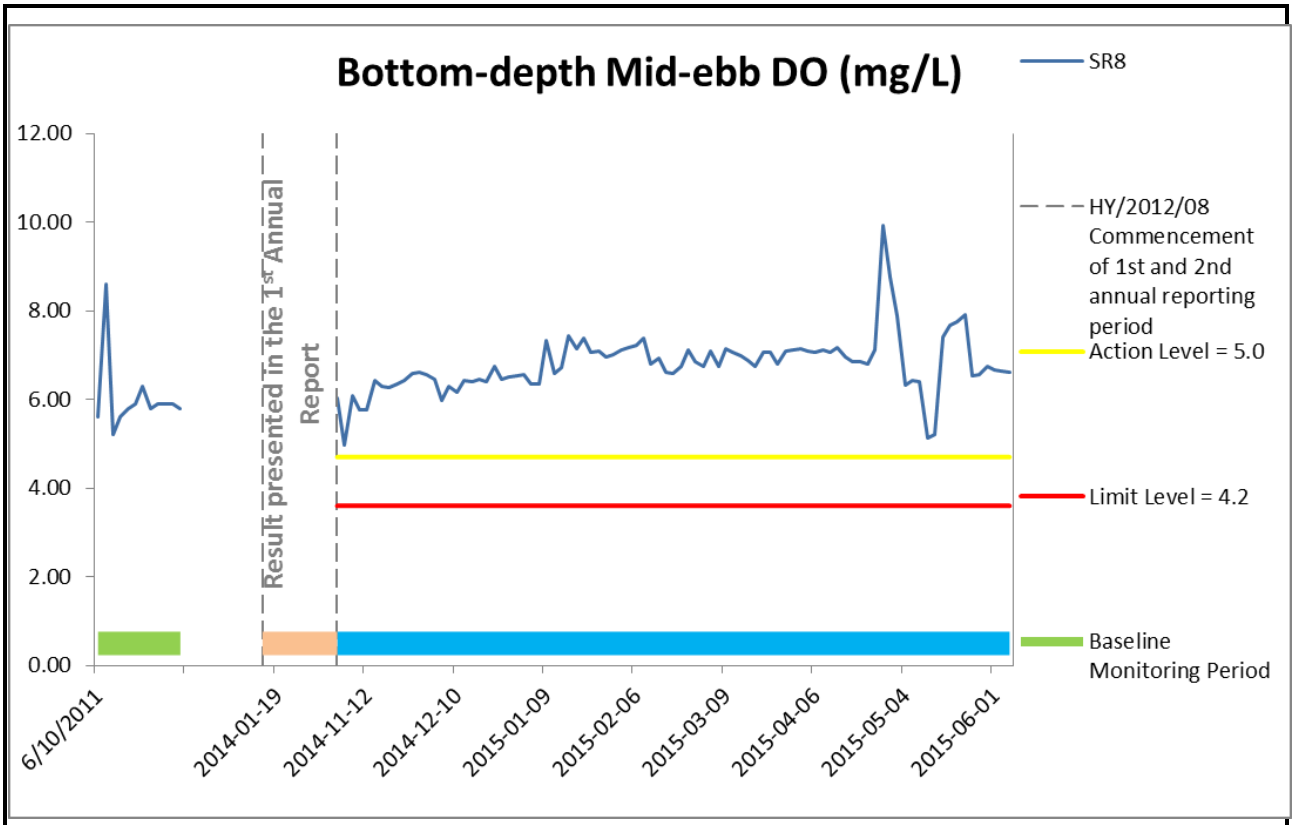


Figure E23 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



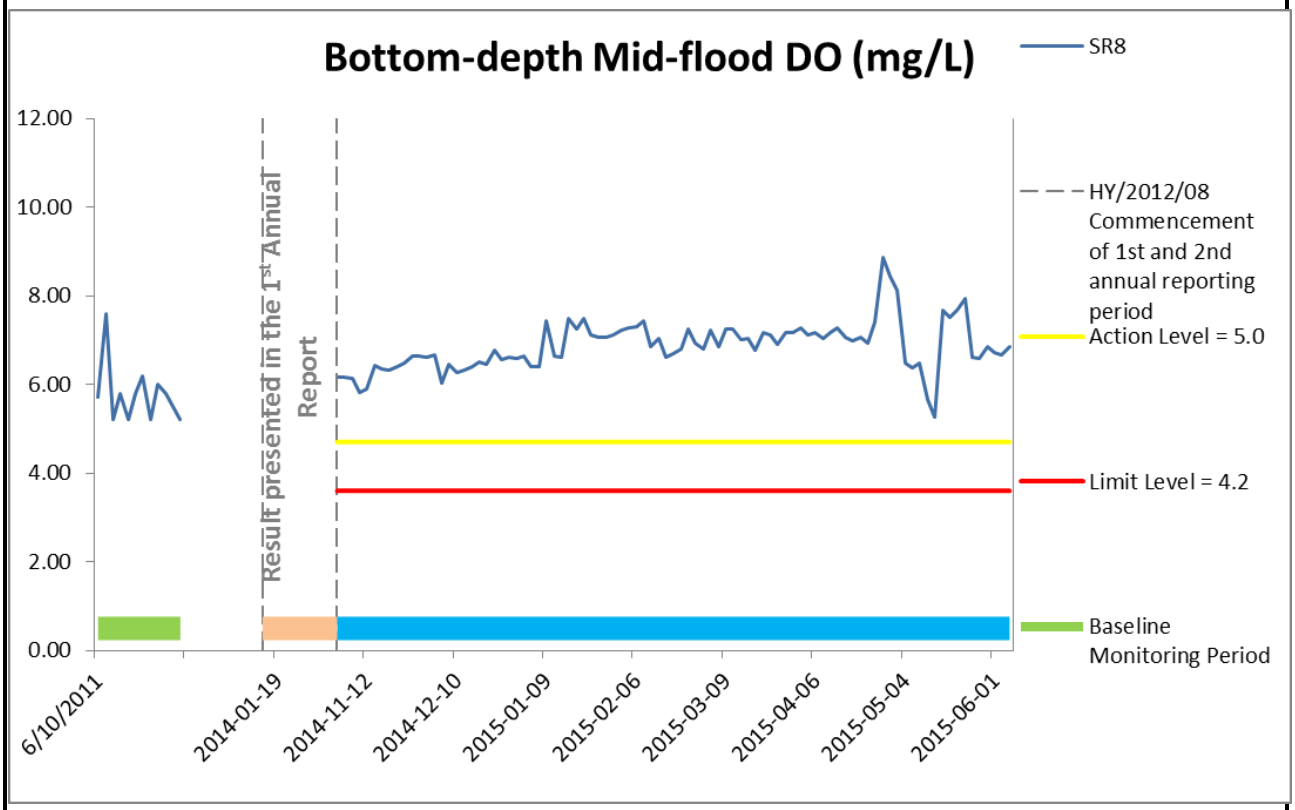


Figure E24 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

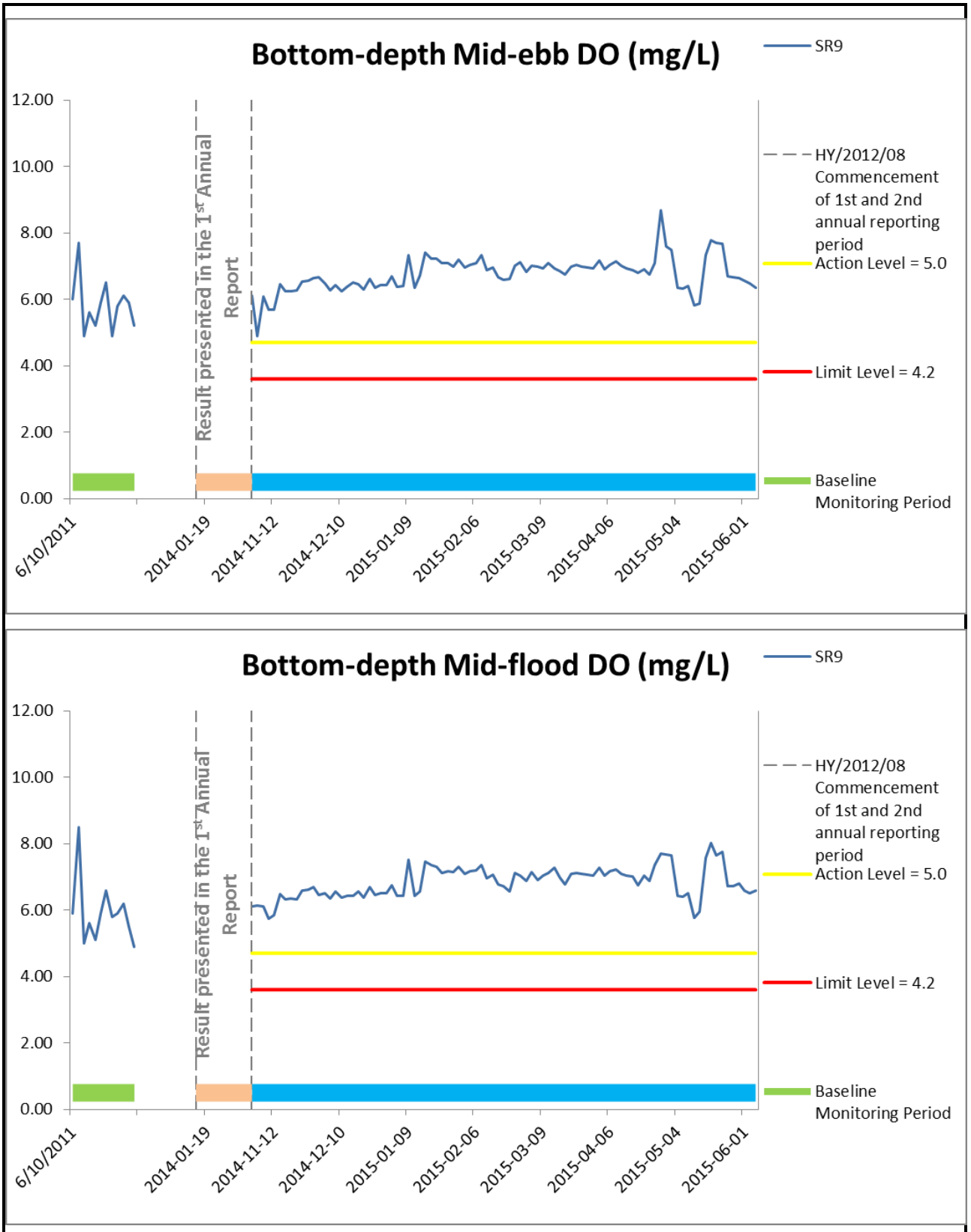
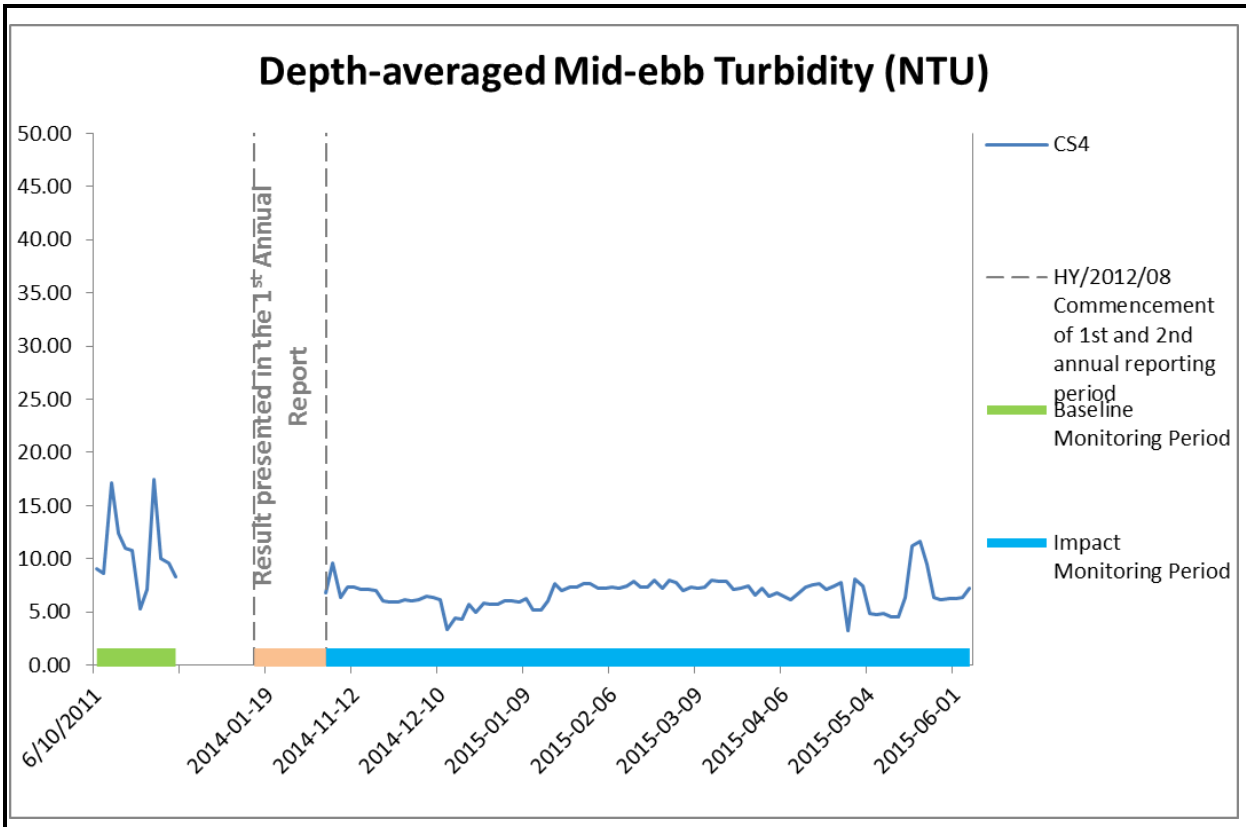


Figure E25 Baseline & Impact Monitoring – Mean Level of Dissolved Oxygen (mg/L) in bottom water between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



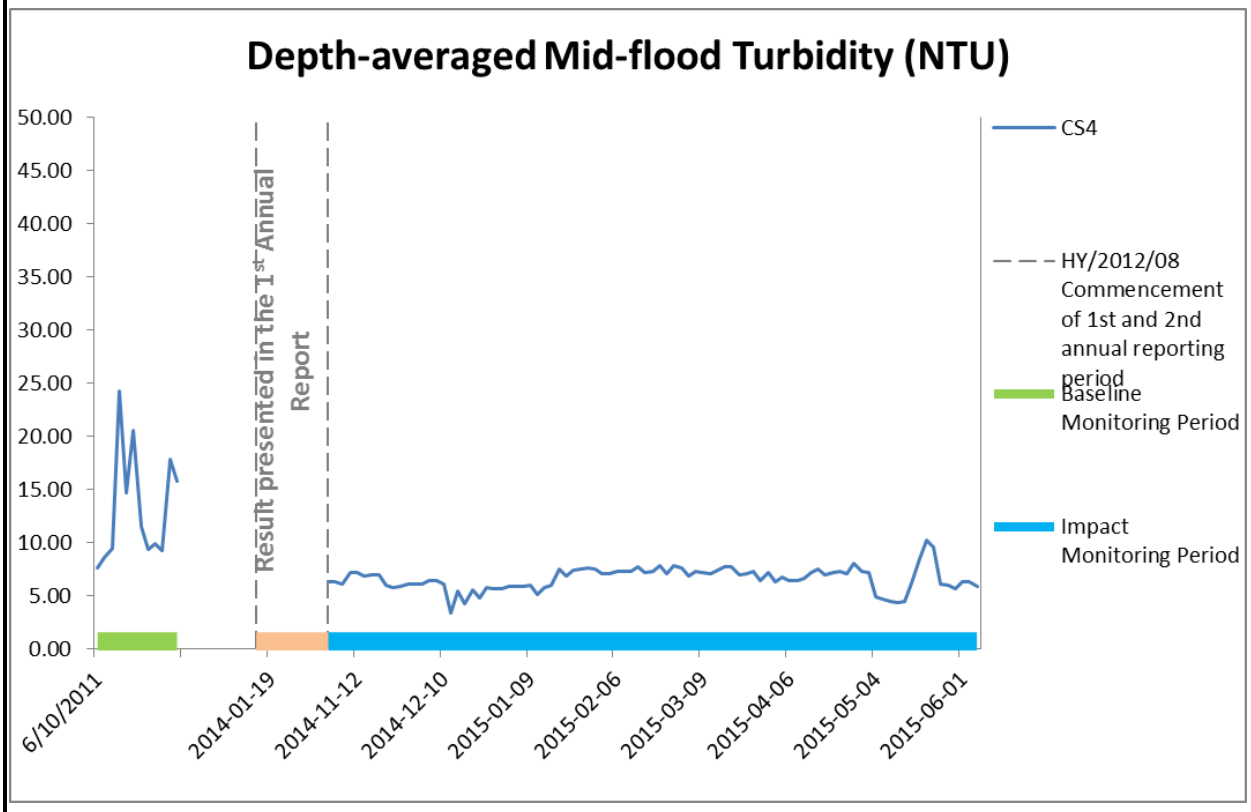
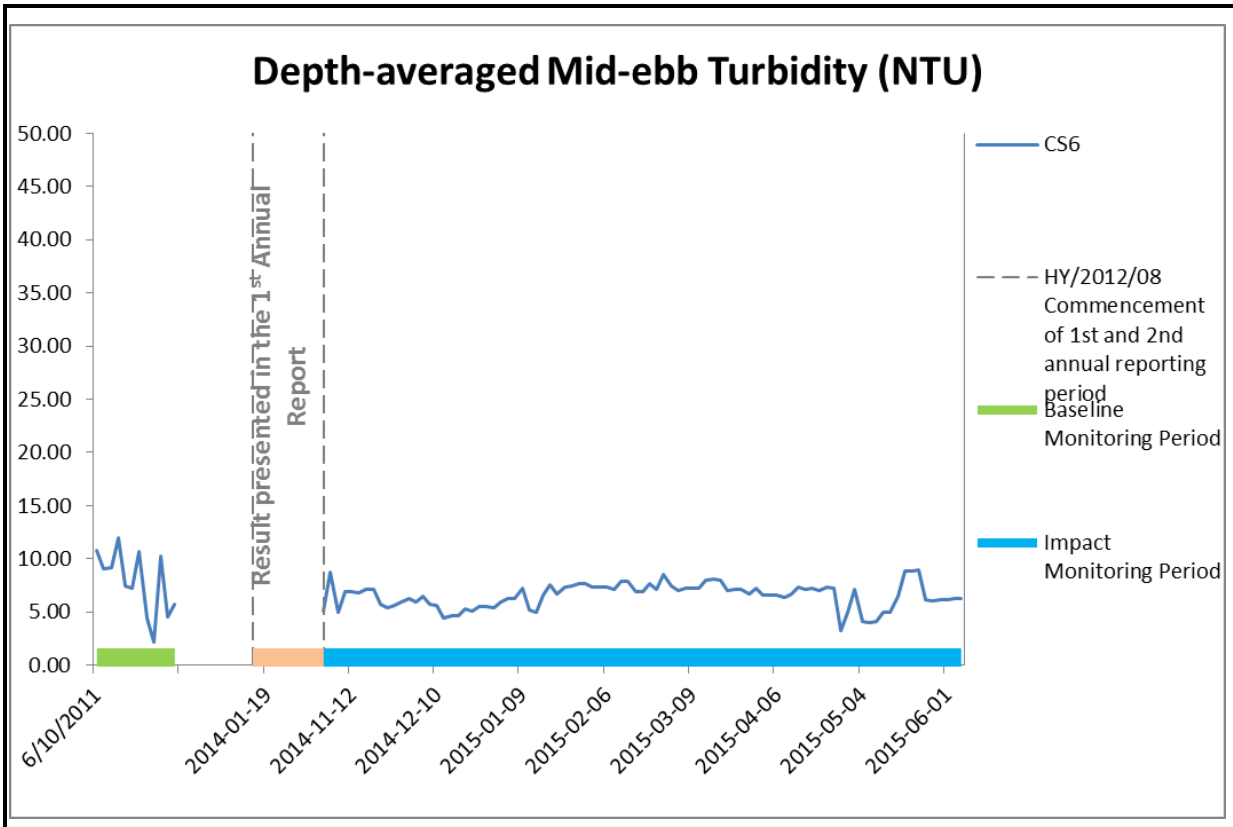


Figure E26 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx



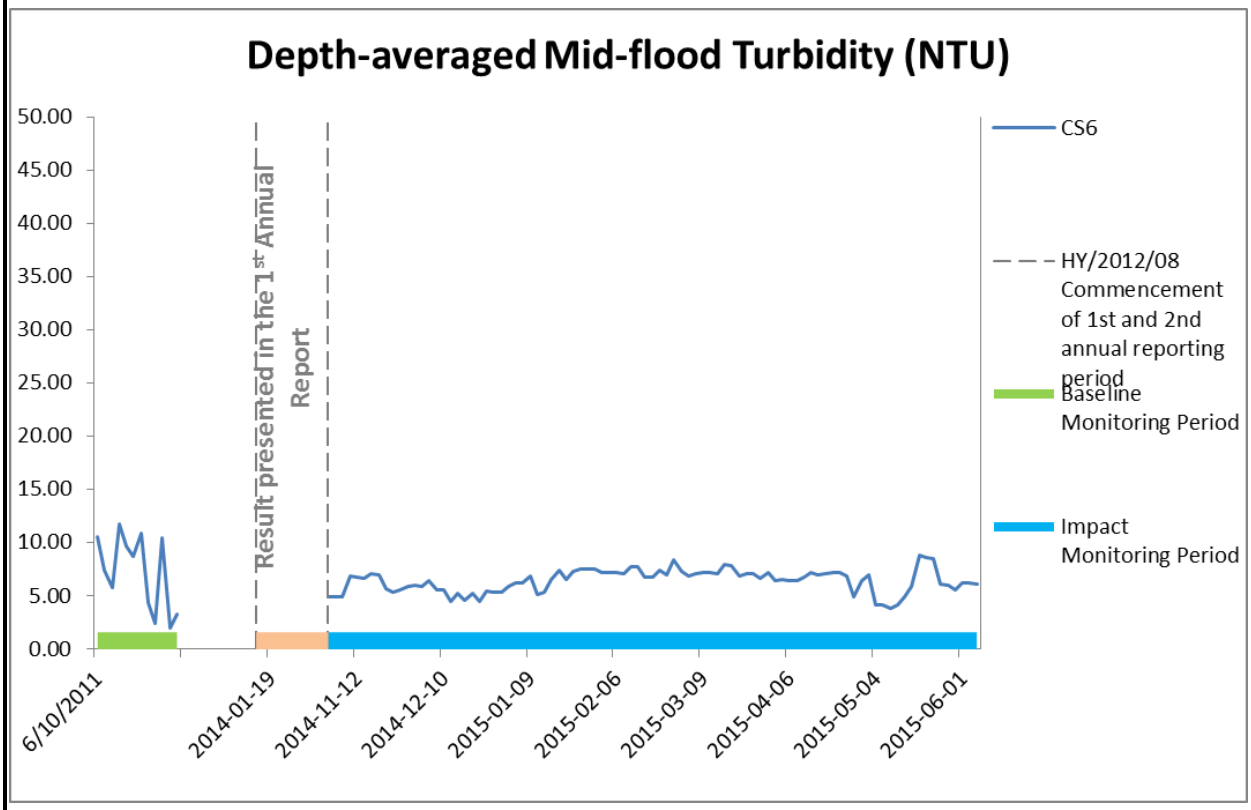


Figure E27 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx

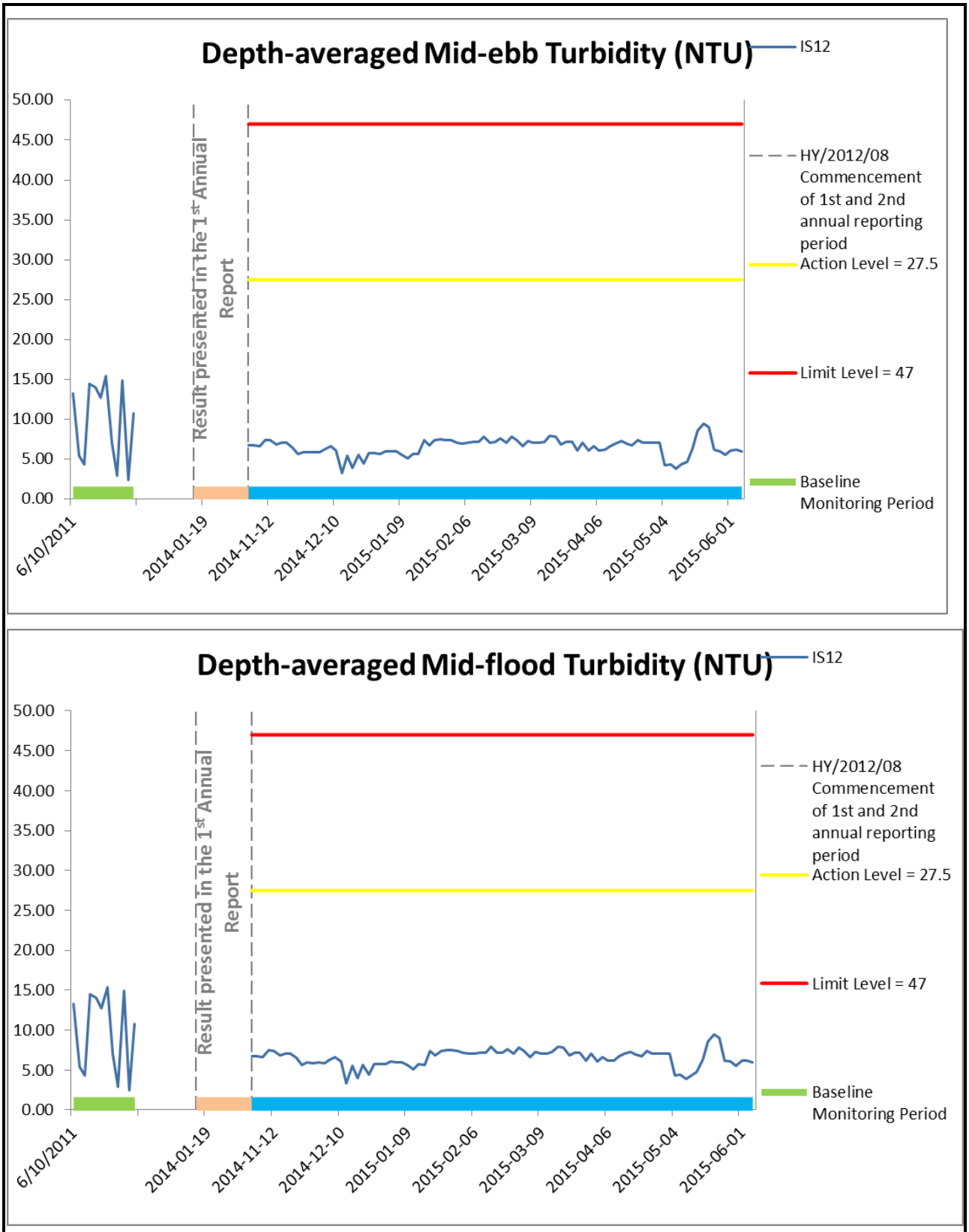
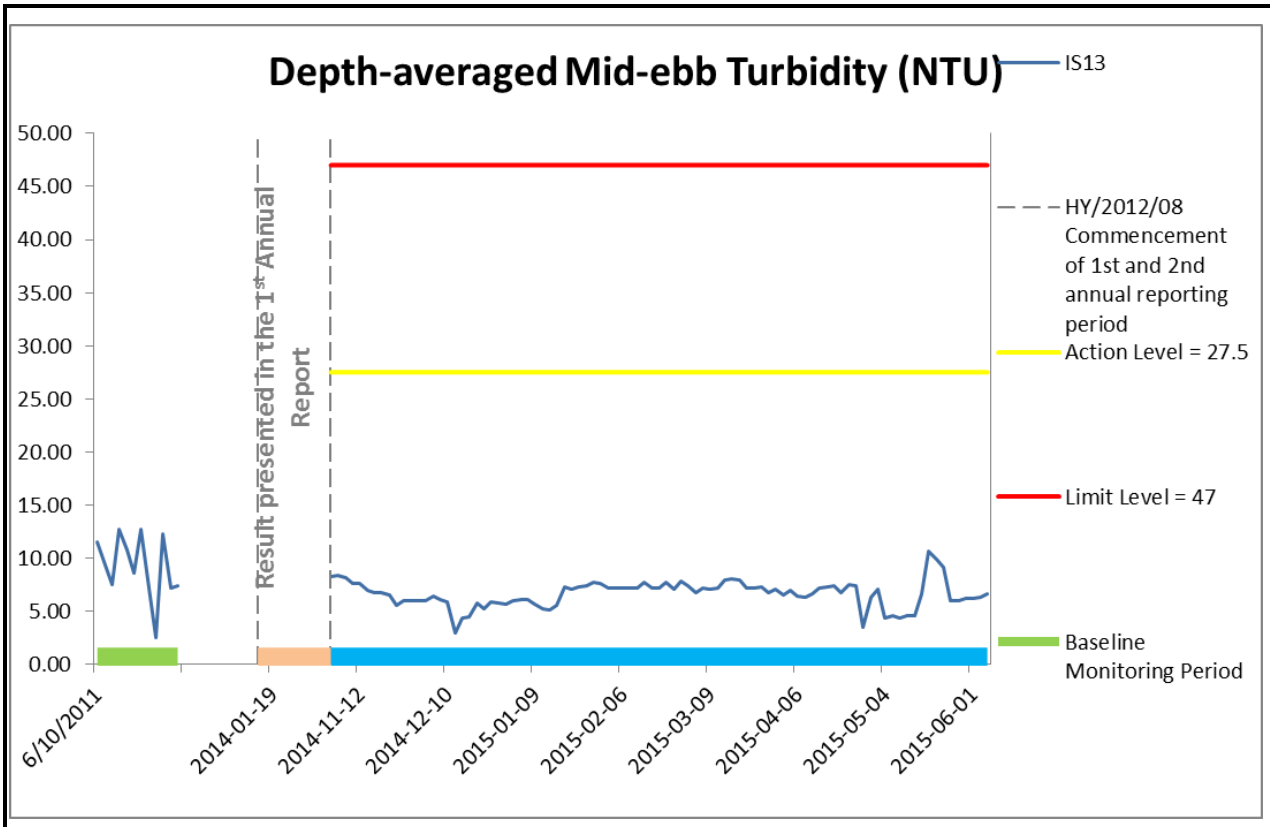


Figure E28 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx



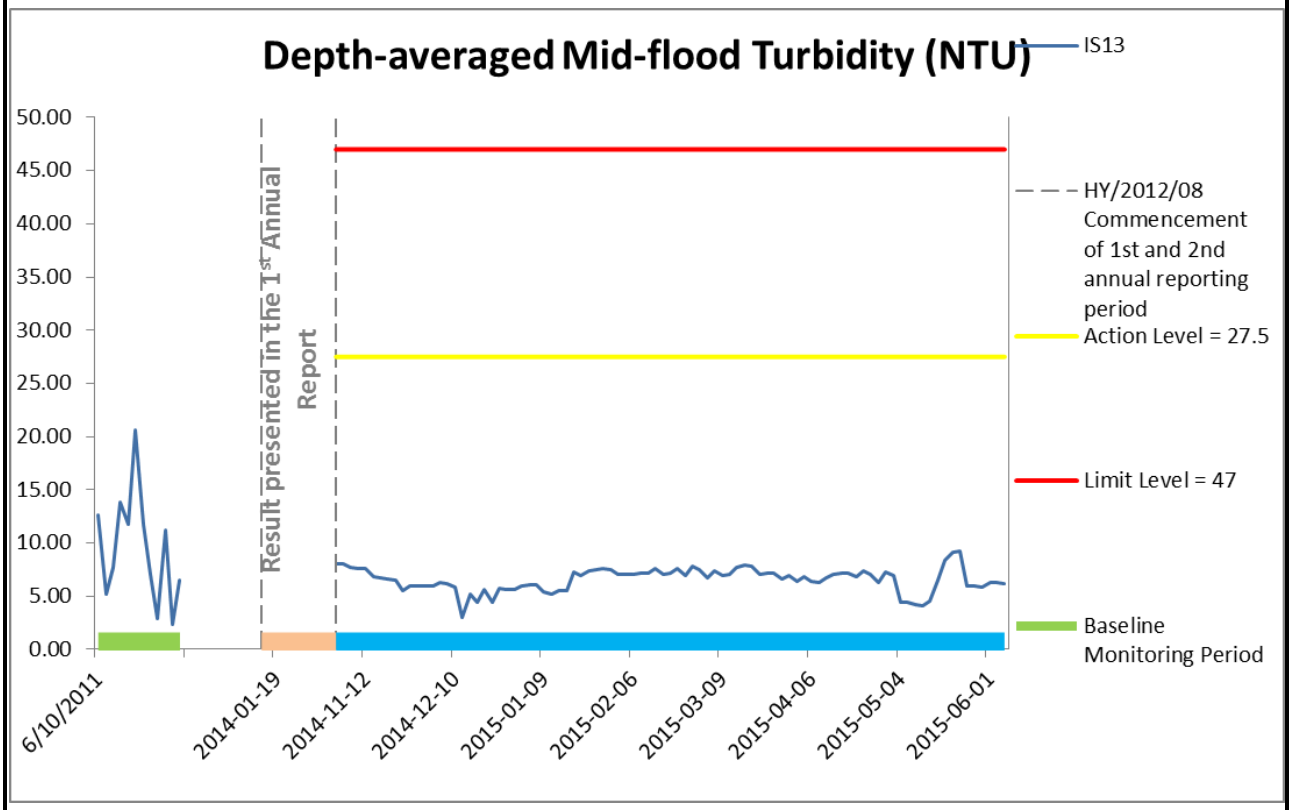


Figure E29 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx

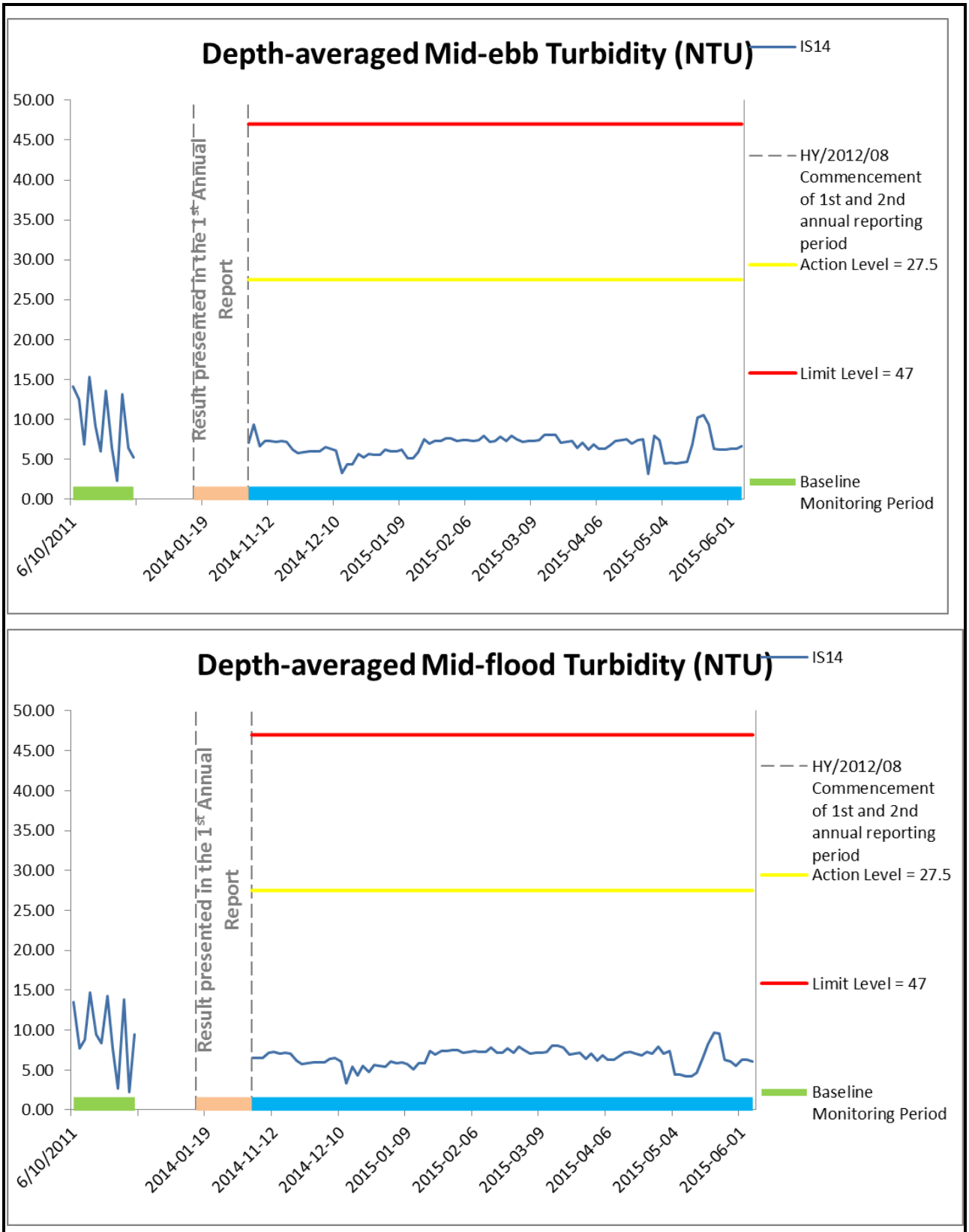
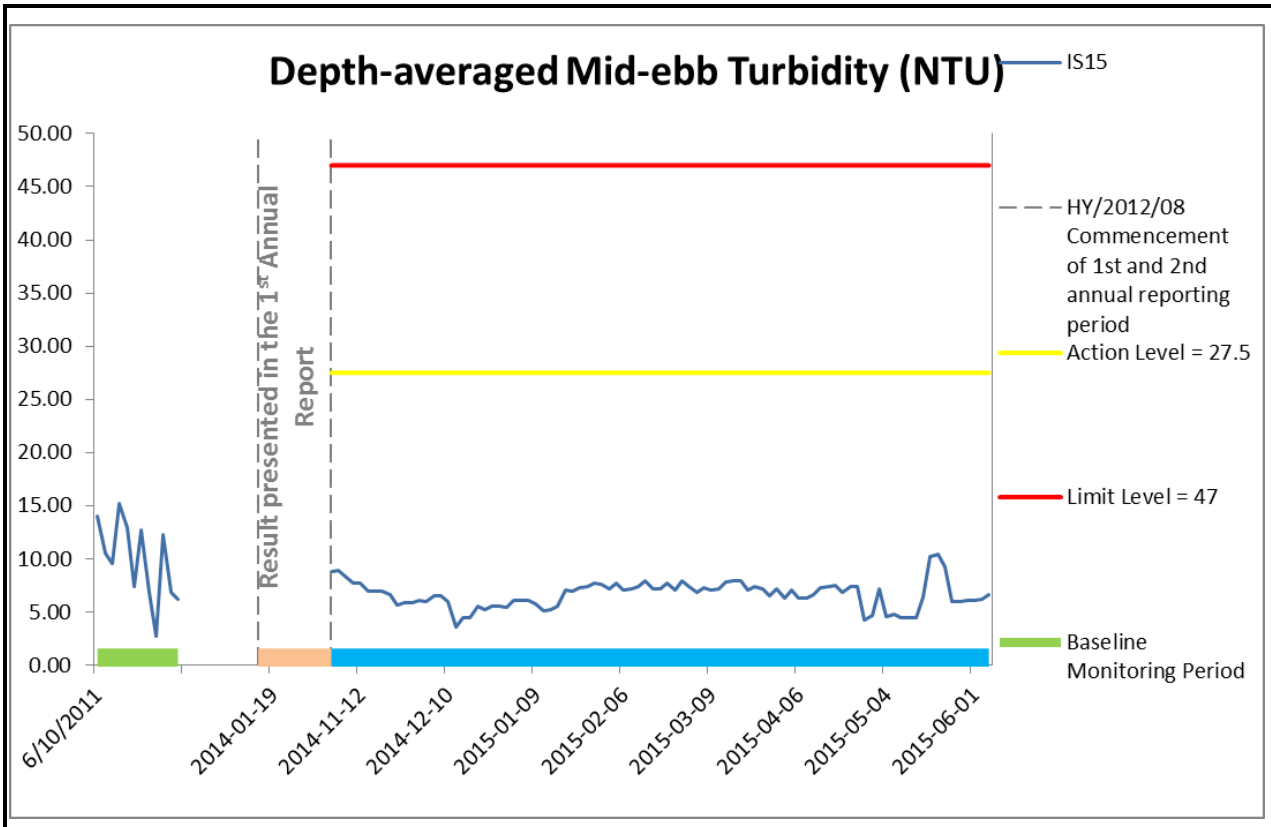


Figure E30 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx



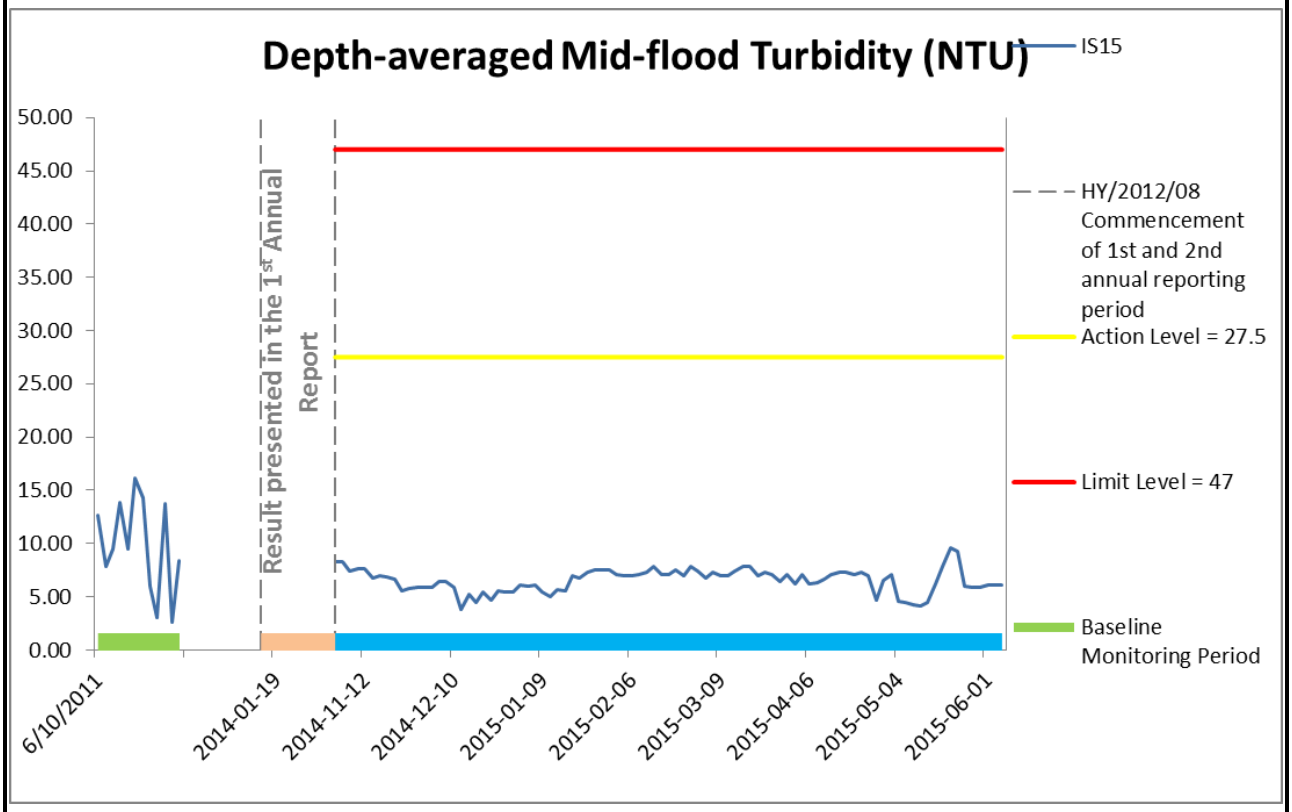


Figure E31 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx

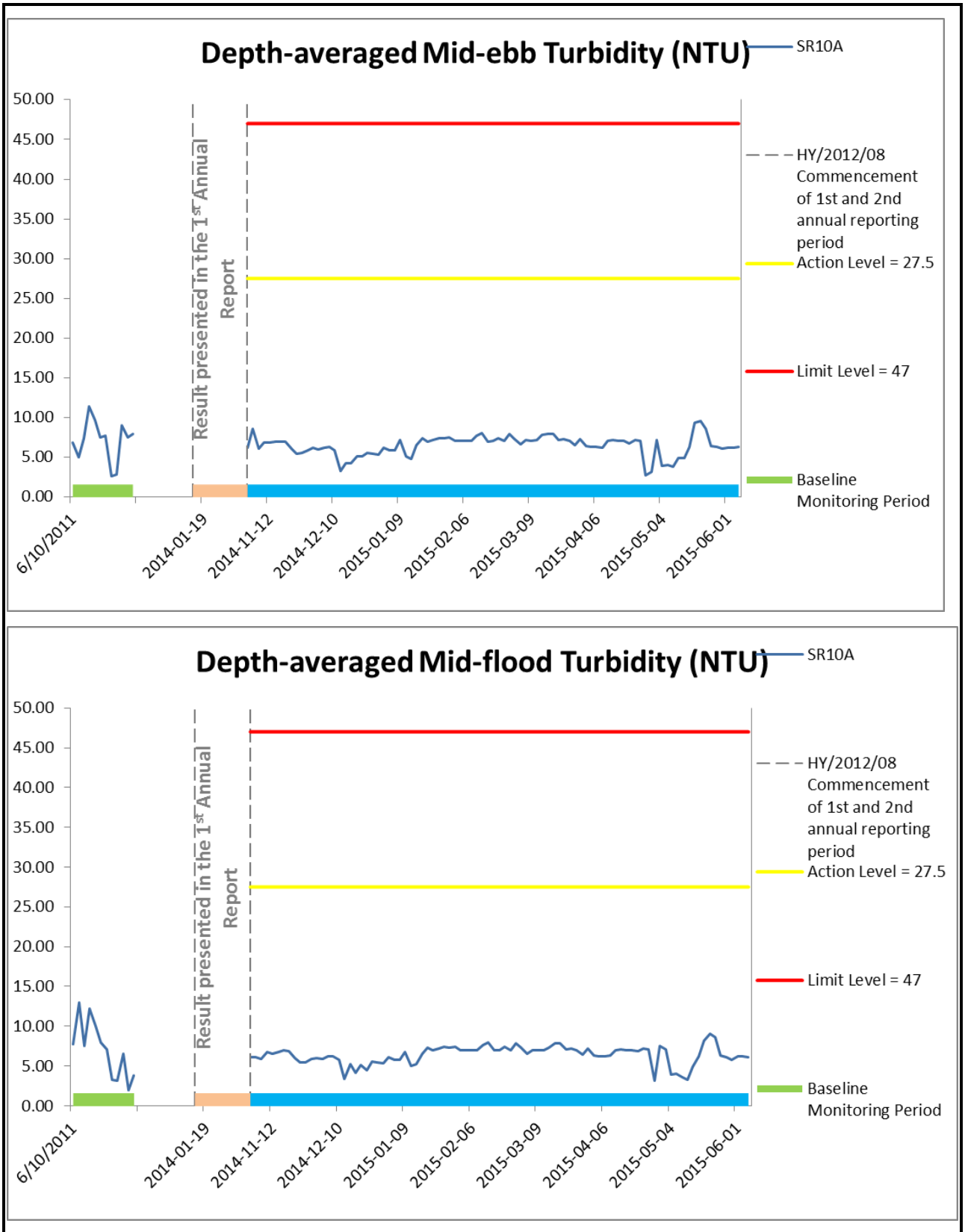


Figure E32 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx

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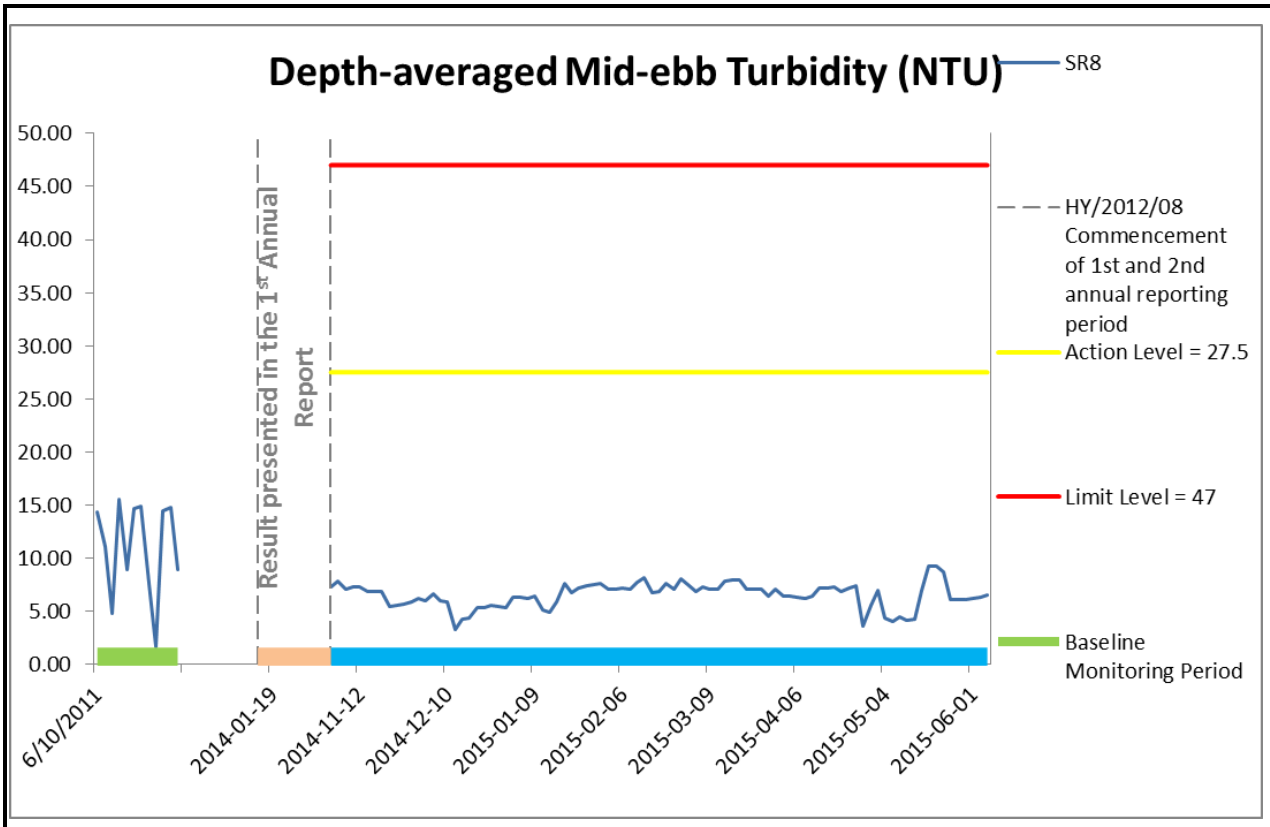


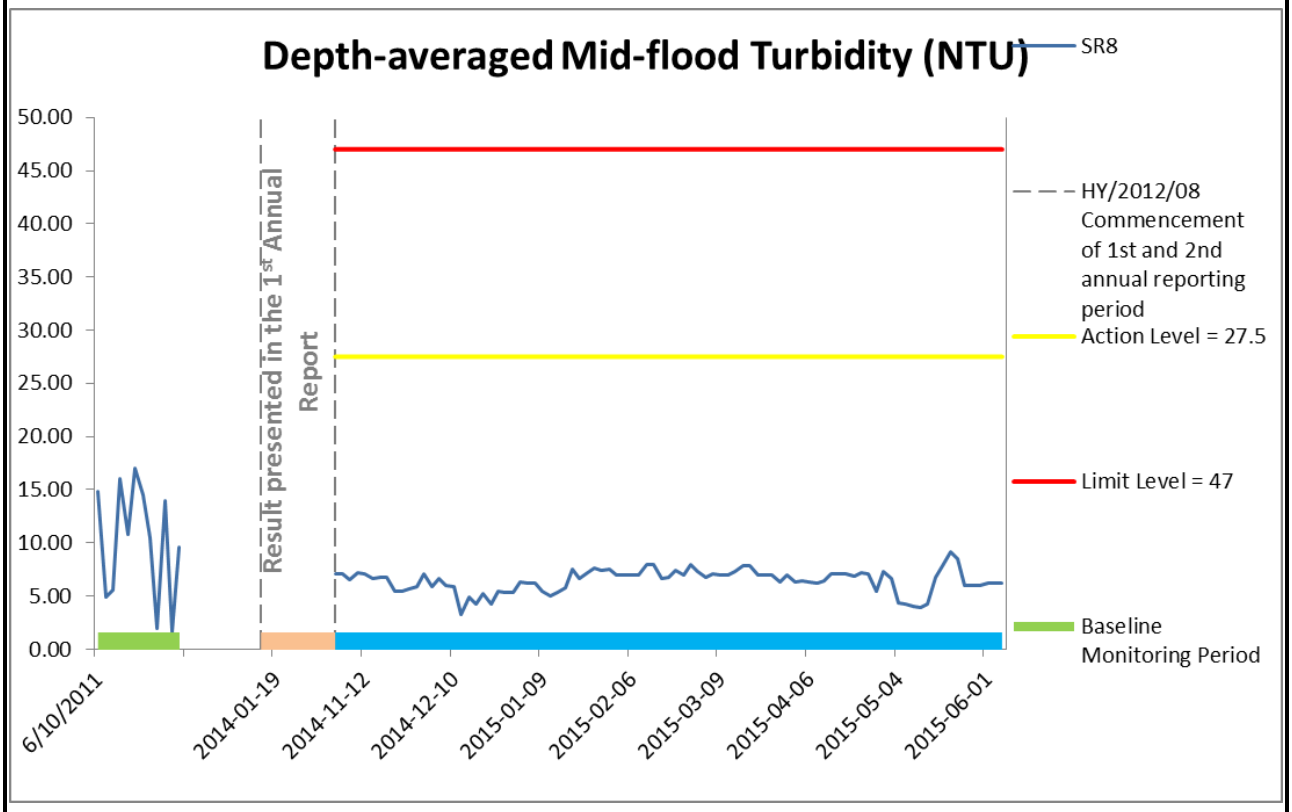
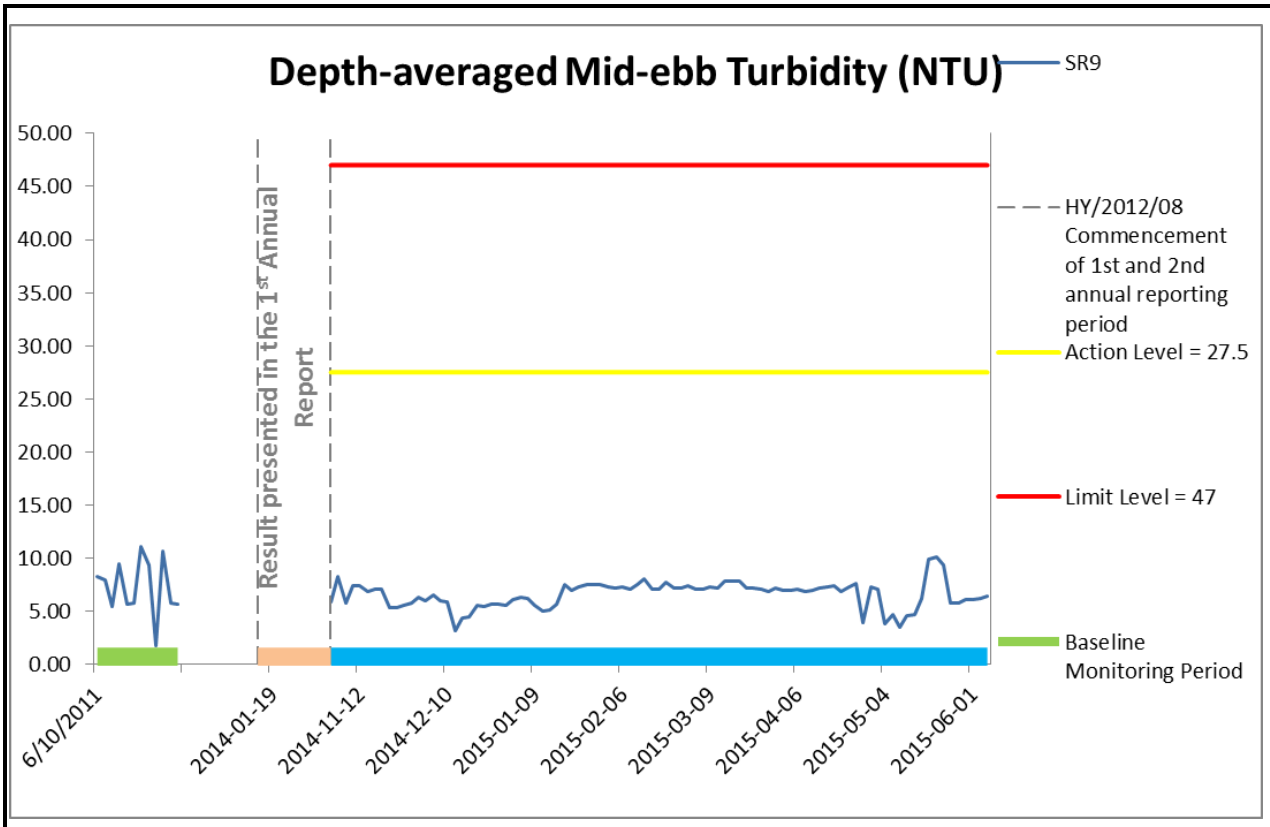


Figure E33 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx



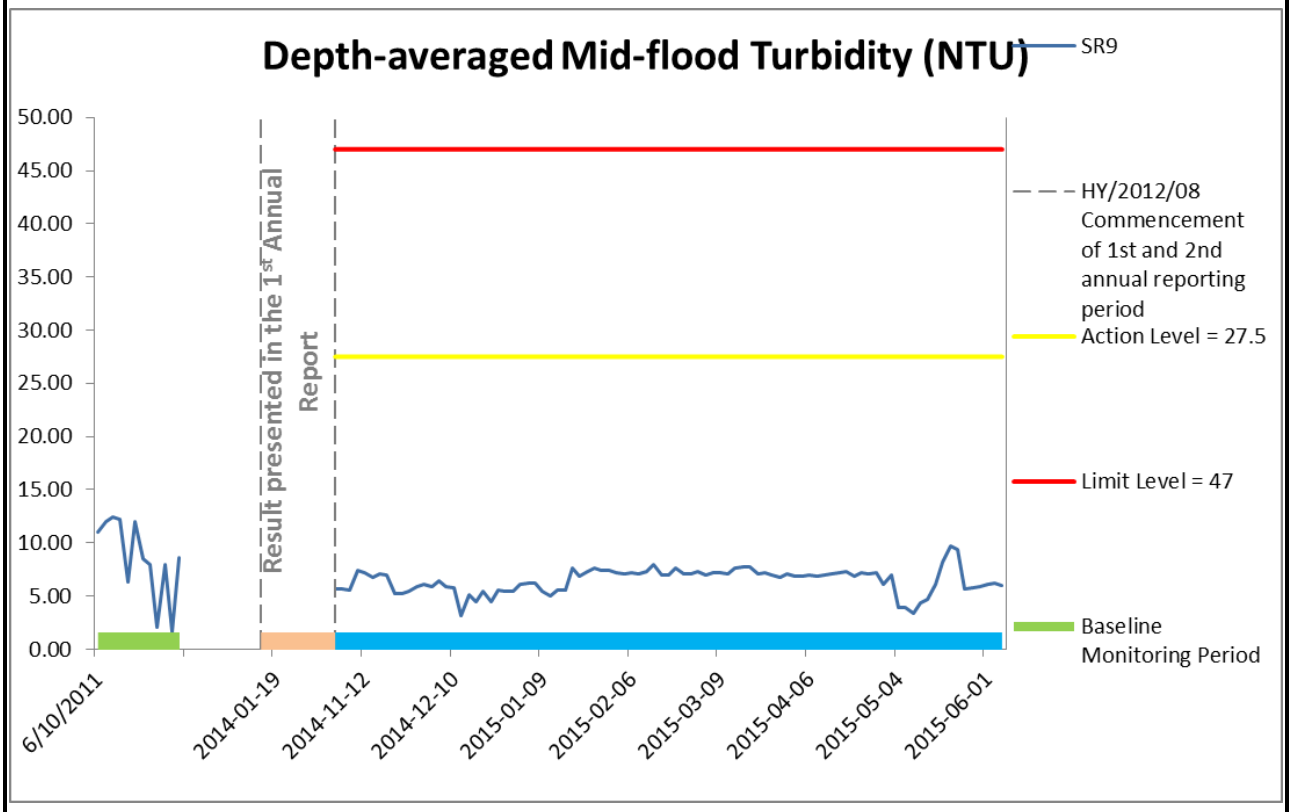
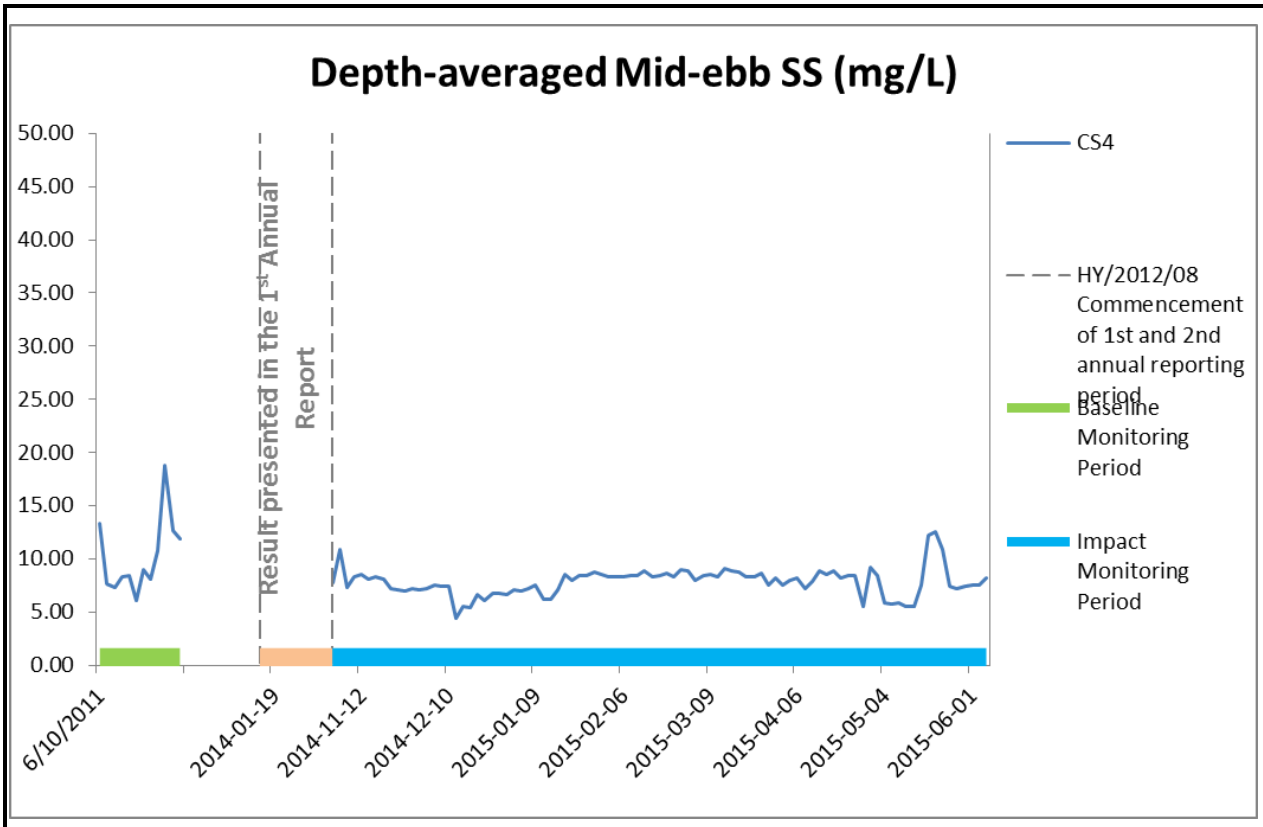


Figure E34 Baseline & Impact Monitoring – Mean Depth-averaged Level of Turbidity (NTU) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively.

Ref: 0212330_Impact-WQM_2nd annual.xlsx



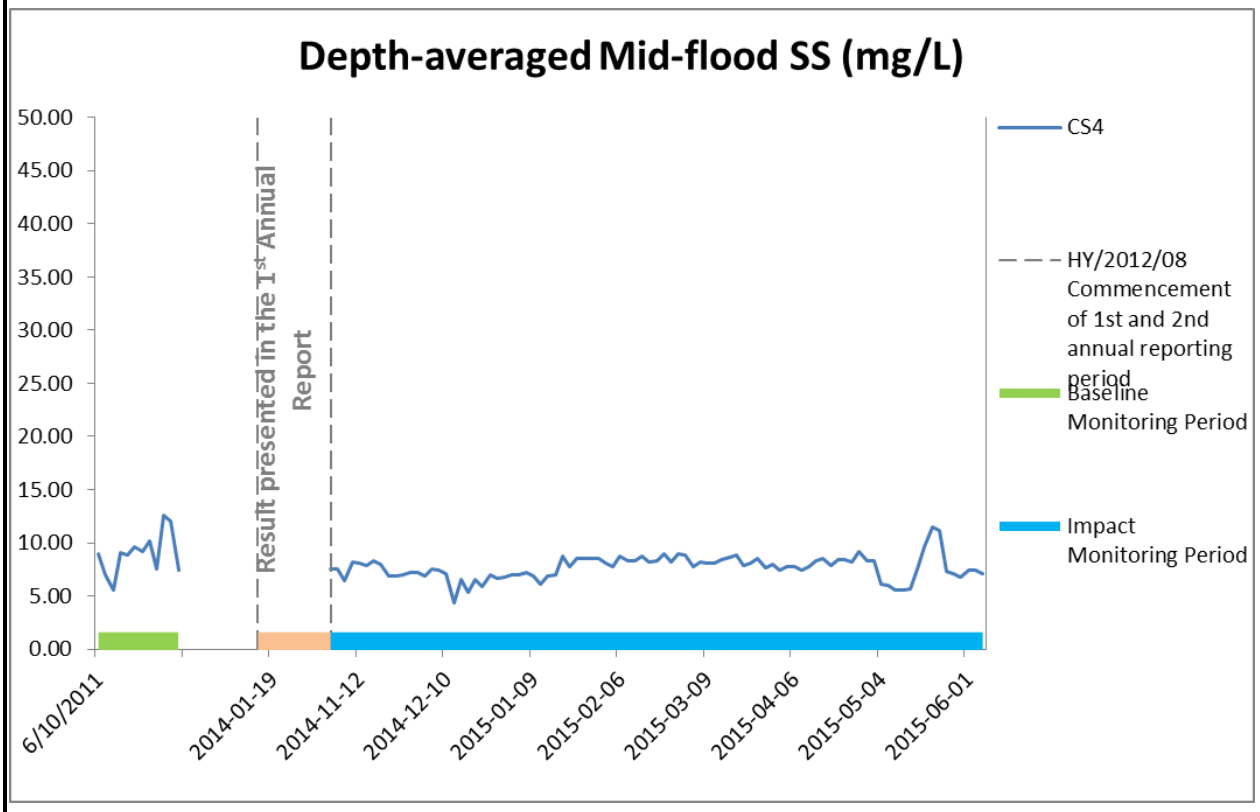


Figure E35 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS4. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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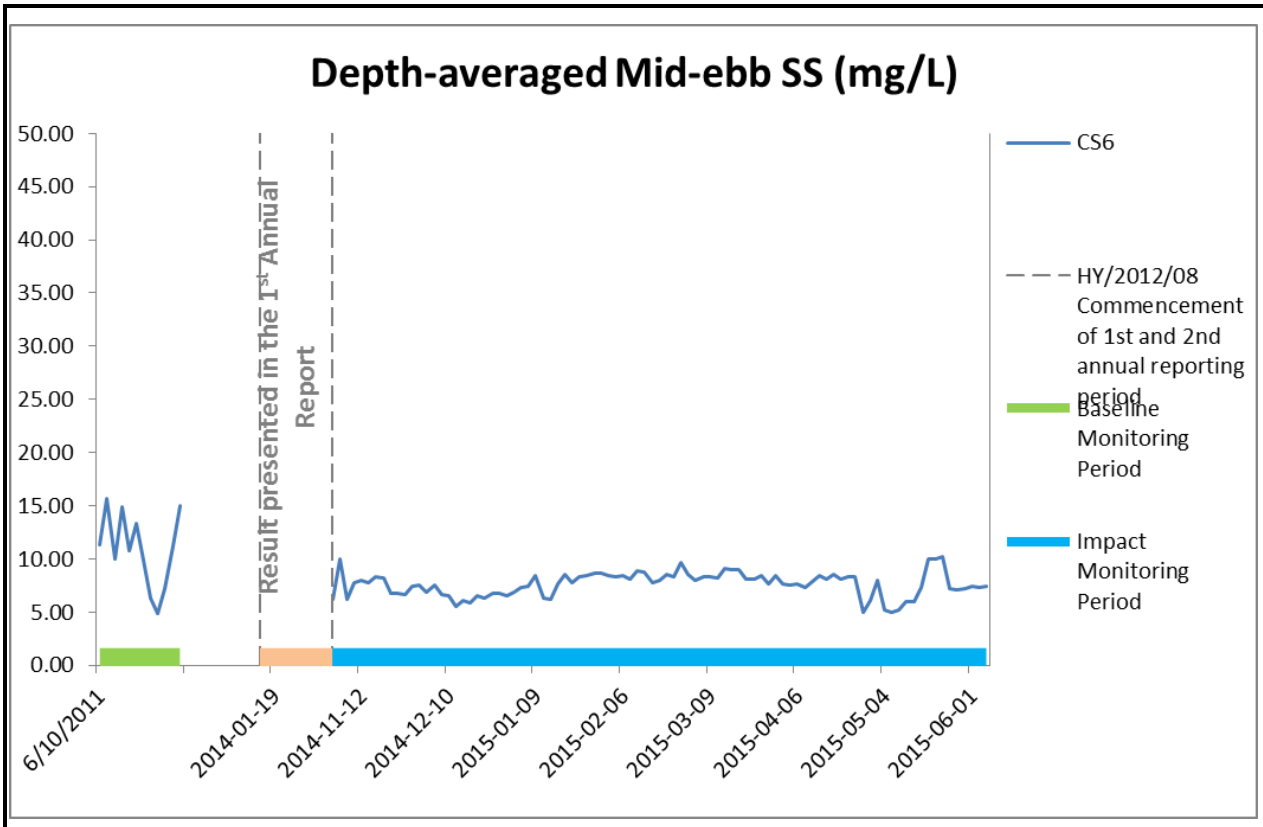

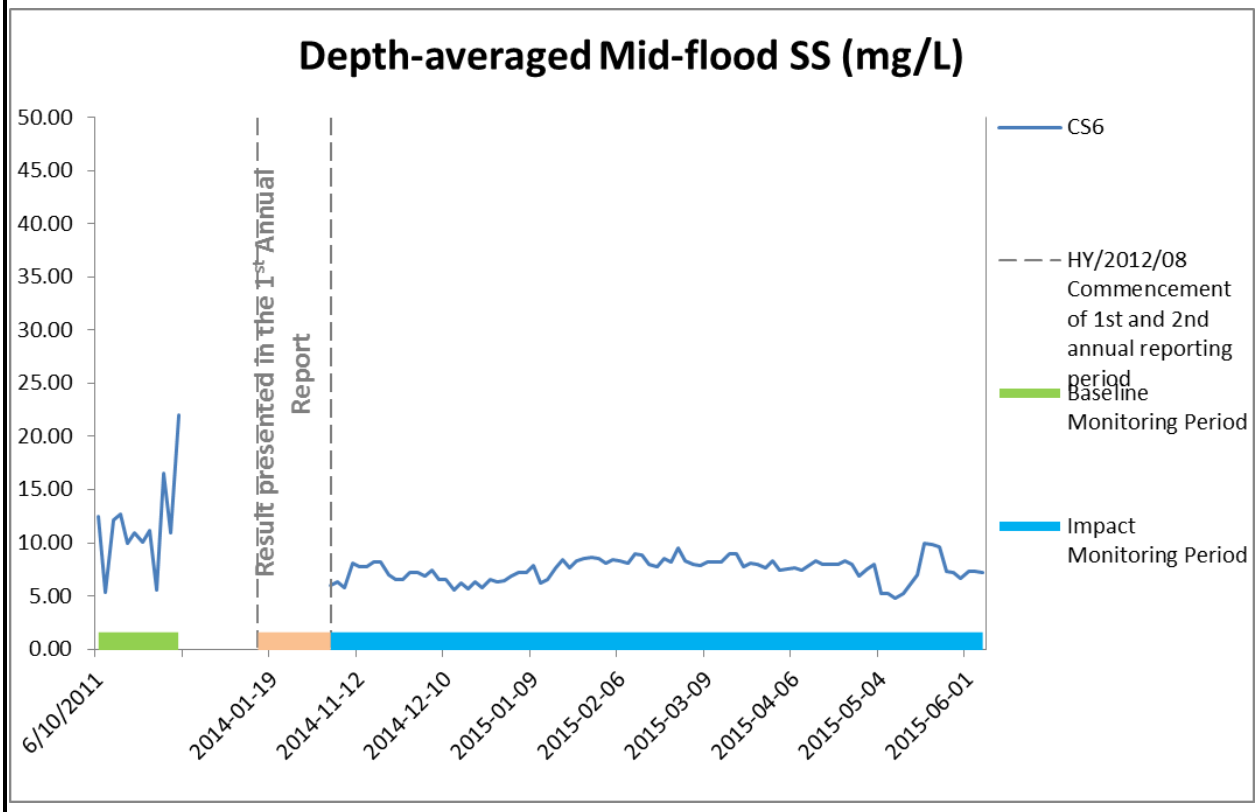

Figure E36 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at CS6. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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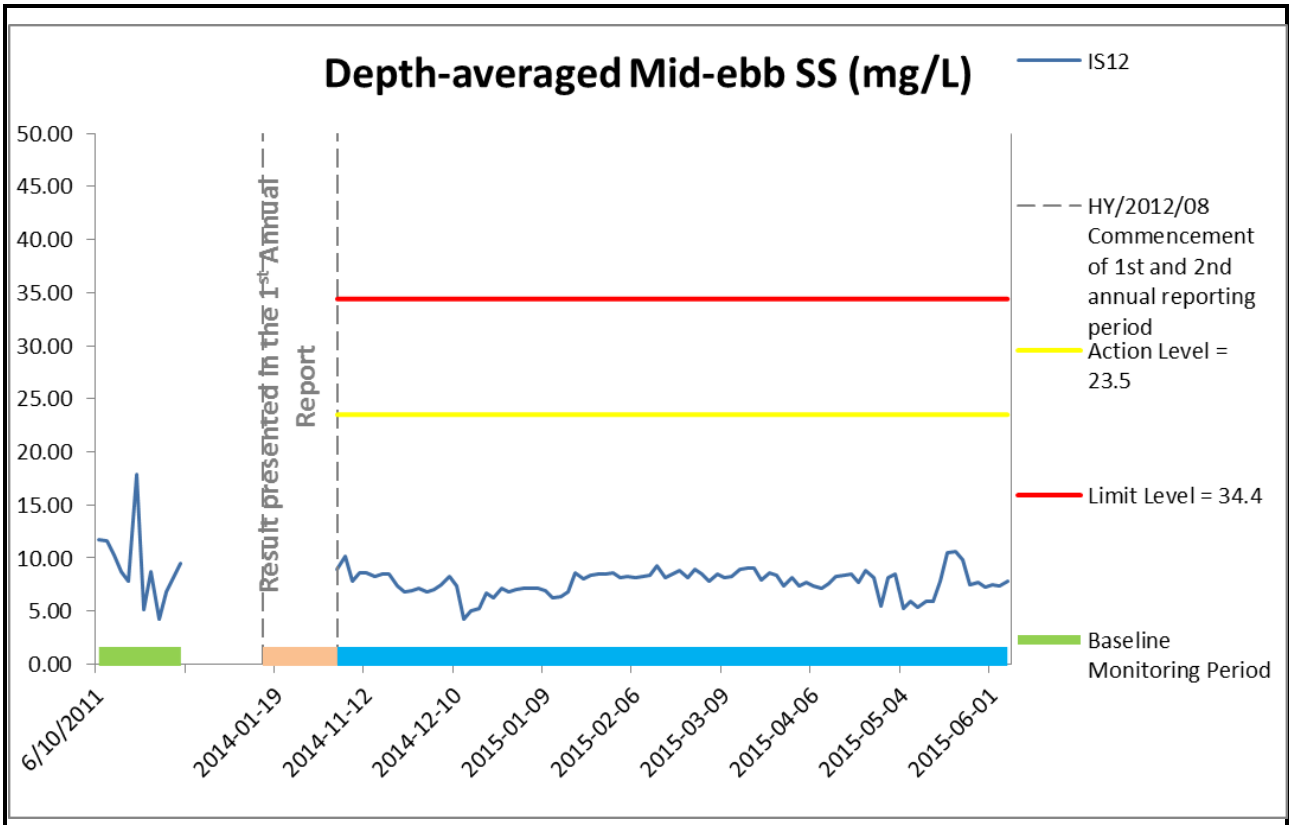

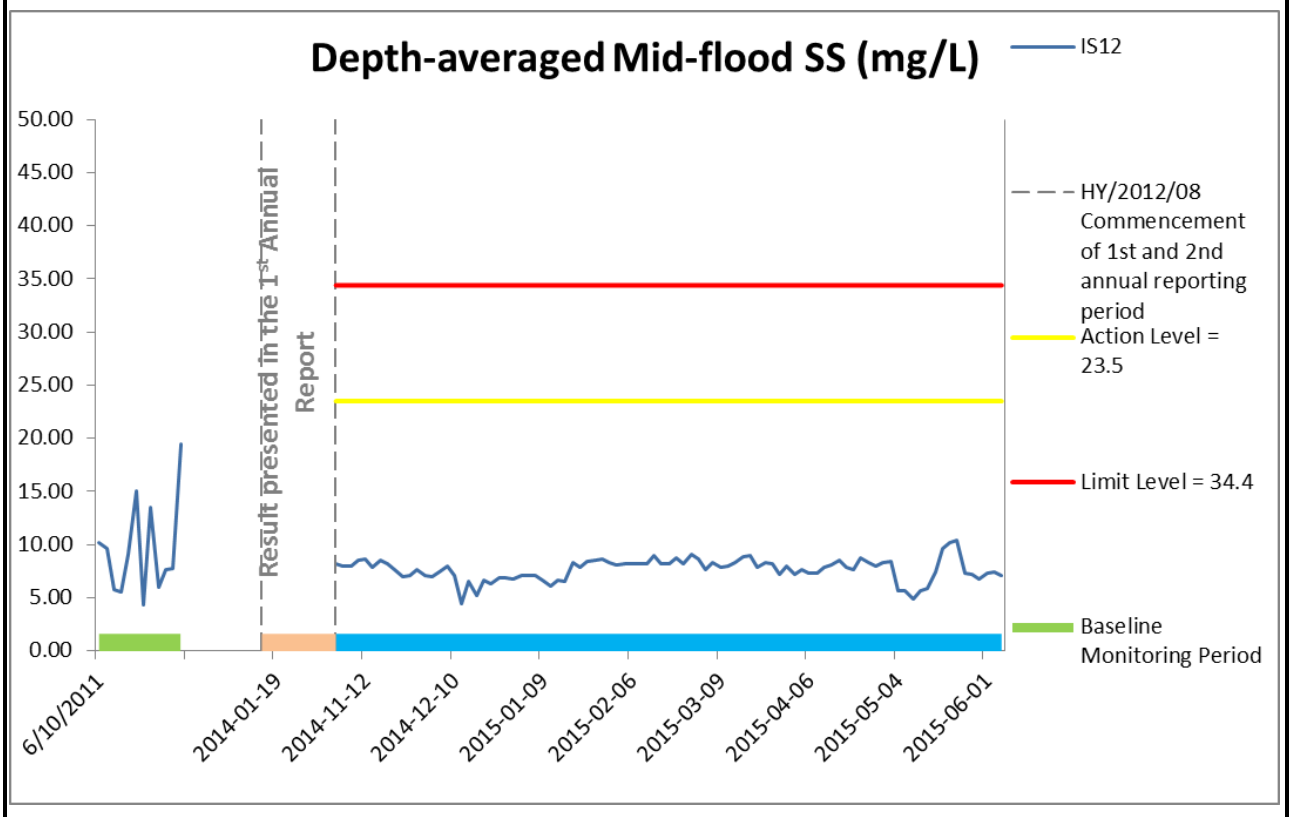

Figure E37 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS12. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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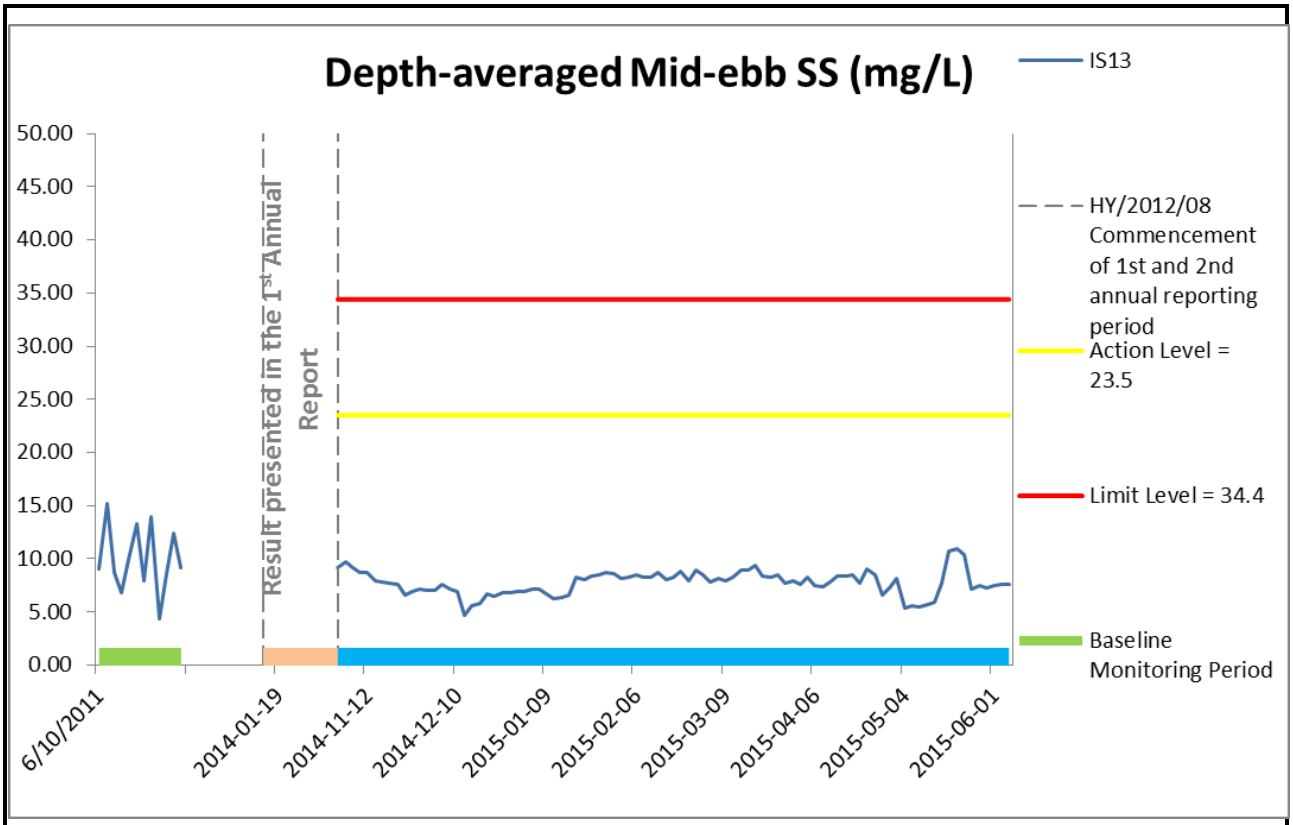

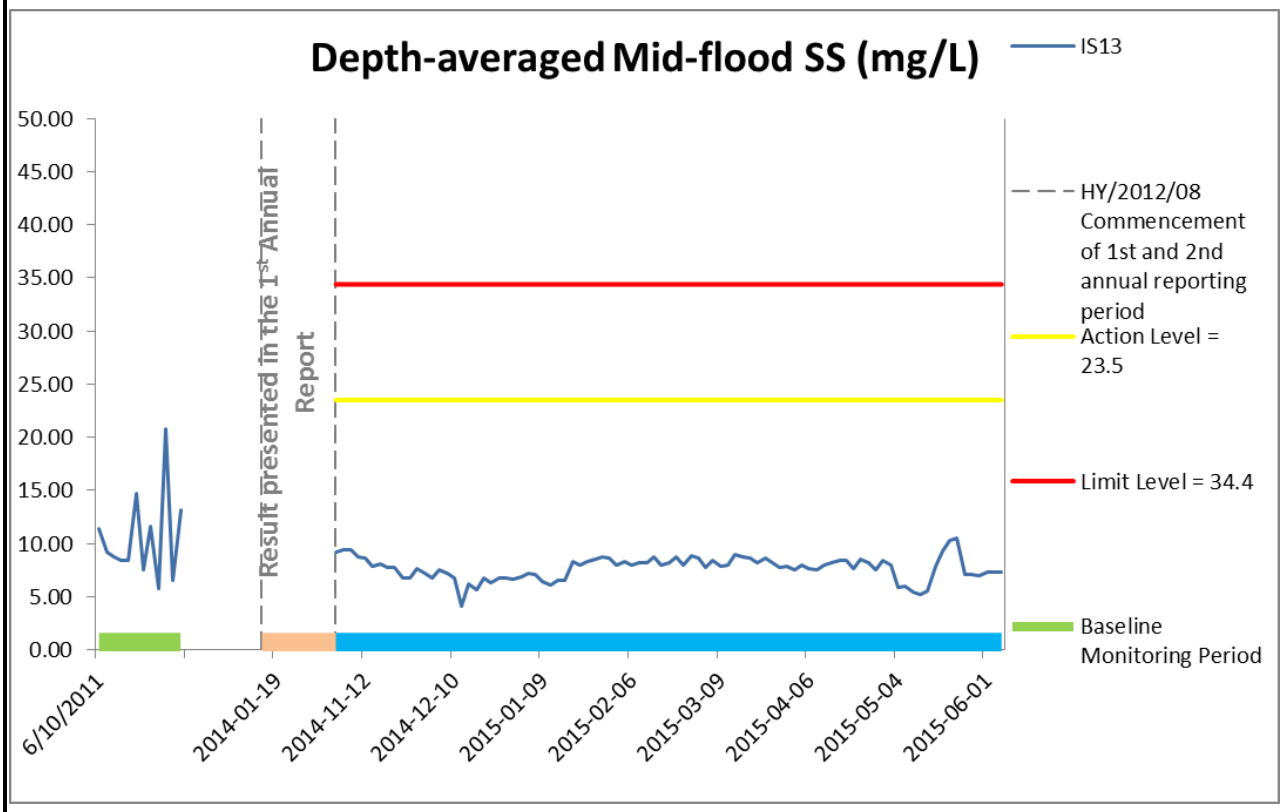

Figure E38 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS13. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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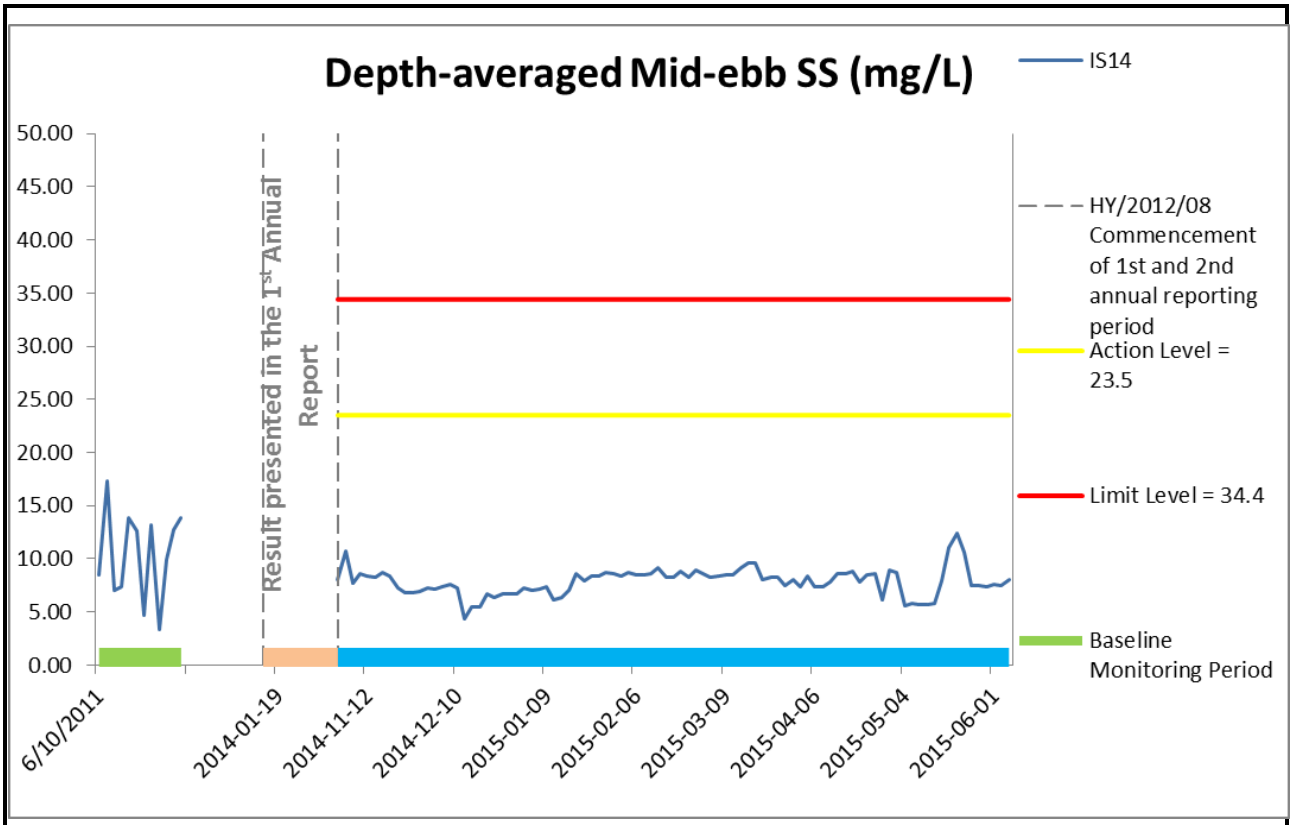

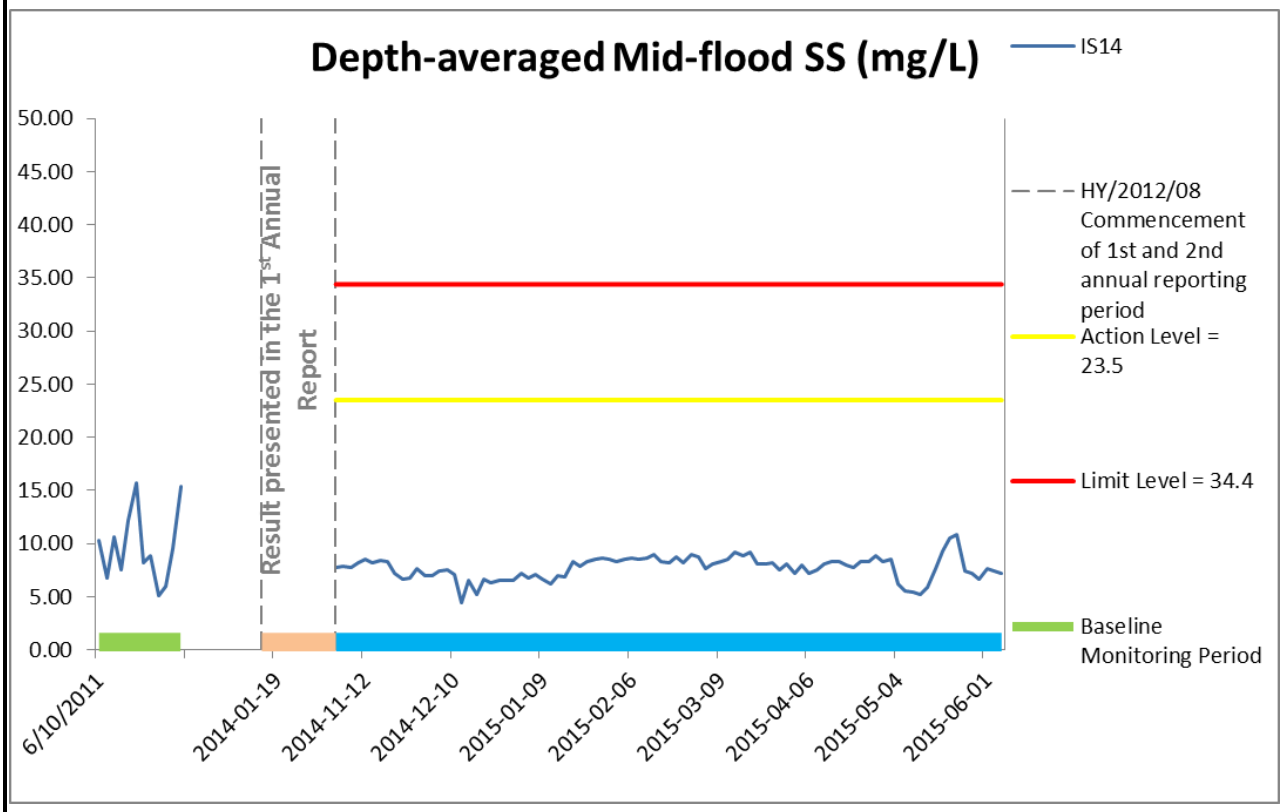

Figure E39 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS14. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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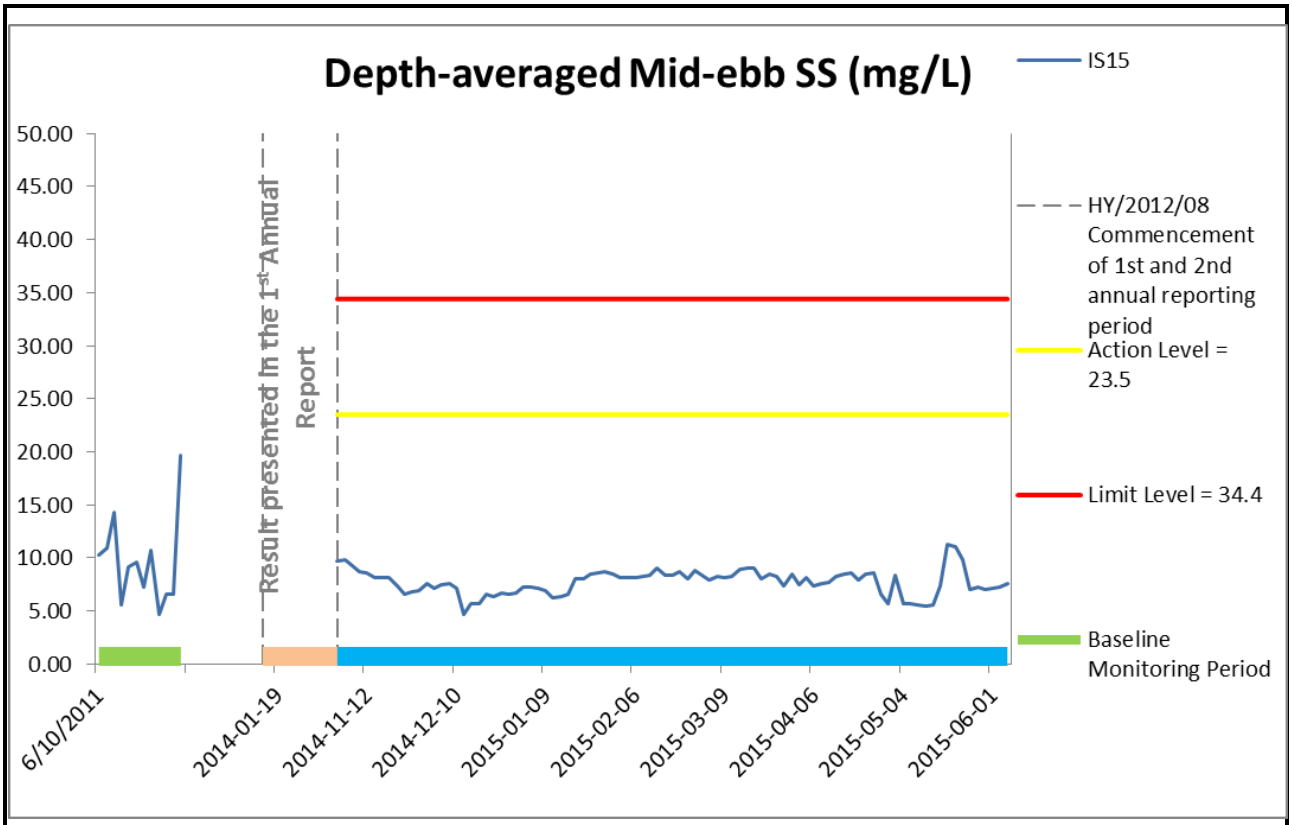

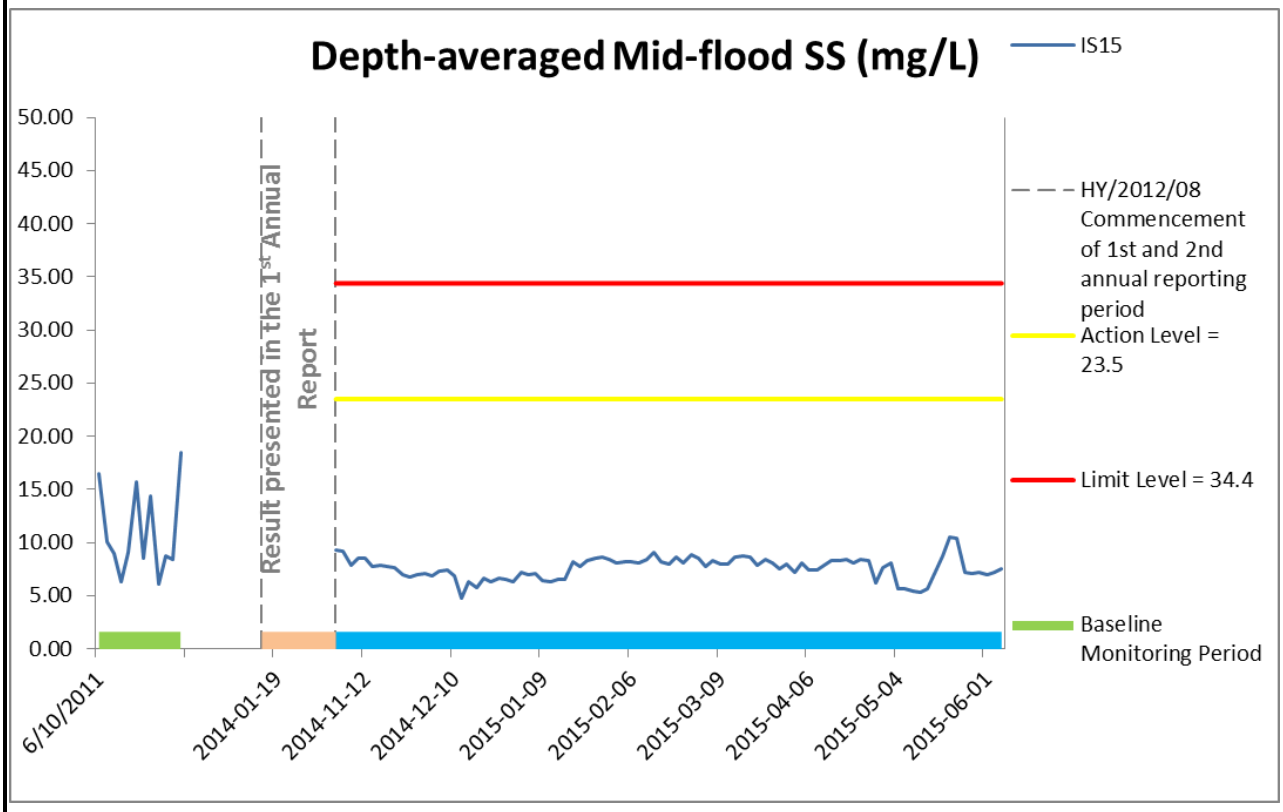

Figure E40 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at IS15. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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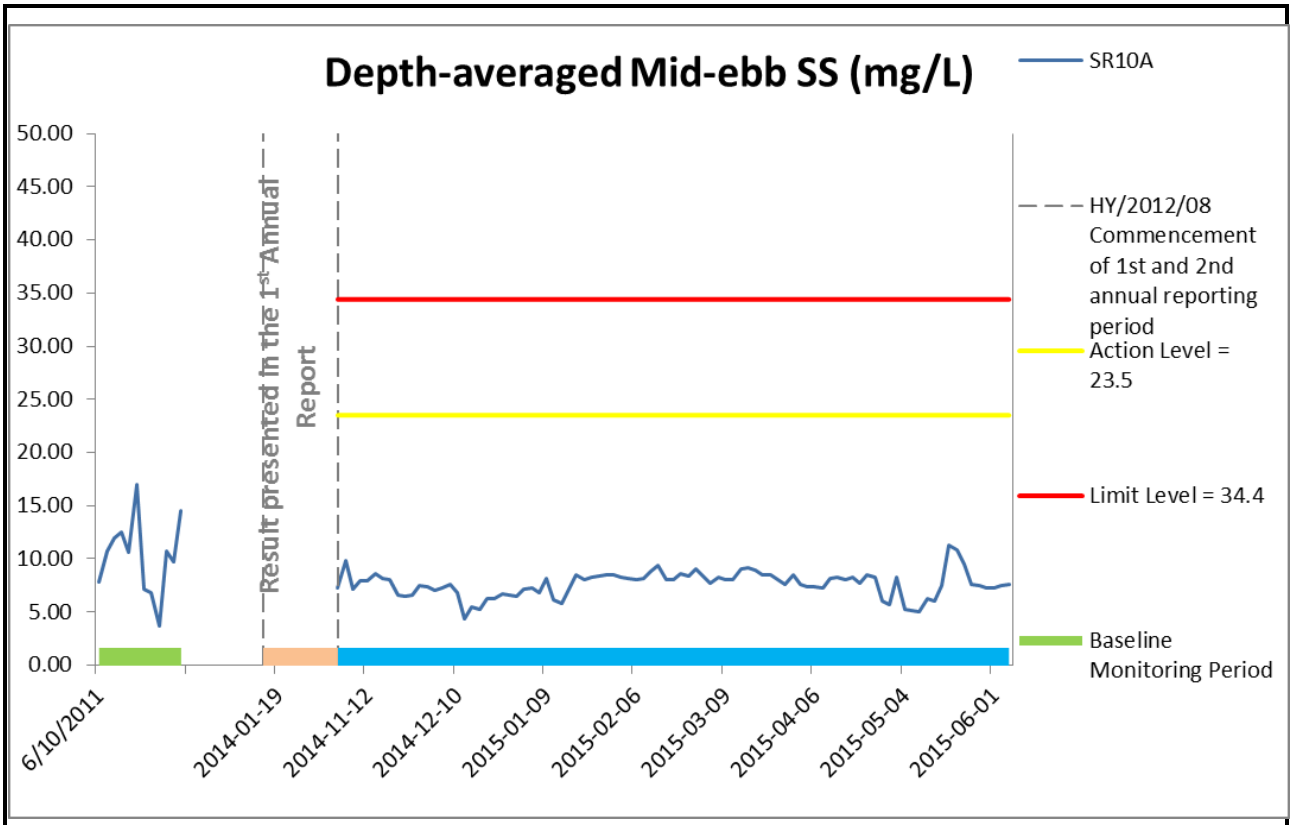

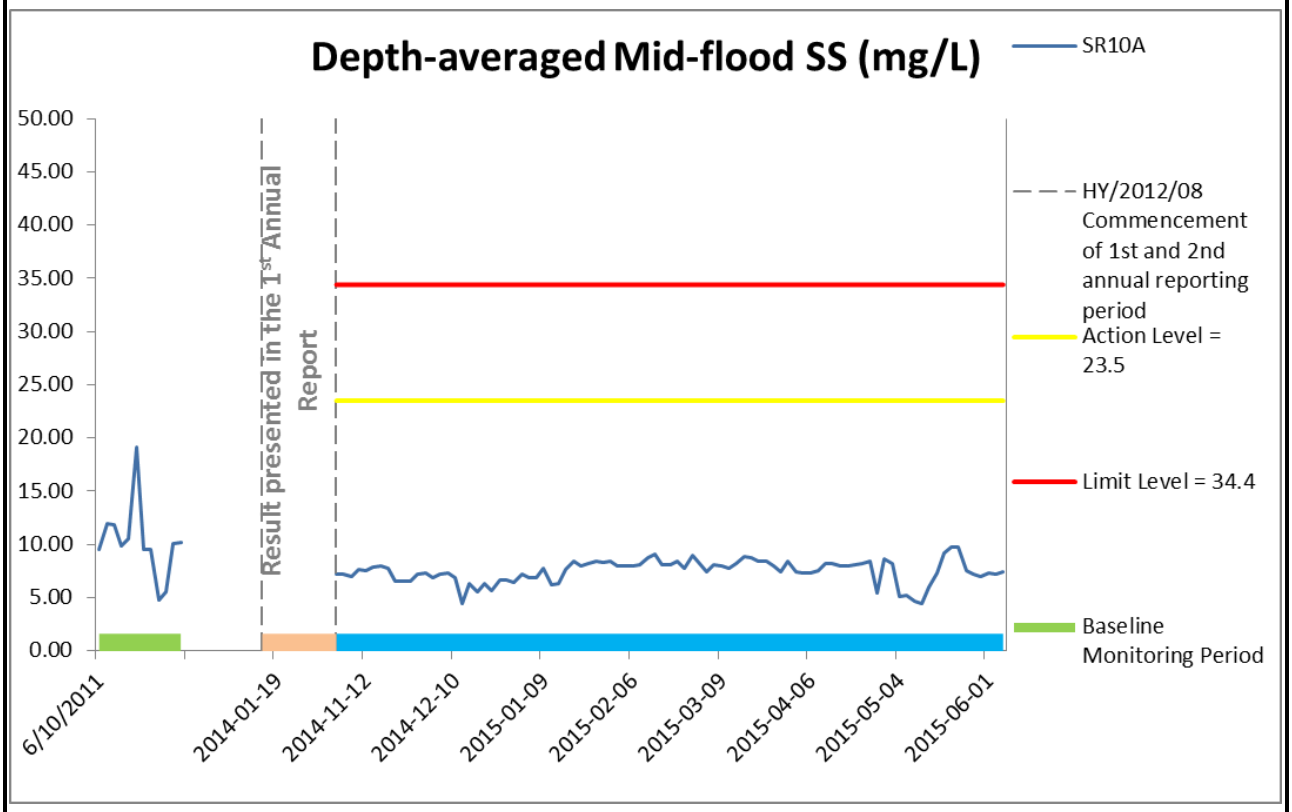

Figure E41 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR10A. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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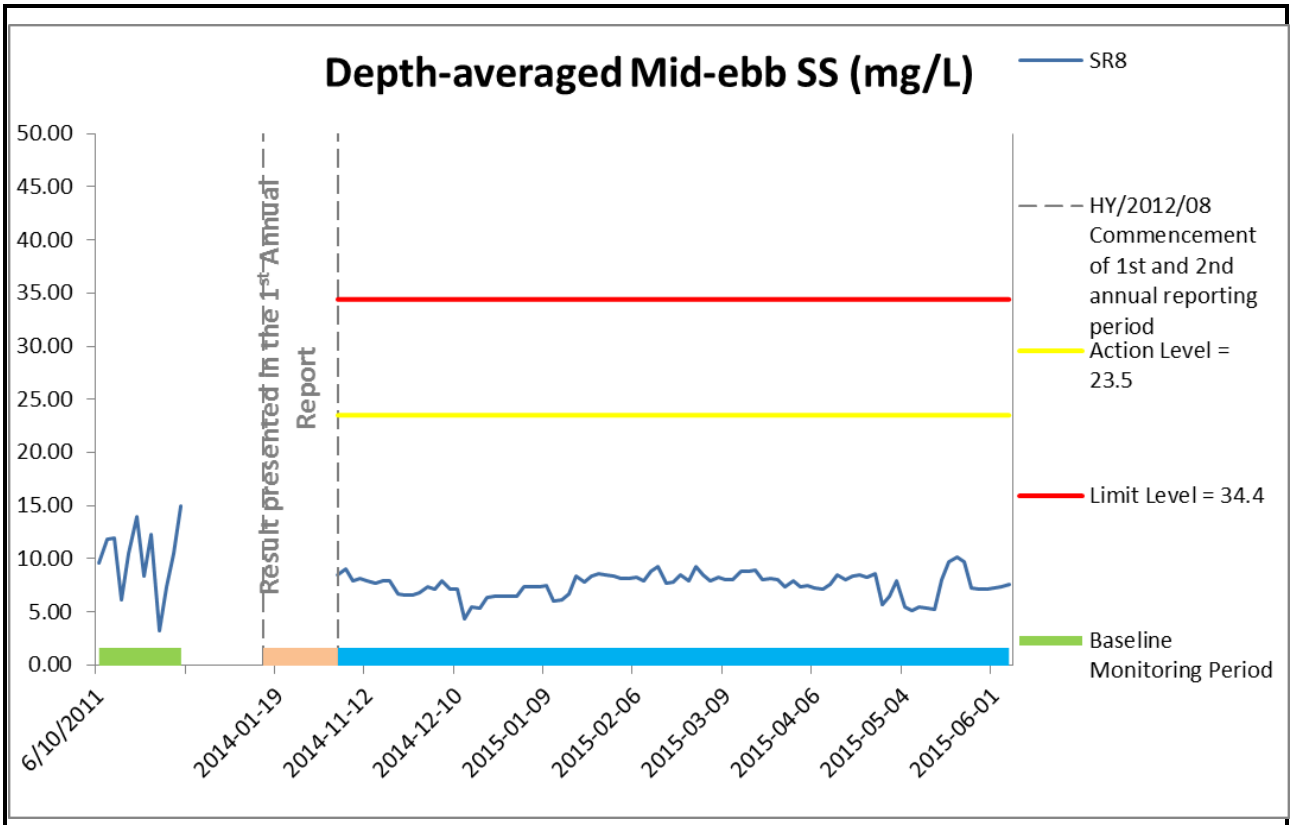


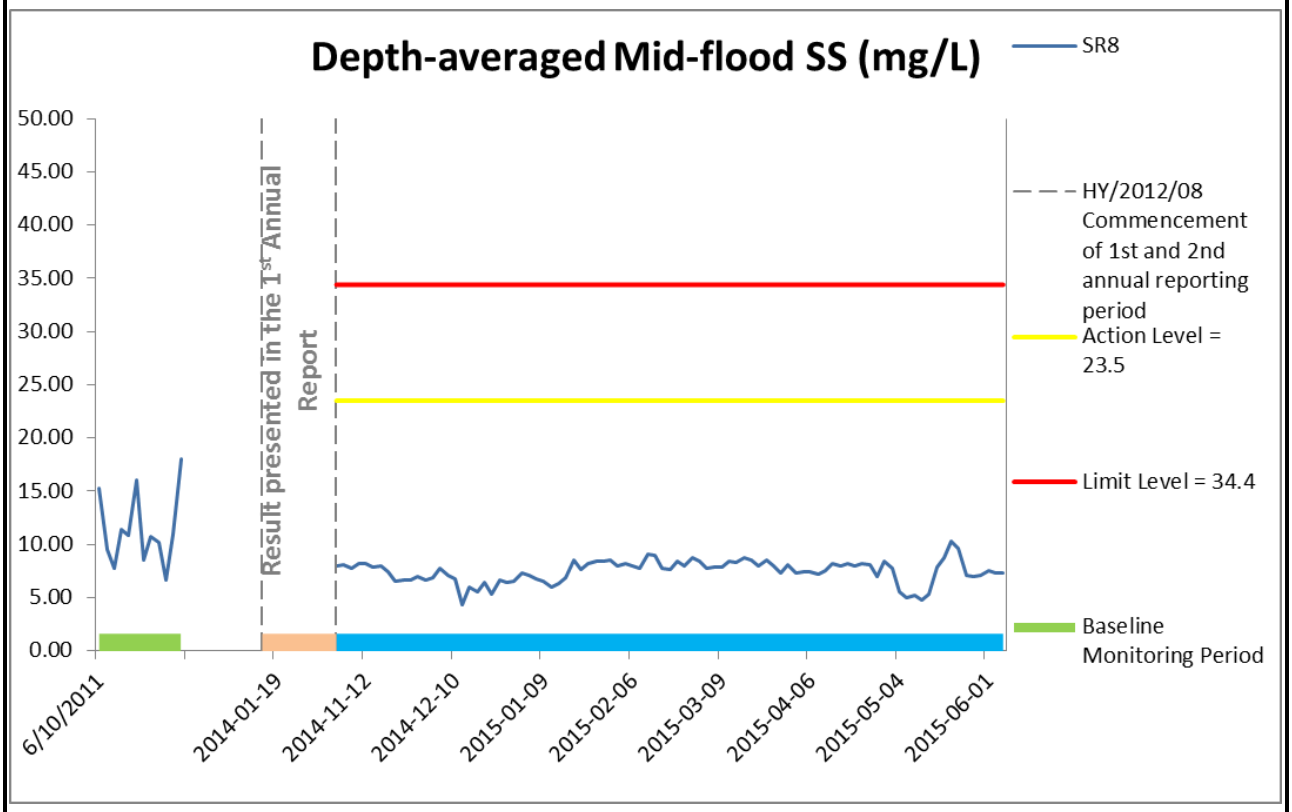
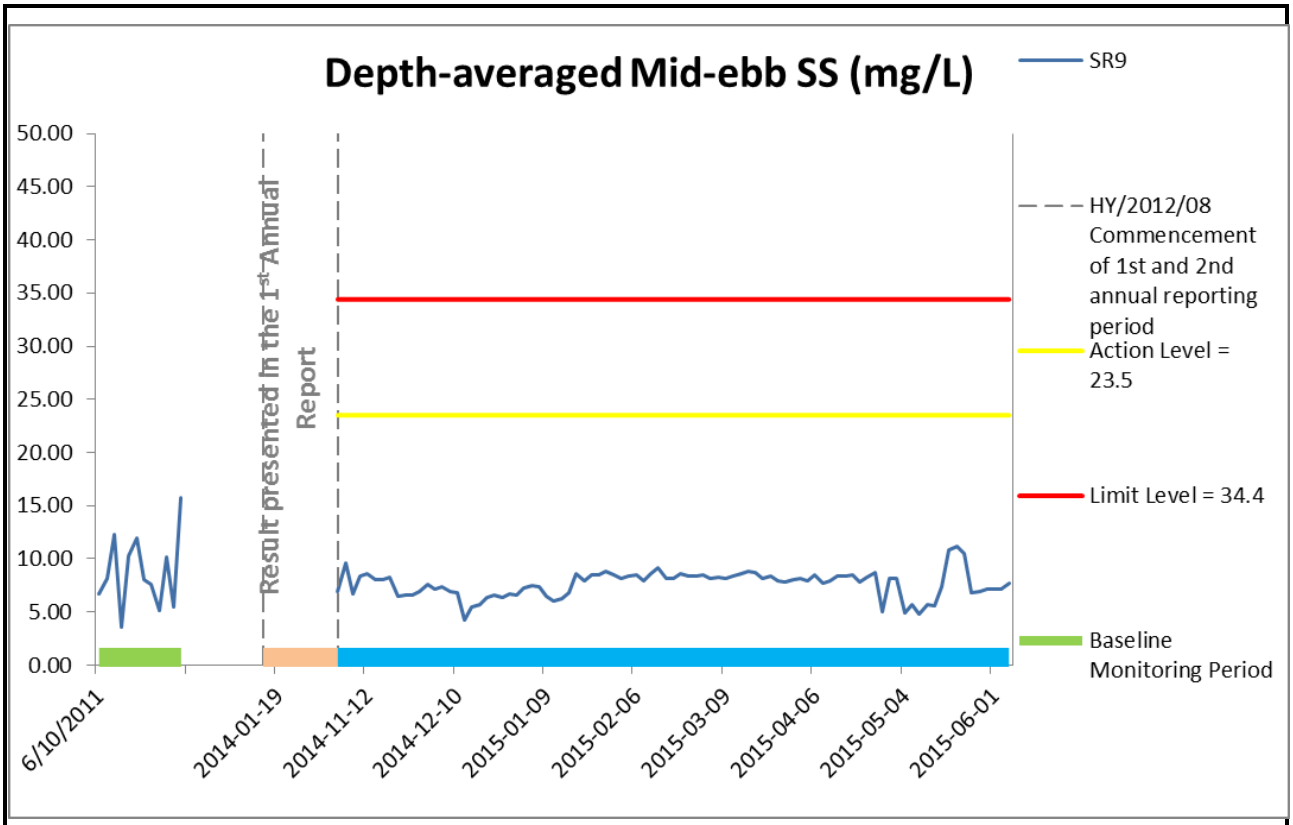


Figure E42 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR8. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*



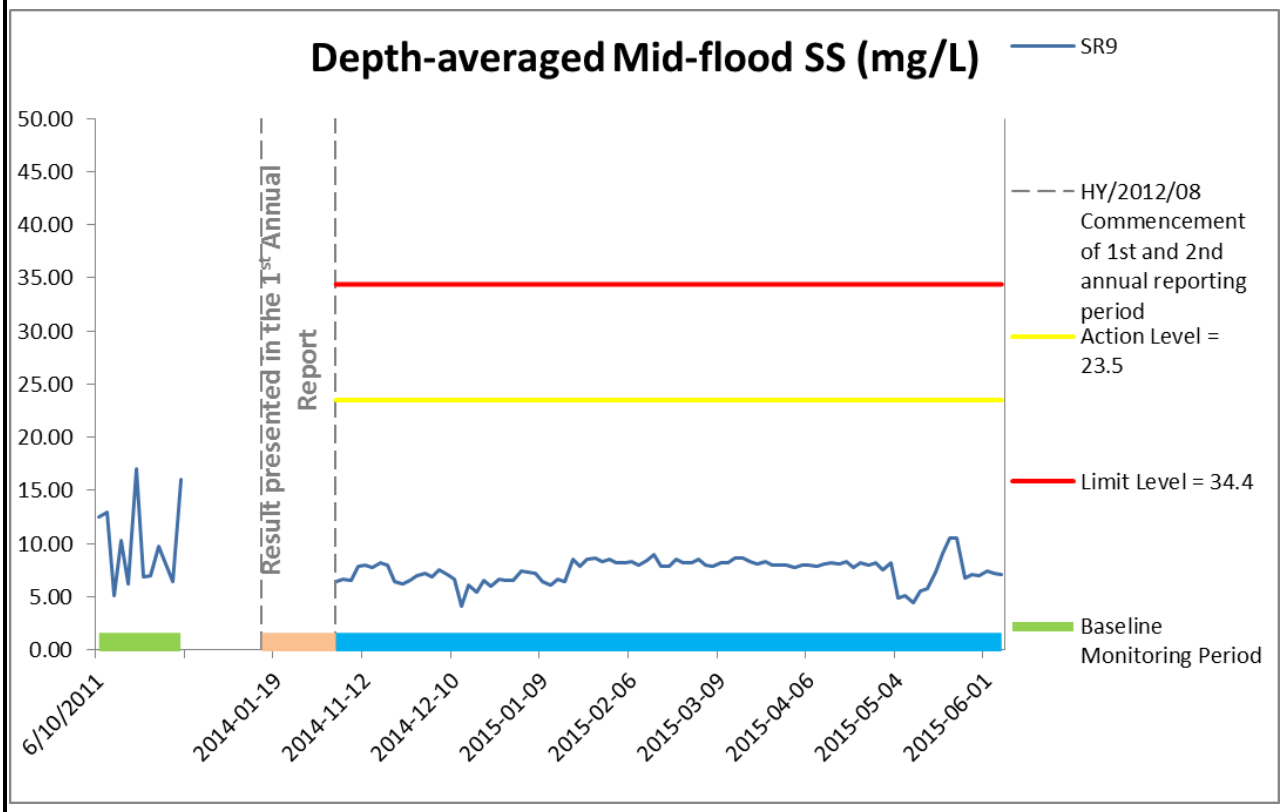


Figure E43 Baseline & Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between Baseline monitoring period: 6/10/2011 to 31/10/2011 and Impact monitoring period: 1/11/2014 to 5/6/2015 at SR9. Weather condition within the reporting period varied between sunny to rainy. The overall monitoring results were not affected by weather conditions. Major marine construction activities included: Vertical and Sloping Seawall construction; Marine Sheet Piling for box culvert extension; Reclamation filling; and Box Culvert extension. Water Quality Monitoring was suspended from 6 June 2015 effectively. *Ref:0212330_Impact-WQM_2nd annual.xlsx*

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Appendix F

Impact Dolphin Monitoring Survey

CONTRACT NO. HY/2012/08
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Northern Connection Sub-sea Tunnel Section)
Chinese White Dolphin Monitoring

Second Annual Progress Report (November 2014 - October 2015)
submitted to Dragages – Bouygues Joint Venture & ERM Hong Kong Ltd.

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

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1. Introduction

1.1. As part of the Hong Kong-Zhuhai-Macao Bridge, the Tuen Mun-Chek Lap Kok Link (TM-CLKL) Northern Connection Sub-sea Tunnel Section (Contract no. HY/2012/08) comprises the sub-sea TBM tunnels (two tubes with cross passages) across the Urmston Road to connect Tuen Area 40 and Hong Kong Boundary Crossing Facilities (HKBCF) of approximately 4 km in length with dual 2-lane carriageway, the tunnels at both the southern landfall and the northern landfall for construction of approach roads to the sub-sea TBM tunnels of approximately 1.5 km in length, as well as the northern landfall reclamation of approximately 16.5 hectares and about 20.km long seawalls. Dragages – Bouygues Joint Venture (hereinafter called the "Contractor") was awarded as the main contractor for the Northern Connection Sub-sea Tunnel Section, and ERM Hong Kong Limited would serve as the Environmental Team to implement the Environmental Monitoring and Audit (EM&A) programme.

1.2. According to the updated 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.

1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by ERM Hong Kong Limited as the dolphin specialist for the TM-CLKL Northern Connection Sub-sea Tunnel 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.

1.5. From the monitoring results, any changes in dolphin occurrence within the study area will be examined for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

1.6. This report is the second annual progress report under the TM-CLKL construction phase dolphin monitoring programme submitted to the Contractor, summarizing the results of the surveys findings during the period of November 2014 to October 2015, utilizing the survey data collected by HKLR03 project.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines 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	814577		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805475	815457		14	Start Point	817537	820220
2	End Point	805477	826654		14	End Point	817537	824613
3	Start Point	806464	819435		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	819771		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	820220		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	820466		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	820690		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321

8	Start Point	811508	820847		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	820892		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	820872		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818449		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807					
12	End Point	815542	824882					

2.1.2. 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 18 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2014, 2015). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{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.

2.1.4. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).

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

2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

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

2.2. Photo-identification Work

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

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

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

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

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

2.3. Data Analysis

2.3.1. The following analyses were performed utilizing the HKLR03 dolphin monitoring data collected under the present impact phase (the second year of TMCLKL construction; i.e. November 2014 to October 2015). 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 year of TMCLKL construction (i.e. November 2013 to October 2014).

2.3.2. Along with the analyzed results from the baseline and transitional phases as well as the first year of impact phase, results from the second 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 six 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 one deduced from the events during the first year of impact period, 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 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 second year of TMCLKL impact phase monitoring (November 2014 to October 2015), 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 3,589.91 km of survey effort was collected, with 97.0% 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, 1,381.43 km and 2,208.48 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 2,612.04 km, while the effort on secondary lines was 977.87 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 2014 to October 2015, a total of 54 groups of 229 Chinese White Dolphins were sighted. All except four dolphin sightings were made during on-effort search. Among the 50 on-effort sightings, 44 of them were made on primary lines, while the other six dolphin sightings were made on secondary lines.

3.1.5. During this 12-month period, all except one dolphin sighting were made in NWL, and the only rare sighting made in NEL on June 26th was a lone animal. 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 2014 to October 2015 is shown in Figure 1.

3.2.2. Similar to the first year of impact phase, the majority of dolphin sightings made in the second year of impact phase were concentrated at the northwestern end of the North Lantau region, mainly around and to the north of Lung Kwu Chau (Figure 1). Some dolphin groups were also sighted near Sha Chau, to the west and north of the Chek Lap Kok Airport, and the lone sighting made in NEL was located to the north of Shum Shui Kok and Yam O (Figure 1).

3.2.3. None of the dolphin groups were sighted in the vicinity of TMCLKL northern landfall and southern viaduct construction sites, as well as the HKLR03 and HKBCF reclamation

sites (Figure 1). On the contrary, a few sightings were made in the vicinity of the HKLR09 alignment (Figure 1). Generally speaking, dolphin appeared to have avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution during the first year of impact phase.

3.2.4. Dolphin sighting distribution of the present impact phase monitoring period (November 2014 to October 2015) 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 year of impact phase (November 2013 to October 2014). In the present impact phase period, dolphins have largely vacated from the NEL survey area and the eastern half of the NWL survey area, which 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 first and second years of the TMCLKL impact phase (Figure 2).

3.2.5. The only area where dolphin occurrence was consistent across the four phases was around the Lung Kwu Chau area (Figure 2). Notably, dolphin usage was also diminished progressively around Sha Chau and to the west of the airport platform, and the waters around Lung Kwu Chau appeared to be the remaining area in North Lantau region where dolphins consistently utilized during the second year of impact phase (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 year of impact phases (Table 2).

Table 2. Comparison of average daily dolphin encounter rates from first and second years of impact phase, transitional phase and baseline phase monitoring periods (Note: encounter rates deduced from the three 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 (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

3.3.2. 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 2.27 sightings and 10.10 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both 0.07.

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

3.3.4. For the comparison between the different monitoring periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.000001 and 0.00279 respectively. Even if the alpha value is set at 0.005, significant differences were detected among the different periods in both dolphin encounter rates of STG and ANI.

3.3.5. In NEL, the dolphin encounter rates (both STG and ANI) in the second year of TMCLKL impact monitoring period were close to nil, which was only a tiny fraction of the averages during the baseline phase and transitional phase (Table 2). Such decline has actually existed in this area during 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 years of TMCLKL construction works.

3.3.6. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were much lower (reductions of 67.2% and 60.6% respectively) than the ones recorded in the baseline period, indicating a dramatic decline in dolphin usage of this survey area during the second year of TMCLKL impact phase monitoring period (Table 2). 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 second year of impact phase (2014-15), signaling a further widespread of declining usage by the dolphins throughout the entire North Lantau region.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to 13 individuals per group in North Lantau region during November 2014 – October 2015. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline, transitional and first year of impact phases, as shown in Table 3.

3.4.2. The average dolphin group sizes in the entire North Lantau region as well as in NWL waters during the present impact phase monitoring period were higher than the ones recorded during the baseline and transitional phases (Table 3). On the other hand, there was only one group of a lone animal found in NEL during the present impact phase monitoring period, and such group size was much lower than the ones during the baseline and transitional phases. Among the 136 dolphin groups sighted during the impact phase, 93 of them were composed of 1-4 individuals only, while there were only four dolphin

groups with more than 10 individuals.

Table 3. Comparison of average dolphin group sizes from the first two 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 (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)

3.4.3. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present quarter is shown in Figure 3, with comparison to the ones in the first year of impact phase, transitional phase and baseline phase. During the impact phase in 2014-15, distribution of the larger dolphin groups were mainly concentrated around Lung Kwu Chau and to the north of the island (Figure 3).

3.4.4. Notably, since the transitional phase and the first year of impact phase, distribution of these larger groups has already been restricted to the northwestern portion of North Lantau region. Such restriction was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many also sighted in NEL waters (Figure 3).

3.5. Habitat use

3.5.1. During the impact phase monitoring period in 2014-15, the most heavily utilized habitat by Chinese White Dolphins was only found around Lung Kwu Chau (Figures 4a and 4b). For the rest of North Lantau region, only one grid in NEL as well as a few grids to the north and west of the airport platform in NWL recorded the presence of dolphins in very low density. Moreover, all grids along the alignments of TMCLKL and HKLR09 projects as well as the reclamation sites of HKLR03 and HKBCF projects sites rarely recorded the presence of dolphins in the present 12-month impact monitoring period in 2014-15 (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 in the transitional phase and the two 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 extremely low dolphin usage in this area with only one grid recorded with very low dolphin density during the present impact phase period (Figure 5).

3.5.3. Moreover, usage of NWL waters also declined dramatically during the present impact phase monitoring period, with the only higher dolphin densities occurred right around the Lung Kwu Chau area, in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and first year of impact phase monitoring. It appeared that there was a more widespread decline of dolphin usage throughout the North Lantau waters during 2014-15 in the midst of the on-going TMCLKL construction works in addition to other HZMB-related construction activities.

3.6. Mother-calf pairs

3.6.1. During the present 12-month impact phase monitoring period, only three unspotted juveniles (UJ) were sighted with their mothers in North Lantau waters. These young calves comprised of 1.3% of all animals sighted, which was a small fraction of the percentages recorded during the previous impact phase in 2013-14 (5.7%), transitional phase (6.7%) and baseline phase (4.5%).

3.6.2. Not surprisingly, these three young calves were only sighted around Lung Kwu Chau, which was drastically different from the distribution patterns during the baseline and transitional phases when the young calves were sighted throughout NWL waters (Figure 6). Their distribution was even further restricted in the second year of impact phase when compared to the one during the first year of impact phase (Figure 6).

3.6.3. None of the young calves were sighted in the vicinity of the TMCLKL/HKLR09 alignments and HKBCF/HKLR03 reclamation sites during the present impact phase monitoring period (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. Ten and three dolphin sightings were associated with feeding and socializing activities respectively during the 12-month impact phase monitoring period. The percentage of sightings associated with feeding activities during the present impact phase (18.5%) was much higher than the previous impact phase in 2013-14 (5.9%), transitional phase (8.6%) and baseline phase (12.8%).

3.7.2. On the other hand, the percentage of socializing activities during the present impact phase monitoring period (5.5%) was similar to the first year of impact phase (5.9%), but was higher than the one during the baseline period (3.8%) and slightly lower than the one during the transitional period (6.4%). Notably, none of the 54 dolphin groups were engaged in either traveling or resting activity during the present impact phase monitoring period in 2014-15.

3.7.3. Distribution of dolphins engaged in feeding and socializing activities during the present impact phase monitoring period is shown in Figure 7. The sightings associated with feeding activities occurred near Sha Chau and Lung Kwu Chau, as well as to the west and north of the airport platform, while the ones associated with socializing activities were mainly found near Lung Kwu Chau and Black Point (Figure 7). In comparison, feeding activities were frequently sighted along the Urmston Road, within the marine park, to the west of airport platform and around the Brothers Islands during the baseline phase, while

the socializing activities were more scattered throughout the North Lantau region in the same period as well as in the transitional phase (Figure 7). It is apparent that the "hotspots" where dolphins engaged in different activities were very different between the baseline, transitional and impact phases.

3.7.4. During the impact phase monitoring period in 2014-15, only one of the 54 dolphin groups were found to be associated with an operating fishing vessel (a purse-seiner) near Lung Kwu Chau. The extremely rare event of fishing boat association during the two 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. This was likely related to the trawl ban being implemented in December 2012 in Hong Kong waters.

3.8. Summary of photo-identification works

3.8.1. During the 12-month impact phase monitoring period in 2014-15, a total of 54 individuals sighted 154 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL and the lone individual sighted in NEL was not identified

3.8.2. About two-third of the 54 identified individuals were sighted only once or twice, while the rest were sighted frequently during the 12-month period. For example, seven individuals were sighted more than five to nine times (CH34, NL48, NL104, NL136, NL182, NL284 and WL05), while two individuals (NL202 and NL286) were sighted thirteen times each. Their frequent occurrences during the second year of impact phase monitoring indicated strong reliance of North Lantau waters as their home ranges.

3.8.3. Notably, eight recognized females (i.e. NL33, NL98, NL104, NL123, NL202, NL220, WL05 and WL17) were accompanied with their calves during their re-sightings, and many of these calves are older and already in their juvenile stage. For example, the calves of NL123 (i.e. NL285) and NL202 (NL286) have been accompanying their mothers for over 7-8 years.

3.9. Individual range use

3.9.1. Ranging patterns of the 54 individuals identified during the 12-month impact phase monitoring period in 2014-15 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. All identified dolphins sighted in this 12-month period were utilizing their ranges primarily in NWL, while 25 of them have extended their range use to West Lantau waters (e.g. NL33, NL49, NL165, NL210) based on the HKLR09 monitoring data collected during the same period (Appendix IV). All of these identified dolphins have avoided the NEL waters, the area where many of them have utilized as their core areas of activities in the past.

3.9.3. Temporal changes in range use of 28 individual dolphins that ranged across different survey areas in North, West and South Lantau waters were examined in details during baseline phase, transitional phase and two periods of impact phases (Appendix V). It is apparent that at least 10 individuals (e.g. CH34, NL98, NL136, NL261) have gradually shifted their range use away from their previously important habitat in NEL, while

another six individuals (e.g. NL49, NL220, NL259) have utilized NEL waters in the past but have been completely absent from there across the four phases (Appendix V).

3.9.4. Moreover, 21 individual dolphins have diminished their utilization of NWL waters during the TMCLKL impact phases, and at the same time 12 of them (NL33, NL49, NL98, NL123, NL145, NL150, NL210, NL236, NL259, NL261, NL284 and NL287) have increased their utilization of WL waters, apparently expanding their range use into West Lantau waters. Two individuals (NL98 and NL287) were even expanding their range use to Southwest Lantau waters as well during the 2014-15 impact phase period.

3.9.5. Notably, while some individuals have expanded their range use in WL and diminished their range use in NWL, other individuals (e.g. NL37, NL103, NL104, NL220) have utilized waters of Hong Kong generally less during the 2014-15 impact phase period. This corresponded well with a much lower dolphin encounter rate in NWL in 2014-15 impact phase period as explained in Section 3.3.4.

3.9.6. When compared with the list of individuals identified in the previous period of TMCLKL phase in 2013-14, 38 individual dolphins were sighted in 2013-14 but not in 2014-15. After examining the HKCRP photo-identification catalogue which included the long-term monitoring data from other concurrent projects, it was found that 14 of them were not sighted at all in Hong Kong waters in 2014-15. For the other 24 individuals, almost all of them were sighted exclusively in WL and SWL waters during the TMCLKL impact phase in 2014-15. For example, EL01 were sighted eight times in North Lantau waters during 2013-14, but was only sighted once in SWL in 2014-15. NL120 were sighted four times in North Lantau waters during 2013-14, but was sighted seven times in West and Southwest Lantau in 2014-15. NL226 was sighted four times in North Lantau waters during 2013-14, but was sighted eight times in West and Southwest Lantau in 2014-15. These examples indicated that a number of individuals have vacated from North Lantau waters during the TMCLKL impact phase in 2014-15, and have shifted their range use to WL and SWL waters instead.

3.9.7. The apparent range shifts of many identified individual dolphins examined above were also documented in Hung (2015), and could be related to the disturbance of construction activities and other existing threats in the North Lantau region. This should be continuously monitored for the rest of the TMCLKL impact phase monitoring 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 second 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 northern connection sub-sea tunnel section in the past and during the baseline monitoring period, it is apparent that dolphin usage has been significantly reduced in NEL, and many individuals have shifted away from the important habitat around the Brothers Islands.

4.3. It is critical to monitor the dolphin usage in North Lantau region 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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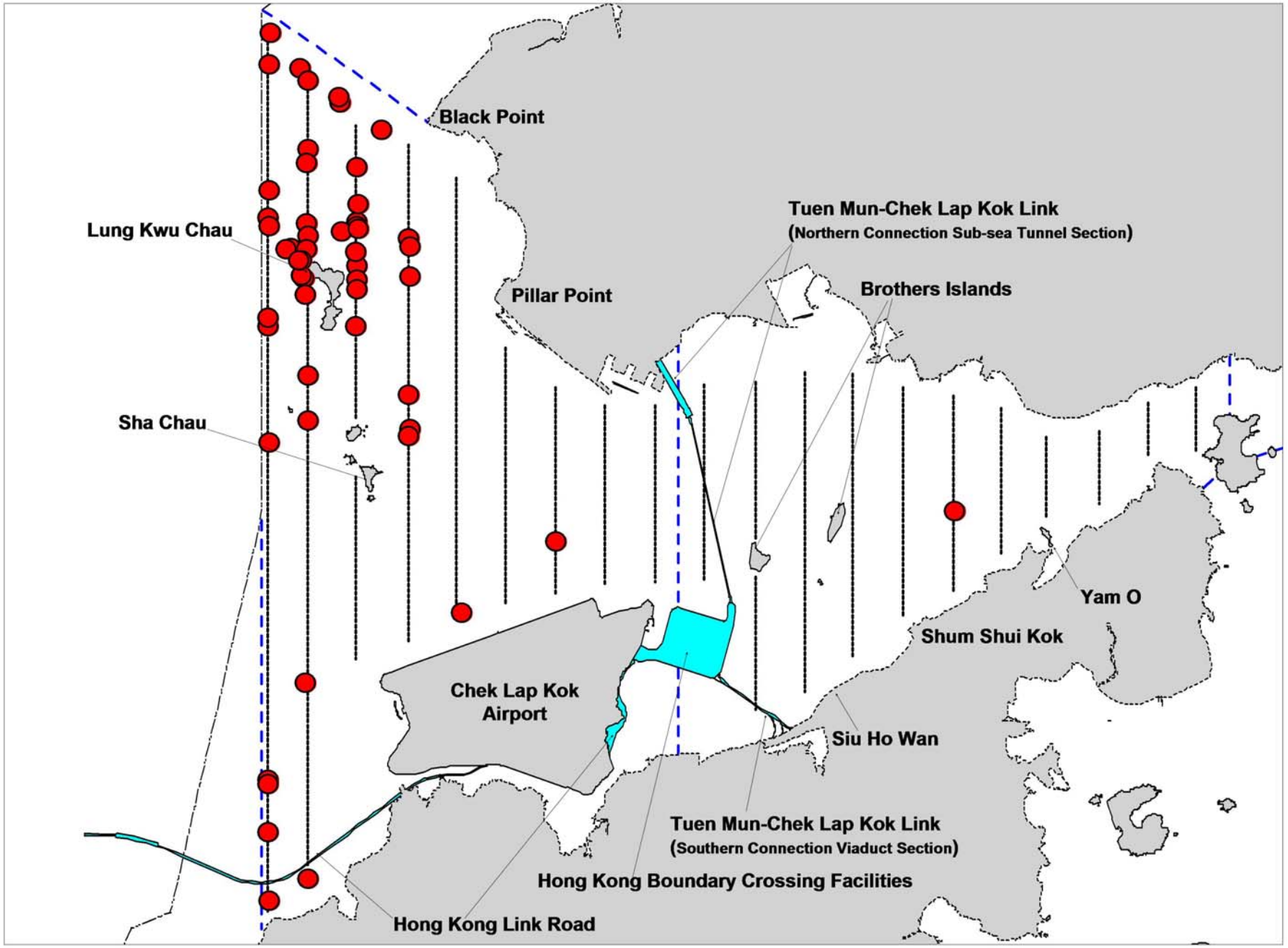


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the second year of TMCLKL construction works (November 2014 to October 2015), utilizing the HKLR03 monitoring data

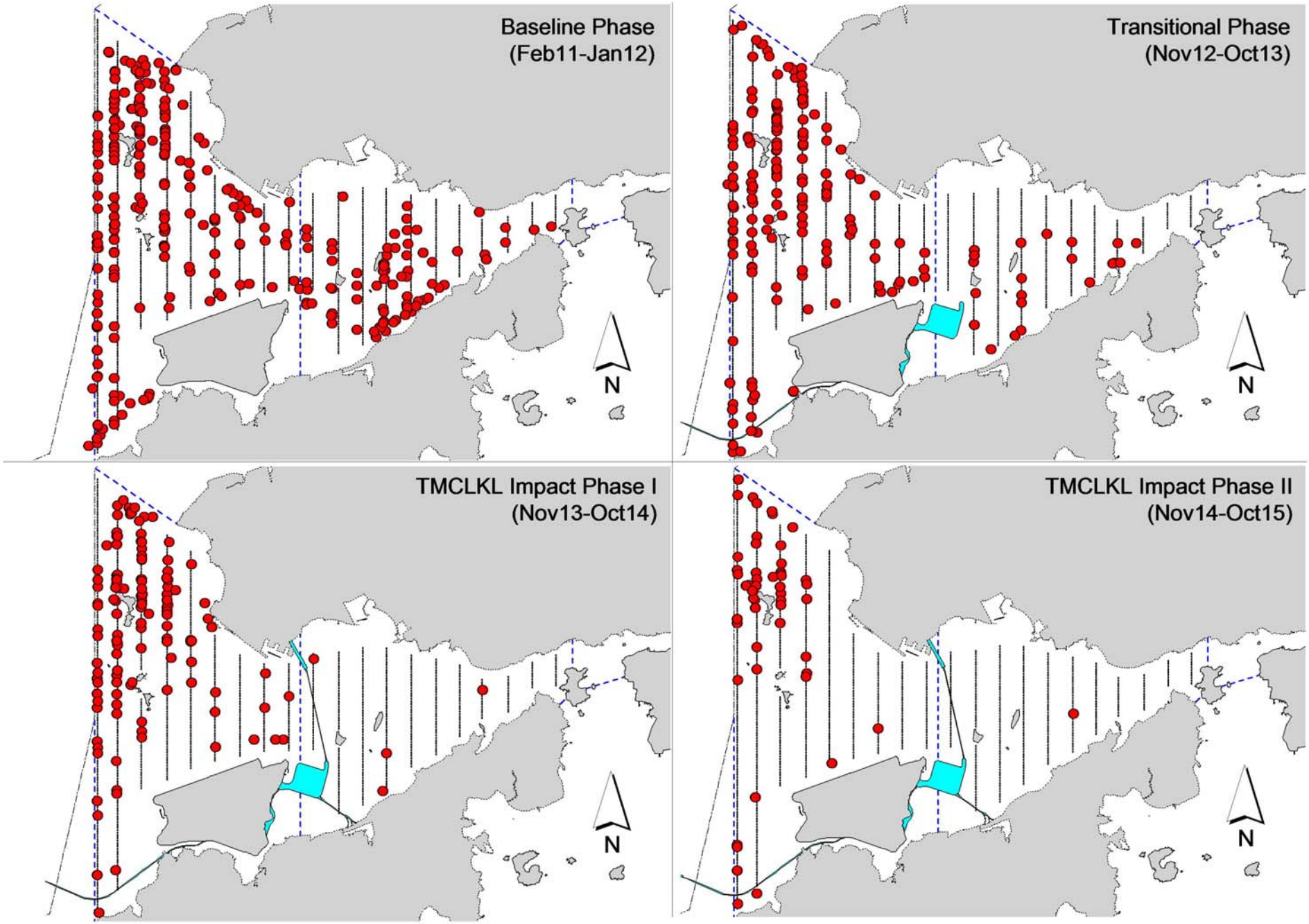


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline, transitional and two impact phases of TMCLKL construction works

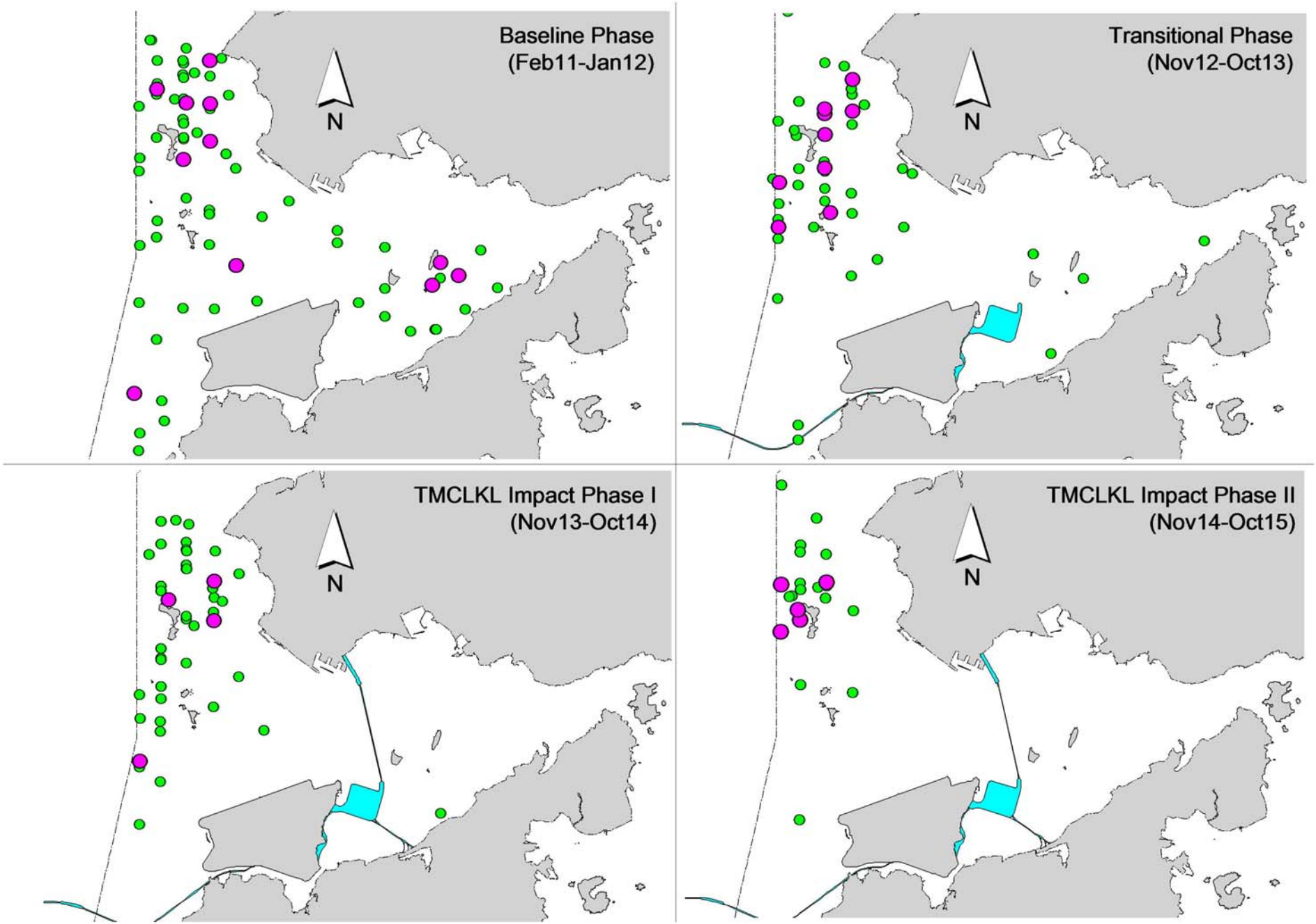


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works
(green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

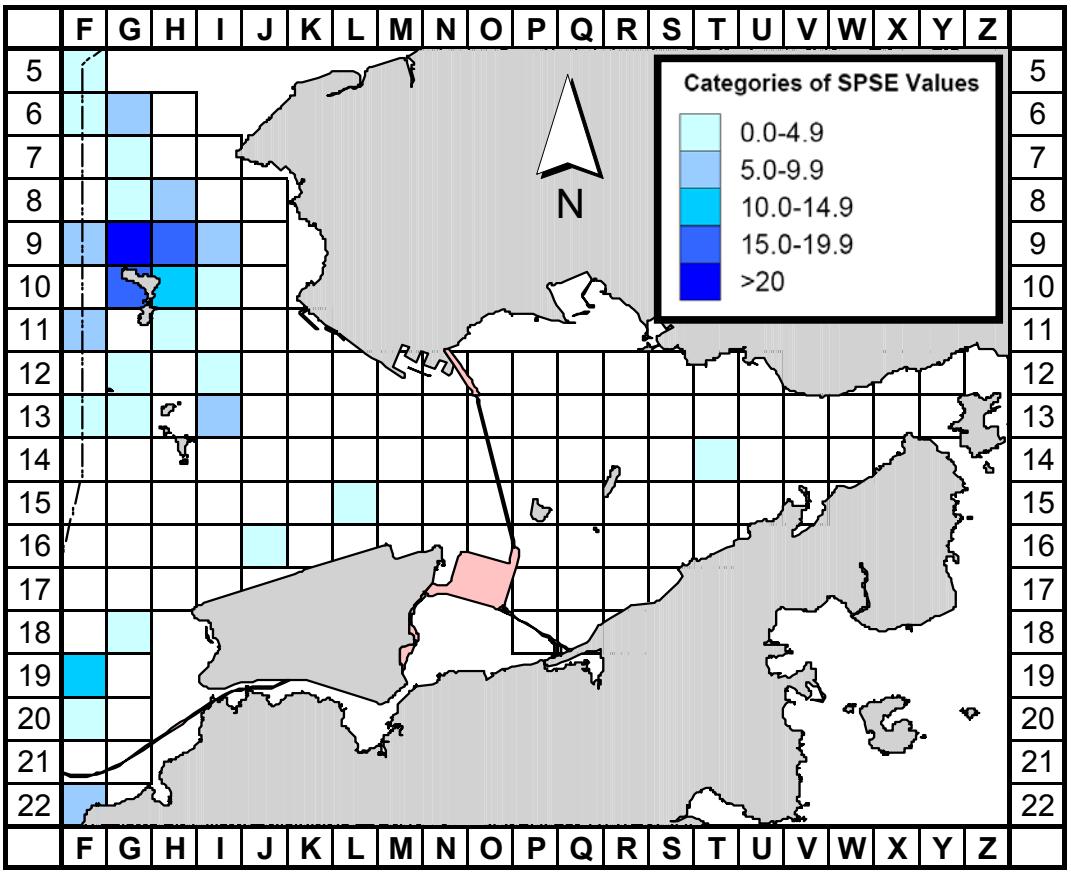


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Nov14 - Oct15) (SPSE = no. of on-effort sightings per 100 units of survey effort)

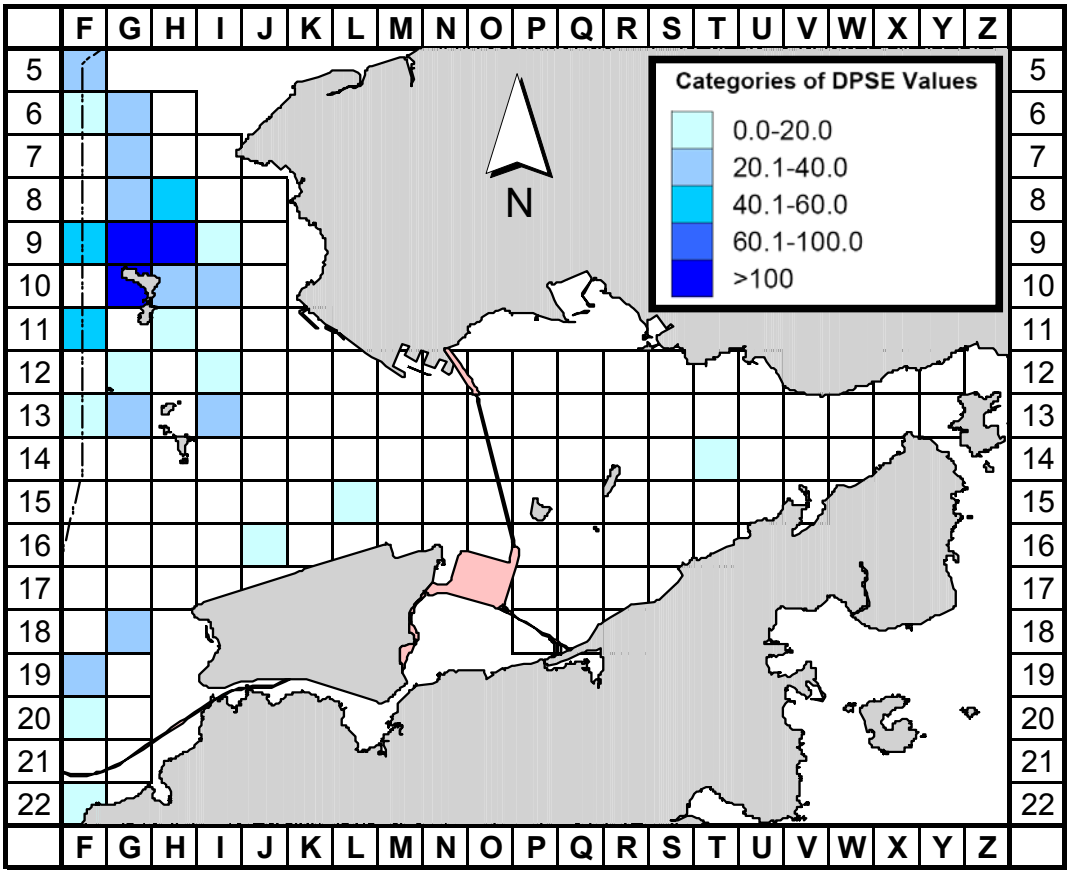


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Nov14 -Oct15) (DPSE = no. of dolphins per 100 units of survey effort)

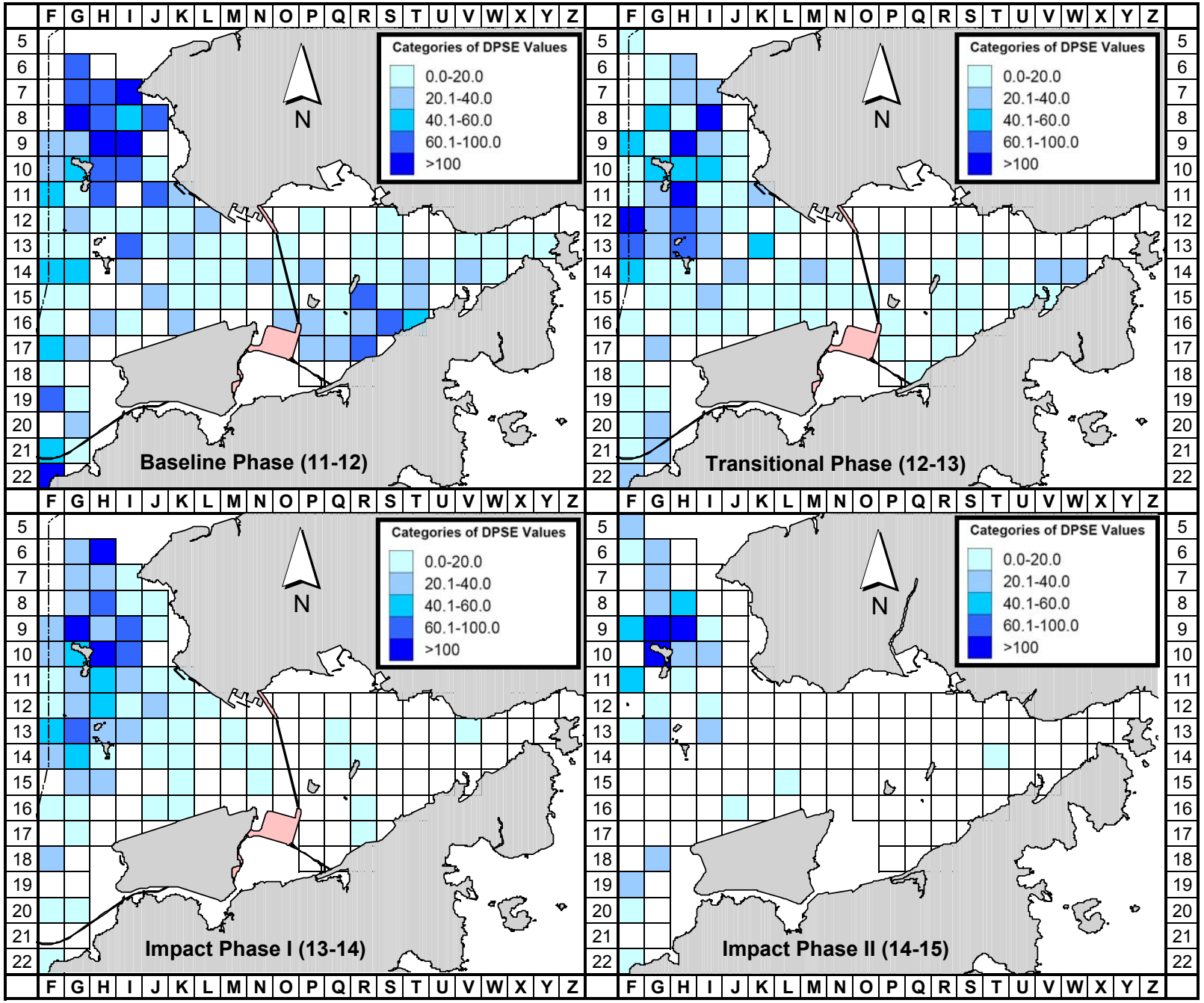


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in NWL and NEL survey areas between the two impact phases (Nov14-Oct15 and Nov13-Oct14), transitional phase (Nov12-Oct13) and baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)

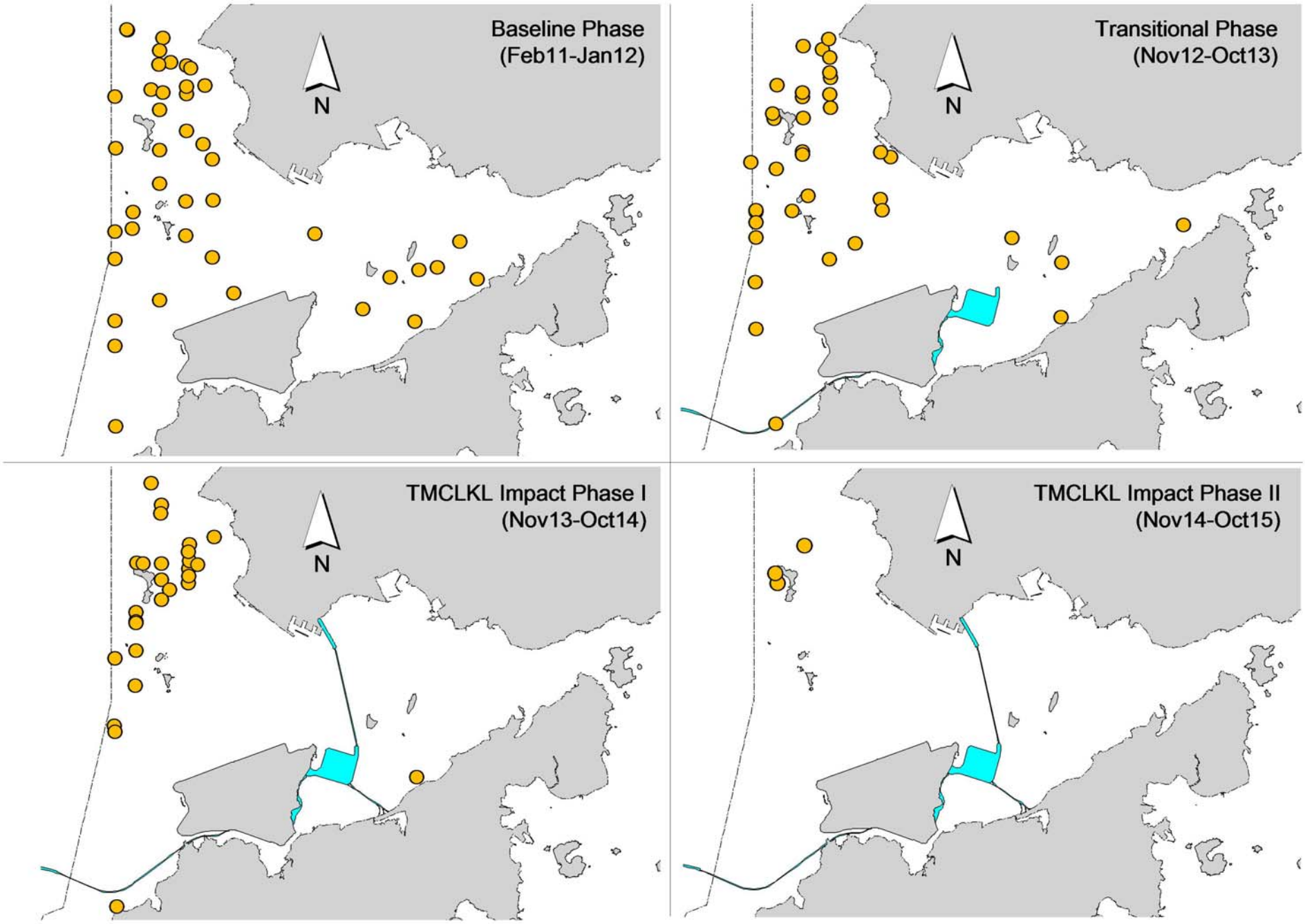


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

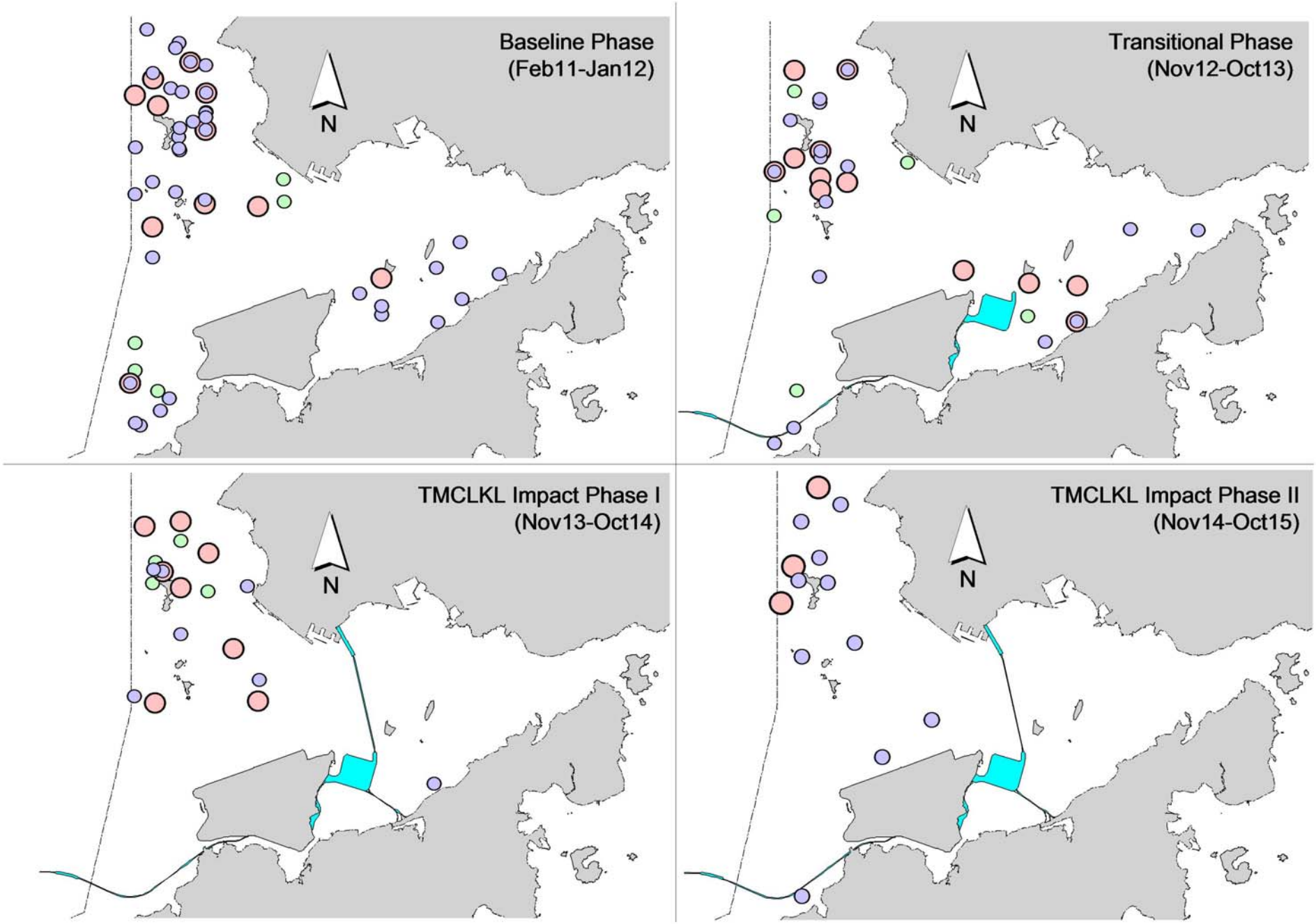


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. HKLR03 Survey Effort Database (November 2014 - October 201

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Nov-14	NE LANTAU	2	7.47	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NE LANTAU	3	9.93	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NE LANTAU	2	7.41	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NE LANTAU	3	1.59	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NW LANTAU	1	1.50	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	2	25.21	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	3	12.20	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	2	12.82	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NW LANTAU	3	0.60	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NE LANTAU	2	8.28	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NE LANTAU	3	9.93	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NE LANTAU	2	9.49	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NE LANTAU	3	1.00	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	3	26.28	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NW LANTAU	4	6.12	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NW LANTAU	3	4.40	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	4	1.20	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	5	1.10	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	2	1.30	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NW LANTAU	3	30.29	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NW LANTAU	2	0.60	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	3	5.98	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	4	0.63	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NE LANTAU	2	8.30	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	3	9.41	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	4	2.40	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	2	7.11	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NE LANTAU	3	3.48	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NW LANTAU	2	13.70	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	3	25.02	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	4	1.76	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	2	2.19	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NW LANTAU	3	10.43	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NE LANTAU	1	1.78	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	2	14.94	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	3	2.00	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	1	1.20	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NE LANTAU	2	7.09	AUTUMN	STANDARD31516	HKLR	S
2-Dec-14	NE LANTAU	2	15.30	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NE LANTAU	3	2.28	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NE LANTAU	2	7.54	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NE LANTAU	3	2.28	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NW LANTAU	2	18.17	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NW LANTAU	3	23.09	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NW LANTAU	2	10.54	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NW LANTAU	3	2.10	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NE LANTAU	1	5.79	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NE LANTAU	2	14.41	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NE LANTAU	1	2.20	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NE LANTAU	2	8.30	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NW LANTAU	1	2.11	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NW LANTAU	2	28.31	WINTER	STANDARD31516	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
9-Dec-14	NW LANTAU	2	5.13	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NW LANTAU	3	2.45	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NW LANTAU	2	31.56	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NW LANTAU	3	9.34	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NW LANTAU	2	12.90	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NE LANTAU	1	3.57	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NE LANTAU	2	13.37	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NE LANTAU	1	3.76	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NE LANTAU	2	6.50	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NE LANTAU	2	19.81	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NE LANTAU	2	9.69	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NE LANTAU	3	0.90	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NW LANTAU	2	13.36	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NW LANTAU	3	16.71	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NW LANTAU	2	5.81	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NW LANTAU	3	1.82	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NE LANTAU	2	20.00	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NE LANTAU	2	10.40	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NW LANTAU	2	10.06	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NW LANTAU	3	21.99	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NW LANTAU	2	5.53	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NW LANTAU	3	1.94	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NW LANTAU	2	0.89	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NW LANTAU	3	36.39	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NW LANTAU	2	1.05	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NW LANTAU	3	11.06	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NE LANTAU	2	9.56	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NE LANTAU	3	7.91	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NE LANTAU	2	8.56	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NE LANTAU	3	1.17	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NE LANTAU	2	10.35	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NE LANTAU	3	7.00	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NE LANTAU	2	6.55	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NE LANTAU	3	3.90	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	2	10.38	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	3	26.22	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	4	3.10	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	2	7.53	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	3	4.15	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	4	0.80	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	1	1.41	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	2	15.47	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	3	13.03	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	1	2.34	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	2	4.25	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	3	0.60	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NE LANTAU	1	4.67	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NE LANTAU	2	15.57	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NE LANTAU	2	10.56	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	2	11.79	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NE LANTAU	3	8.03	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NE LANTAU	1	0.20	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	2	7.00	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	3	3.88	WINTER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
5-Feb-15	NW LANTAU	2	11.86	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NW LANTAU	3	19.78	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NW LANTAU	2	3.96	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NW LANTAU	3	4.10	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NW LANTAU	1	10.31	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	2	24.74	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	3	4.98	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	1	4.92	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NW LANTAU	2	8.01	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NE LANTAU	2	16.97	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NE LANTAU	2	9.83	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NE LANTAU	2	17.07	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NE LANTAU	1	2.87	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NE LANTAU	2	7.61	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NW LANTAU	1	0.90	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	2	36.33	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	3	2.60	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	2	10.57	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NW LANTAU	3	2.60	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NW LANTAU	2	9.92	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NW LANTAU	3	19.49	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NW LANTAU	2	3.49	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NW LANTAU	3	4.30	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NE LANTAU	1	1.24	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	2	16.34	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	3	1.96	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	2	10.36	WINTER	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	1	1.07	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	2	12.71	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	3	25.62	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	2	8.00	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	3	3.30	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	4	1.00	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NE LANTAU	2	5.38	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NE LANTAU	3	12.87	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NE LANTAU	2	3.40	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NE LANTAU	3	5.39	SPRING	STANDARD31516	HKLR	S
11-Mar-15	NW LANTAU	2	25.99	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NW LANTAU	3	5.09	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NW LANTAU	2	7.53	SPRING	STANDARD31516	HKLR	S
11-Mar-15	NE LANTAU	2	20.05	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NE LANTAU	2	10.95	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NW LANTAU	2	3.26	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	3	36.14	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	4	0.80	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NW LANTAU	3	10.40	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	2	14.63	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NE LANTAU	3	1.97	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NE LANTAU	1	1.94	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	2	7.69	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	3	0.68	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NW LANTAU	1	20.26	SPRING	STANDARD31516	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
26-Mar-15	NW LANTAU	2	10.63	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NW LANTAU	2	6.76	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NE LANTAU	1	11.38	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NE LANTAU	2	8.40	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NE LANTAU	1	4.32	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NE LANTAU	2	6.20	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	2	14.22	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NE LANTAU	3	5.10	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NE LANTAU	1	0.50	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	2	9.09	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	3	0.99	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NW LANTAU	2	4.96	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	3	25.95	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	4	0.84	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	2	2.29	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NW LANTAU	3	5.26	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NW LANTAU	2	14.40	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NW LANTAU	3	26.10	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NW LANTAU	2	9.40	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NW LANTAU	3	4.20	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NE LANTAU	2	15.44	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NE LANTAU	3	1.30	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NE LANTAU	2	10.06	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	2	4.84	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	3	29.76	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	4	5.80	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	2	0.30	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	3	7.60	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	4	4.80	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NE LANTAU	2	3.60	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	3	11.51	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	4	2.21	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	2	4.41	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NE LANTAU	3	5.07	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NE LANTAU	2	20.00	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NE LANTAU	2	10.90	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NW LANTAU	1	3.24	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	2	25.27	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	3	3.37	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	2	7.07	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NW LANTAU	3	0.85	SPRING	STANDARD31516	HKLR	S
4-May-15	NW LANTAU	2	18.60	SPRING	STANDARD31516	HKLR	P
4-May-15	NW LANTAU	3	13.60	SPRING	STANDARD31516	HKLR	P
4-May-15	NW LANTAU	2	2.30	SPRING	STANDARD31516	HKLR	S
4-May-15	NW LANTAU	3	4.80	SPRING	STANDARD31516	HKLR	S
4-May-15	NE LANTAU	1	3.54	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	2	10.73	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	3	5.40	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	2	8.13	SPRING	STANDARD31516	HKLR	S
4-May-15	NE LANTAU	3	2.70	SPRING	STANDARD31516	HKLR	S
8-May-15	NW LANTAU	2	7.57	SPRING	STANDARD31516	HKLR	P
8-May-15	NW LANTAU	3	33.53	SPRING	STANDARD31516	HKLR	P
8-May-15	NW LANTAU	2	2.30	SPRING	STANDARD31516	HKLR	S
8-May-15	NW LANTAU	3	11.20	SPRING	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
8-May-15	NE LANTAU	2	4.55	SPRING	STANDARD31516	HKLR	P
8-May-15	NE LANTAU	3	12.74	SPRING	STANDARD31516	HKLR	P
8-May-15	NE LANTAU	2	6.25	SPRING	STANDARD31516	HKLR	S
8-May-15	NE LANTAU	3	3.66	SPRING	STANDARD31516	HKLR	S
14-May-15	NE LANTAU	2	12.61	SPRING	STANDARD31516	HKLR	P
14-May-15	NE LANTAU	3	4.43	SPRING	STANDARD31516	HKLR	P
14-May-15	NE LANTAU	2	9.96	SPRING	STANDARD31516	HKLR	S
14-May-15	NW LANTAU	2	5.56	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	3	34.27	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	4	0.60	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	2	8.17	SPRING	STANDARD31516	HKLR	S
14-May-15	NW LANTAU	3	4.80	SPRING	STANDARD31516	HKLR	S
18-May-15	NW LANTAU	2	5.11	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	3	24.12	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	4	3.37	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S
18-May-15	NW LANTAU	3	4.70	SPRING	STANDARD31516	HKLR	S
18-May-15	NE LANTAU	2	15.13	SPRING	STANDARD31516	HKLR	P
18-May-15	NE LANTAU	3	4.30	SPRING	STANDARD31516	HKLR	P
18-May-15	NE LANTAU	2	10.77	SPRING	STANDARD31516	HKLR	S
2-Jun-15	NW LANTAU	2	10.00	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NW LANTAU	3	30.49	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NW LANTAU	2	7.70	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NW LANTAU	3	5.61	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NE LANTAU	2	6.93	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NE LANTAU	3	10.05	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NE LANTAU	2	9.12	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NE LANTAU	3	0.80	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NE LANTAU	2	17.06	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NE LANTAU	3	3.30	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NE LANTAU	2	9.14	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NE LANTAU	3	1.30	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	2	8.02	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	3	17.50	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	4	5.86	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	2	3.48	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	3	1.65	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	4	2.39	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NW LANTAU	2	12.10	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NW LANTAU	3	19.70	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NW LANTAU	2	4.80	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NW LANTAU	3	2.40	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NE LANTAU	2	20.32	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NE LANTAU	2	10.68	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NW LANTAU	3	30.27	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NW LANTAU	4	10.98	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NW LANTAU	3	6.40	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NW LANTAU	4	6.05	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NE LANTAU	2	14.33	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NE LANTAU	3	3.16	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NE LANTAU	2	6.53	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NE LANTAU	3	3.18	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NW LANTAU	2	1.80	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	3	29.96	SUMMER	STANDARD31516	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
2-Jul-15	NW LANTAU	4	6.90	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	5	2.30	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	3	6.30	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NW LANTAU	4	6.26	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NE LANTAU	2	14.61	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NE LANTAU	3	2.80	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NE LANTAU	2	6.35	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NE LANTAU	3	3.44	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NE LANTAU	2	15.85	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NE LANTAU	3	4.59	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NE LANTAU	2	6.60	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NE LANTAU	3	4.36	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NW LANTAU	3	27.41	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NW LANTAU	4	4.20	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NW LANTAU	3	5.89	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NW LANTAU	4	1.90	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NW LANTAU	2	17.06	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NW LANTAU	3	14.40	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NW LANTAU	2	4.32	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NW LANTAU	3	2.62	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NE LANTAU	2	14.48	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NE LANTAU	3	5.54	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NE LANTAU	2	8.78	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NE LANTAU	3	2.00	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	2	1.68	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	3	24.69	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	4	14.63	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	2	2.10	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	3	8.60	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	4	2.50	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NE LANTAU	2	8.93	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NE LANTAU	3	7.93	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NE LANTAU	2	7.74	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NW LANTAU	2	19.11	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NW LANTAU	3	21.29	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NW LANTAU	2	7.50	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NW LANTAU	3	5.90	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NE LANTAU	2	11.97	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NE LANTAU	3	4.50	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NE LANTAU	2	8.13	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NW LANTAU	1	3.92	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	2	20.74	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	3	7.02	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	2	3.00	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NW LANTAU	3	4.52	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NE LANTAU	2	18.24	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NE LANTAU	3	1.90	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NE LANTAU	2	8.36	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
19-Aug-15	NW LANTAU	2	26.22	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NW LANTAU	3	12.61	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NW LANTAU	2	8.42	SUMMER	STANDARD31516	HKLR	S

Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
19-Aug-15	NW LANTAU	3	4.39	SUMMER	STANDARD31516	HKLR	S
19-Aug-15	NE LANTAU	2	16.55	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NE LANTAU	2	9.95	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NE LANTAU	1	1.65	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NE LANTAU	2	17.34	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NE LANTAU	1	3.09	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NE LANTAU	2	7.70	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NW LANTAU	2	16.74	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	3	14.81	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	4	1.30	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	2	6.65	SUMMER	STANDARD31516	HKLR	S
2-Sep-15	NW LANTAU	2	1.92	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NW LANTAU	3	30.24	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NW LANTAU	3	6.89	AUTUMN	STANDARD31516	HKLR	S
2-Sep-15	NE LANTAU	2	11.59	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NE LANTAU	3	7.98	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NE LANTAU	2	8.83	AUTUMN	STANDARD31516	HKLR	S
2-Sep-15	NE LANTAU	3	2.00	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NW LANTAU	2	30.26	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NW LANTAU	3	10.73	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NW LANTAU	2	4.41	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NW LANTAU	3	8.40	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NE LANTAU	2	7.75	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NE LANTAU	3	8.95	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NE LANTAU	2	7.97	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NE LANTAU	3	2.11	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NE LANTAU	2	9.43	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NE LANTAU	3	10.80	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NE LANTAU	2	5.51	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NE LANTAU	3	5.22	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NW LANTAU	2	4.70	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NW LANTAU	3	28.06	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NW LANTAU	3	7.34	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	2	3.00	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	3	12.12	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	4	1.90	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	2	3.06	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	3	6.02	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	4	1.10	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NW LANTAU	2	25.66	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NW LANTAU	3	16.42	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NW LANTAU	2	1.60	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NW LANTAU	3	11.49	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NW LANTAU	2	10.62	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NW LANTAU	3	18.78	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NW LANTAU	2	0.59	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NW LANTAU	3	7.02	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NE LANTAU	2	20.01	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NE LANTAU	3	10.79	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NW LANTAU	2	23.12	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NW LANTAU	3	15.72	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NW LANTAU	2	8.61	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NW LANTAU	3	4.20	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NE LANTAU	2	7.15	AUTUMN	STANDARD31516	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
13-Oct-15	NE LANTAU	3	9.80	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NE LANTAU	2	4.56	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NE LANTAU	3	5.59	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NE LANTAU	2	14.52	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NE LANTAU	3	2.90	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NE LANTAU	1	2.10	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NE LANTAU	2	7.68	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NW LANTAU	2	14.07	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NW LANTAU	3	27.17	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NW LANTAU	2	6.61	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NW LANTAU	3	6.25	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NE LANTAU	2	10.41	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NE LANTAU	3	10.00	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NE LANTAU	2	8.99	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NE LANTAU	3	1.60	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NW LANTAU	2	1.22	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NW LANTAU	3	30.67	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NW LANTAU	2	0.10	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NW LANTAU	3	7.51	AUTUMN	STANDARD31516	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (November 2014 - October 2015)

(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
04-Nov-14	1	1435	13	NW LANTAU	1	73	ON	HKLR	827747	806468	AUTUMN	NONE	P
04-Nov-14	2	1539	1	NW LANTAU	2	0	ON	HKLR	827839	804666	AUTUMN	NONE	P
04-Nov-14	3	1558	2	NW LANTAU	2	118	ON	HKLR	825757	804662	AUTUMN	NONE	P
12-Nov-14	1	1050	4	NW LANTAU	3	105	ON	HKLR	826686	805385	AUTUMN	NONE	P
18-Nov-14	1	1255	2	NW LANTAU	2	334	ON	HKLR	827669	806479	AUTUMN	NONE	P
18-Nov-14	2	1307	7	NW LANTAU	3	ND	OFF	HKLR	827559	806149	AUTUMN	NONE	
02-Dec-14	1	1428	1	NW LANTAU	3	207	ON	HKLR	826916	806457	WINTER	NONE	P
09-Dec-14	1	1315	3	NW LANTAU	2	280	ON	HKLR	824445	807513	WINTER	NONE	P
23-Dec-14	1	1335	1	NW LANTAU	3	151	ON	HKLR	827424	807518	WINTER	NONE	P
08-Jan-15	1	1355	1	NW LANTAU	2	148	ON	HKLR	830029	806123	WINTER	NONE	S
08-Jan-15	2	1421	8	NW LANTAU	3	556	ON	HKLR	827716	805449	WINTER	NONE	P
15-Jan-15	1	1132	2	NW LANTAU	3	189	ON	HKLR	830762	804693	WINTER	NONE	P
15-Jan-15	2	1143	5	NW LANTAU	3	24	ON	HKLR	831349	804705	WINTER	NONE	P
15-Jan-15	3	1156	3	NW LANTAU	3	464	ON	HKLR	830673	805331	WINTER	NONE	S
27-Jan-15	1	1409	2	NW LANTAU	3	163	ON	HKLR	825753	806454	WINTER	NONE	S
27-Jan-15	2	1442	3	NW LANTAU	3	410	ON	HKLR	830429	805475	WINTER	NONE	P
29-Jan-15	1	1104	4	NW LANTAU	3	63	ON	HKLR	824825	805464	WINTER	NONE	P
29-Jan-15	2	1128	6	NW LANTAU	2	143	ON	HKLR	826287	805456	WINTER	NONE	P
29-Jan-15	3	1150	7	NW LANTAU	2	343	ON	HKLR	827483	805469	WINTER	NONE	P
29-Jan-15	4	1208	5	NW LANTAU	2	143	ON	HKLR	829122	805472	WINTER	NONE	P
13-Feb-15	1	1344	1	NW LANTAU	2	103	ON	HKLR	821649	810495	WINTER	NONE	P
04-Mar-15	1	1009	1	NW LANTAU	2	ND	OFF	HKLR	815213	805485	SPRING	NONE	
11-Mar-15	1	1347	1	NW LANTAU	2	ND	OFF	HKLR	829495	806976	SPRING	NONE	
11-Mar-15	2	1519	7	NW LANTAU	2	258	ON	HKLR	818956	805421	SPRING	NONE	P
26-Mar-15	1	1201	3	NW LANTAU	2	21	ON	HKLR	820290	808597	SPRING	NONE	S
08-Apr-15	1	1309	3	NW LANTAU	3	142	ON	HKLR	823791	807532	SPRING	NONE	P
10-Apr-15	1	1103	2	NW LANTAU	2	ND	OFF	HKLR	828359	804688	SPRING	NONE	
22-Apr-15	1	1432	8	NW LANTAU	2	354	ON	HKLR	830139	806113	SPRING	NONE	S
02-Jun-15	1	1110	10	NW LANTAU	3	88	ON	HKLR	827673	804687	SUMMER	NONE	P
26-Jun-15	1	1210	4	NW LANTAU	4	357	ON	HKLR	826650	806456	SUMMER	NONE	P
26-Jun-15	2	1610	1	NE LANTAU	2	0	ON	HKLR	822224	818562	SUMMER	NONE	P
02-Jul-15	1	1051	2	NW LANTAU	3	158	ON	HKLR	823542	804688	SUMMER	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
22-Jul-15	1	1055	3	NW LANTAU	3	153	ON	HKLR	827217	805458	SUMMER	NONE	P
22-Jul-15	2	1140	1	NW LANTAU	3	147	ON	HKLR	827280	807549	SUMMER	NONE	P
19-Aug-15	1	1019	1	NW LANTAU	2	45	ON	HKLR	814805	804681	SUMMER	NONE	P
19-Aug-15	2	1031	4	NW LANTAU	2	502	ON	HKLR	816101	804673	SUMMER	NONE	P
19-Aug-15	3	1036	1	NW LANTAU	2	285	ON	HKLR	817097	804675	SUMMER	NONE	P
19-Aug-15	4	1125	5	NW LANTAU	2	733	ON	HKLR	827218	805036	SUMMER	NONE	P
19-Aug-15	5	1221	5	NW LANTAU	2	98	ON	HKLR	827182	806436	SUMMER	NONE	P
28-Aug-15	1	1417	5	NW LANTAU	3	344	ON	HKLR	826693	807538	SUMMER	NONE	P
02-Sep-15	1	1045	8	NW LANTAU	3	629	ON	HKLR	823950	805482	AUTUMN	NONE	P
02-Sep-15	2	1122	12	NW LANTAU	2	240	ON	HKLR	826365	805436	AUTUMN	NONE	P
02-Sep-15	3	1143	12	NW LANTAU	2	75	ON	HKLR	826741	805344	AUTUMN	NONE	P
11-Sep-15	1	1155	6	NW LANTAU	2	349	ON	HKLR	828788	806460	AUTUMN	NONE	P
17-Sep-15	1	1411	7	NW LANTAU	3	134	ON	HKLR	828867	805462	AUTUMN	PURSE-SEINE	P
29-Sep-15	1	1445	5	NW LANTAU	2	430	ON	HKLR	827625	806489	AUTUMN	NONE	P
29-Sep-15	2	1512	4	NW LANTAU	2	281	ON	HKLR	828090	806500	AUTUMN	NONE	P
06-Oct-15	1	1113	2	NW LANTAU	2	72	ON	HKLR	827029	805334	AUTUMN	NONE	P
13-Oct-15	1	1025	2	NW LANTAU	3	195	ON	HKLR	817031	804665	AUTUMN	NONE	P
13-Oct-15	2	1036	3	NW LANTAU	3	102	ON	HKLR	817020	804675	AUTUMN	NONE	P
13-Oct-15	3	1123	10	NW LANTAU	2	745	ON	HKLR	825923	804673	AUTUMN	NONE	P
19-Oct-15	1	1407	2	NW LANTAU	3	14	ON	HKLR	826473	806476	AUTUMN	NONE	P
26-Oct-15	1	1326	6	NW LANTAU	3	73	ON	HKLR	823681	807511	AUTUMN	NONE	P
26-Oct-15	2	1444	2	NW LANTAU	2	107	ON	HKLR	827007	805303	AUTUMN	NONE	S

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in November 2014-October 2015

ID#	DATE	STG#	AREA
CH34	18/11/14	2	NW LANTAU
	15/01/15	1	NW LANTAU
	15/01/15	2	NW LANTAU
	29/01/15	4	NW LANTAU
	11/03/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	28/08/15	1	NW LANTAU
	29/09/15	1	NW LANTAU
	19/10/15	1	NW LANTAU
CH84	02/09/15	3	NW LANTAU
NL33	13/10/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL37	02/06/15	1	NW LANTAU
NL46	04/11/14	1	NW LANTAU
	19/08/15	4	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
NL48	04/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	23/12/14	1	NW LANTAU
	15/01/15	3	NW LANTAU
	02/06/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	11/09/15	1	NW LANTAU
	17/09/15	1	NW LANTAU
NL49	11/03/15	2	NW LANTAU
NL80	02/09/15	2	NW LANTAU
NL98	15/01/15	2	NW LANTAU
NL103	29/01/15	2	NW LANTAU
NL104	04/11/14	1	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
	28/08/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
NL123	08/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	17/09/15	1	NW LANTAU

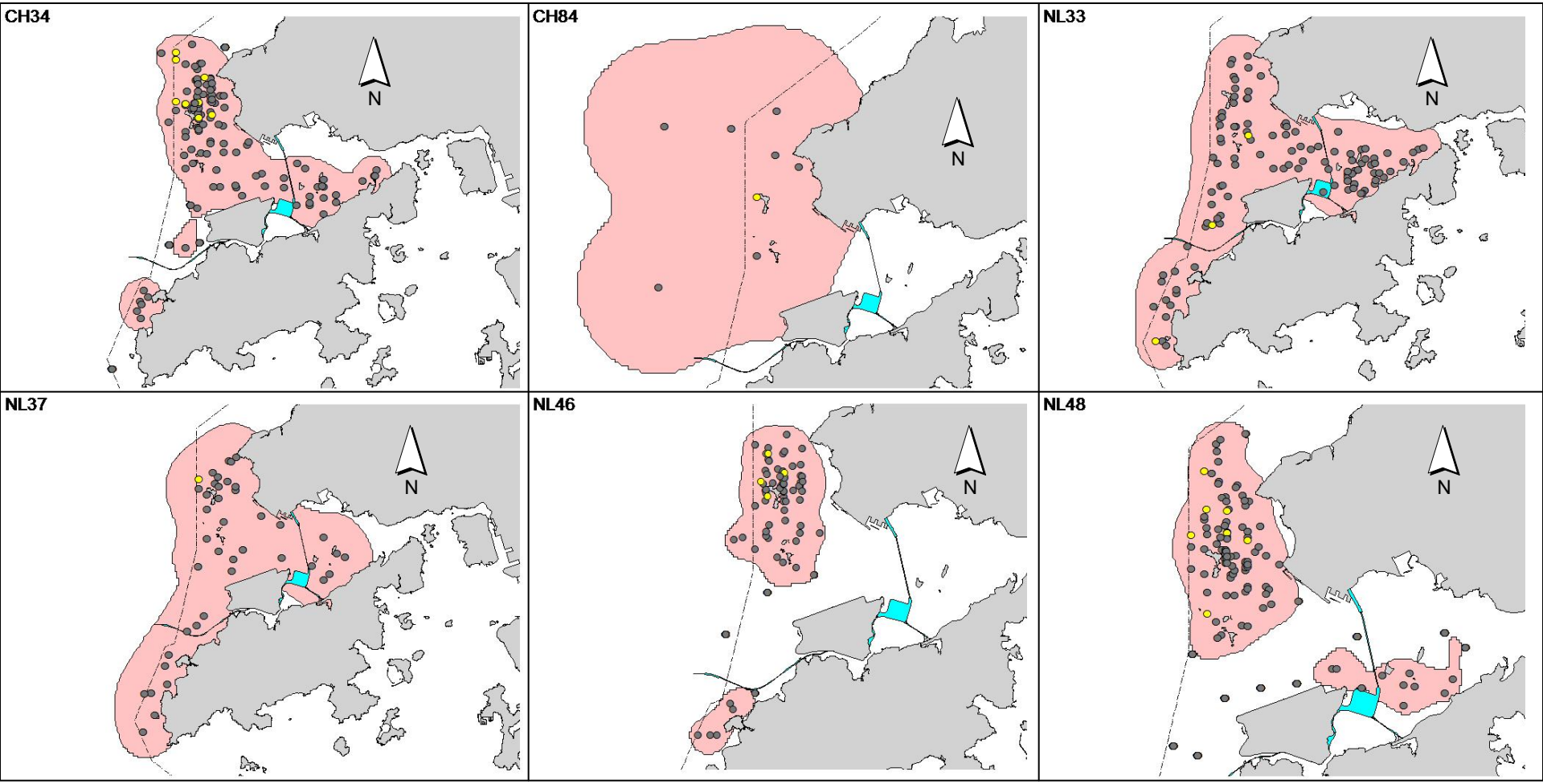
ID#	DATE	STG#	AREA
NL136	02/12/14	1	NW LANTAU
	11/03/15	2	NW LANTAU
	08/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	28/08/15	1	NW LANTAU
	29/09/15	1	NW LANTAU
NL145	08/01/15	2	NW LANTAU
	29/01/15	2	NW LANTAU
NL150	02/09/15	2	NW LANTAU
NL153	22/04/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
NL165	11/03/15	2	NW LANTAU
	02/09/15	1	NW LANTAU
NL182	18/11/14	2	NW LANTAU
	15/01/15	1	NW LANTAU
	15/01/15	2	NW LANTAU
	02/06/15	1	NW LANTAU
	17/09/15	1	NW LANTAU
NL202	12/11/14	1	NW LANTAU
	18/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	26/06/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	2	NW LANTAU
NL203	02/09/15	3	NW LANTAU
NL210	12/11/14	1	NW LANTAU
	29/01/15	2	NW LANTAU
	02/09/15	2	NW LANTAU
	13/10/15	3	NW LANTAU
NL213	26/06/15	1	NW LANTAU
NL214	09/12/14	1	NW LANTAU
	28/08/15	1	NW LANTAU
	13/10/15	3	NW LANTAU

Appendix III. (cont'd)

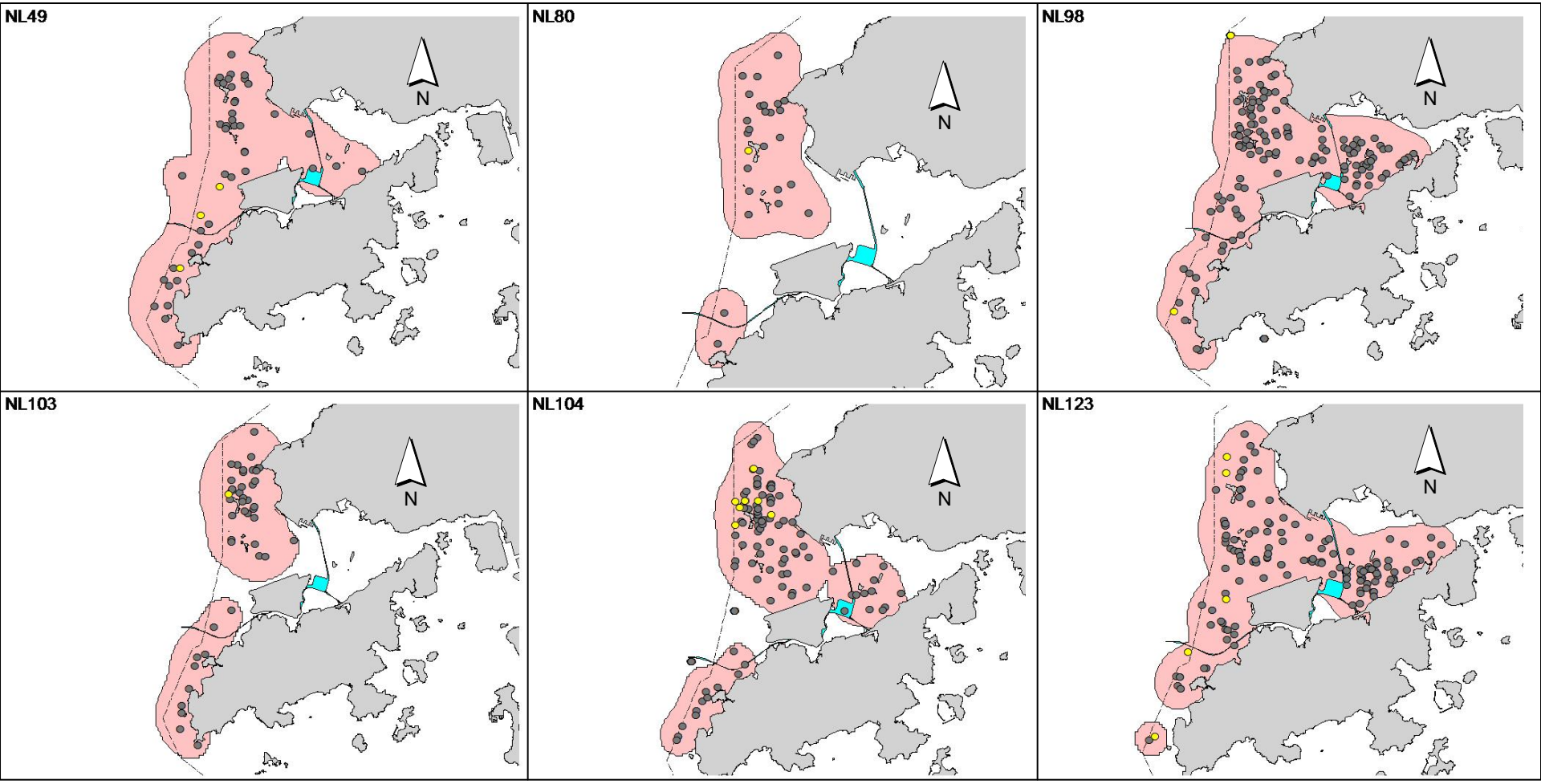
ID#	DATE	STG#	AREA
NL220	09/12/14	1	NW LANTAU
	28/08/15	1	NW LANTAU
	19/10/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL233	22/07/15	1	NW LANTAU
	02/09/15	2	NW LANTAU
NL236	22/04/15	1	NW LANTAU
NL256	04/11/14	1	NW LANTAU
NL259	04/11/14	1	NW LANTAU
	15/01/15	3	NW LANTAU
NL261	08/01/15	2	NW LANTAU
	26/03/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL272	12/11/14	1	NW LANTAU
	26/03/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL284	15/01/15	2	NW LANTAU
	29/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	26/03/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	1	NW LANTAU
NL285	08/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	02/09/15	1	NW LANTAU
	11/09/15	1	NW LANTAU
NL286	04/11/14	1	NW LANTAU
	18/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	26/06/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
	06/10/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	2	NW LANTAU
NL287	29/01/15	1	NW LANTAU

ID#	DATE	STG#	AREA
NL293	19/08/15	1	NW LANTAU
NL297	02/09/15	3	NW LANTAU
NL302	02/09/15	3	NW LANTAU
	11/09/15	1	NW LANTAU
NL306	29/01/15	1	NW LANTAU
	13/02/15	1	NW LANTAU
NL307	09/12/14	1	NW LANTAU
	29/01/15	1	NW LANTAU
	22/04/15	1	NW LANTAU
NL308	02/09/15	2	NW LANTAU
NL310	02/07/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
NL319	26/06/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
SL47	13/10/15	2	NW LANTAU
WL05	04/11/14	1	NW LANTAU
	04/11/14	3	NW LANTAU
	12/11/14	1	NW LANTAU
	02/06/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
WL17	27/01/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
WL79	13/10/15	3	NW LANTAU
WL97	12/11/14	1	NW LANTAU
WL124	19/08/15	3	NW LANTAU
WL167	02/07/15	1	NW LANTAU
WL178	04/03/15	1	NW LANTAU
WL188	29/01/15	2	NW LANTAU
WL231	29/01/15	2	NW LANTAU
WL241	13/10/15	2	NW LANTAU
WL243	13/10/15	2	NW LANTAU

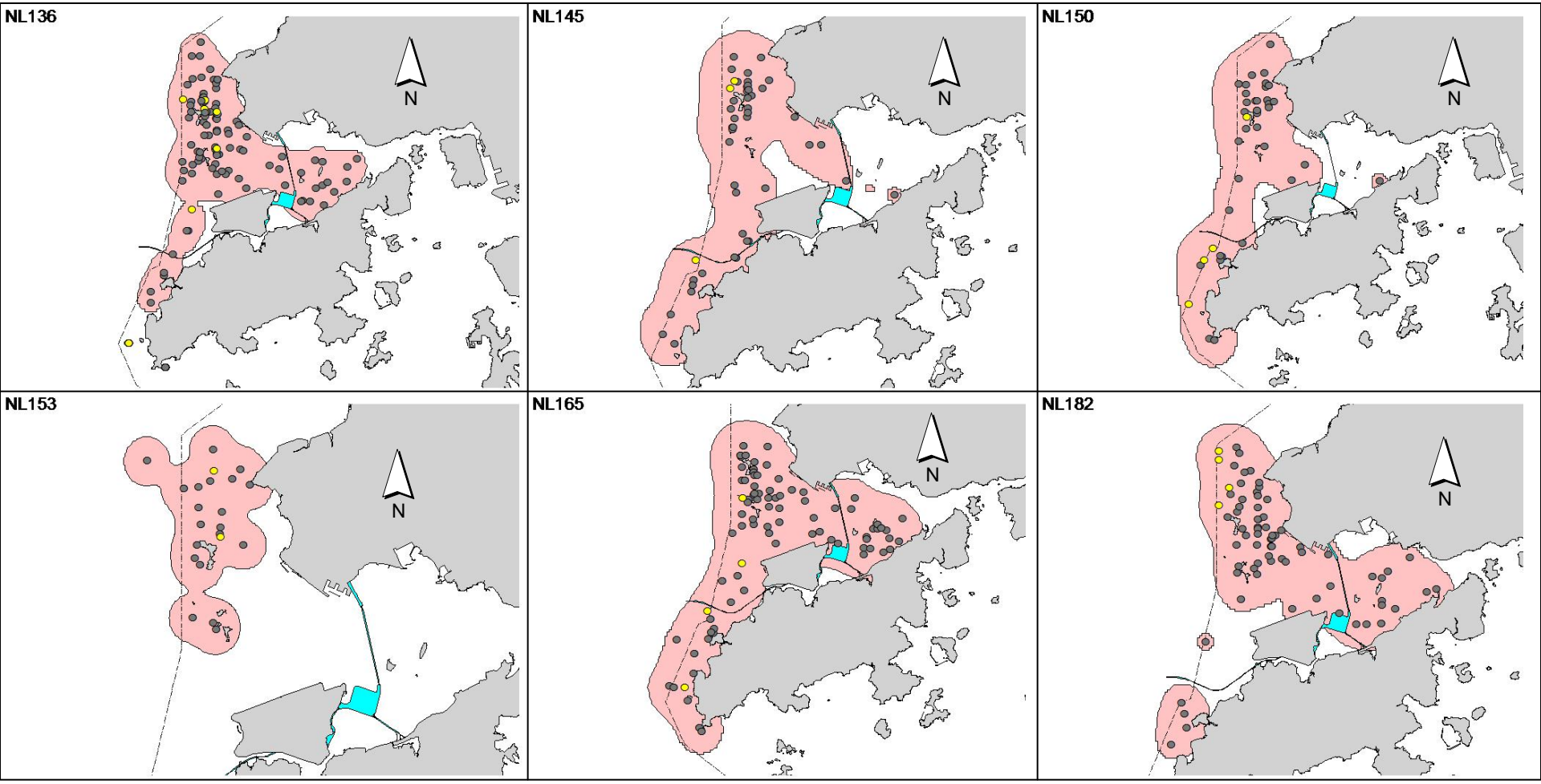
Appendix IV. Ranging patterns (95% kernel ranges) of 54 individual dolphins that were sighted during the first year of TMCLKL construction works, utilizing the HKLR03 and HKLR09 monitoring data
(note: yellow dots indicates sightings made in November 2014 to October 2015)



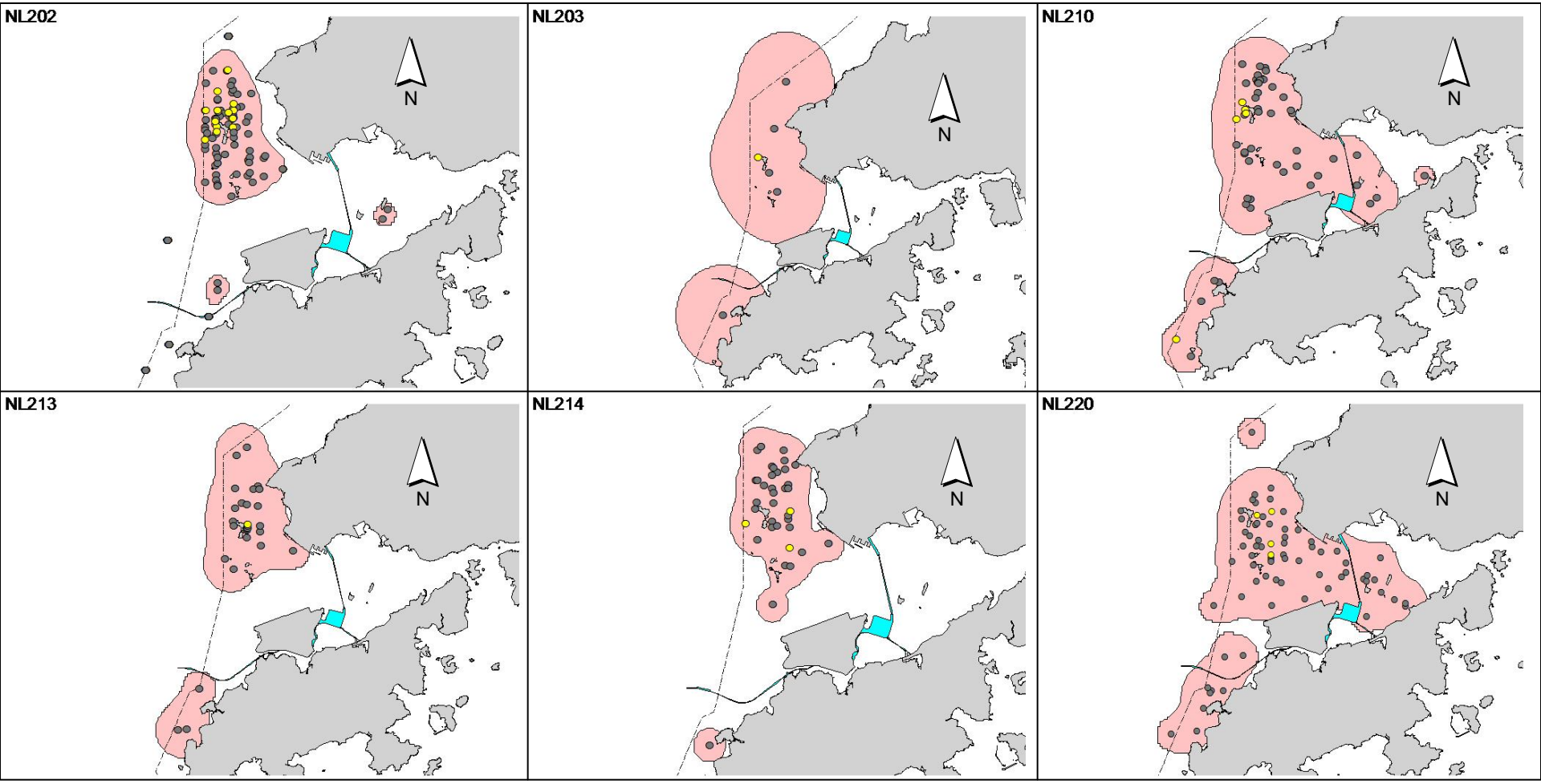
Appendix IV. (cont'd)



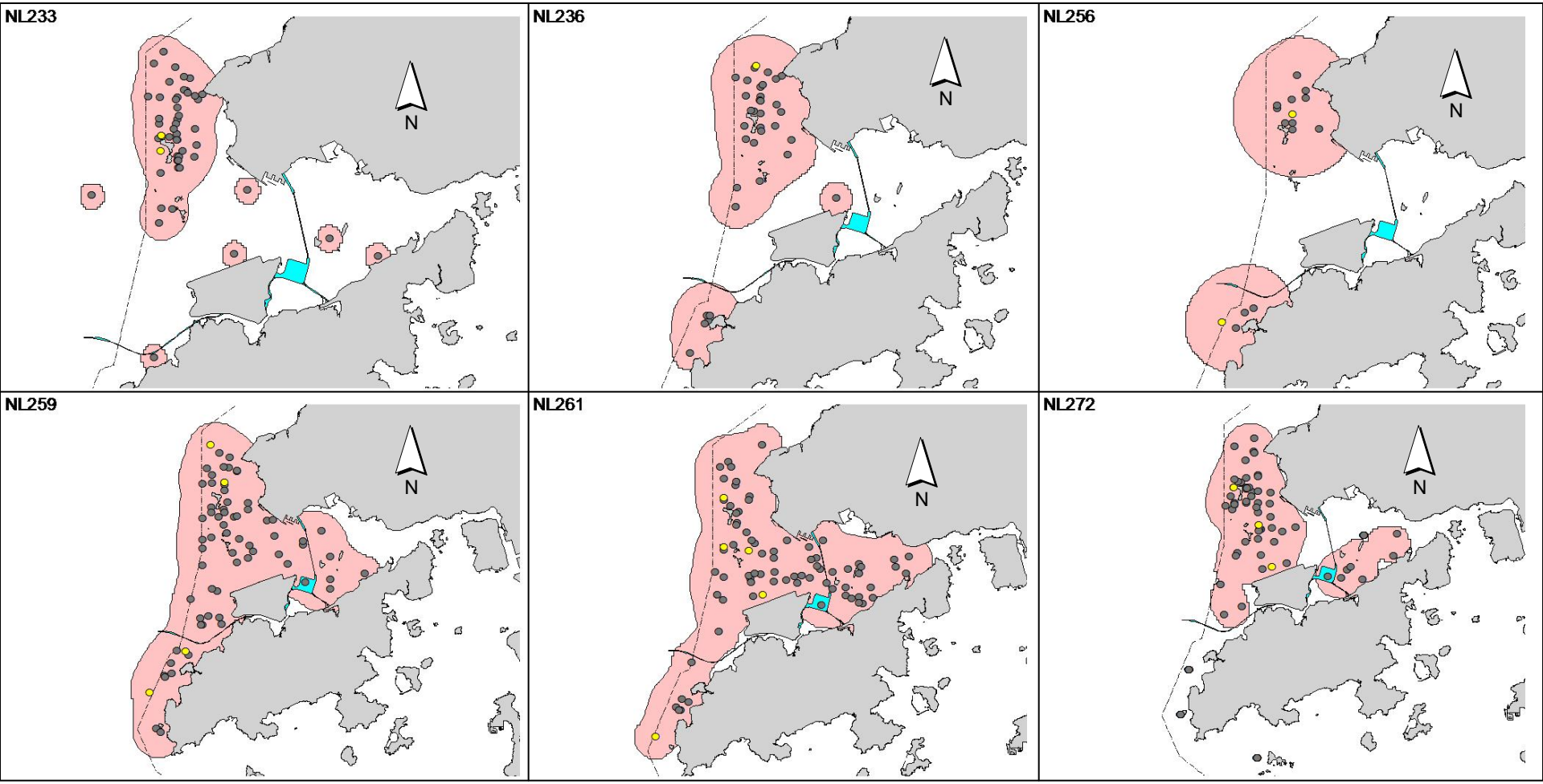
Appendix IV. (cont'd)



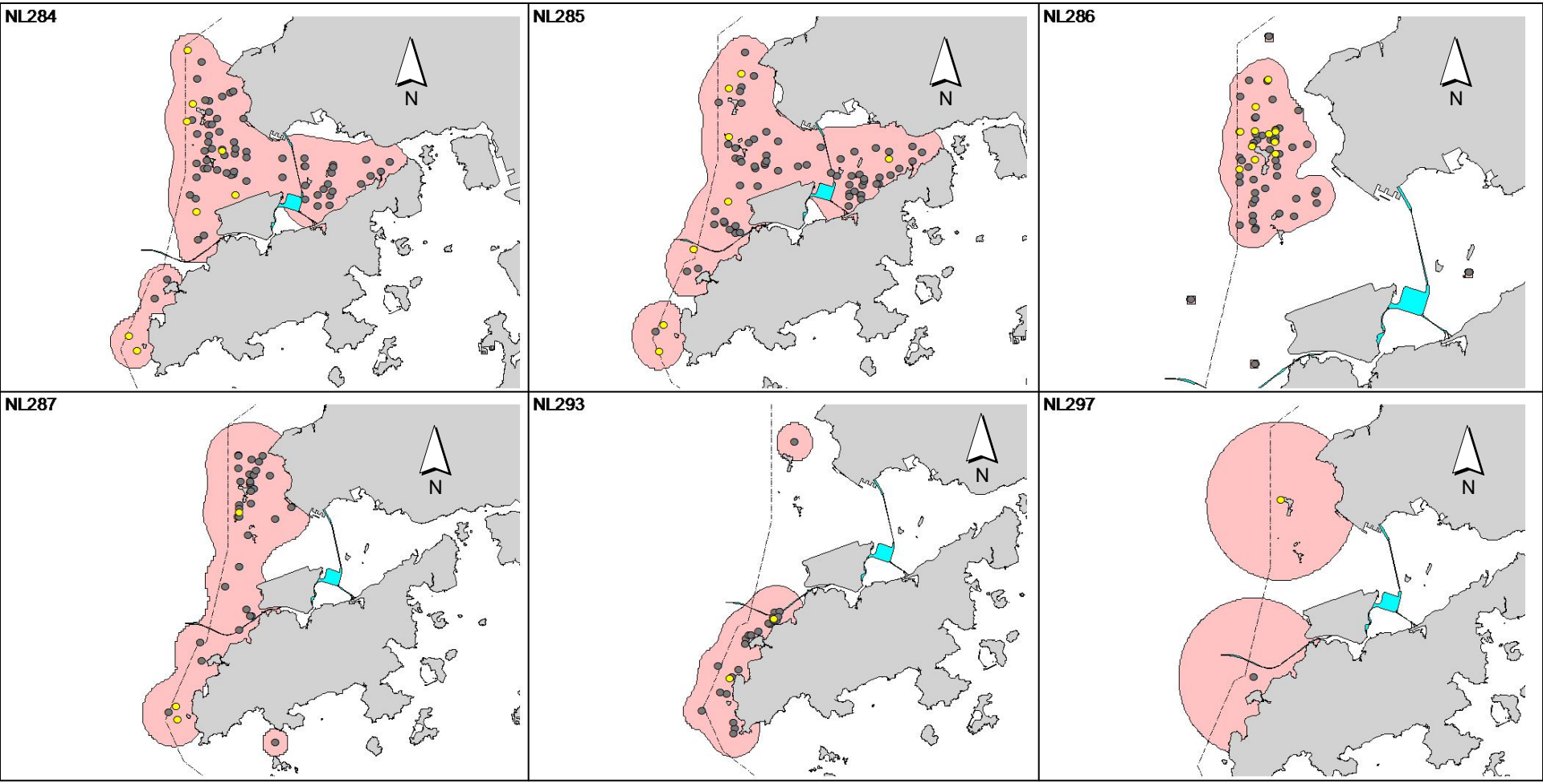
Appendix IV. (cont'd)



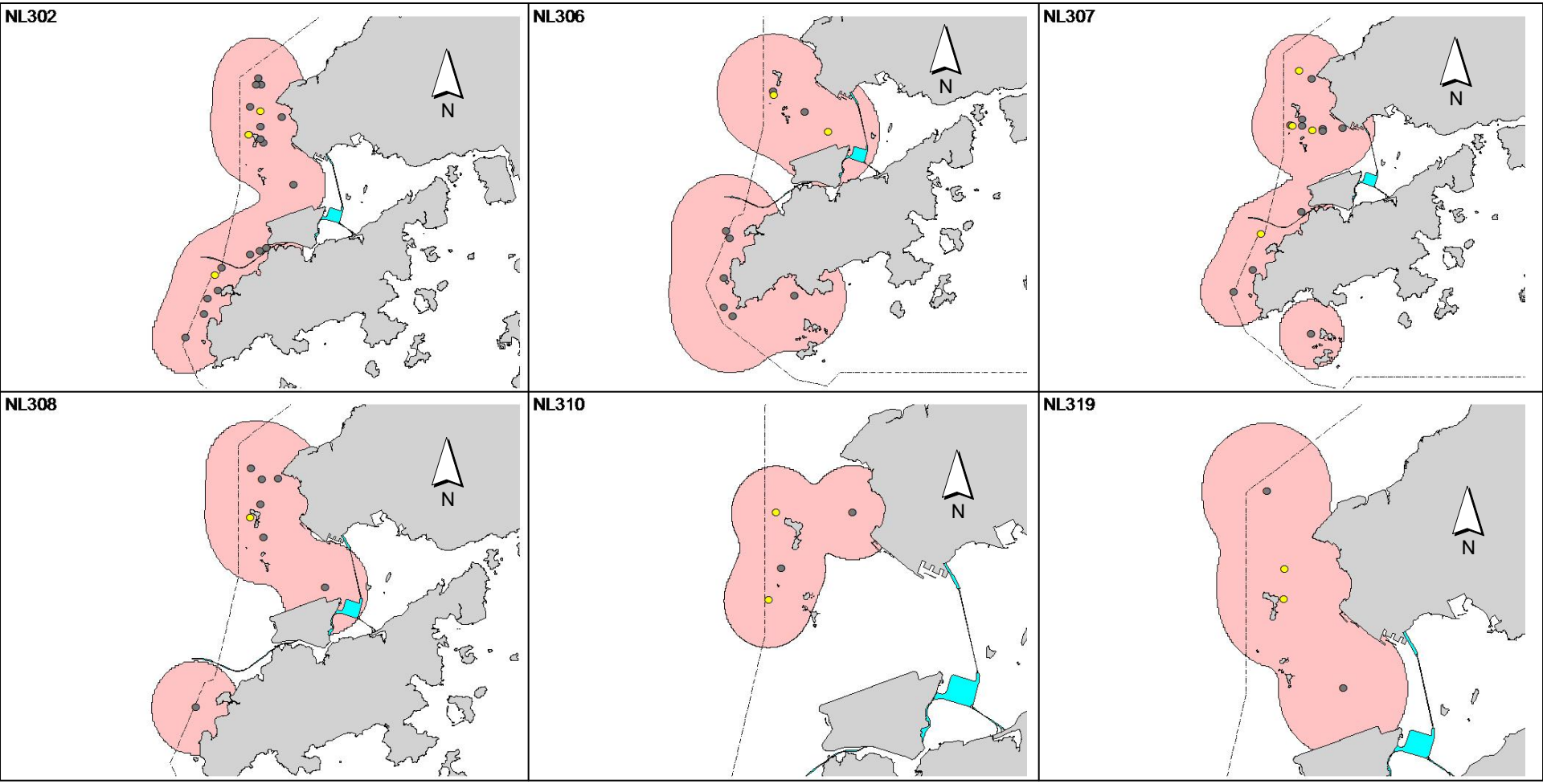
Appendix IV. (cont'd)



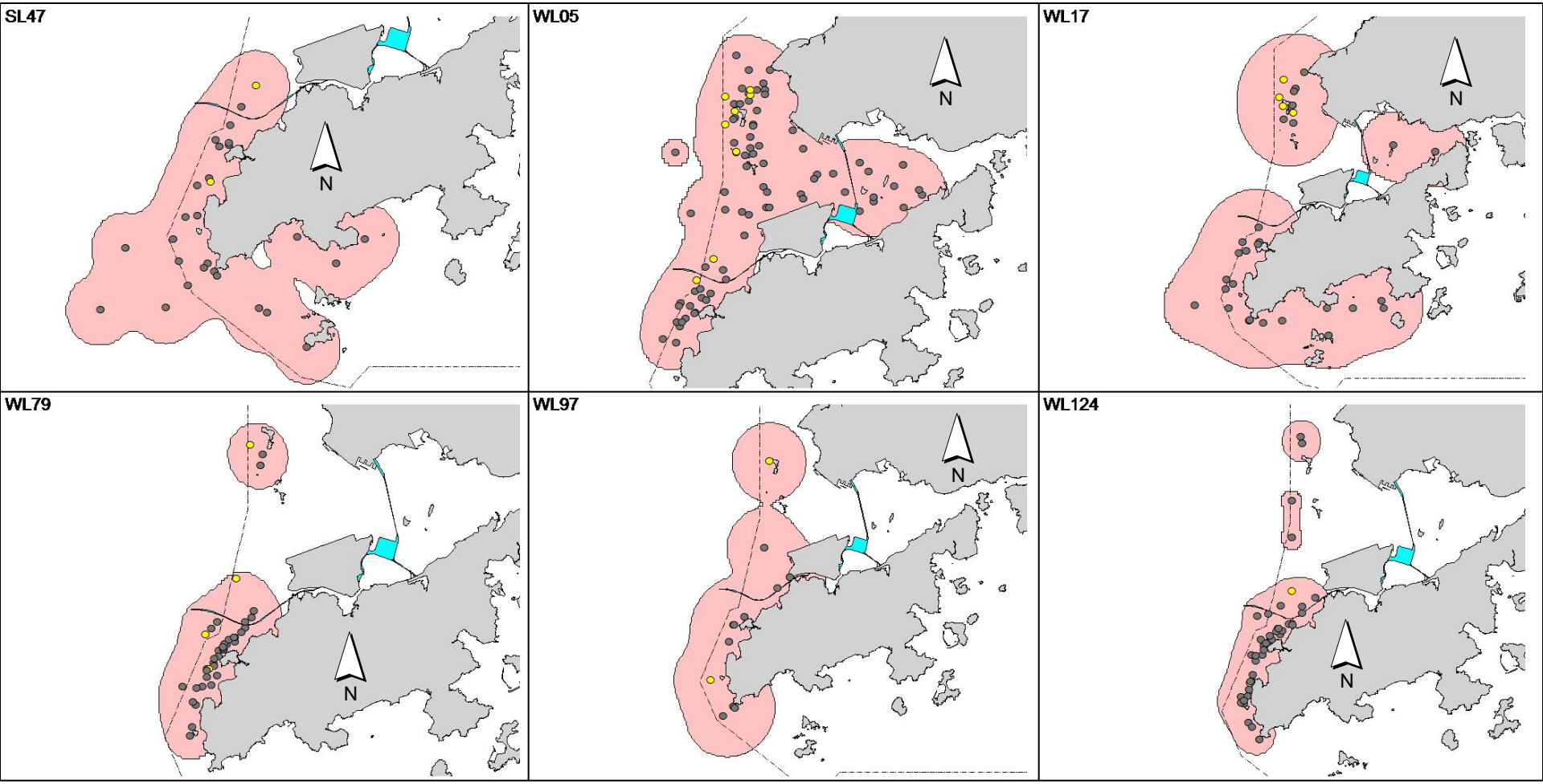
Appendix IV. (cont'd)



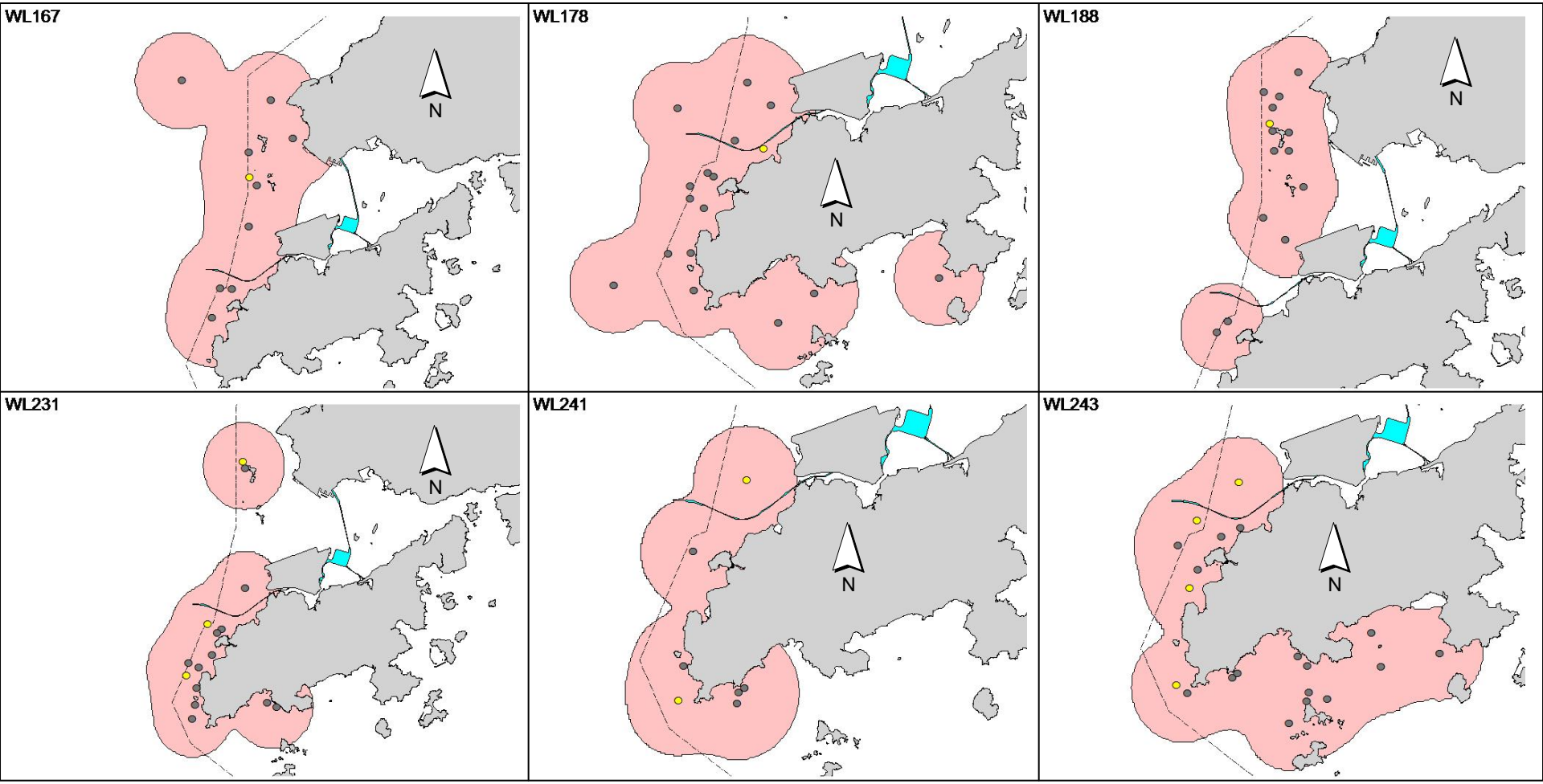
Appendix IV. (cont'd)

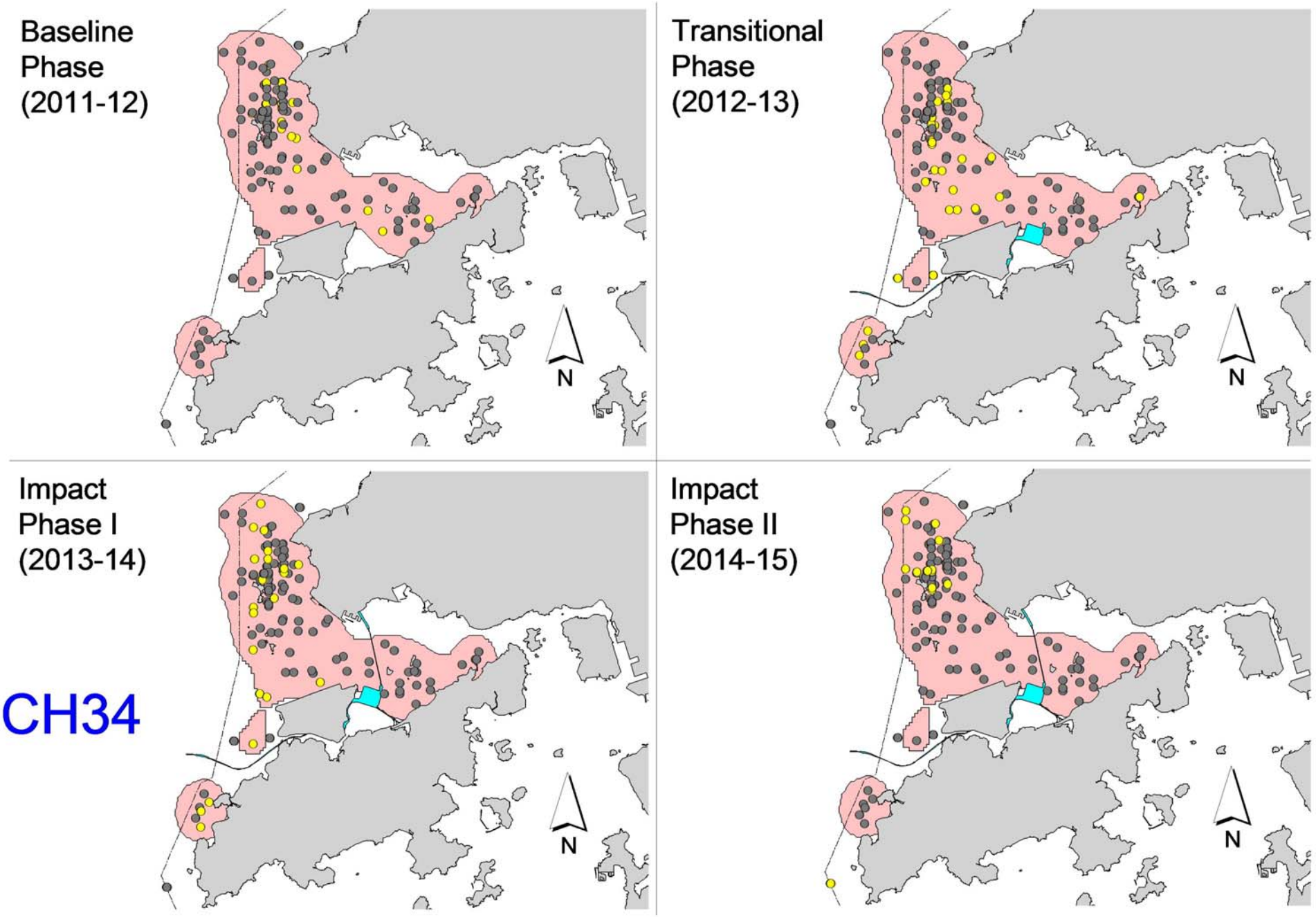


Appendix IV. (cont'd)

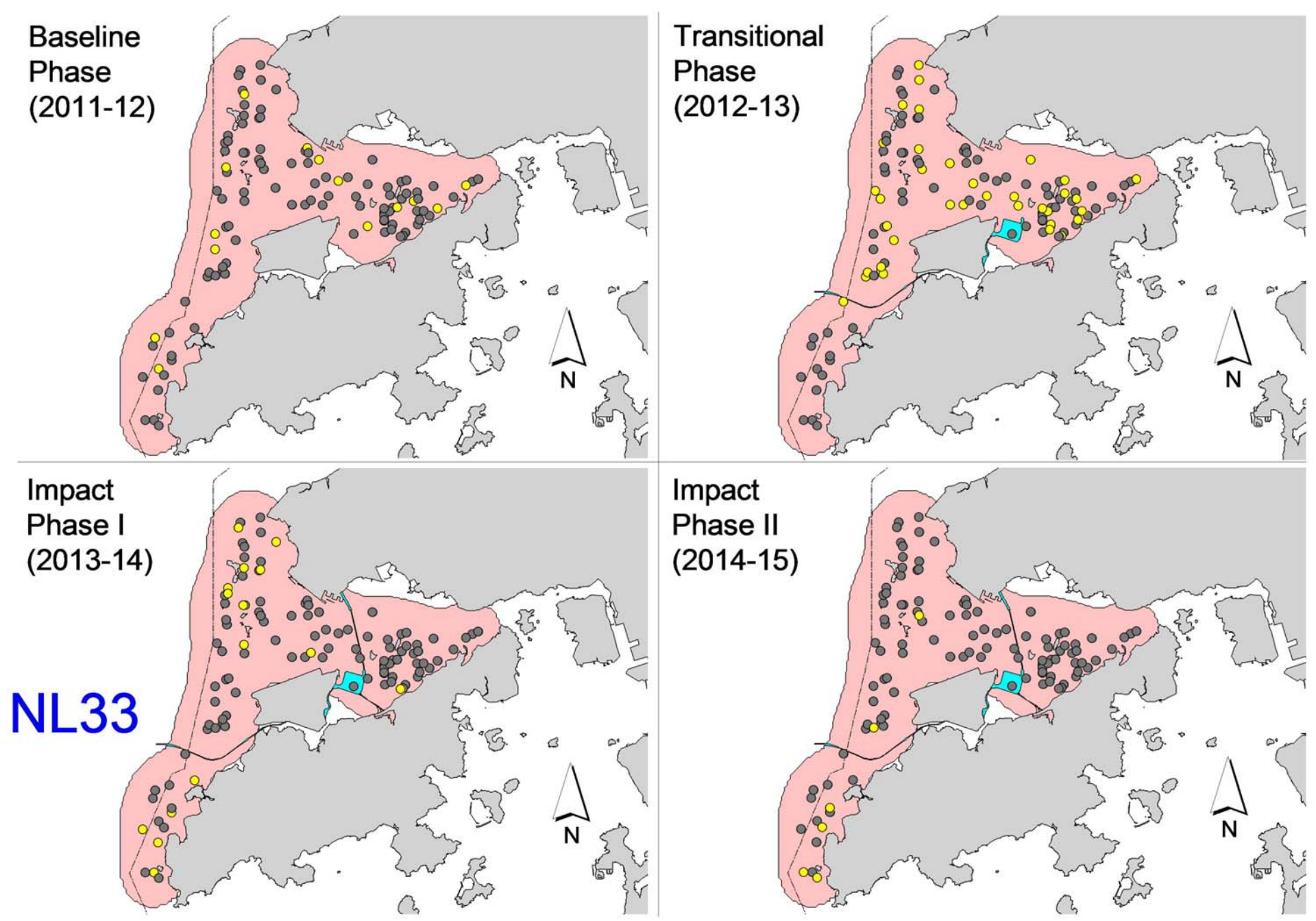


Appendix IV. (cont'd)

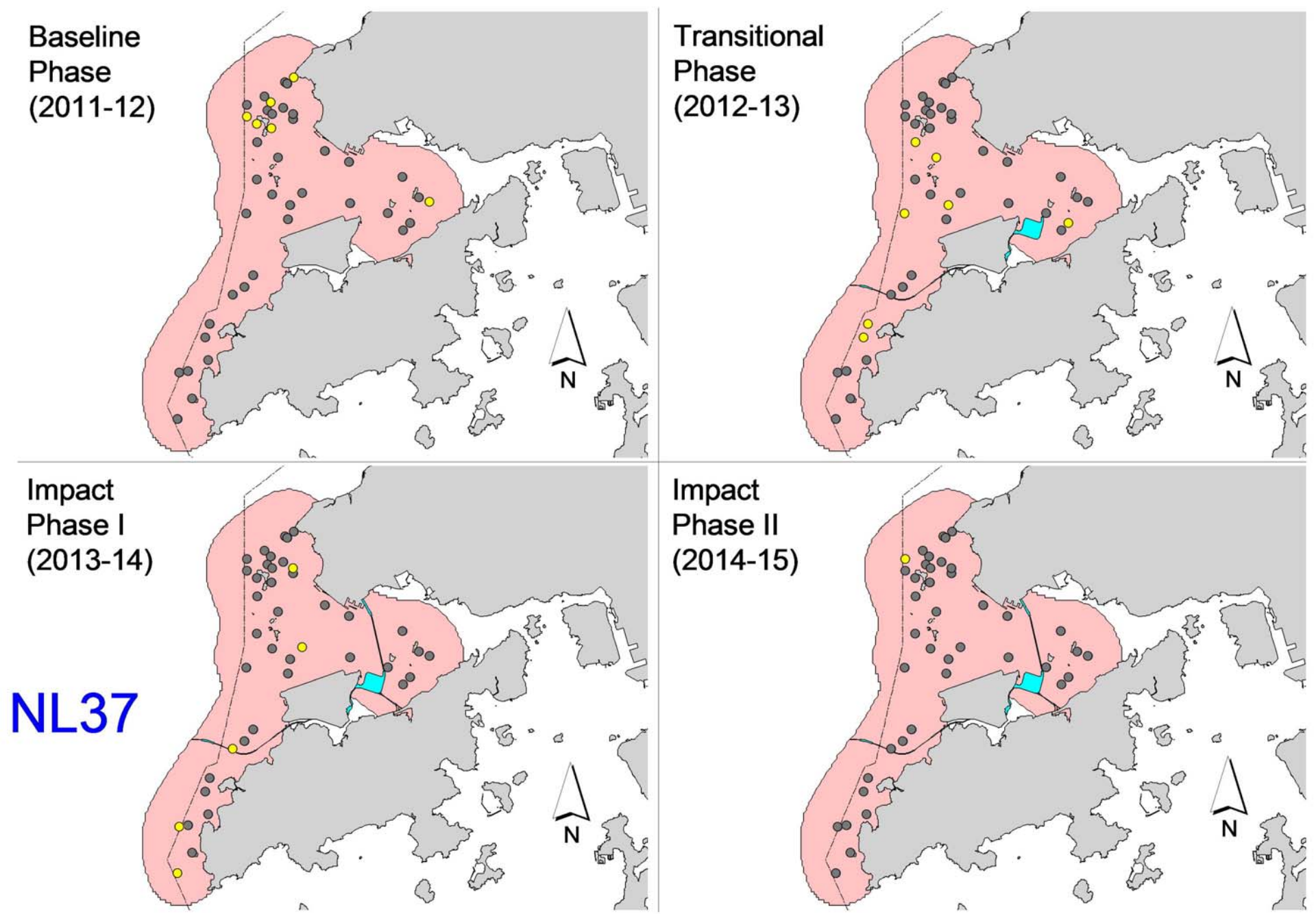




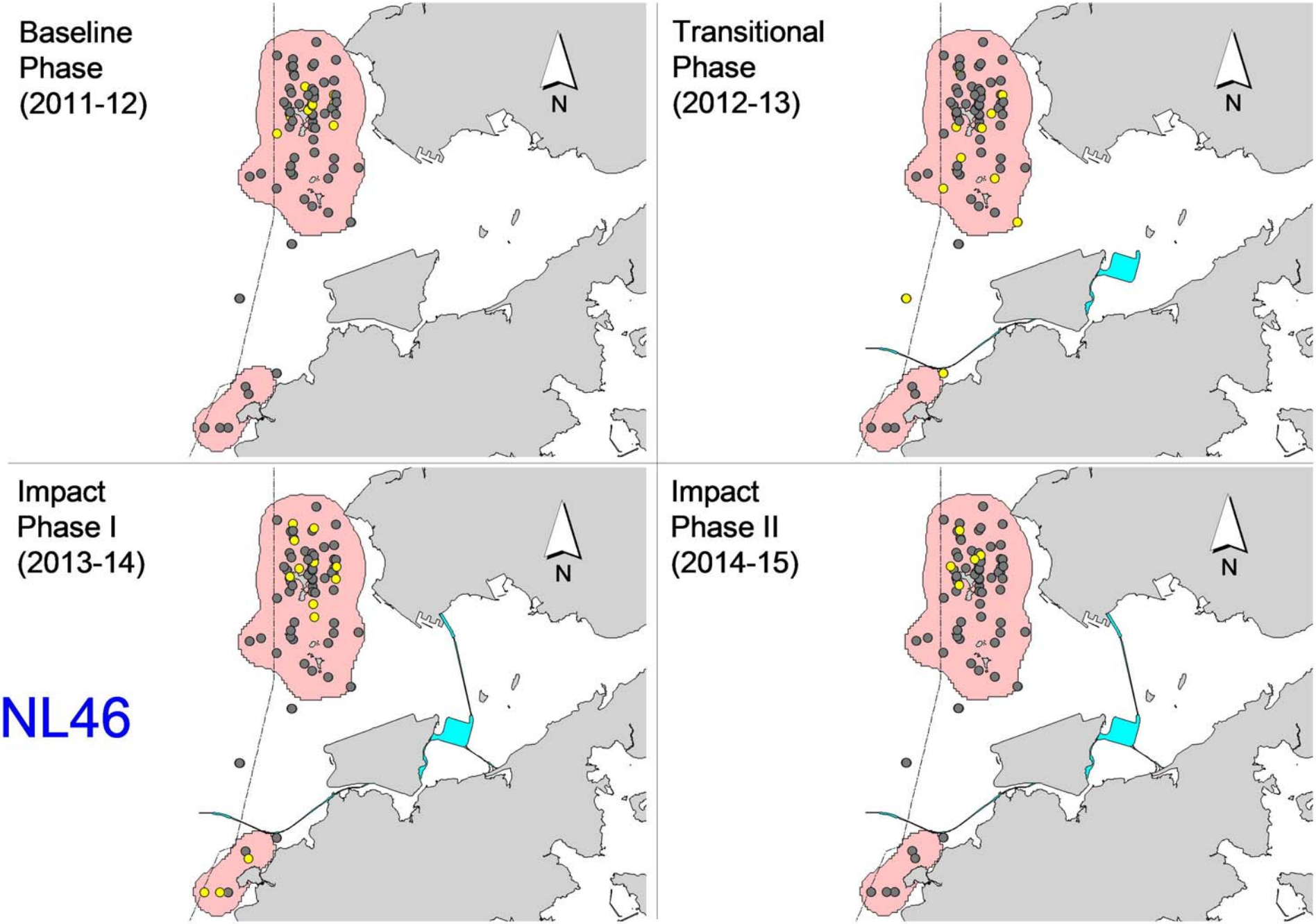
Appendix V. Temporal changes in range use patterns of 28 individual dolphins during baseline, transitional & impact phases of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)



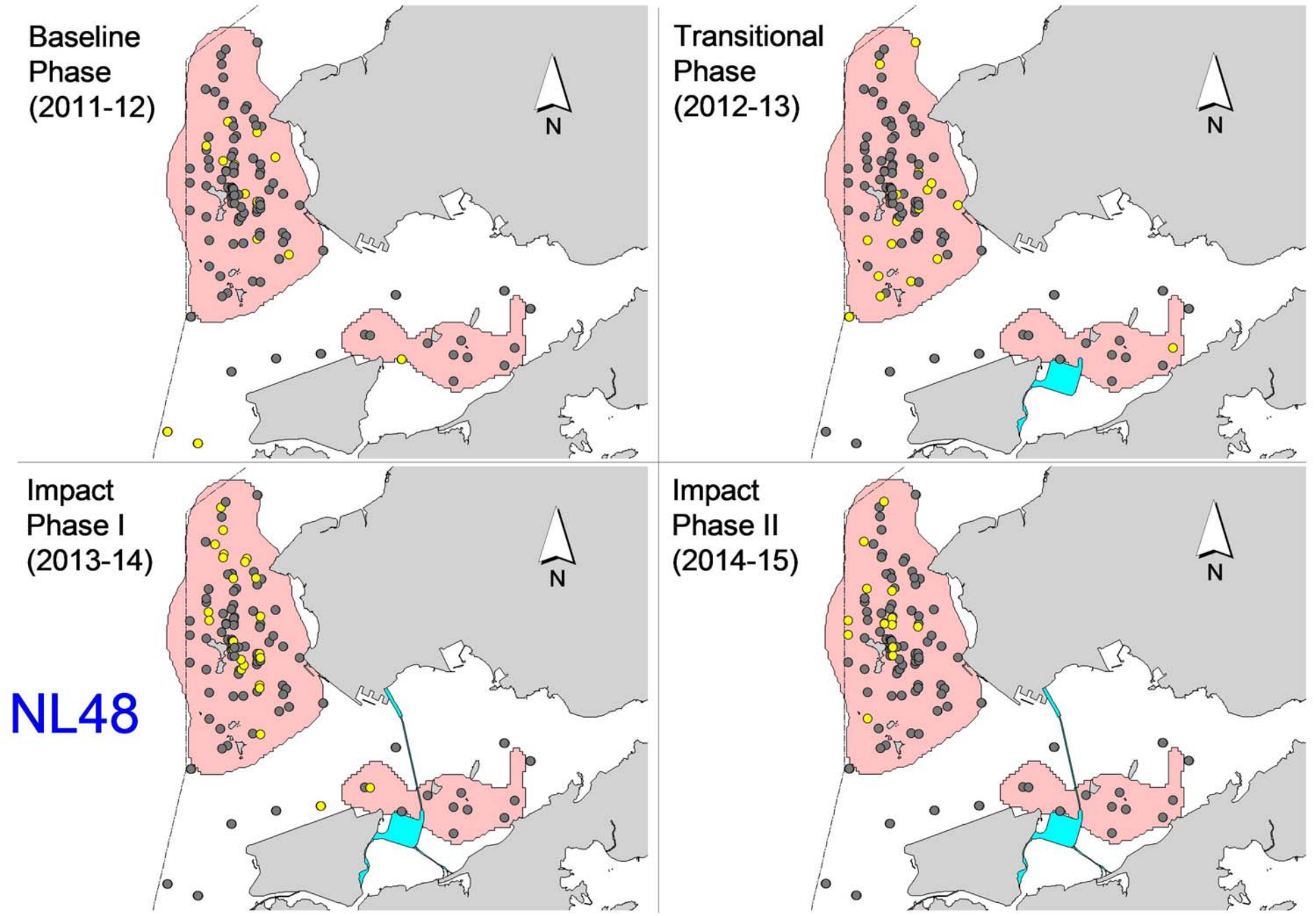
Appendix V. (cont'd)



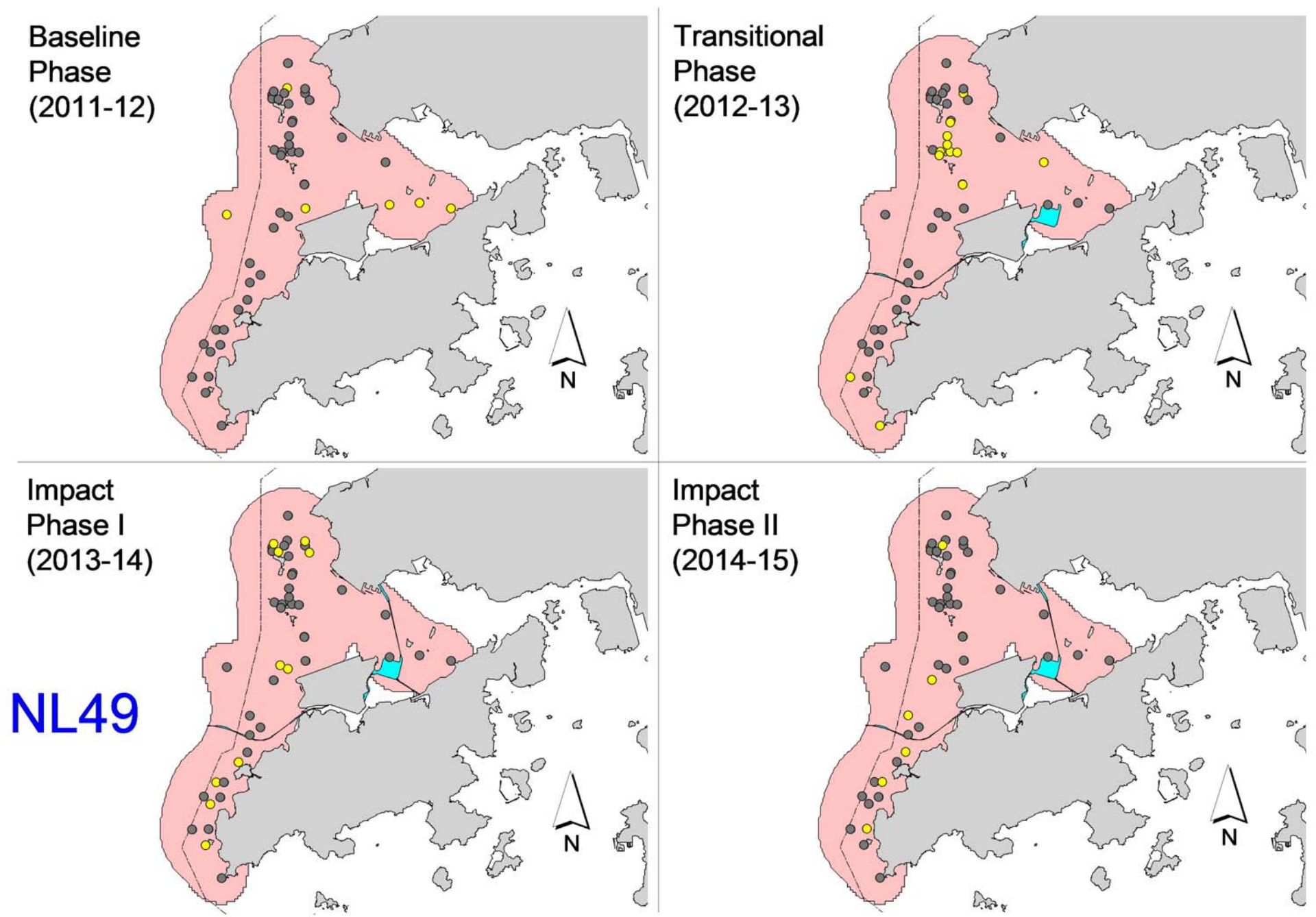
Appendix V. (cont'd)



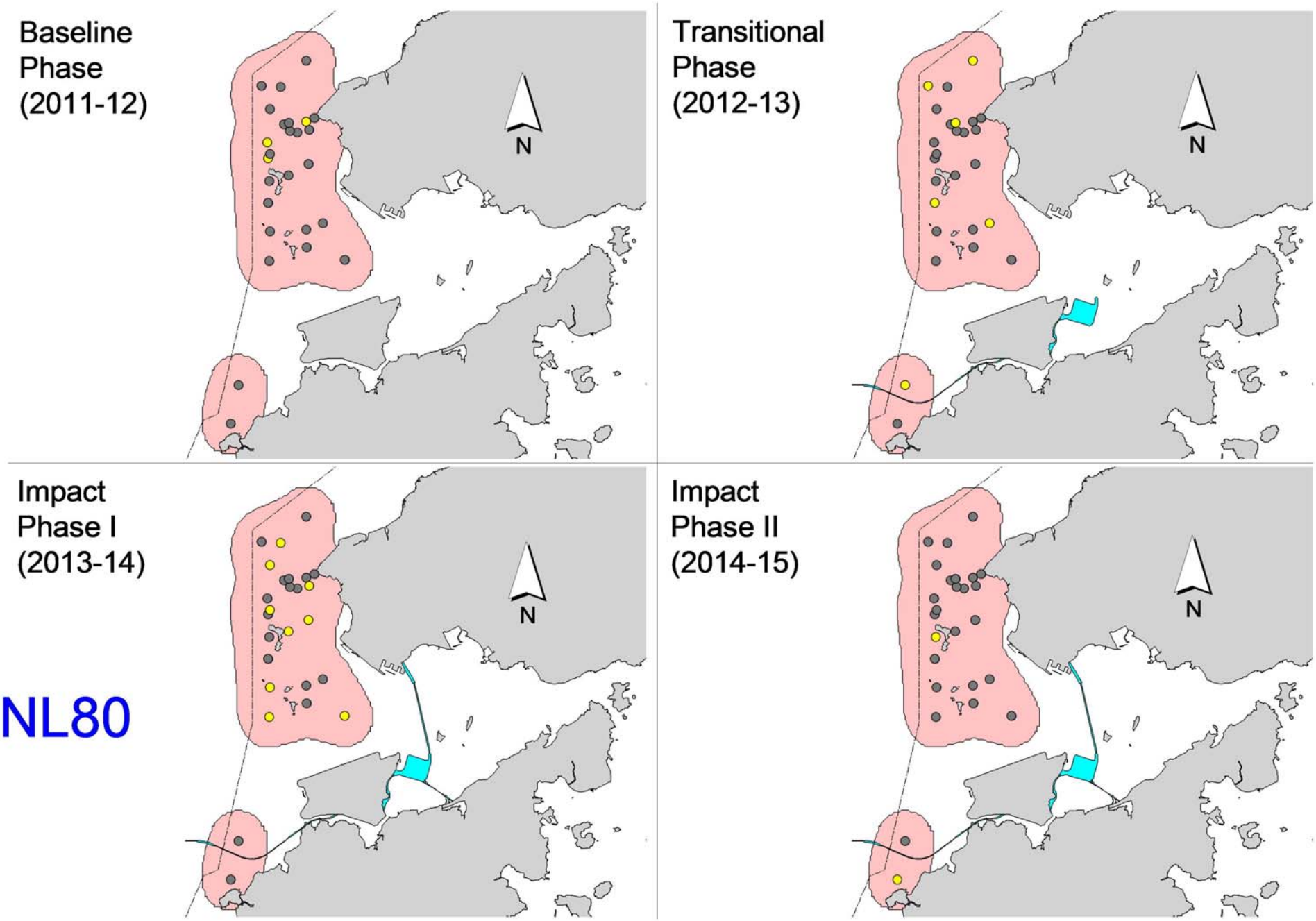
Appendix V. (cont'd)



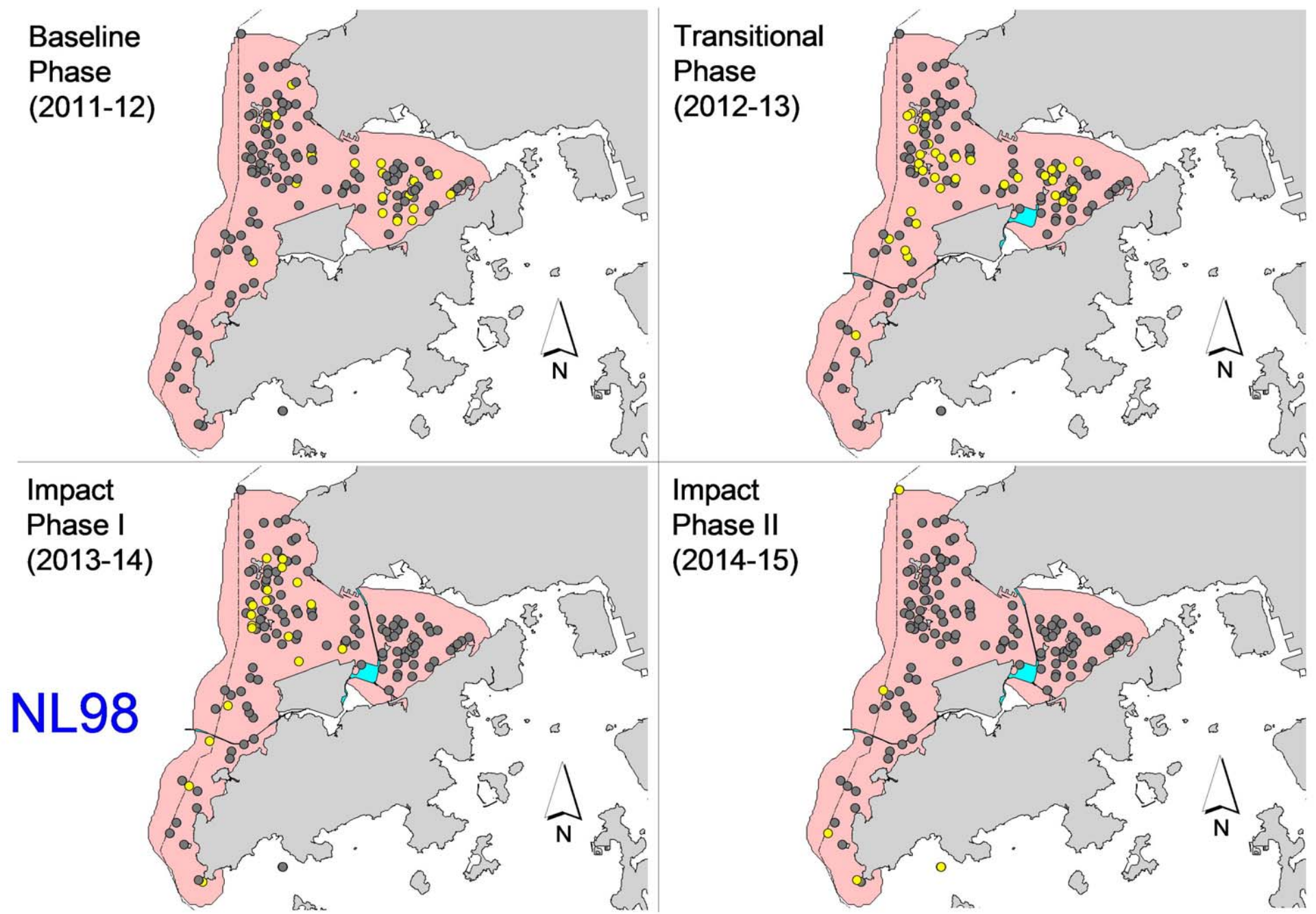
Appendix V. (cont'd)



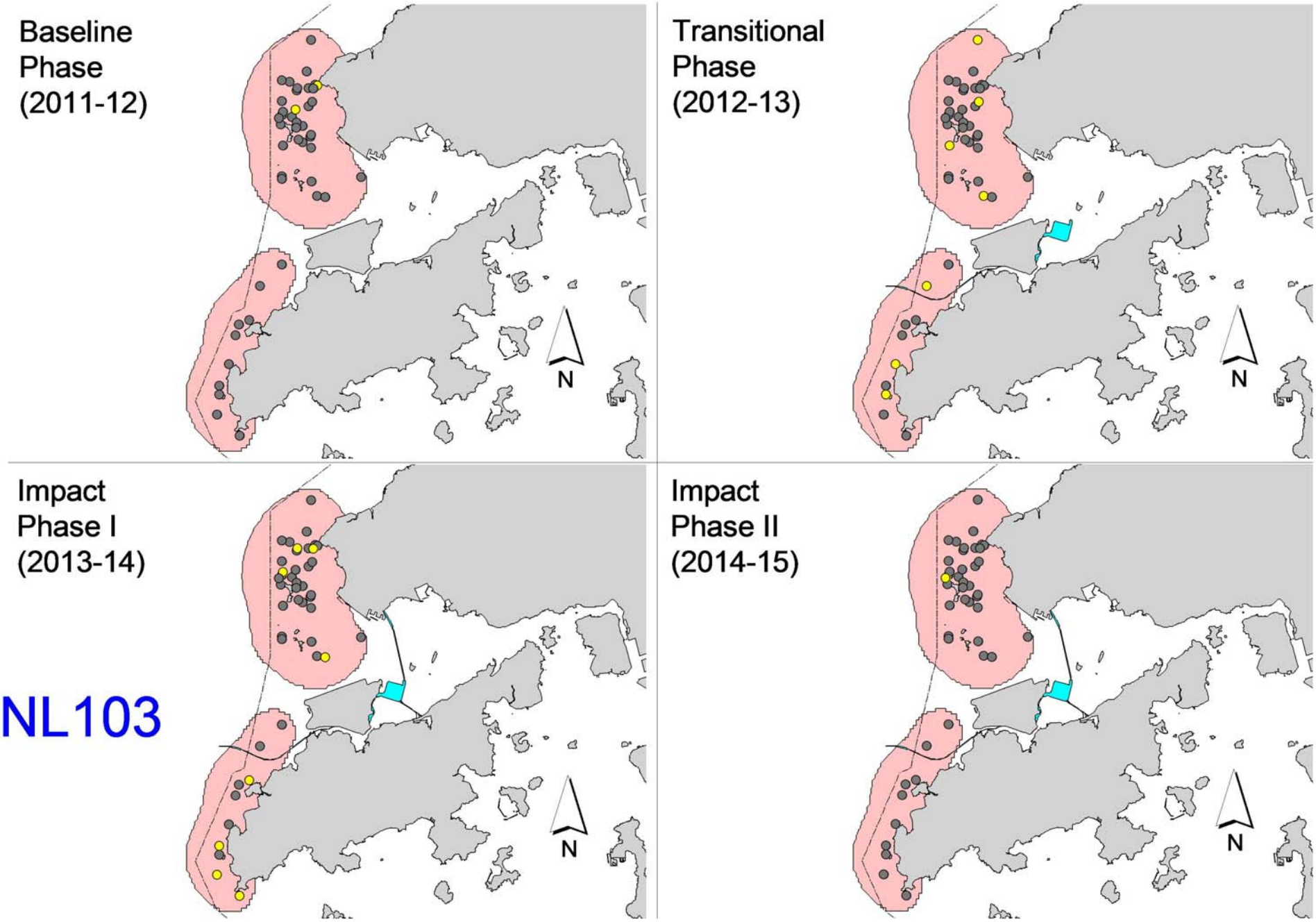
Appendix V. (cont'd)



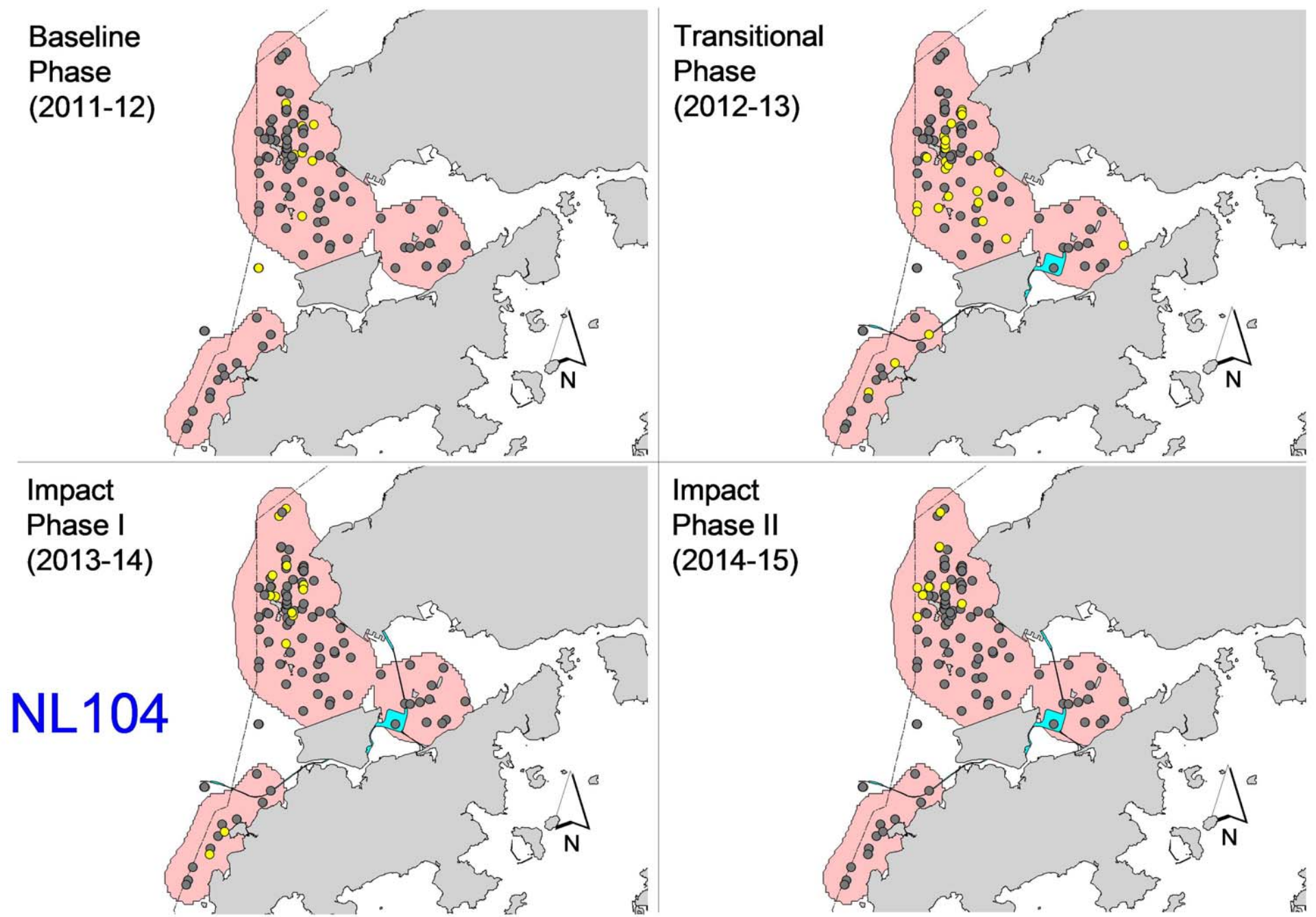
Appendix V. (cont'd)



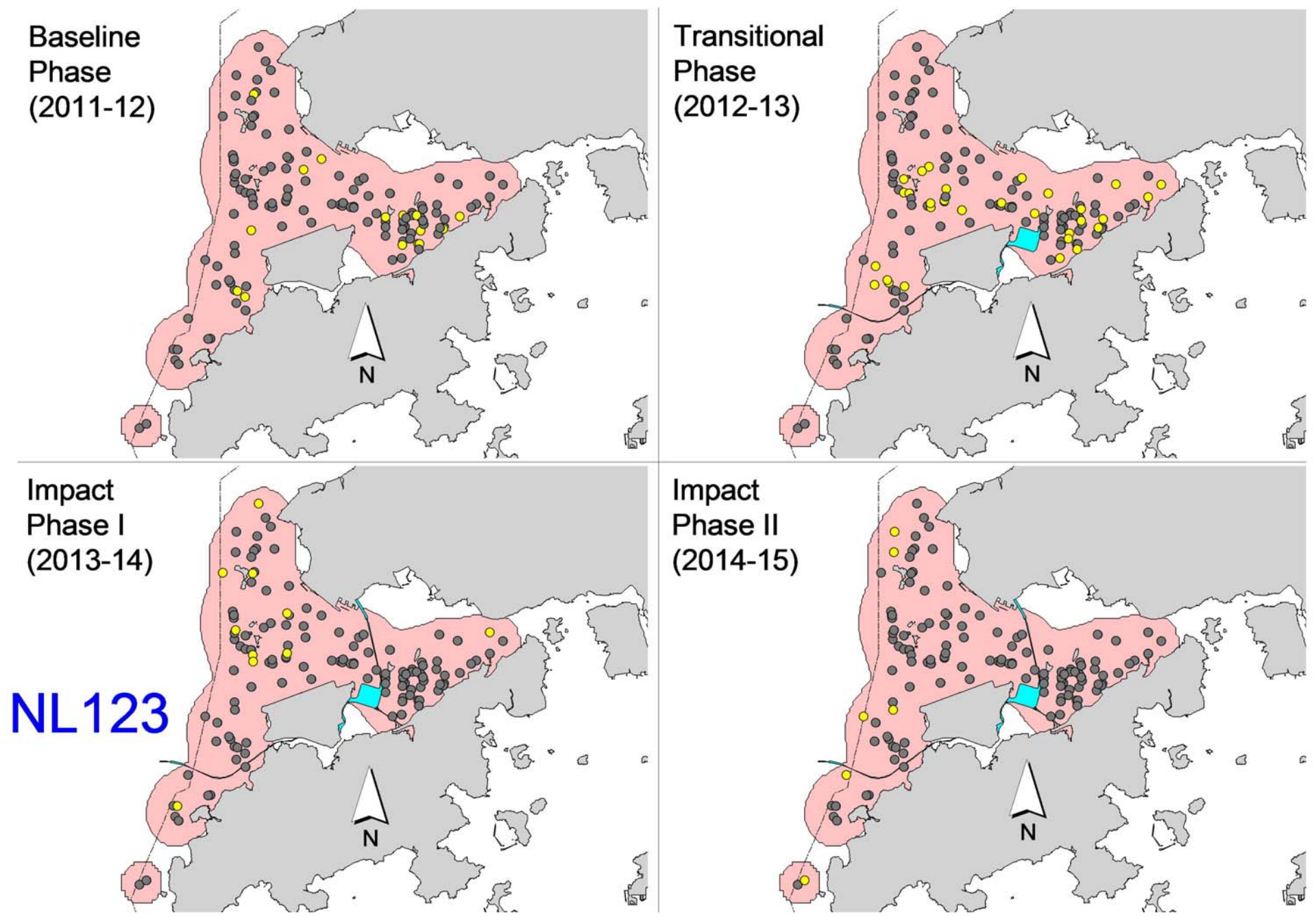
Appendix V. (cont'd)



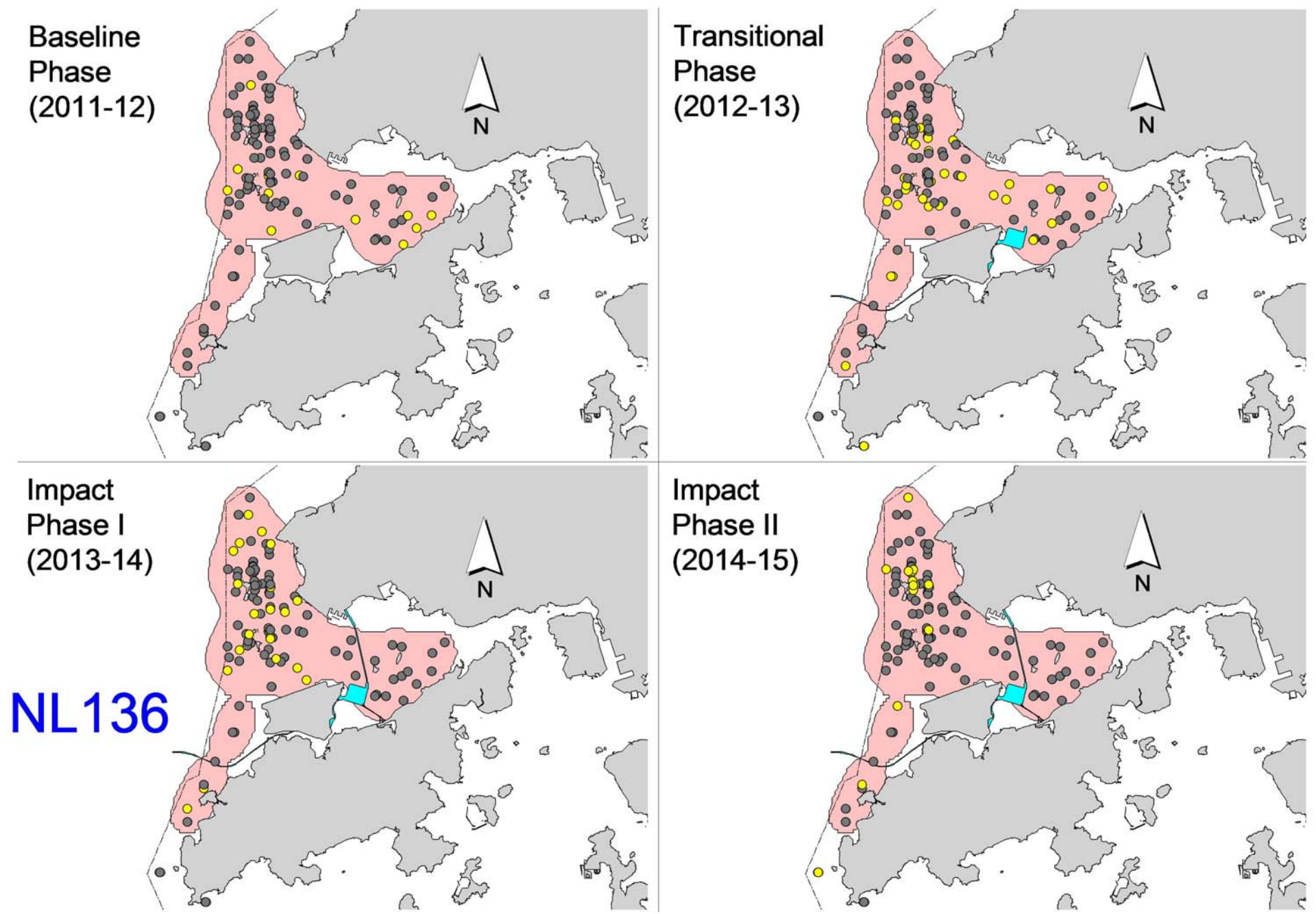
Appendix V. (cont'd)



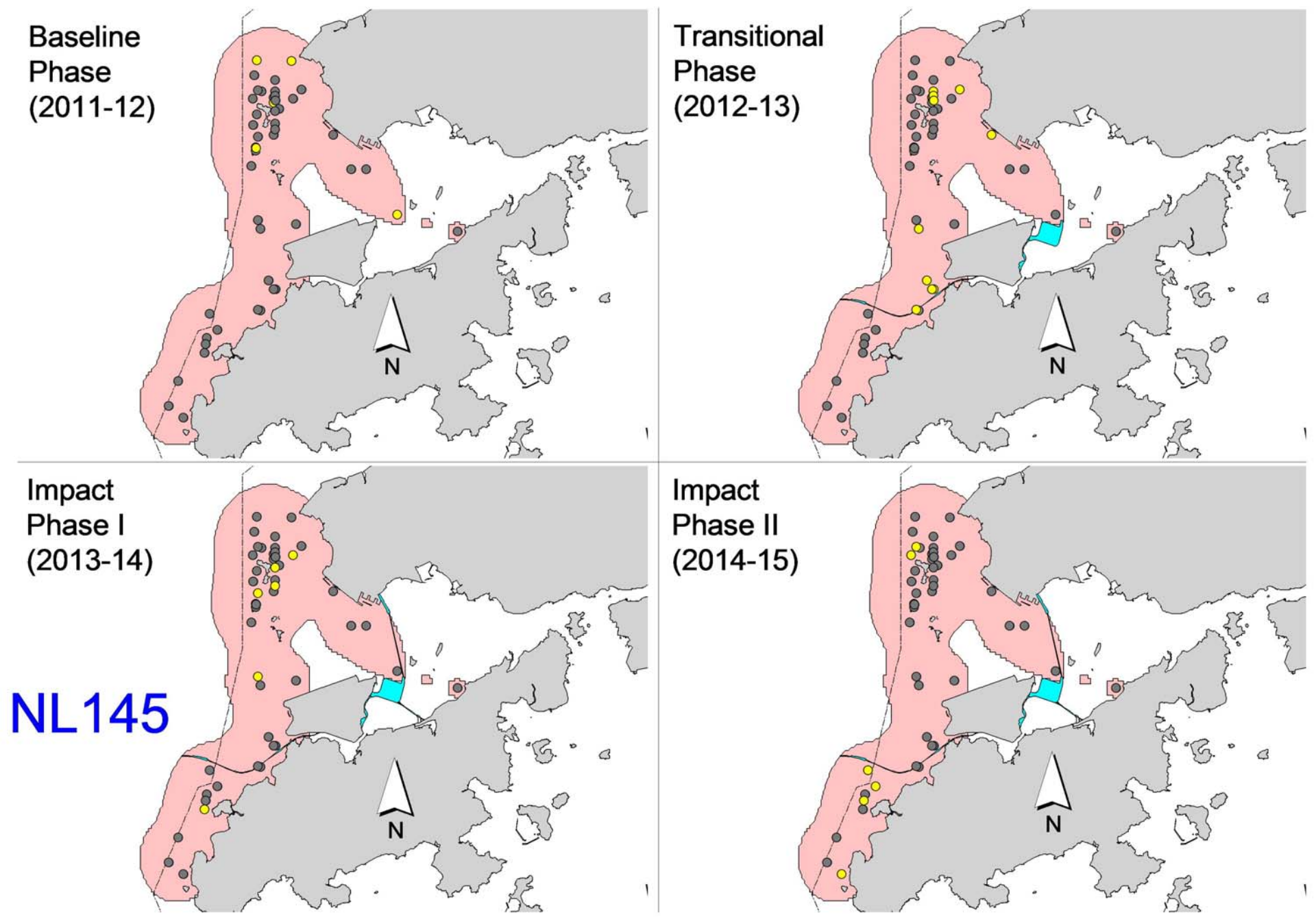
Appendix V. (cont'd)



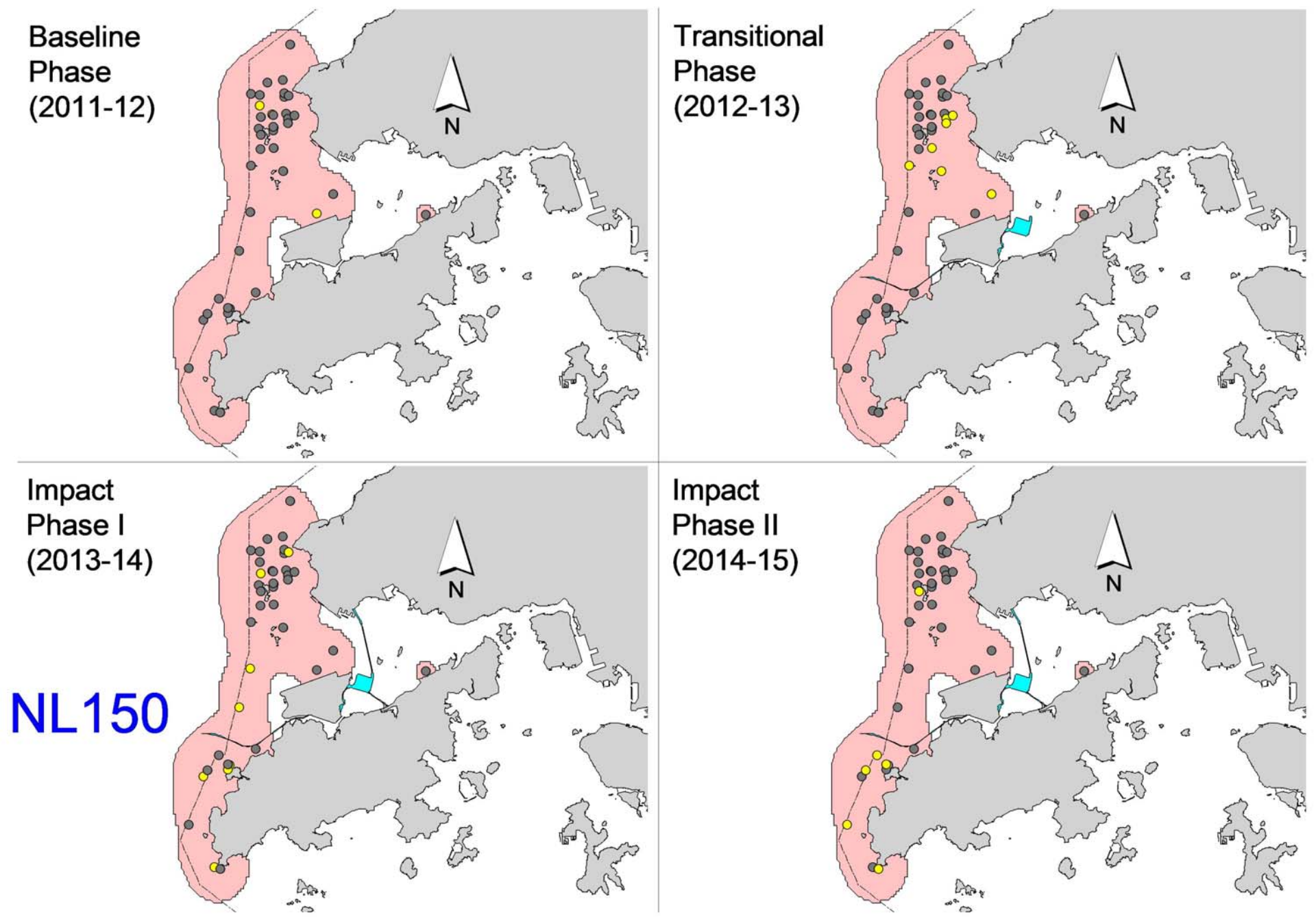
Appendix V. (cont'd)



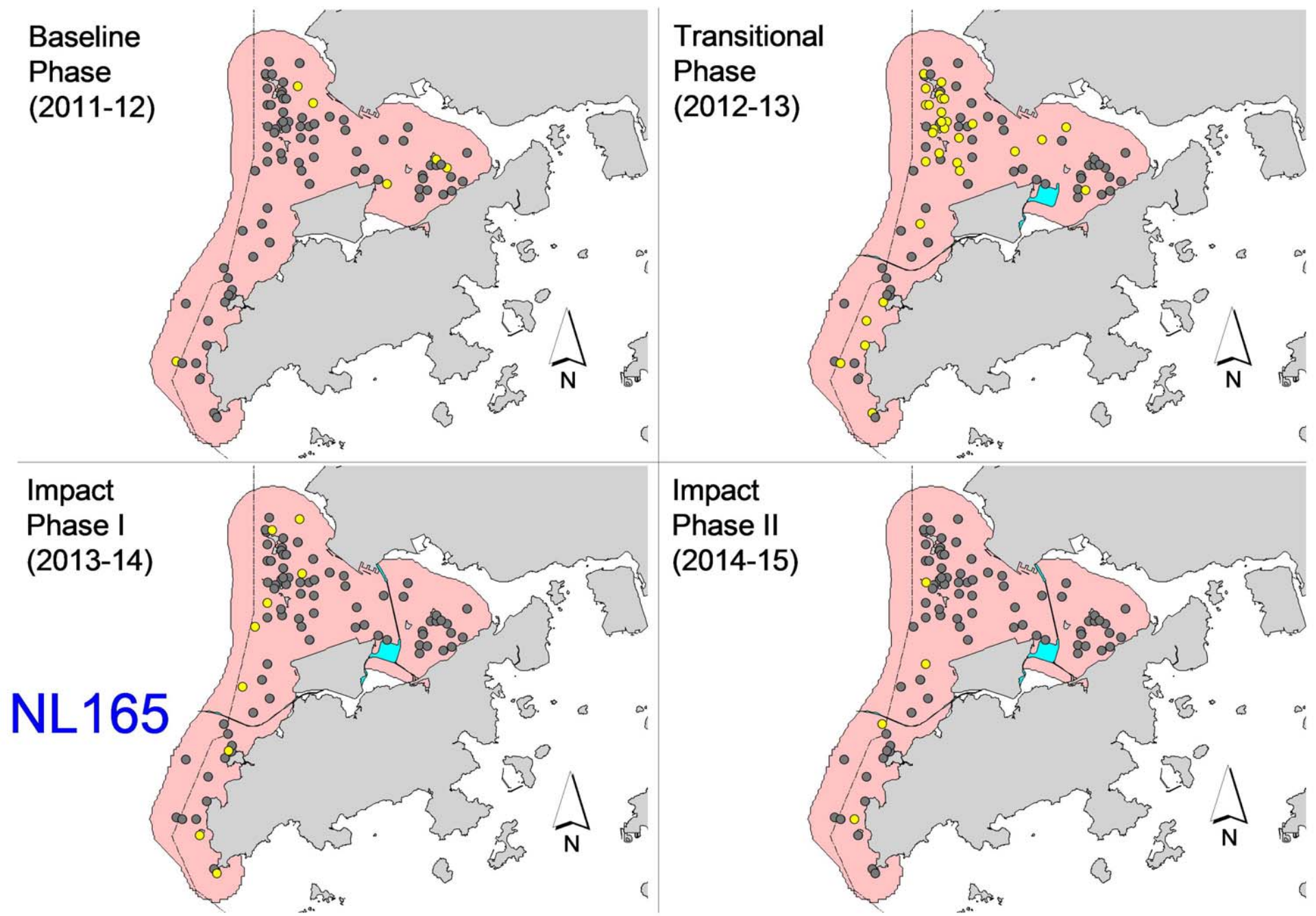
Appendix V. (cont'd)



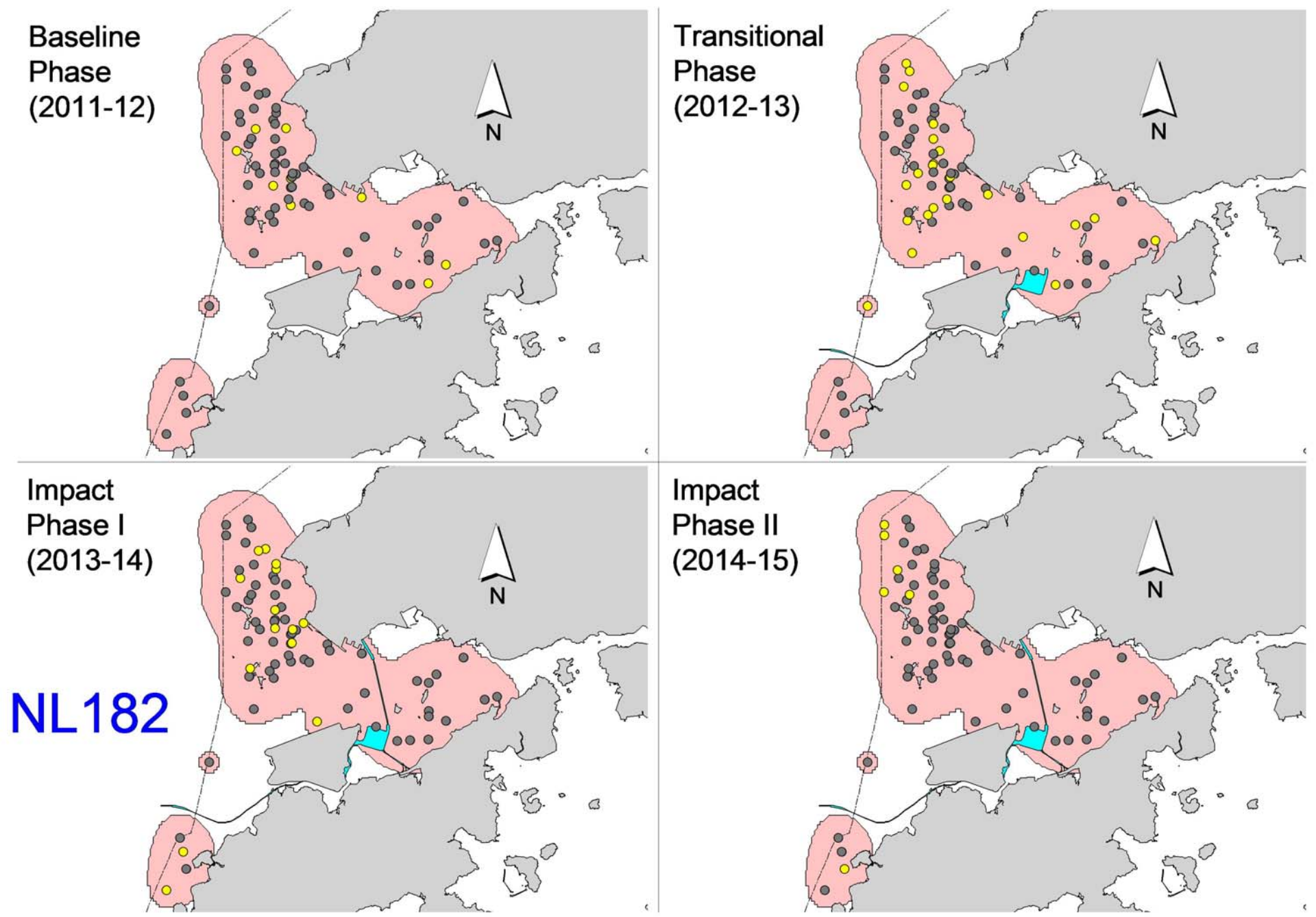
Appendix V. (cont'd)



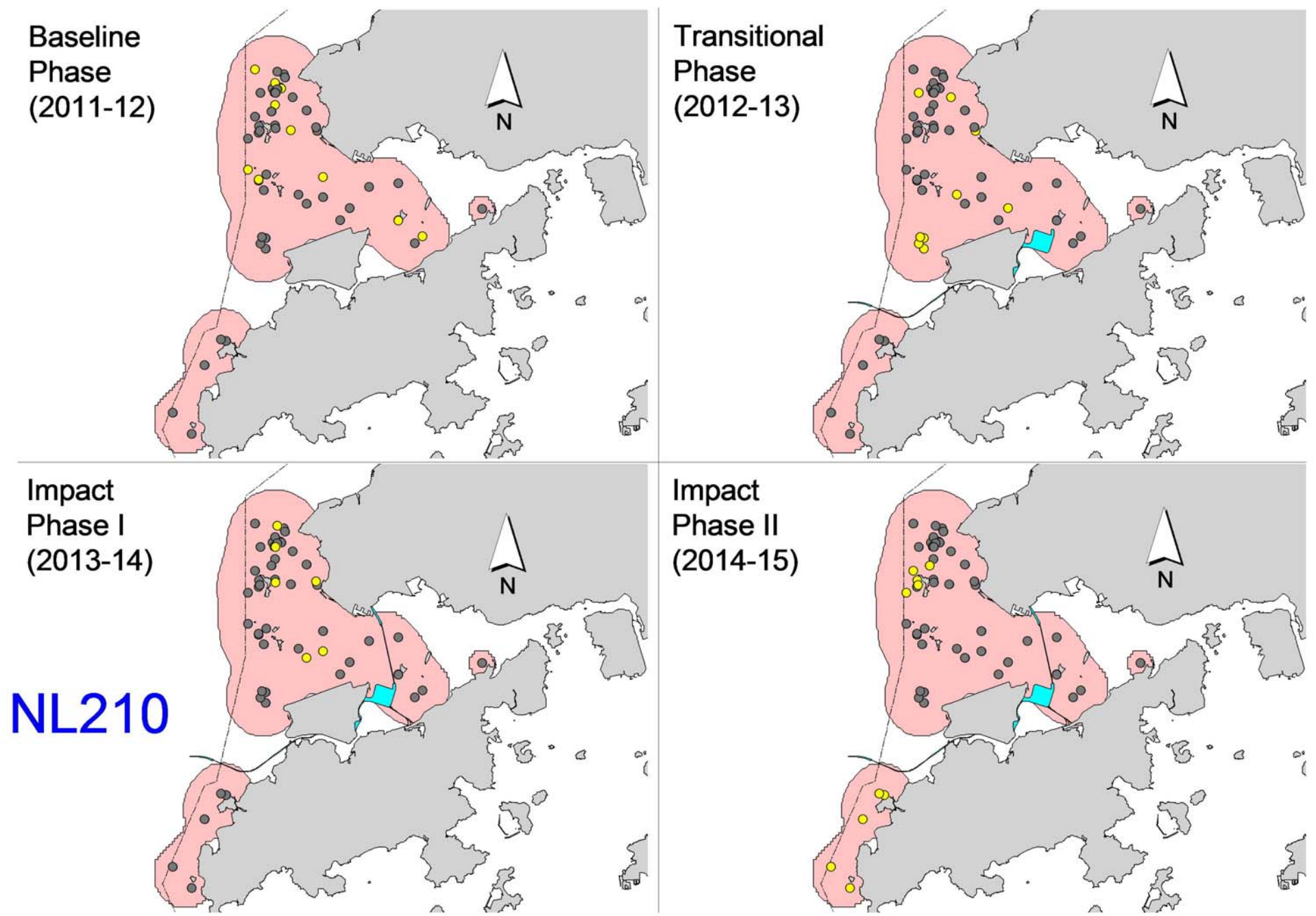
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



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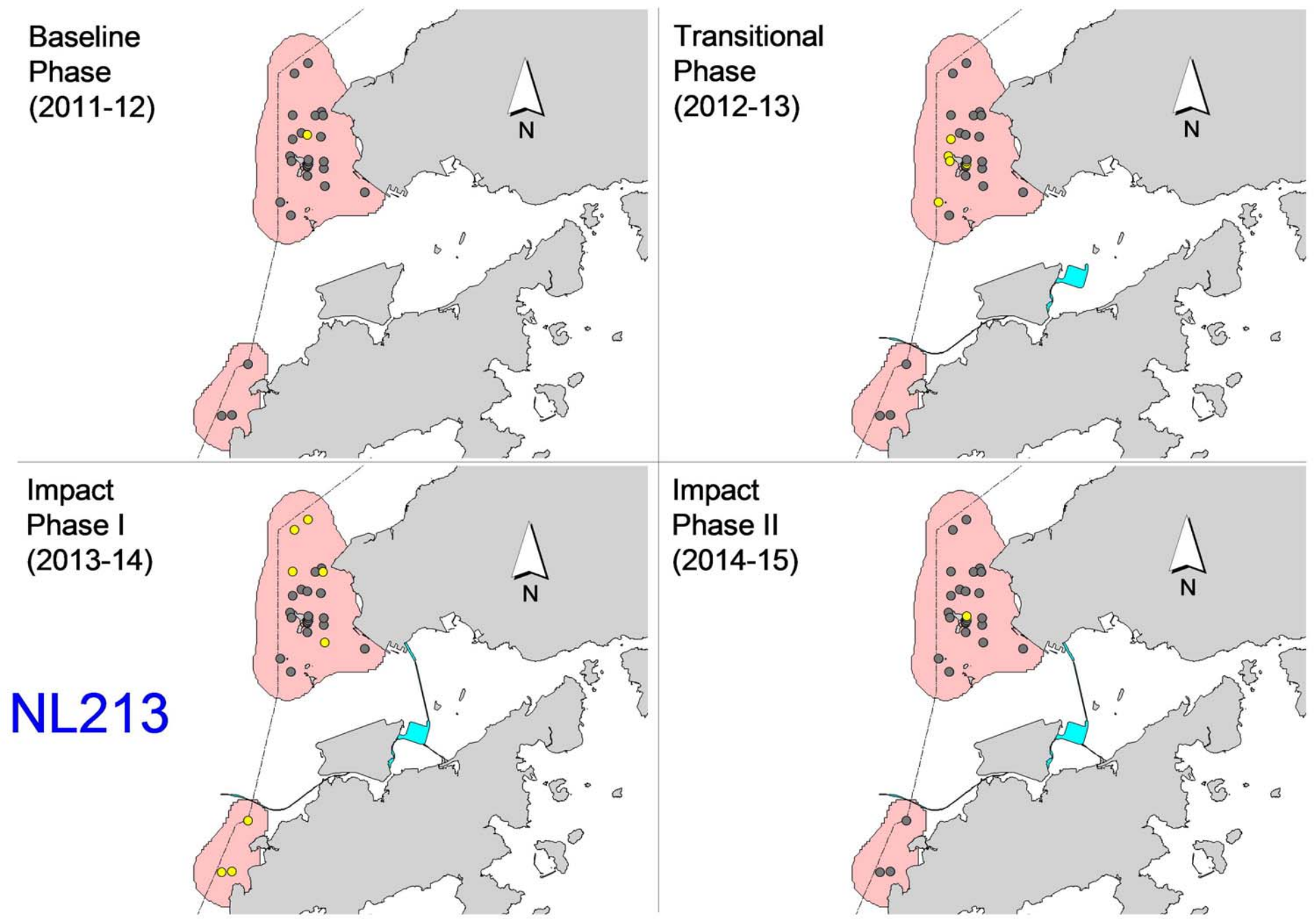

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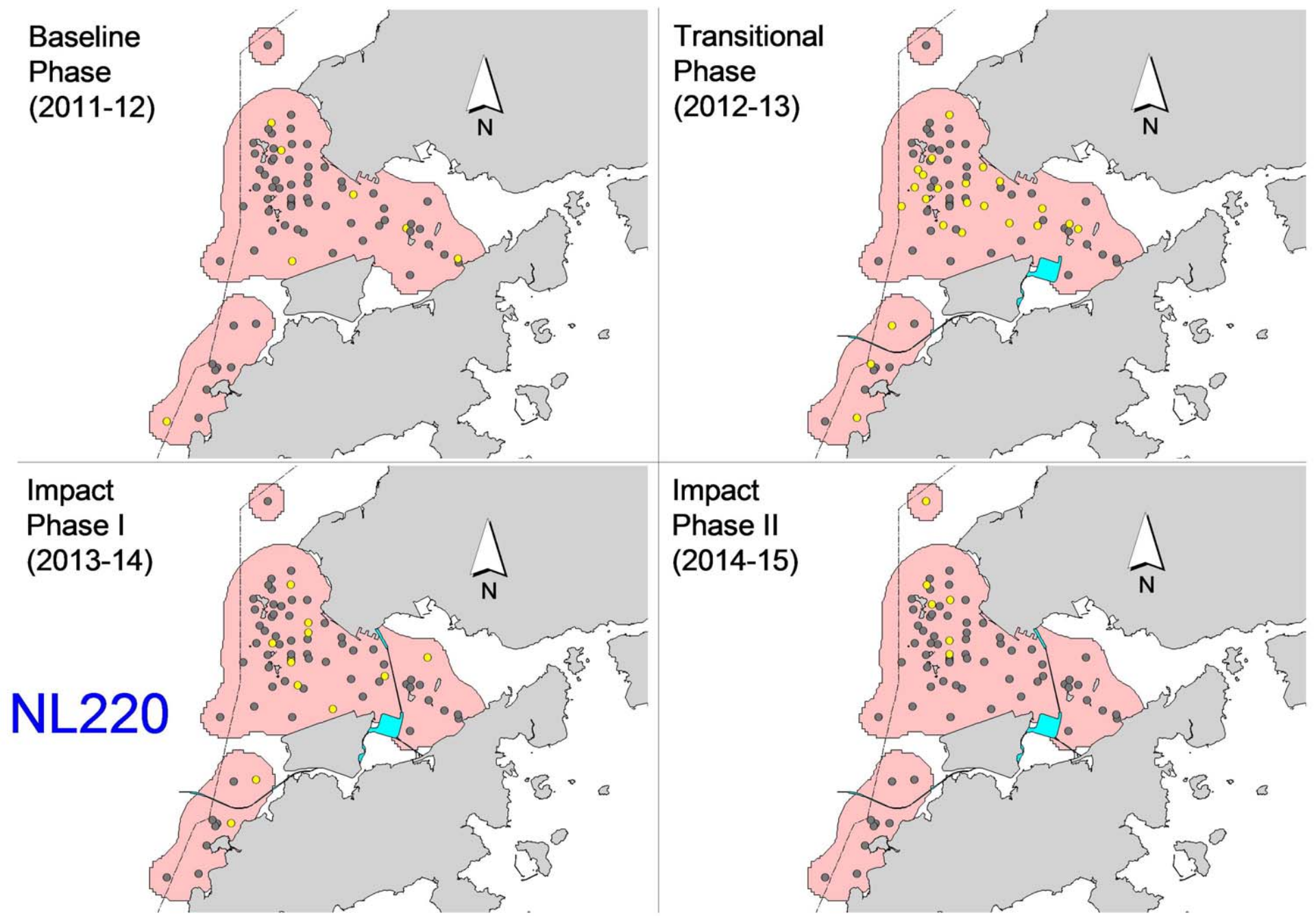

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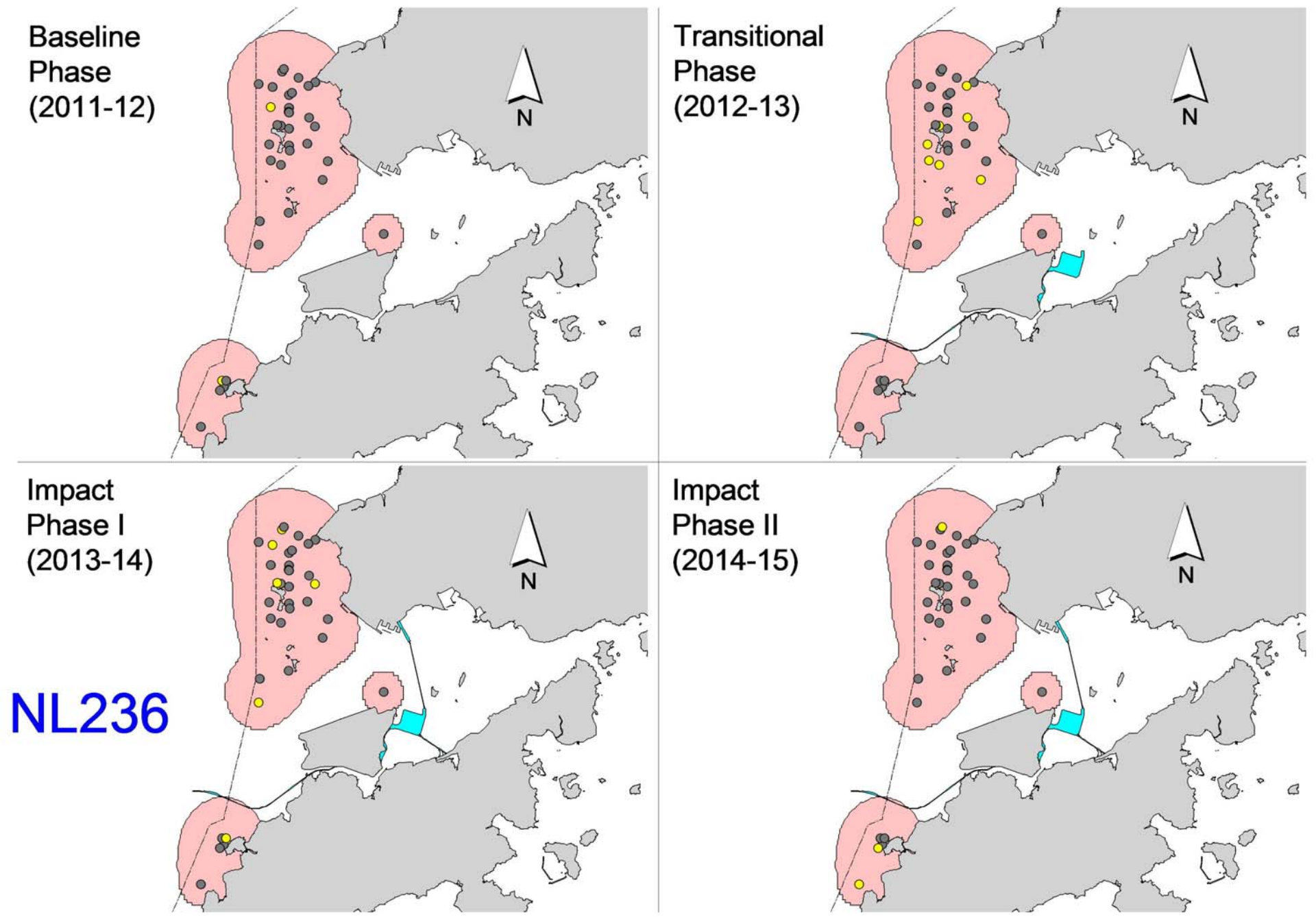

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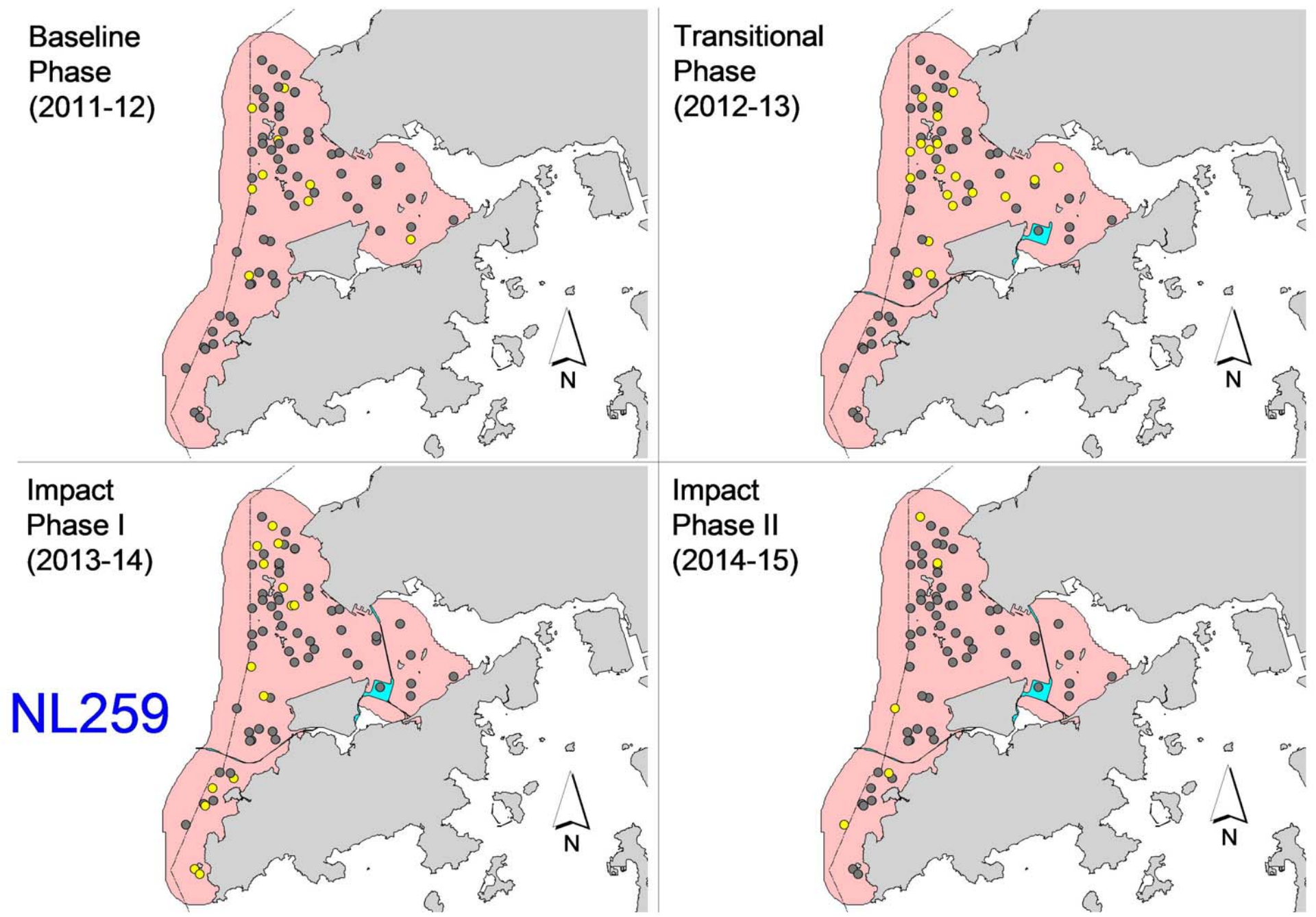

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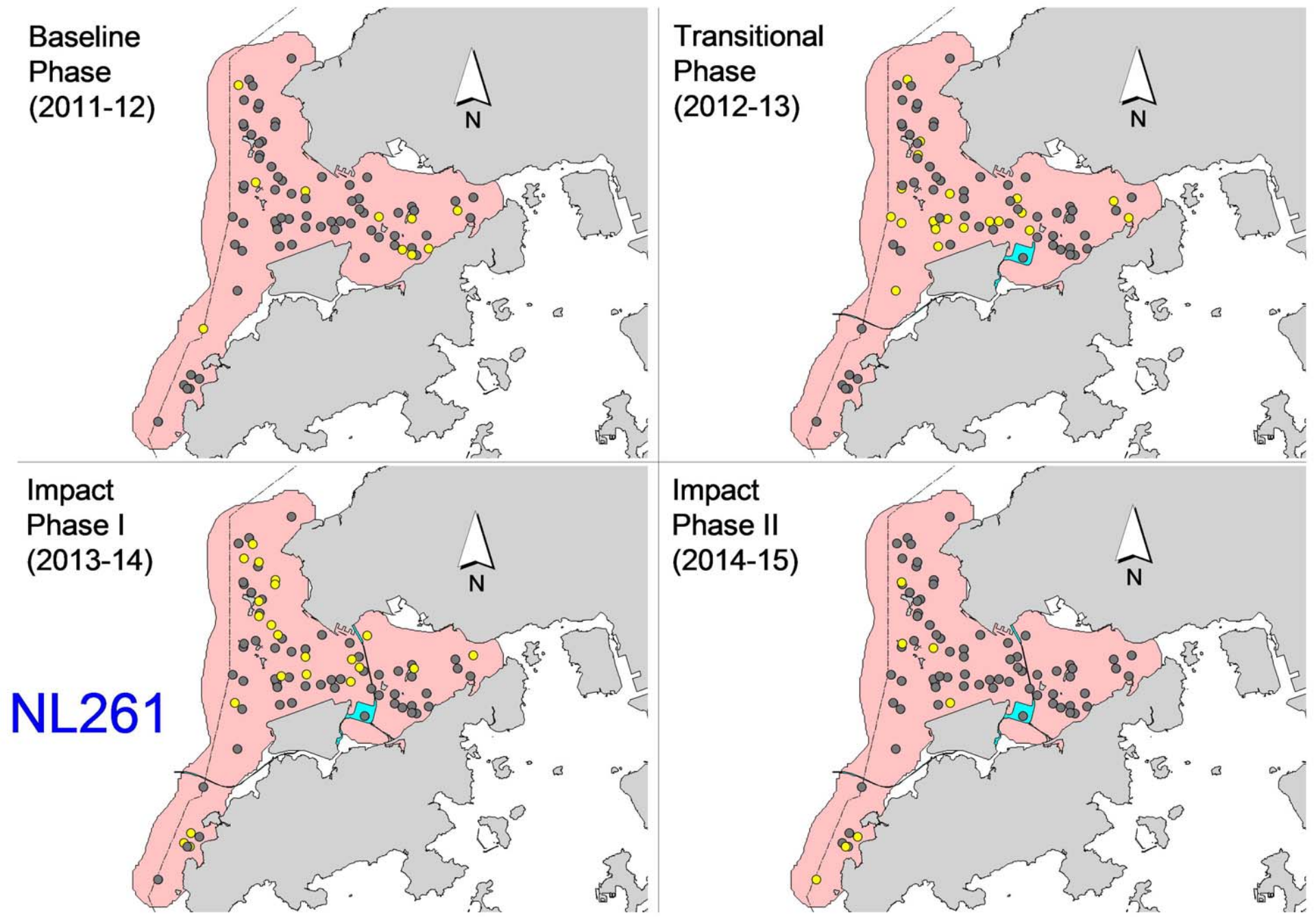

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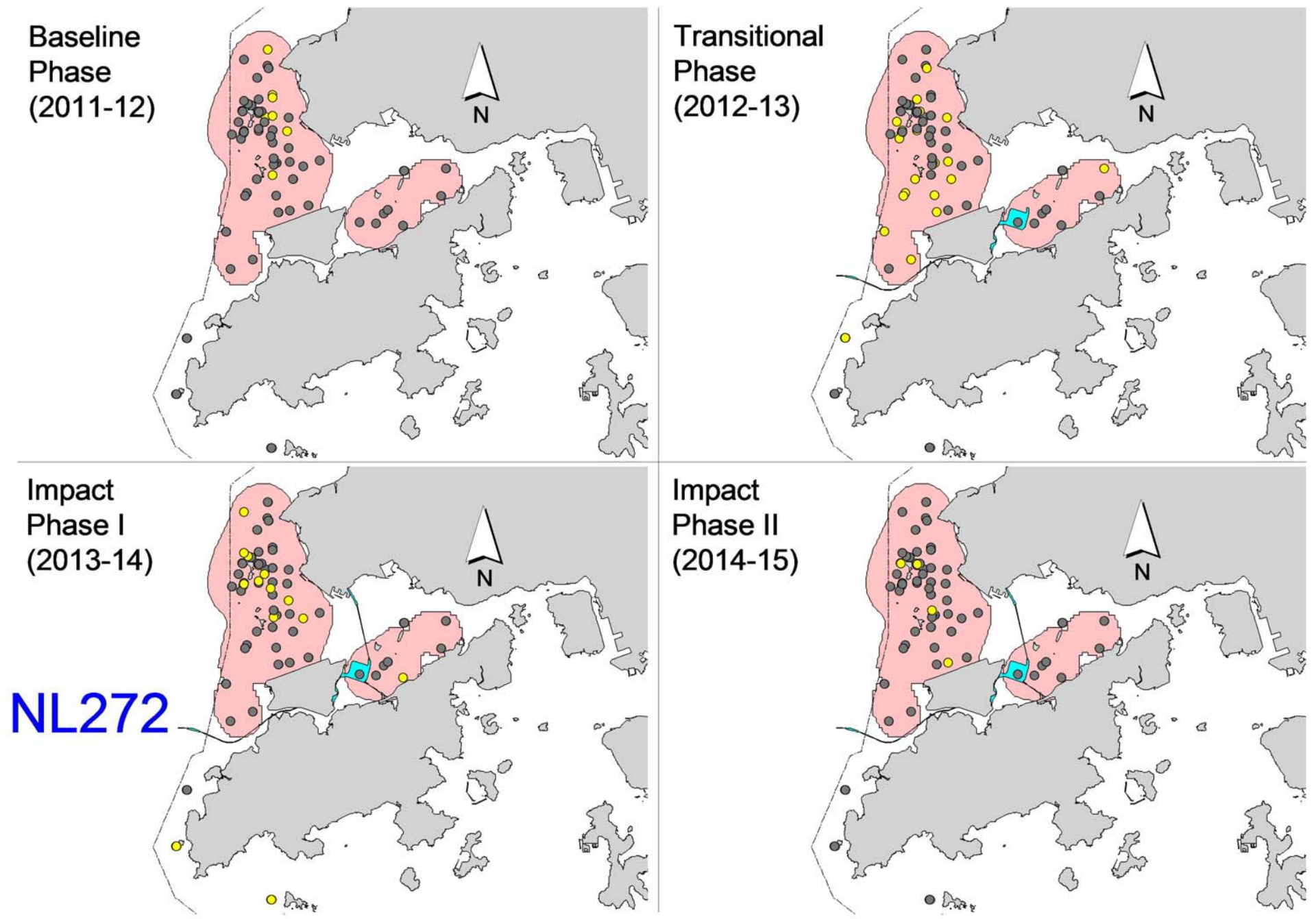

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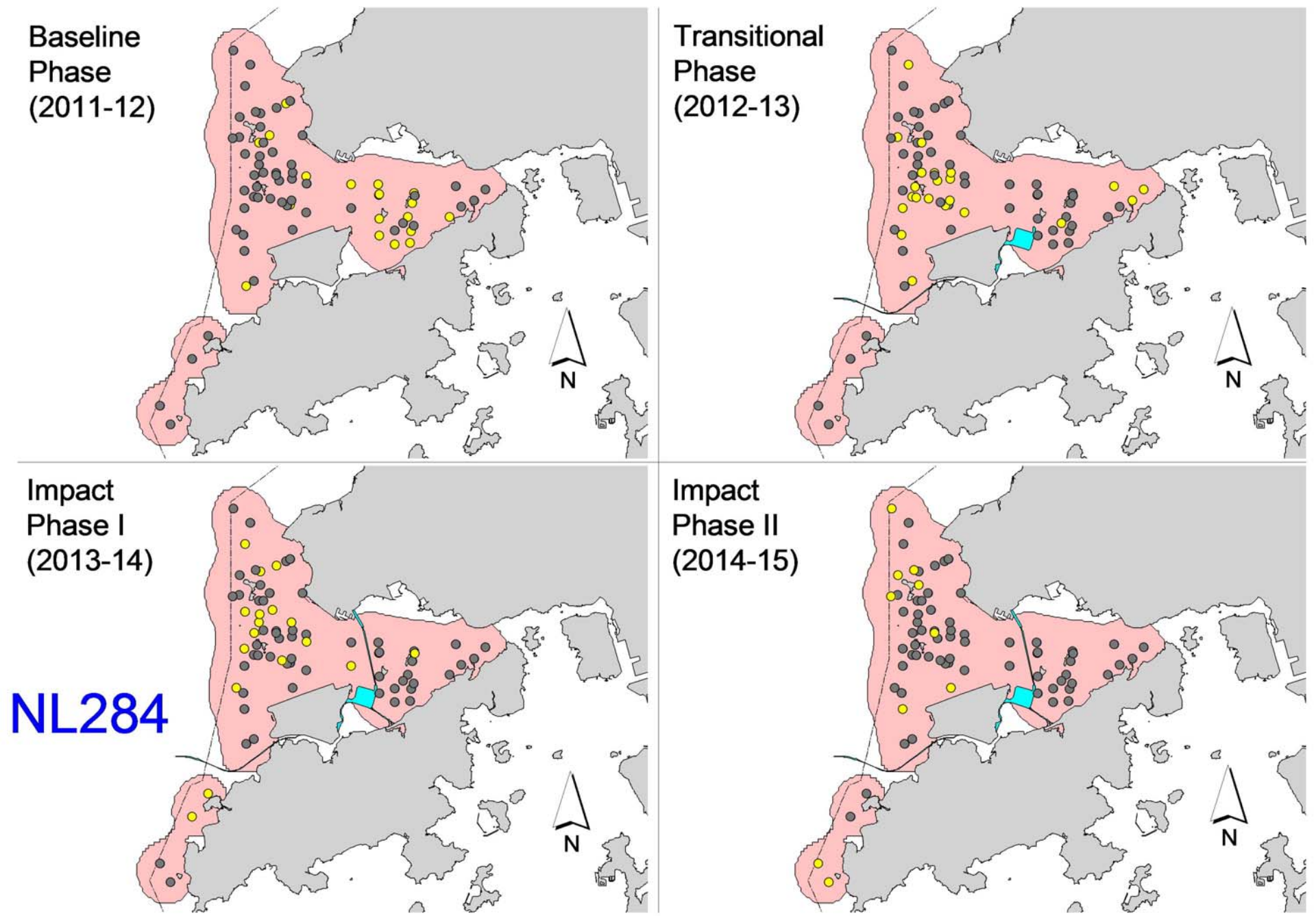

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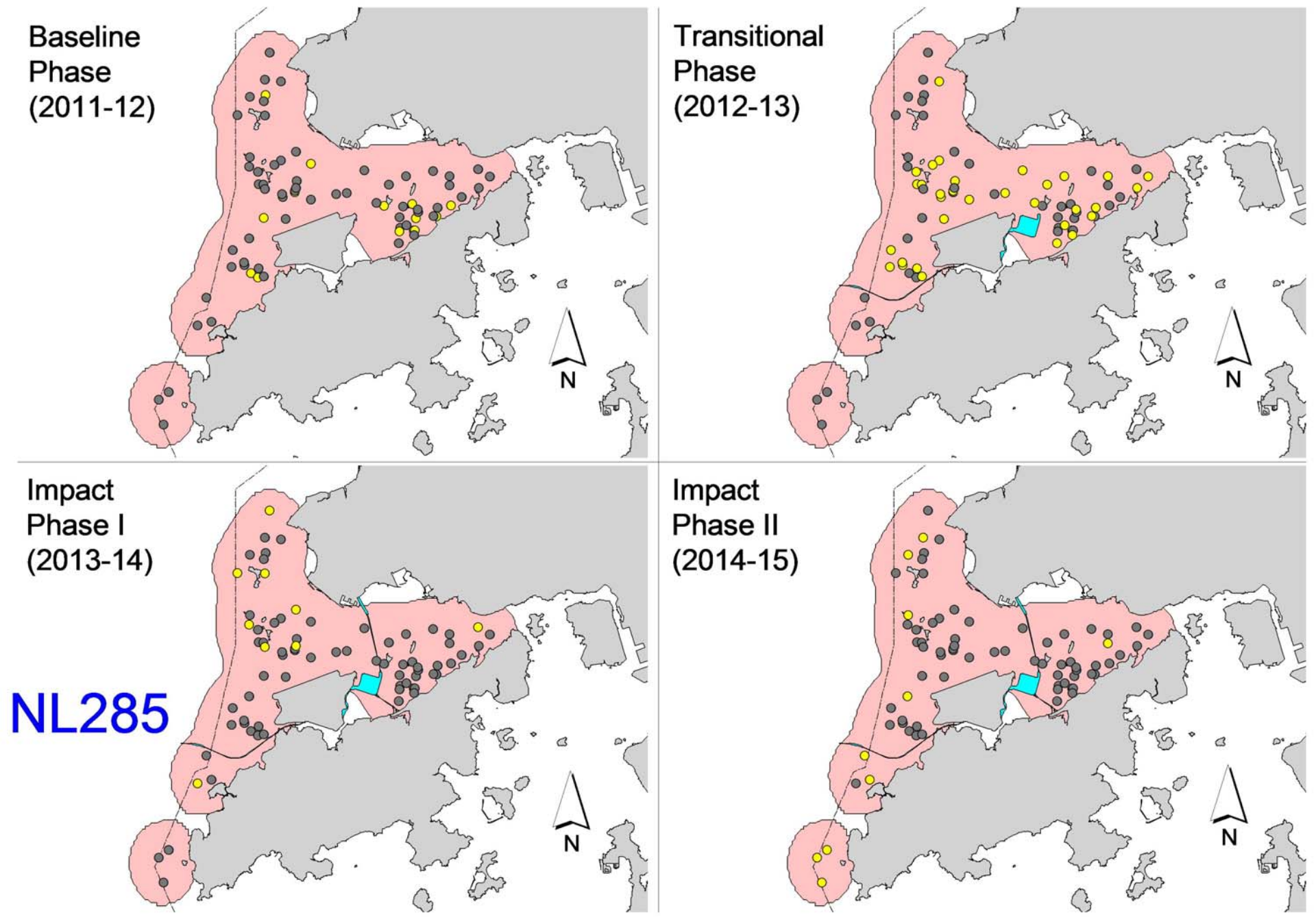

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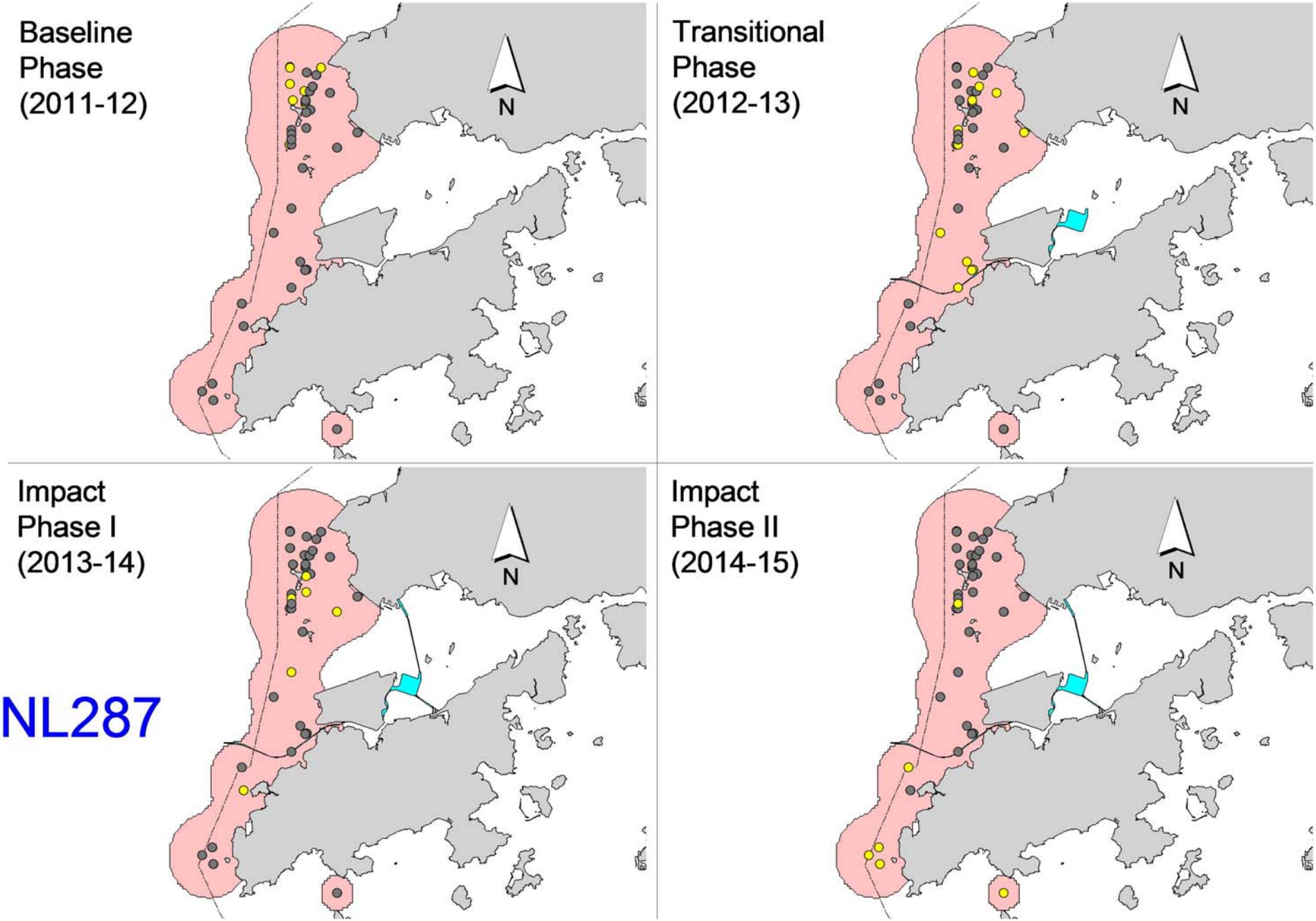

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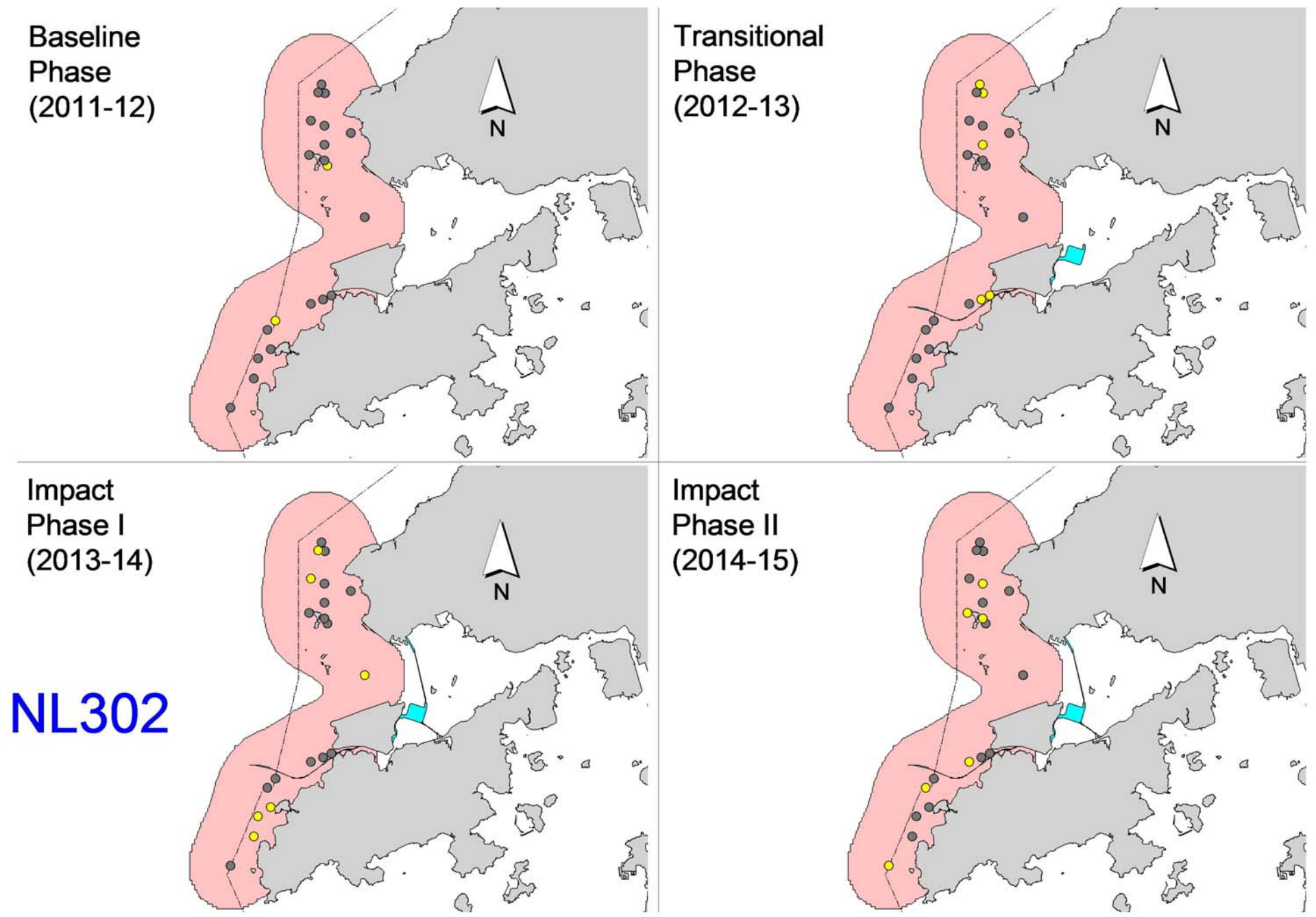

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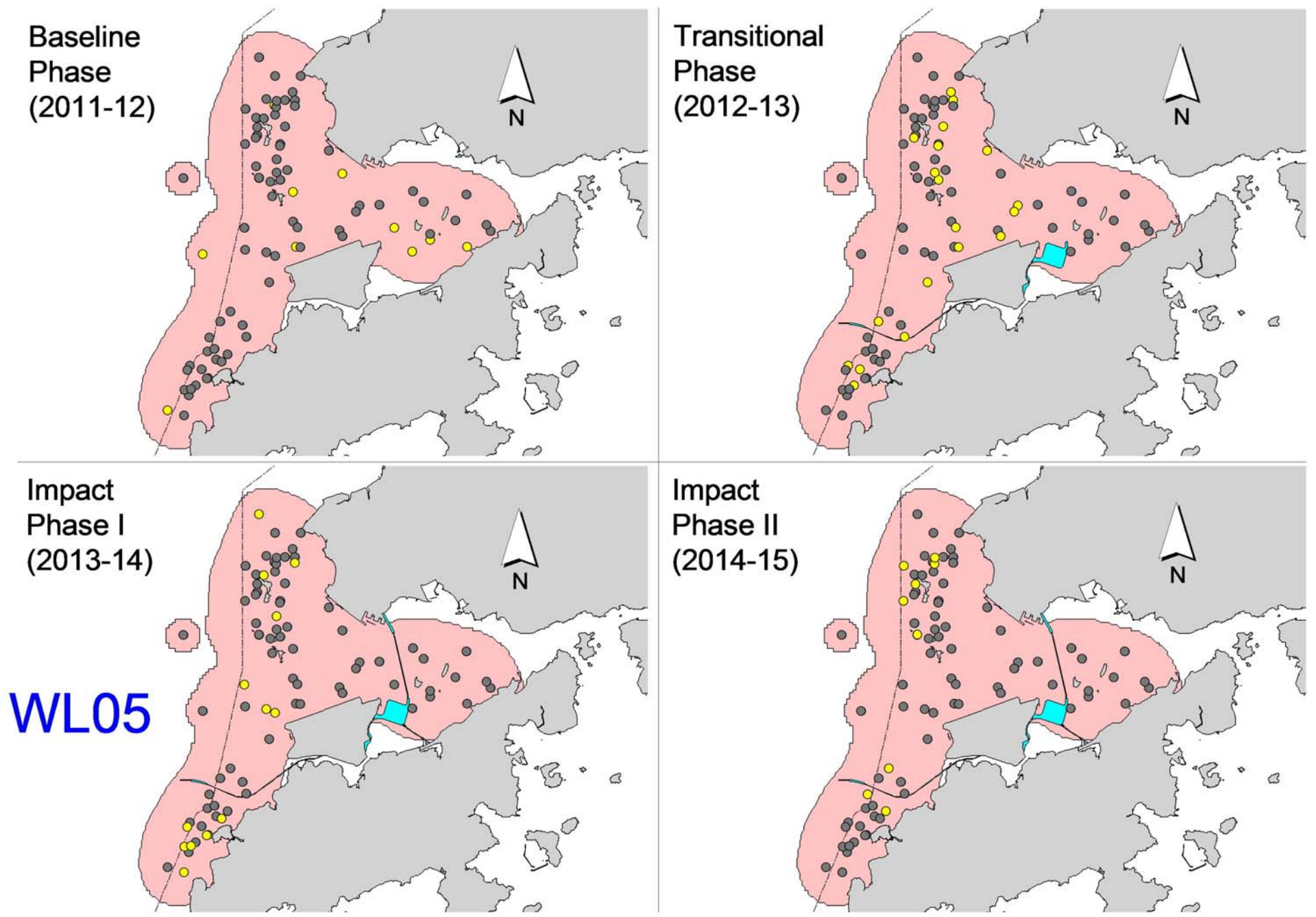

Appendix V. (cont'd)

Appendix G

Event and Action Plan

Event and Action Plan for Impact Air Monitoring

	Action			
	ET [(a)]	**IEC [(a)]**	**SOR [(a)]**	**Contractor(s)**
Action Level Exceedance				
	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Action Level, the exceedance is then confirmed. 3. Inform the IEC and the SOR. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Discuss with the IEC and the Contractor on remedial actions required. 7. If exceedance continues, arrange meeting with the IEC and the SOR. 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate 3. If the exceedance is confirmed to be Project related, submit proposals for remedial actions to IEC within 3 working days of notification 4. Implement the agreed proposals 5. Amend proposal if appropriate

	Action			
	ET [(a)]	**IEC [(a)]**	**SOR [(a)]**	**Contractor(s)**
Limit Level Exceedance				
	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Limit Level, the exceedance is then confirmed. 3. Inform the IEC, the SOR, the DEP and the Contractor. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 7. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 8. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 9. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. If the exceedance is confirmed to be Project related after investigation, 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. If the exceedance is confirmed to be Project related after investigation, submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Amend proposal if appropriate. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Note: (a) ET – Environmental Team; IEC – Independent Environmental Checker; SOR – Supervising Officer's Representative

Event & Action Plan for Impact Water Quality Monitoring

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	1. Confirm receipt of notification of failure in	1. Inform the SOR and confirm notification of the

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;	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.	writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to review the working methods.	non-compliance in writing; 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. Ensure mitigation measures are properly implemented; 5. 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.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

Event / Action Plan for Impact Dolphin Monitoring

EVENT	ACTION			
	ET	**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 finding 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.
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;	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, SOR and	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 SOR is satisfied with the	1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Attend the meeting to discuss with ET, IEC and SOR the necessity of additional dolphin monitoring and any other

EVENT	ACTION			
	ET	**IEC**	**SOR**	**Contractor**
	3. Identify source(s) of impact; 4. Inform the IEC, 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, 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.	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 SOR of the results and findings accordingly. 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise SOR the results and findings accordingly.	proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, 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.	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.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

Appendix H

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

Table H1 *Cumulative Statistics on Exceedances*

Monitoring Parameters	Action/Limit Level	Total No. recorded in this reporting year (Nov 2014 to Oct 2015)	Total No. recorded since project commencement
1-Hr TSP	Action	4	30
	Limit	0	2
24-Hr TSP	Action	0	5
	Limit	0	1
Water Quality	Action	0	6
	Limit	0	1
Impact Dolphin Monitoring	Action	2	7
	Limit	3	3

Table H2 *Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions*

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
This Reporting Period (Nov 2014 to Oct 2015)	2	0	0
Total No. received since project commencement	4	0	0

Appendix I

Waste Flow Table

Appendix D – Monthly Summary Waste Flow Table

Name of Department: HyD **Contract No. / Works Order No.:** HY/2012/08

Monthly Summary Waste Flow Table for December 2014 [to be submitted not later than the 15th day of each month following reporting month] (All quantities shall be rounded off to 3 decimal places.)

Month	Monthly Break-down of Inert Construction & Demolition Materials (i.e. Public Fill Materials)				
	(a)=(b)+(c)+(d)+(e) Total Quantity Generated	(b) Hard Rock and Large Broken Concrete	(c) Reused in the Contract	(d) Reused in other Projects	(e) Disposed of as Public Fill
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
2013 Sub-total	3.718	0.000	0.000	0.000	3.718
Jan-2014	9.012	0.000	0.000	0.000	9.012
Feb-2014	0.000	0.000	0.000	0.000	0.000
Mar-2014	0.105	0.000	0.000	0.000	0.105
Apr-2014	0.022	0.000	0.000	0.000	0.022
May-2014	1.016	0.000	0.000	0.000	1.016
Jun-2014	4.393	0.000	0.000	0.000	4.393
Half Year Sub-total	14.548	0.000	0.000	0.000	14.548
Jul-2014	14.405	0.000	0.000	0.000	14.405
Aug-2014	12.728	0.000	0.000	0.000	12.728
Sep-2014	6.843	0.000	0.000	0.000	6.843
Oct-2014	1.228	0.000	0.000	0.000	1.228
Nov-2014	0.595	0.000	0.000	0.000	0.595
Dec-2014	10.151	0.000	0.000	0.000	10.151
Project Total Quantities	64.216	0.000	0.000	0.000	64.216

Month	Monthly Construction & Demolition Material Movements (Import Fill Materials & Marine Mud Disposal)							
	Imported Fill to WA 23 & Reclamation Area (Rockfill 400)	Imported Fill to WA 23 & Reclamation Area (Rockfill 200)	Imported Fill to WA 23 & Reclamation Area (Rockfill Type A)	Imported Fill to Reclamation Area (Public Fill) (by Barge)	* Imported Fill to Reclamation Area (Public Fill)(From Rambler Channel) (by Truck)	* Imported Fill to Reclamation Area (From RTT Barging Point) (by Truck)	Marine Disposal (Cat. L)	Marine Disposal (Cat. M_P &M_F)
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
2013 Sub-total	211.541	2.508	19.460	0.000	0.000	45.472	61.600	18.200
Jan-2014	177.300	4.050	8.544	0.000	0.000	124.412	34.000	12.500
Feb-2014	143.891	27.825	5.371	0.000	0.000	81.296	18.500	24.500
Mar-2014	257.304	53.388	27.958	113.789	0.000	63.961	37.300	40.450
Apr-2014	198.245	10.186	41.702	191.094	0.000	26.640	28.600	15.400
May-2014	236.816	4.612	65.308	150.749	43.718	15.165	18.700	29.150
Jun-2014	233.430	2.856	37.103	108.667	25.433	0.000	40.700	7.700
Half Year Sub-total	1246.986	102.917	185.986	564.299	69.151	311.474	177.800	129.700
Jul-2014	177.859	0.000	65.758	161.817	22.958	0.000	37.950	7.150
Aug-2014	174.710	23.110	33.127	351.703	40.379	0.000	12.100	0.000
Sep-2014	124.251	28.994	23.424	476.618	22.932	0.000	0.000	0.000
Oct-2014	22.217	22.729	17.547	481.962	0.000	0.000	0.000	0.000
Nov-2014	25.889	22.640	16.268	175.370	0.000	0.000	2.320	0.000
Dec-2014	23.498	2.830	1.431	80.520	0.000	0.000	0.000	0.000
Project Total Quantities	2006.951	205.728	363.001	2292.289	155.420	356.946	291.770	155.050

- Fields under review. These are good imported purchased material, not wastes generated from the site.

Month	**Actual Quantities of <u>Non-inert</u> Construction Waste Generated Monthly**								
	Metals		Paper/ cardboard packaging		Plastics (see Note 3)		Chemical Waste		Others, e.g. General Refuse disposed at Landfill
	(in '000kg)		(in '000kg)		(in '000kg)		(in '000kg)		(in '000ton)
	generated	recycled	generated	recycled	generated	recycled	generated	Disposed	generated
2013 Sub-total	0.000	0.000	0.380	0.380	0.000	0.000	0.000	0.000	0.172
Jan-2014	0.000	0.000	0.130	0.130	0.000	0.000	0.000	0.000	0.045
Feb-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.028
Mar-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036
Apr-2014	0.000	0.000	0.160	0.160	0.000	0.000	0.000	0.000	0.026
May-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042
Jun-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030	0.030
Half Year Sub-total	0.000	0.000	0.290	0.290	0.000	0.000	0.050	0.050	0.207
Jul-2014	0.000	0.000	0.300	0.300	0.000	0.000	0.000	0.000	0.033
Aug-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
Sep-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.039
Oct-2014	0.000	0.000	0.080	0.080	0.000	0.000	0.060	0.060	0.033
Nov-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050
Dec-2014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.049
Project Total Quantities	0.000	0.000	1.050	1.050	0.000	0.000	0.110	0.110	0.605

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*							
Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed of as Public Fill	Imported Fill	Marine Disposal (Cat. L)	Marine Disposal (Cat. M)
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 m^3)	(in '000 m^3)
5.000	0.000	0.000	0.000	5.000	180.000	5.000	40.000

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*				
Metals	Paper/ cardboard packaging	Plastics (see Note 3)	Chemical Waste	General Refuse disposed of at Landfill
(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m^3)
0.000	0.050	0.000	0.000	0.100

Notes:
(1) The performance targets are given in the **ER Appendix 8J Clause 14** and the EM & A Manual(s).
(2) The waste flow table shall also include C&D materials to be imported for use at the Site.
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
(4) The Contractor shall also submit the latest forecast of the total amount of C&D materials expected to be generated from the Works, together with a breakdown of the nature where the amount of C&D materials expected to be generated from the Works is equal to or exceeding 50,000 m^3. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).

Monthly Summary Waste Flow Table

Name of Department: HyD **Contract No. / Works Order No.: HY/2012/08**

Monthly Summary Waste Flow Table for October 2015 [to be submitted not later than the 15th day of each month following reporting month] (All quantities shall be rounded off to 3 decimal places.)

Month	Monthly Break-down of Inert Construction & Demolition Materials (i.e. Public Fill Materials)				
	(a)=(b)+(c)+(d)+(e) Total Quantity Generated	(b) Hard Rock and Large Broken Concrete	(c) Reused in the Contract	(d) Reused in other Projects	(e) Disposed of as Public Fill
	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
Sub-total	64.216	0.000	0.000	0.000	64.216
Jan-2015	30.877	0.000	0.000	0.000	30.877
Feb-2015	4.152	0.000	0.000	0.000	4.152
Mar-2015	36.718	0.000	0.000	0.000	36.718
Apr-2015	62.847	0.000	0.000	0.000	62.847
May-2015	121.436	0.000	0.000	0.000	121.436
Jun-2015	247.282	0.000	0.000	0.000	247.282
Half Year Sub-total	503.312	0.000	0.000	0.000	503.312
Jul-2015	233.422	0.000	0.000	0.000	233.422
Aug-2015	62.367	0.000	0.000	0.000	62.367
Sep-2015	9.555	0.000	0.000	0.000	9.555
Oct-2015	1.979	0.000	0.000	0.000	1.979
Nov-2015					
Dec-2015					
Project Total Quantities	874.255	0.000	0.000	0.000	874.255

Month	**Actual Quantities of <u>Non-inert</u> Construction Waste Generated Monthly**								
	Metals		Paper/ cardboard packaging		Plastics (see Note 3)		Chemical Waste		Others, e.g. General Refuse disposed at Landfill
	(in '000kg)		(in '000kg)		(in '000kg)		(in '000kg)		(in '000ton)
	generated	recycled	generated	recycled	generated	recycled	generated	Disposed	generated
Sub-total	0.000	0.000	1.050	1.050	0.000	0.000	0.110	0.110	0.605
Jan-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080
Feb-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.074
Mar-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.115
Apr-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.091
May-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.108
Jun-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120
Half Year Sub-total	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.588
Jul-2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.172
Aug-2015	0.000	0.000	0.000	0.300	0.000	0.000	0.000	0.000	0.246
Sep-2015	0.000	0.000	0.000	0.300	0.220	0.220	0.000	0.000	0.195
Oct-2015	0.000	0.000	0.000	0.300	0.000	0.000	0.000	0.000	0.177
Nov-2015									
Dec-2015									
Project Total Quantities	0.000	0.000	1.050	1.350	0.220	0.220	0.110	0.110	1.983

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*				
Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed of as Public Fill
(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)	(in '000 ton)
100.000	0.000	0.000	0.000	100.000

Forecast of Total Quantities of Construction and Demolition Materials to be Generated from the Contract*				
Metals	Paper/ cardboard packaging	Plastics (see Note 3)	Chemical Waste	General Refuse disposed of at Landfill
(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m^3)
0.000	0.000	0.000	0.000	0.200

Notes:
(1) The performance targets are given in the **ER Appendix 8J Clause 14** and the EM & A Manual(s).
(2) The waste flow table shall also include C&D materials to be imported for use at the Site.
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.
(4) The Contractor shall also submit the latest forecast of the total amount of C&D materials expected to be generated from the Works, together with a breakdown of the nature where the amount of C&D materials expected to be generated from the Works is equal to or exceeding 50,000 m^3. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).