



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

*Fourteenth Quarterly Environmental Monitoring  
& Audit (EM&A) Report*

15 January 2018

**Environmental Resources Management**  
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Ref.: HYDHZMBEEM00\_0\_6178L.18

16 January 2018

AECOM  
Supervising Officer Representative's Office  
No.8 Mong Fat Street, Tuen Mun,  
New Territories, Hong Kong

By Fax (2293 6300) and By Post

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  
Fourteenth Quarterly EM&A Report (March 2017 – May 2017)**

Reference is made to the Fourteenth Quarterly Environmental Monitoring and Audit (EM&A) Report (March 2017 - May 2017) (ET's ref.: "0212330\_14th Quarterly EM&A\_20170104.doc" dated 15 January 2018) certified by the ET Leader and provided to us via e-mail on 15 January 2018.

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

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

Yours sincerely,



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

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

Internal: DY, YH, TMC, ENPO Site

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# Contract No. HY/2012/08





## Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

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*Fourteenth Quarterly Environmental Monitoring & Audit (EM&A) Report*

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Client:  DBJV		Project No:  0212330			
Summary:  This document presents the Fourteenth Quarterly EM&A Report for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.		Date: 15 January 2018			
		Approved by:  			
		Mr Craig Reid Partner			
		Certified by:  			
		Mr Jovy Tam ET Leader			
	14 <sup>th</sup> Quarterly EM&A Report	VAR	JT	CAR	15/01/18
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p>			
		 			

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## **EXECUTIVE SUMMARY**

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 Ltd. 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 Fourteenth Quarterly EM&A report presenting the EM&A works carried out during the period from 1 March 2017 to 31 May 2017 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 quarter included:

### *Land-based Works*

- Box Culvert Extension at Works Area – Portion N-A;
- Construction of North Ventilation Building – Portion N-C;
- Construction of Cross Passage Tympanum – TBM tunnel;
- Cross Passage Lining Installation – TBM Tunnel;
- Excavation of Sub-sea Tunnel – TBM tunnel;
- Corbel Construction – TBM Tunnel;
- Sub-sea Tunnel Gallery Installation – TBM tunnel;
- Bulk Excavation – Portion S-A; and
- Jet Grouting, CSM Ground Treatment and Diaphragm Wall Construction – Portion S-A.

### *Marine-based Works*

- Construction of Vertical Seawall at Portion N-A; and
- Band drains and Filling works at Portion N-A.

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

24-hour TSP Monitoring	31 sessions
1-hour TSP Monitoring	31 sessions
Water Quality Monitoring	39 sessions
Impact Dolphin Monitoring	6 sessions
Joint Environmental Site Inspection	14 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. 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. No sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) was recorded in this reporting period during the exclusion zone monitoring.

#### Summary of Breaches of Action/Limit Levels

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

No exceedances were recorded from the air quality monitoring in this reporting period.

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

No exceedances were recorded from the water quality monitoring in this reporting period.

##### *Dolphin Monitoring*

Whilst one (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between March and May 2017, 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 quarter.

#### 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.

One (1) environmental complaint case regarding noise nuisance and water pollution was referred by EPD on 27 March 2017.

The complaint investigation reports are provided in Appendix J.

A notification of summons regarding the complaint case received on 17 November 2016 has been received in the reporting period.

### Reporting Change

There was no reporting change required in the reporting period.

### Upcoming Works for the Next Reporting Period

Works to be undertaken in the coming quarterly period include the following:

#### *Land-based Works*

- Box Culvert Extension at Works Area – Portion N-A;
- Construction of North Ventilation Building – Portion N-C;
- Construction of Cross Passage Tympanum – TBM tunnel;
- Cross Passage Lining Installation – TBM Tunnel;
- Excavation of Sub-sea Tunnel – TBM tunnel;
- Corbel Construction – TBM Tunnel; and
- CSM Ground Treatment and Bulk excavation – Portion S-A

### Future Key Issues

Potential environmental impacts arising from the above upcoming construction activities in the coming quarterly period are expected to be mainly associated with dust, marine water quality, marine ecology and waste management issues.

## 1.1

## BACKGROUND

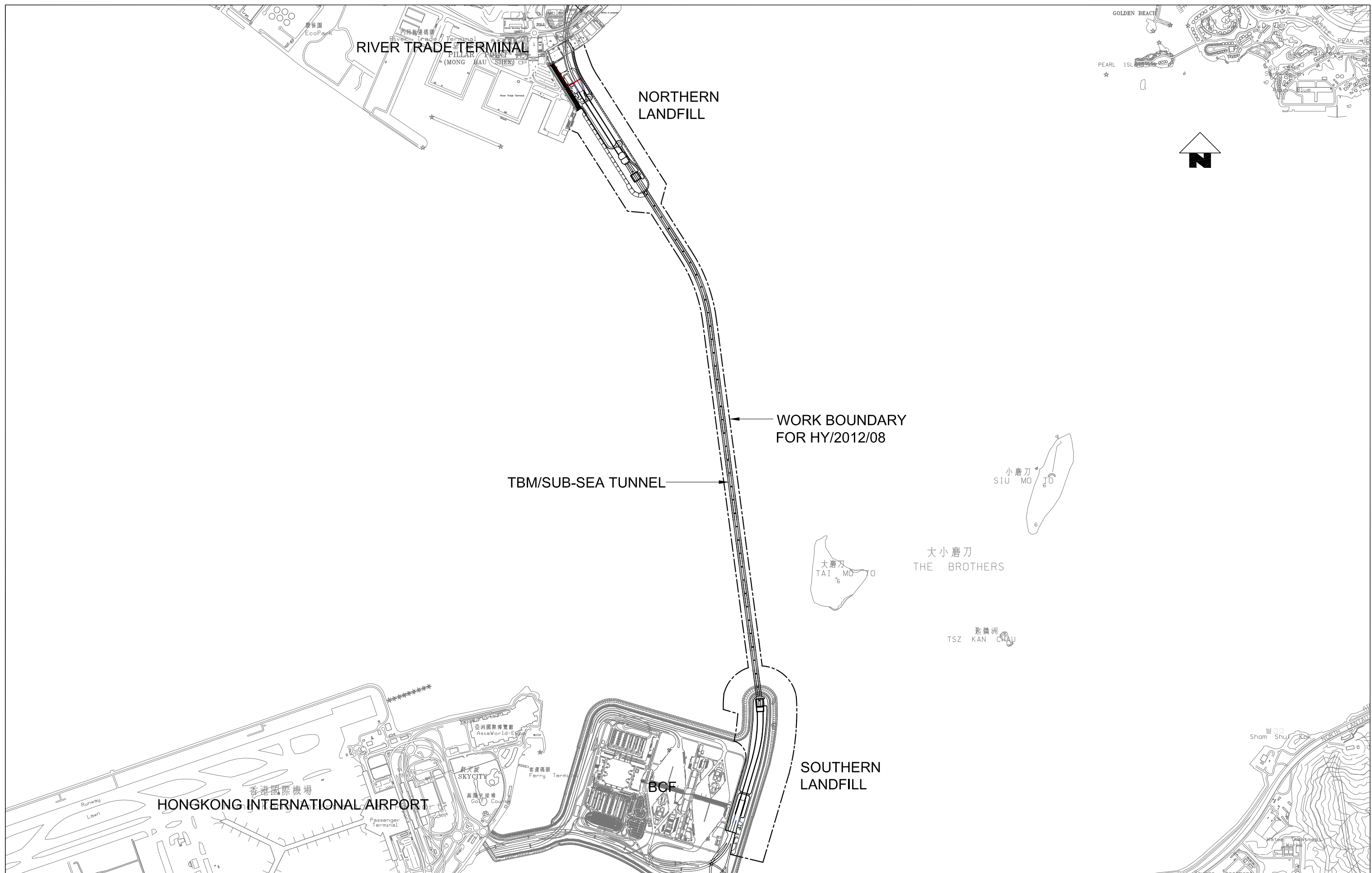
According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated 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) in accordance with Environmental Permit No. EP-354/2009/A. Ramboll 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*.





Designed By	PKV
Drawn By	DAI
Approved By	SPo
Date	11SEP2013
Rev.	Description
A	FIRST ISSUE
	11SEP13
	PKV
	Checked

Main Contractor

Dragages - Bouygues Joint Venture 寶嘉 - 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

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.

## 1.2 SCOPE OF REPORT

This is the Fourteenth Quarterly 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 March 2017 to 31 May 2017.

## 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 22/HZMB	Chow Man Lung, Andrew	2762 4110	2762 4110
SOR (AECOM Asia Company Limited)	Chief Resident Engineer	Roger Man	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 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

The construction phase of this Contract was commenced on 1 November 2013. The construction programme is shown in *Appendix B*.

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

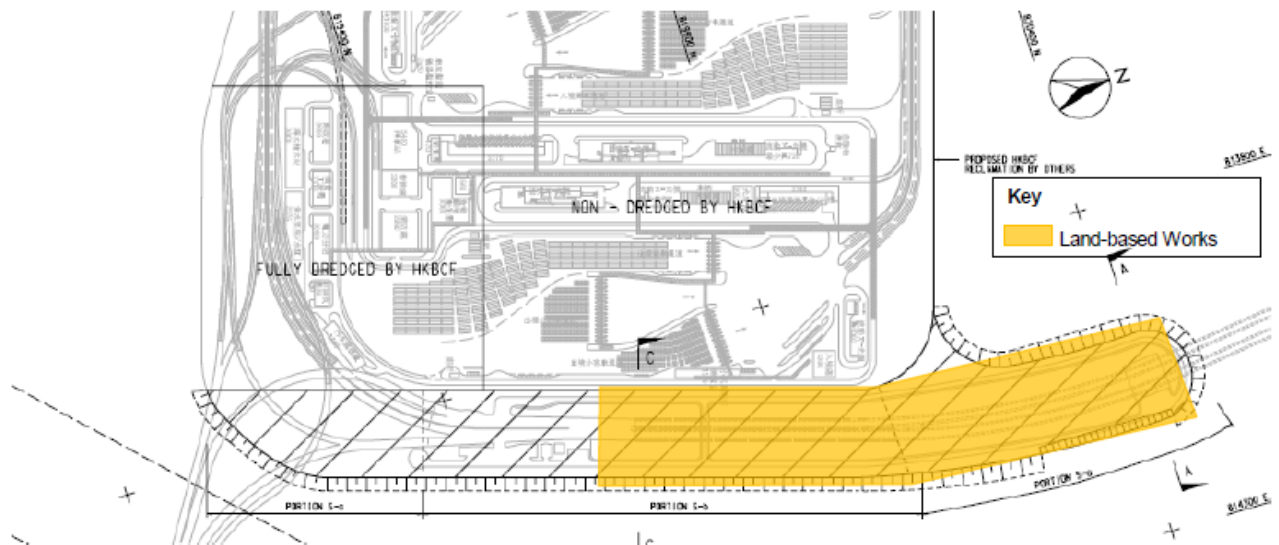
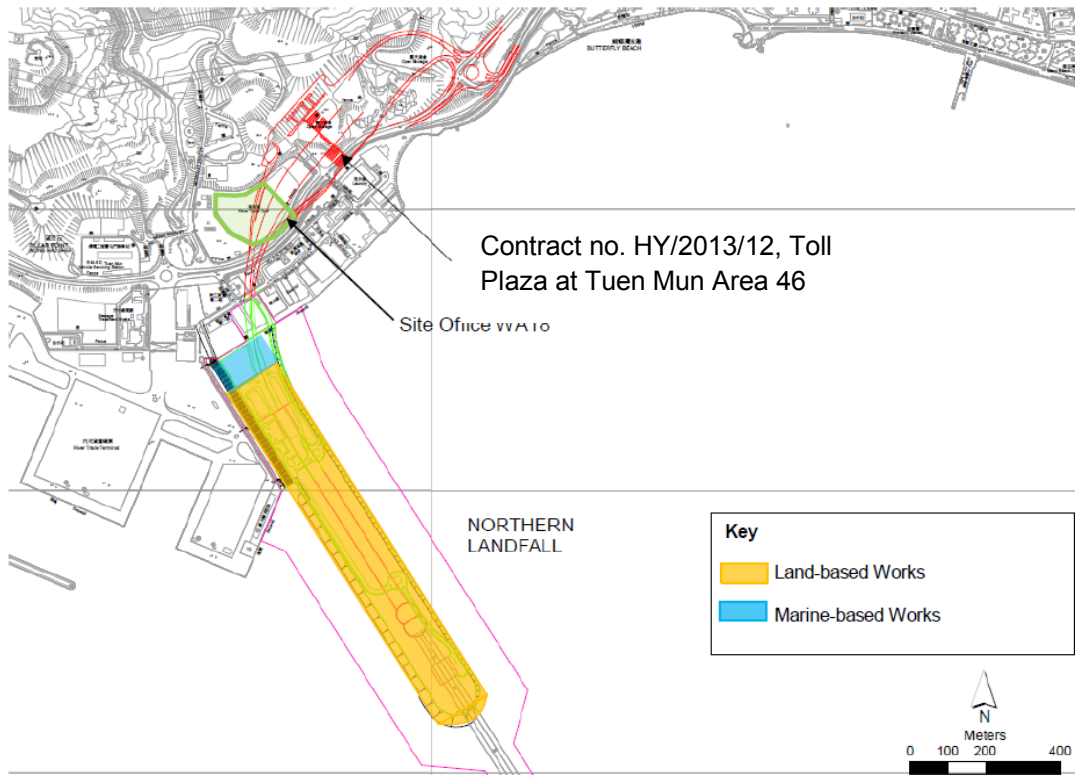
The general layout plan of the site showing the detailed works areas is shown in *Figure 1.2*. The Environmental Sensitive Receivers in the vicinity of the Project are shown in *Figure 1.3*.

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

**Table 1.2** *Summary of Construction Activities Undertaken during the Reporting Period*

<b>Construction Activities Undertaken</b>
<i>Land-based Works</i>
<ul style="list-style-type: none"><li>• Box Culvert Extension at Works Area – Portion N-A;</li><li>• Construction of North Ventilation Building – Portion N-C;</li><li>• Construction of Cross Passage Tympanum – TBM tunnel;</li><li>• Cross Passage Lining Installation – TBM Tunnel;</li><li>• Excavation of Sub-sea Tunnel – TBM tunnel;</li><li>• Corbel Construction – TBM Tunnel;</li><li>• Sub-sea Tunnel Gallery Installation – TBM tunnel;</li><li>• Bulk Excavation – Portion S-A; and</li><li>• Jet Grouting, CSM Ground Treatment and Diaphragm Wall Construction – Portion S-A.</li></ul>
<i>Marine-based Works</i>
<ul style="list-style-type: none"><li>• Construction of Vertical Seawall at Portion N-A; and</li><li>• Band drains and Filling works at Portion N-A.</li></ul>

Figure 1.2 Locations of Construction Activities – March 2017 to May 2017



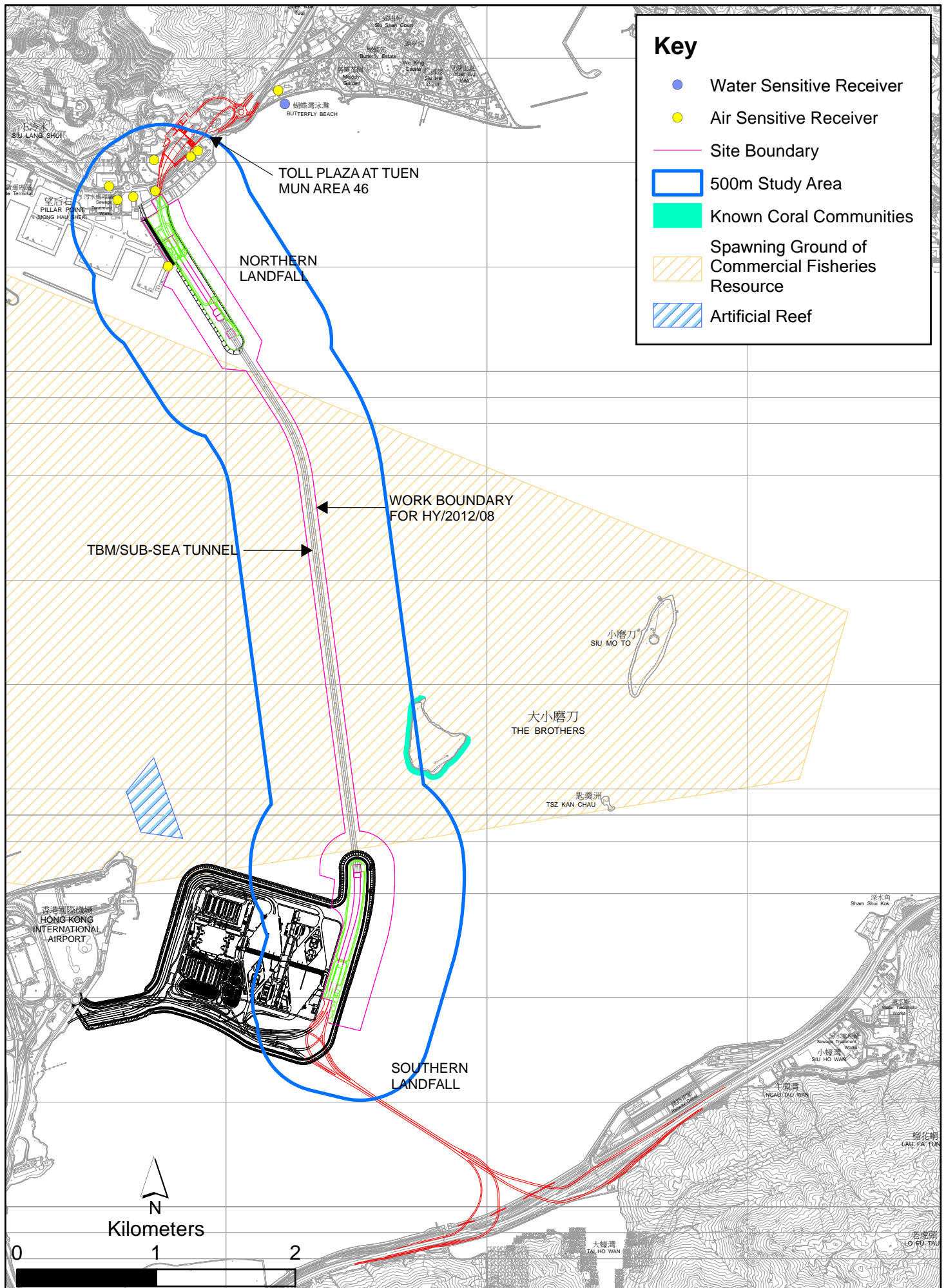


Figure 1.3 Environmental Sensitive Receivers in the vicinity of Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section

File: T:\GIS\CONTRACT\0212330\I\mxd\0212330\_EMnA\_Env\_Sensitive\_Receiver.mxd  
Date: 15/4/2014



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

As per the requirements under *Condition 2.4* of *EP-354/2009/D*, the Enhanced TSP Monitoring Plan has been prepared under *Contract No. HY/2012/08*. Details of the monitoring plan are presented in the *Enhanced TSP Monitoring Plan* <sup>(1)</sup>.

### 2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the *Enhanced TSP Monitoring Plan*, 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 quarter 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*.

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

Monitoring Station	Monitoring Dates	Location	Description	Parameters & Frequency
ASR1	1, 4, 7, 10, 13, 16, 19, 22, 25, 28 and 31 March 2017	Tuen Mun Fireboat Station	Office	TSP monitoring
ASR5	3, 6, 9, 12, 15, 18, 21, 24, 27 and 30 April 2017	Pillar Point Fire Station	Office	<ul style="list-style-type: none"> <li>1-hour Total Suspended Particulates (1-hour TSP, <math>\mu\text{g}/\text{m}^3</math>), 3 times in every 6 days</li> <li>24-hour Total Suspended Particulates (24-hour TSP, <math>\mu\text{g}/\text{m}^3</math>), daily for 24-hour in every 6 days</li> </ul>
AQMS1	3, 6, 9, 12, 15, 18, 21, 24, 27 and 30 May 2017	Previous River Trade Golf	Bare ground	Enhanced TSP monitoring (commenced on 24 October 2014)
ASR6		Butterfly Beach Laundry	Office	<ul style="list-style-type: none"> <li>1-hour Total Suspended Particulates (1-hour TSP,</li> </ul>

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

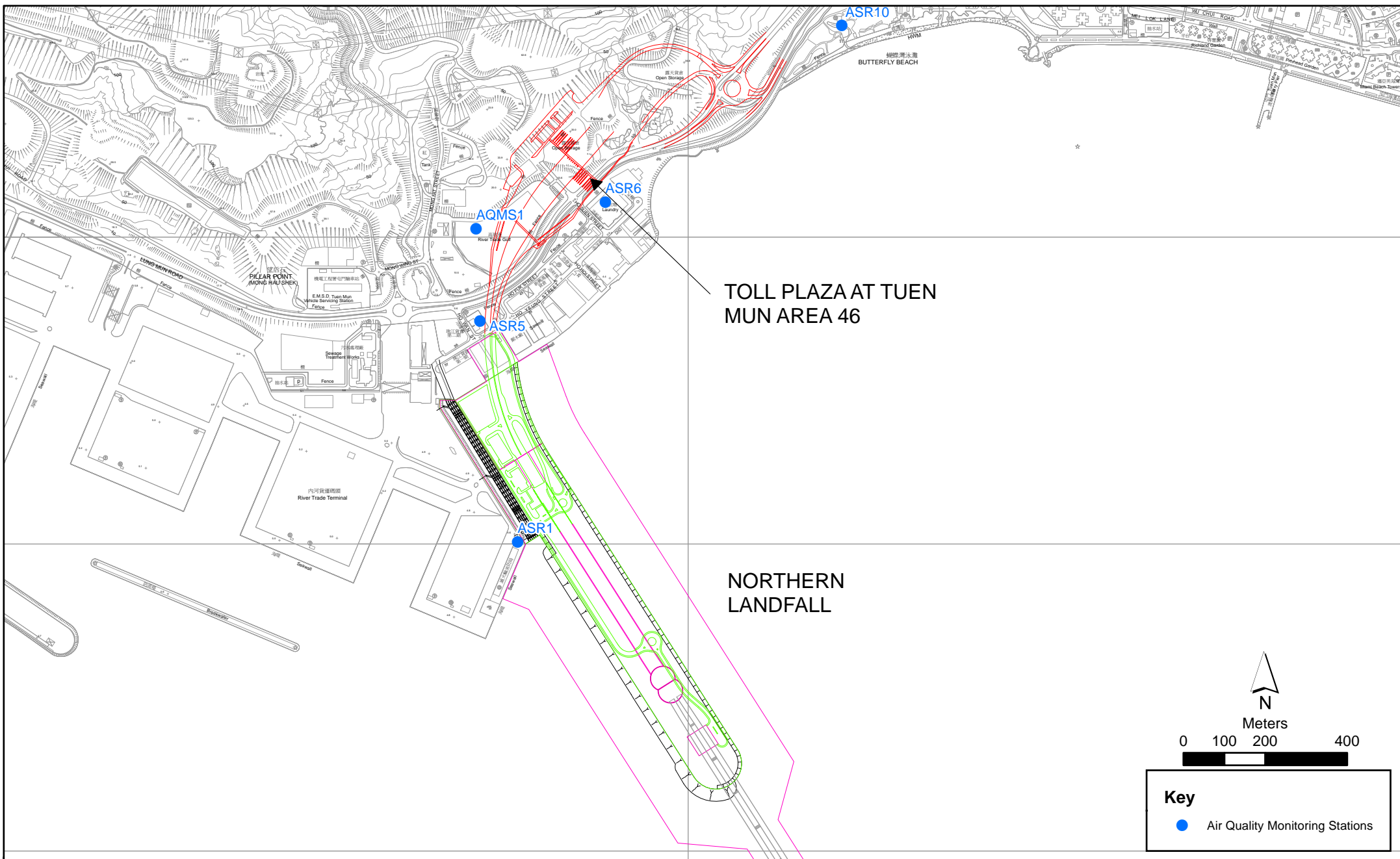


Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

Monitoring Station	Monitoring Dates	Location	Description	Parameters & Frequency
ASR10		Butterfly Beach Park	Recreational uses	$\mu\text{g}/\text{m}^3$ , 3 times in every 3 days • 24-hour Total Suspended Particulates (24-hour TSP, $\mu\text{g}/\text{m}^3$ ), daily for 24-hour in every 3 days

**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	Davis (Model: Vantage Pro 2 (S/N: AS160104014))
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 is provided in *Appendix D*. The Event and Action plan is presented in *Appendix I*.

### 2.1.3 *Monitoring Schedule for the Reporting Quarter*

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

### 2.1.4 *Results and Observations*

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 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. Monitoring results are presented graphically in *Appendix F* and detailed impact air quality monitoring data were reported in the *Forty-first to Forty-third Monthly EM&A Report*.

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

Month/Year	Station	Average ( $\mu\text{g}/\text{m}^3$ )	Range ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
March 2017 to	ASR 1	153	54 - 320	331	500
May 2017	ASR 5	184	50 - 318	340	500
	AQMS1	120	42 - 256	335	500
	ASR6	148	51 - 292	338	500
	ASR10	94	38 - 234	337	500

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

Month/Year	Station	Average ( $\mu\text{g}/\text{m}^3$ )	Range ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
March 2017 to	ASR 1	87	58 - 128	213	260

Month/Year	Station	Average ( $\mu\text{g}/\text{m}^3$ )	Range ( $\mu\text{g}/\text{m}^3$ )	Action Level ( $\mu\text{g}/\text{m}^3$ )	Limit Level ( $\mu\text{g}/\text{m}^3$ )
May 2017	ASR 5	91	58 - 126	238	260
	AQMS1	64	44 - 107	213	260
	ASR6	77	44 - 103	238	260
	ASR10	57	41 - 75	214	260

No Action or Limit Level exceedances for 1-hr TSP were recorded. No Action or Limit Level exceedances for 24-hr TSP were recorded. Summary of Exceedances for Air Quality Impact Monitoring in this Reporting Quarter is detailed in *Table 2.13*.

## 2.2 WATER QUALITY MONITORING

### 2.2.1 Monitoring Requirements & Equipment

In accordance with the Updated EM&A Manual, impact water quality monitoring was carried out three days per week during the construction period at nine (9) water quality monitoring stations (*Figure 2.2; Table 2.5*).

**Table 2.5** *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	<ul style="list-style-type: none"> <li>• Temperature(<math>^{\circ}\text{C}</math>)</li> <li>• pH(pH unit)</li> <li>• Turbidity (NTU)</li> <li>• Water depth (m)</li> <li>• Salinity (ppt)</li> <li>• DO (mg/L and % of saturation)</li> <li>• SS (mg/L)</li> </ul>	3 water depths: 1m	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		below sea surface,	
IS14	Impact Station	812592	824172		mid-depth and 1m	
IS15	Impact Station	813356	825008		above sea bed. If	
CS4	Control / Far Field Station	810025	824004		the water depth is less than 3m, mid-depth sampling only. If water	
CS6	Control / Far Field Station	817028	823992		depth less than 6m, mid-depth may be omitted.	
SR8	Sensitive receiver (Gazettal beaches in Tuen Mun)	816306	825715			
SR9	Sensitive receiver (Butterfly Beach)	813601	825858			
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 2.6* summarizes the equipment used in the impact water quality monitoring programme.



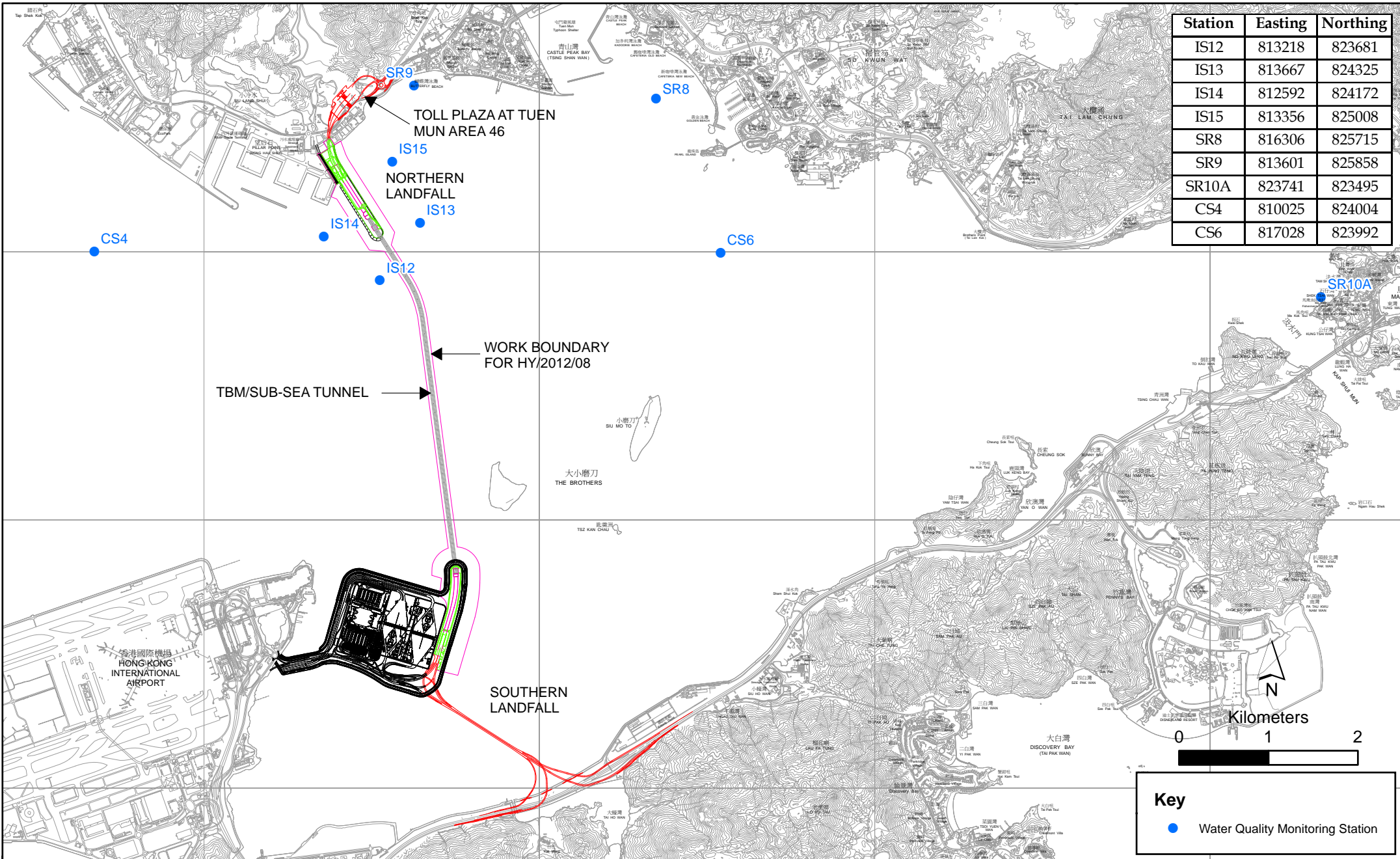


Figure 2.2

Water Quality Monitoring Station



**Table 2.6 Water Quality Monitoring Equipment**

<b>Equipment</b>	<b>Model</b>
Water Sampler	Kahlsico Water-Bottle Model 135DW 150
Dissolved Oxygen Meter	YSI Pro 2030
pH Meter	HANNA HI 8314 HANNA HI 9125
Turbidity Meter	HACH 2100Q
Monitoring Position Equipment	“Magellan” Handheld GPS Model explorist GC DGPS Kodon KGP913MK2 <sup>(1)</sup>

**2.2.2 Action & Limit Levels**

The Action and Limit levels of water quality impact monitoring are shown in *Appendix D*. The Event and Action plan is presented in *Appendix I*.

**2.2.3 Monitoring Schedule for the Reporting Month**

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

**2.2.4 Results and Observations**

Impact water quality monitoring was conducted at all designated monitoring stations in the reporting quarter. Results and graphical presentations of impact water quality monitoring are presented in *Appendix G*. Detailed water quality monitoring data were reported in the *Forty-first to Forty-third Monthly EM&A Report*.

Since marine works for Phase 2 reclamation commenced on 27 December 2016, impact water quality monitoring resumed on 27 December 2016. In this reporting quarter, a total of thirty-nine monitoring events were undertaken in which no Action Level or Limit Levels of exceedances for impact water quality monitoring was recorded.

**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 2.7* summarizes the equipment used for the impact dolphin monitoring.

**Table 2.7**      ***Dolphin Monitoring Equipment***

<b>Equipment</b>	<b>Model</b>
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 2.8* below.

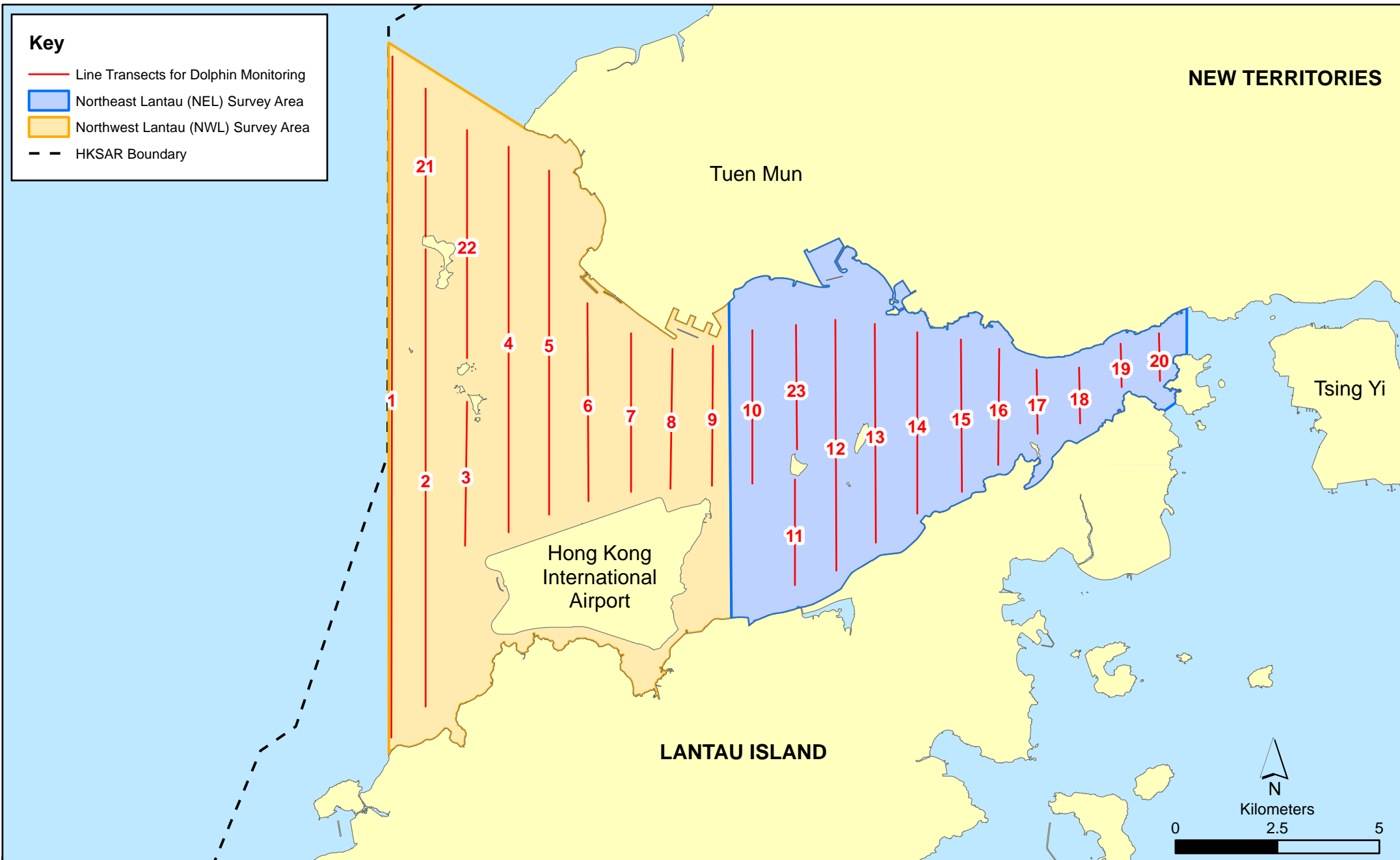


Figure 2.3

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

**Table 2.8 Impact Dolphin Monitoring Line Transect Co-ordinates**

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

**2.3.5 Action & Limit Levels**

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

### 2.3.6 *Monitoring Schedule for the Reporting Period*

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

### 2.3.7 *Results & Observations*

A total of 830.17 km of survey effort was conducted, with 93.4% of the total survey effort being conducted under favourable weather conditions (ie Beaufort Sea State 3 or below with good visibility) in this reporting quarter. Amongst the two areas, 333.83 km and 496.34 km of survey effort were conducted from NEL and NWL survey areas, respectively. The total survey effort conducted on primary and secondary lines were 583.29 km and 246.88 km, respectively. The survey efforts are summarized in *Appendix H*.

A total of 4 groups of 24 Chinese White Dolphins sightings were recorded during the six sets of surveys in this reporting quarter. All four dolphin sightings were made during on-effort search, and three of the four on-effort dolphin sightings were made on primary lines. During this reporting quarter, all dolphin groups were sighted in NWL, while no dolphin was sighted in NEL.

Encounter rates of Chinese White Dolphins are deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below with good visibility) in the reporting quarter with the results and comparison with baseline results present in *Tables 2.9* and *2.10*.

**Table 2.9** *Individual Survey Event 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)
		Primary Lines Only	Primary Lines Only
NEL	Set 1: Mar 2 <sup>nd</sup> /7 <sup>th</sup>	0.00	0.00
	Set 2: Mar 16 <sup>th</sup> /28 <sup>th</sup>	0.00	0.00
	Set 3: Apr 12 <sup>th</sup> /20 <sup>th</sup>	0.00	0.00
	Set 4: Apr 24 <sup>th</sup> /26 <sup>th</sup>	0.00	0.00
	Set 5: May 18 <sup>th</sup> /22 <sup>nd</sup>	0.00	0.00
	Set 6: May 24 <sup>th</sup> /26 <sup>th</sup>	0.00	0.00
NWL	Set 1: Mar 2 <sup>nd</sup> /7 <sup>th</sup>	0.00	0.00
	Set 2: Mar 16 <sup>th</sup> /28 <sup>th</sup>	2.03	24.37
	Set 3: Apr 12 <sup>th</sup> /20 <sup>th</sup>	1.71	3.41
	Set 4: Apr 24 <sup>th</sup> /26 <sup>th</sup>	0.00	0.00
	Set 5: May 18 <sup>th</sup> /22 <sup>nd</sup>	1.85	3.70
	Set 6: May 24 <sup>th</sup> /26 <sup>th</sup>	0.00	0.00

Note: Dolphin Encounter Rates are deduced from the Two Sets of Surveys (Two Surveys in Each Set) in the reporting quarter in Northeast (NEL) and Northwest Lantau (NWL)

**Table 2.10** *Quarterly 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)	
	March 2017 - May 2017	September - November 2011	March 2017 - May 2017	September - November 2011
<b>Northeast Lantau</b>	0.0	6.00 ± 5.05	0.0	22.19 ± 26.81
<b>Northwest Lantau</b>	0.93 ± 1.03	9.85 ± 5.85	5.25 ± 9.53	44.66 ± 29.85

Note: Encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions.

Group size of Chinese White Dolphins ranged from 1 - 12 individuals per group in North Lantau region during March 2017 to May 2017. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in *Table 2.11*.

**Table 2.11** *Average Dolphin Group Size*

	Average Dolphin Group Size	
	March 2017 - May 2017	September - November 2011
<b>Overall</b>	6.00 ± 4.90 (n = 4)	3.72 ± 3.13 (n = 66)
<b>Northeast Lantau</b>	---	3.18 ± 2.16 (n = 17)
<b>Northwest Lantau</b>	6.00 ± 4.90 (n = 4)	3.92 ± 3.40 (n = 49)

Whilst one limit level exceedance was observed for the quarterly dolphin monitoring data between March 2017 and May 2017, no unacceptable impact from the construction activities of this Contract was recorded from the general observations.

Although the dolphins infrequently occurred along the alignment of TM-CLKL 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.

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

### 2.3.8 *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. 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. No sighting of the Indo-Pacific humpback dolphin *Sousa chinensis* (i.e. Chinese White Dolphin) was recorded in this reporting period during the exclusion zone monitoring.

### 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. Fourteen (14) site inspections were carried out in the reporting quarter on 1, 8, 15, 22 and 29 March 2017; 5, 13, 19 and 26 April 2017; 4, 10, 17, 24 and 31 May 2017.

Key observations during the site inspections in this reporting period are summarized in *Table 2.12*.

**Table 2.12** *Specific Observations and Recommendations during the Weekly Site Inspection in this Reporting Period*

<b>Inspection Date</b>	<b>Environmental Observations</b>	<b>Recommendations/ Remarks</b>
1 March 2017	<p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>Drip tray and chemical labels should be provided to the chemicals.</li> </ul> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>Accumulated waste at the pedestrian walkway should be removed.</li> <li>Muddy surface runoff should be avoided.</li> </ul>	<p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to provide drip tray and chemical labels to the chemicals.</li> </ul> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to remove the accumulated waste at the pedestrian walkway.</li> <li>The Contractor was reminded to avoid muddy surface runoff.</li> </ul>
8 March 2017	<p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>Drip tray and chemical labels should be provided to the chemicals.</li> <li>Broken chemical containers should be removed.</li> </ul> <p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>Muddy substances at the haul road should be removed.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to provide drip tray to the chemicals containers.</li> <li>Drip tray should be provided to the chemicals containers.</li> </ul>	<p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to provide drip tray and chemical labels to the chemicals.</li> <li>The Contractor was reminded to remove the broken chemical containers.</li> </ul> <p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to remove the muddy substances at the haul road.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>Drip tray should be provided to the chemicals containers.</li> <li>The Contractor was reminded to provide drip tray to the chemicals containers.</li> </ul>

Inspection Date	Environmental Observations	Recommendations/ Remarks
15 March 2017	<p>Works Area - TBM tunnel</p> <ul style="list-style-type: none"> <li>• Drip tray should be provided to the chemicals containers.</li> <li>• Cement bags should be covered with tarpaulin sheets.</li> <li>• The grouting facilities should be enclosed on top and 3 sides by tarpaulin sheets.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• Drip tray should be provided to the chemicals containers.</li> </ul>	<p>Works Area - TBM tunnel</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to provide drip tray to the chemicals.</li> <li>• The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> <li>• The Contractor was reminded to enclose the grouting facilities on top and 3 sides by tarpaulin sheets.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to provide drip tray to the chemicals containers.</li> </ul>
22 March 2017	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>• Accumulated rubbish should be removed.</li> </ul> <p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>• Muddy water should be properly treated before discharge.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• Drip tray should be provided to the chemicals containers.</li> <li>• The rock breaker should be wrapped to prevent spread of dust.</li> </ul>	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to remove the accumulated rubbish.</li> </ul> <p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to treat the muddy water properly before discharge.</li> </ul> <p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to provide drip tray to the chemicals containers.</li> <li>• The Contractor was reminded to wrap the rock breaker to prevent spread of dust.</li> </ul>
29 March 2017	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>• Empty cement bags should be removed.</li> <li>• Accumulated rubbish should be removed.</li> </ul>	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to remove the empty cement bags.</li> <li>• The Contractor was reminded to remove the accumulated rubbish.</li> </ul>
5 April 2017	<p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• Cement bags should be covered with tarpaulin sheets.</li> <li>• Accumulated rubbish should be removed.</li> </ul> <p>Works Area - Portion N-B</p> <ul style="list-style-type: none"> <li>• Drip tray and chemical labels should be provided to the chemical containers.</li> </ul>	<p>Works Area - Portion S-C</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> <li>• The Contractor was reminded to remove the accumulated rubbish.</li> </ul> <p>Works Area - Portion N-B</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to provide drip tray and chemical labels to the chemical containers.</li> </ul>
13 April 2017	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>• Cement bags should be covered with tarpaulin sheets.</li> <li>• Drip tray should be provided to the chemical containers.</li> </ul> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>• Drip tray and chemical labels should be provided to the oil drum.</li> <li>• Oily substances near the generator should be removed.</li> </ul>	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> <li>• The Contractor was reminded to provide drip tray to the chemical containers</li> </ul> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>• The Contractor was reminded to provide drip tray and chemical labels to the oil drum.</li> <li>• The Contractor was reminded to remove the oily substances near the generator.</li> </ul>



Inspection Date	Environmental Observations	Recommendations/ Remarks
19 April 2017	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Drip tray should be provided to the chemical containers.</li> </ul> <p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>Water spraying should be applied more frequently during dry conditions.</li> <li>Cement bags should be covered with tarpaulin sheet.</li> </ul>	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to provide drip tray and chemical labels to the oil drum.</li> </ul> <p>Works Area - Portion N-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to apply water spraying more frequently during dry conditions.</li> <li>The Contractor was reminded to cover the cement bags with tarpaulin sheet.</li> </ul>
26 April 2017	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Accumulated waste should be removed.</li> <li>Drip tray should be provided to the chemical containers.</li> </ul>	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to remove the accumulated waste.</li> <li>The Contractor was reminded to provide drip tray and chemical labels to the oil drum.</li> </ul>
4 May 2017	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Cement bags should be covered with tarpaulin sheets.</li> <li>Drip tray should be provided to the chemical containers.</li> </ul>	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> <li>The Contractor was reminded to provide drip tray and chemical labels to the oil drum.</li> </ul>
10 May 2017	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>Cement bags should be covered with tarpaulin sheets.</li> <li>Drip tray should be provided to the chemical containers.</li> </ul> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Drip tray should be provided to the chemical containers.</li> </ul>	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> <li>The Contractor was reminded to provide drip tray to the chemical containers.</li> </ul> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to provide drip tray to the chemical containers.</li> </ul>
17 May 2017	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Accumulated rubbish should be removed.</li> </ul> <p>Reminder from SOR</p> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>Flags of air compressor should be closed at all time during operation to mitigate noise impact..</li> </ul>	<p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to remove the accumulated rubbish.</li> </ul> <p>Reminder from SOR</p> <p>Works Area - Portion S-A</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to close the flags of air compressor at all time during operation to mitigate noise impact.</li> </ul>
24 May 2017	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>The thinner can should be removed.</li> <li>Cement mixer should be enclosed in the tarpaulin sheet covered on the top and the 3 sides.</li> </ul>	<p>Works Area - TBM Tunnel</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to remove the thinner can.</li> <li>The Contractor was reminded to cover the cement mixer with tarpaulin sheet on the top and the 3 sides.</li> </ul>

Inspection Date	Environmental Observations	Recommendations/ Remarks
31 May 2017	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>The pit should be filled up with sand to prevent surface runoff from being discharged to the sea.</li> <li>Cement bags should be covered with tarpaulin sheets.</li> </ul> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>Cement should be covered with tarpaulin sheets.</li> <li>Accumulated rubbish should be removed.</li> </ul> <p>Reminder from SOR</p> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>The breaker tip should be enclosed by noise reduction mat.</li> </ul>	<p>Works Area - Portion N-C</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to filled up the pit with sand to prevent surface runoff from being discharged to the sea.</li> <li>The Contractor was reminded to cover the cement bags with tarpaulin sheets.</li> </ul> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to cover the cement with tarpaulin sheets.</li> <li>The Contractor was reminded to remove the accumulated rubbish.</li> </ul> <p>Reminder from SOR</p> <p>Works Area - Portion S-B</p> <ul style="list-style-type: none"> <li>The Contractor was reminded to enclose the breaker tip by noise reduction mat.</li> </ul>

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

## 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) and chemical wastes. Reference has been made to the waste flow table prepared by the Contractor (*Appendix K*). The quantities of different types of wastes are summarized in *Table 2.13*.

**Table 2.13 Quantities of Different Waste Generated in the Reporting Period**

Month/Year	Inert Construction Waste (a) (tonnes)	Inert Construction Waste Re-used (tonnes)	Non-inert Construction Waste (b) (tonnes)	Recyclable Materials (c) (kg)	Chemical Wastes (kg)	Marine Sediment (m <sup>3</sup> )	
						Category L	Category M
March 2017	7,508	0	286	0	6,100	0	0
April 2017	15,603	0	237	0	0	0	0
May 2017	12,343	0	300	0	0	0	0
Total	35,454	0	823	0	6,100	0	0

**Notes:**

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

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

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

## 2.6 *ENVIRONMENTAL LICENSES AND PERMITS*

The status of environmental licensing and permit is summarized in *Table 2.14* below.

**Table 2.14 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	Application for VEP on 3 March 2015 to supersede EP-354/2009/C
Construction Dust Notification	363510	19 August 2013	Throughout the Contract	DBJV	Northern Landfall
Construction Dust Notification	403620	10 June 2016	Throughout the Contract	DBJV	Southern Landfall
Chemical Waste Registration	5213-422-D2516-01	10 September 2013	Throughout the Contract	DBJV	Northern Landfall
Chemical Waste Registration	5213-422-D2516-02	18 January 2017	Throughout the Contract	DBJV	Northern Landfall
Chemical Waste Registration	5213-951-D2591-01	25 May 2016	Throughout the Contract	DBJV	Southern Landfall
Construction Waste Disposal Account	7018108	28 August 2013	Throughout the Contract	DBJV	Waste disposal in Contract No. HY/2012/08
Construction Waste Disposal Account	7021715	12 January 2017	12 April 2017	DBJV	Vessel disposal
Waste Water Discharge License	WT00017707-2013	18 November 2013	30 November 2018	DBJV	For 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	WT00025944-2016	15 December 2016	31 December 2021	DBJV	Southern Landfall
Marine Dumping Permit	EP/MD/17-103	16 December 2016	13 June 2017	DBJV	Northern Landfall
Marine Dumping Permit	EP/MD/18-006	7 May 2017	6 June 2017	DBJV	Southern Landfall
Construction Noise Permit	GW-RW0644-16	30 November 2016	29 May 2017	DBJV	For Urmston Road in front of Pillar Point
Construction Noise Permit	GW-RW0247-17	19 May 2017	9 November 2017	DBJV	For Urmston Road in front of Pillar Point
Construction Noise Permit	GW-RW0666-16	13 December 2016	12 June 2017	DBJV	For site WA23A+B
Construction Noise Permit	GW-RW0143-17	29 March 2017	28 September 2017	DBJV	For Portion N6
Construction Noise Permit	GW-RS0121-17	25 February 2017	24 August 2017	DBJV	For Southern Landfall

Notes:

HyD = Highways Department

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
DBJV = Dragages - Bouygues Joint Venture VEP = Variation of Environmental Permit					

2.7 **IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES**

In response to the site audit findings, the Contractors carried out all corrective actions.

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

2.8 **SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT**

For air quality impact monitoring, a total of thirty-one monitoring events were undertaken in which no Action Level or Limit Level exceedances for 1-hr TSP; no Action Level exceedances or Limit Level exceedances for 24-hr TSP were recorded in this reporting quarter (*Table 2.15*).

**Table 2.15 Summary of Exceedances for Air Quality Impact Monitoring in this Reporting Quarter**

Station	Exceedance Level	Date of Exceedances		Number of Exceedances	
		1-hr TSP	24-hr TSP	1-hr TSP	24-hr TSP
AQMS1	Action Level	-	-	0	0
	Limit Level	-	-	0	0
ASR1	Action Level	-	-	0	0
	Limit Level	-	-	0	0
ASR5	Action Level	-	-	0	0
	Limit Level	-	-	0	0
ASR6	Action Level	-	-	0	0
	Limit Level	-	-	0	0
ASR10	Action Level	-	-	0	0
	Limit Level	-	-	0	0
<b>Total number of Action level Exceedances:</b>				0	0
<b>Total number of Limit level Exceedances:</b>				0	0

For marine water quality impact monitoring, a total of thirty-nine monitoring events were undertaken in which no Action Level or Limit Level exceedances were recorded (*Table 2.17*). In addition, the construction impact on depth-averaged SS was assessed to compare the quarterly mean values of depth-averaged SS with the relevant ambient mean values. Results showed that the quarterly mean values of depth-averaged SS at all monitoring stations are well below the ambient mean values (*Table 2.16*), thus no further action is required in accordance with the Updated EM&A Manual.

**Table 2.16** *Comparison between Quarterly Mean and Ambient Mean Values of Depth-averaged Suspended Solids*

Station	Baseline Mean		Ambient Mean <sup>(a)</sup>		Quarterly Mean (March to May 2017)	
	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood	Mid-ebb	Mid-flood
CS4	10.2	9.0	13.3	11.7	9.41	9.34
CS6	10.9	11.7	14.1	15.2	9.57	9.41
IS12	9.2	9.5	12.0	12.3	8.77	8.58
IS13	10.0	10.5	13.0	13.7	8.97	8.78
IS14	10.4	9.7	13.5	12.6	8.11	7.93
IS15	9.6	11.0	12.5	14.2	8.79	8.57
SR10A	10.3	10.2	13.3	13.3	8.40	8.18
SR8	10.1	11.3	13.1	14.7	8.26	8.12
SR9	8.8	9.9	11.4	12.8	8.21	8.02
<b>Grand Total</b>	<b>10.0</b>	<b>10.3</b>	<b>13.0</b>	<b>13.4</b>	<b>8.8</b>	<b>8.6</b>

**Notes:**

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

Table 2.17 Summary of Exceedances for Marine Water Quality Impact Monitoring in this Reporting Quarter

Station	Exceedance Level <sup>(a)</sup>	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	-	-	-	-	-	-	-	-
<b>Total AL Exceedances:</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total LL Exceedances:</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Notes:

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



One (1) Limit Level exceedance was observed for the quarterly dolphin monitoring data between March and May 2017, whilst 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.

Cumulative statistics are provided in *Appendix J*.

## 2.9 ***SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS***

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

One (1) environmental complaint case regarding noise nuisance and water pollution was referred by EPD on 27 March 2017.

The complaint investigation reports are provided in Appendix I.

A notification of summons regarding the complaint case received on 17 November 2016 has been received in the reporting period.

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

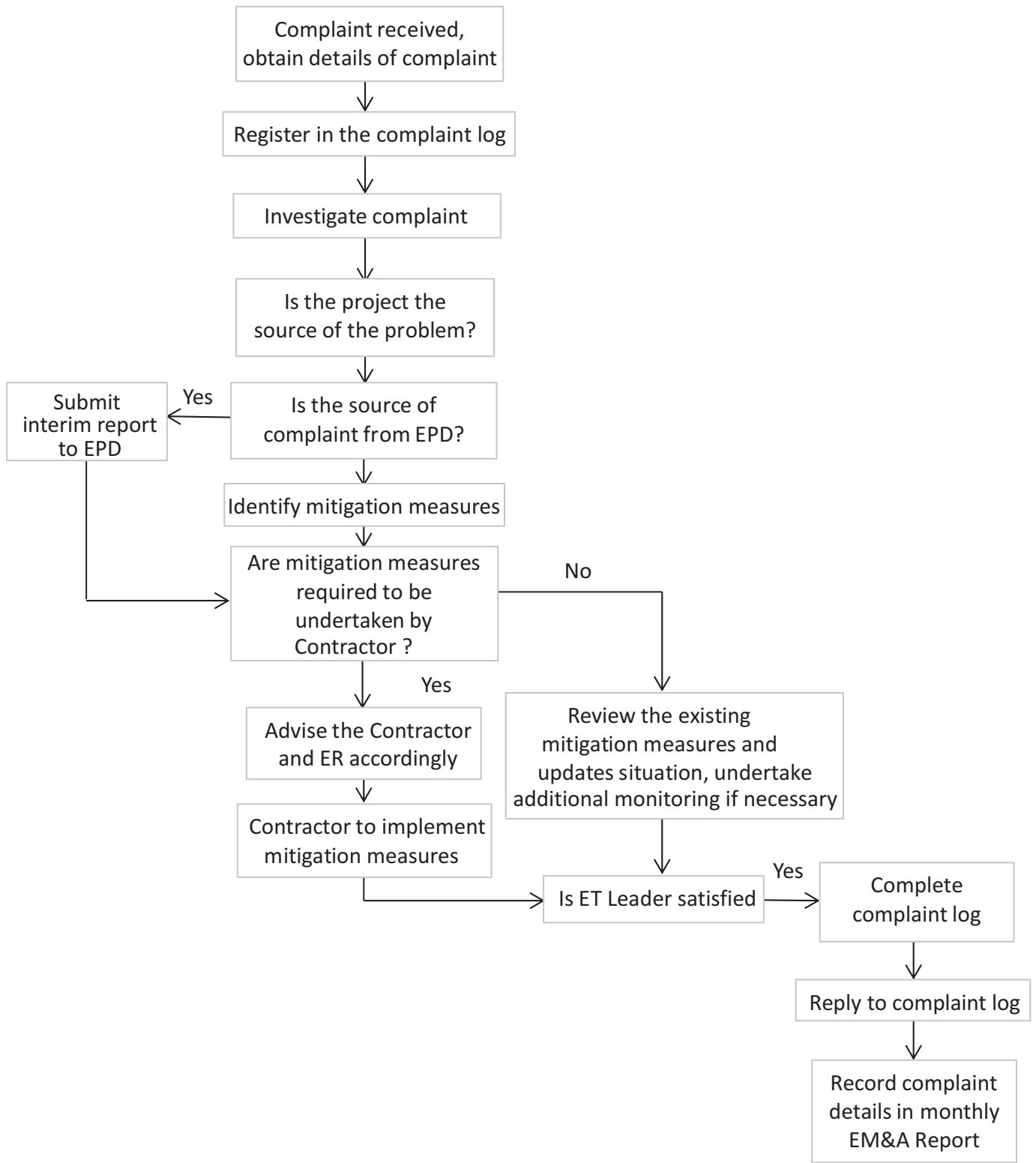


Figure 2.4

Environmental Complaint Handling Procedure

### 3 FUTURE KEY ISSUES

#### 3.1 CONSTRUCTION ACTIVITIES FOR THE COMING QUARTER

As informed by the Contractor, the major works for the Project in the coming quarter are summarized in *Table 3.1*.

*Table 3.1 Construction Works to Be Undertaken in the Coming Quarter*

<b>Works to be undertaken</b>
<i>Land-based Works</i>
<ul style="list-style-type: none"><li>• Box Culvert Extension at Works Area – Portion N-A;</li><li>• Construction of North Ventilation Building – Portion N-C;</li><li>• Construction of Cross Passage Tympanum – TBM tunnel;</li><li>• Cross Passage Lining Installation – TBM Tunnel;</li><li>• Excavation of Sub-sea Tunnel – TBM tunnel;</li><li>• Corbel Construction – TBM Tunnel; and</li><li>• CSM Ground Treatment and Bulk excavation – Portion S-A.</li></ul>

#### 3.2 KEY ISSUES FOR THE COMING QUARTER

Potential environmental impacts arising from the above upcoming construction activities in the coming quarterly period are expected to be mainly associated with dust, marine ecology and waste management issues.

#### 3.3 MONITORING SCHEDULE FOR THE COMING QUARTER

Impact monitoring for air quality and marine ecology (include dolphin monitoring) are scheduled to continue for the next reporting period.

The monitoring programme has been reviewed and was considered as adequate to cater for the nature of works in progress. Change to the monitoring programme was thus not considered to be necessary at this stage. The monitoring programme will be evaluated as appropriate in the next reporting period.

This Fourteenth Quarterly EM&A Report presents the findings of the EM&A activities undertaken during the period from 1 March 2017 to 31 May 2017, 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) and dolphin monitoring were carried out in the reporting period. No Action or Limit Level exceedances for 1-hr TSP were recorded. No Action or Limit Level exceedances for 24-hr TSP were recorded.

A total of 4 groups of 24 Chinese White Dolphins sightings were recorded during the six sets of surveys in this reporting quarter. All four dolphin sightings were made during on-effort search, and three of the four on-effort dolphin sightings were made on primary lines. Whilst one limit level exceedance was observed for the quarterly dolphin monitoring data between March and May 2017, no unacceptable impact from the construction activities of this Contract was recorded from the general observations. Although the dolphins infrequently occurred along the alignment of TM-CLKL 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. It is critical to monitor the dolphin usage in North Lantau region in the upcoming quarters, to determine whether the dolphins are continuously affected by the various construction activities in relation to the construction works of the Contract, and whether suitable mitigation measure can be applied to improve the situation.

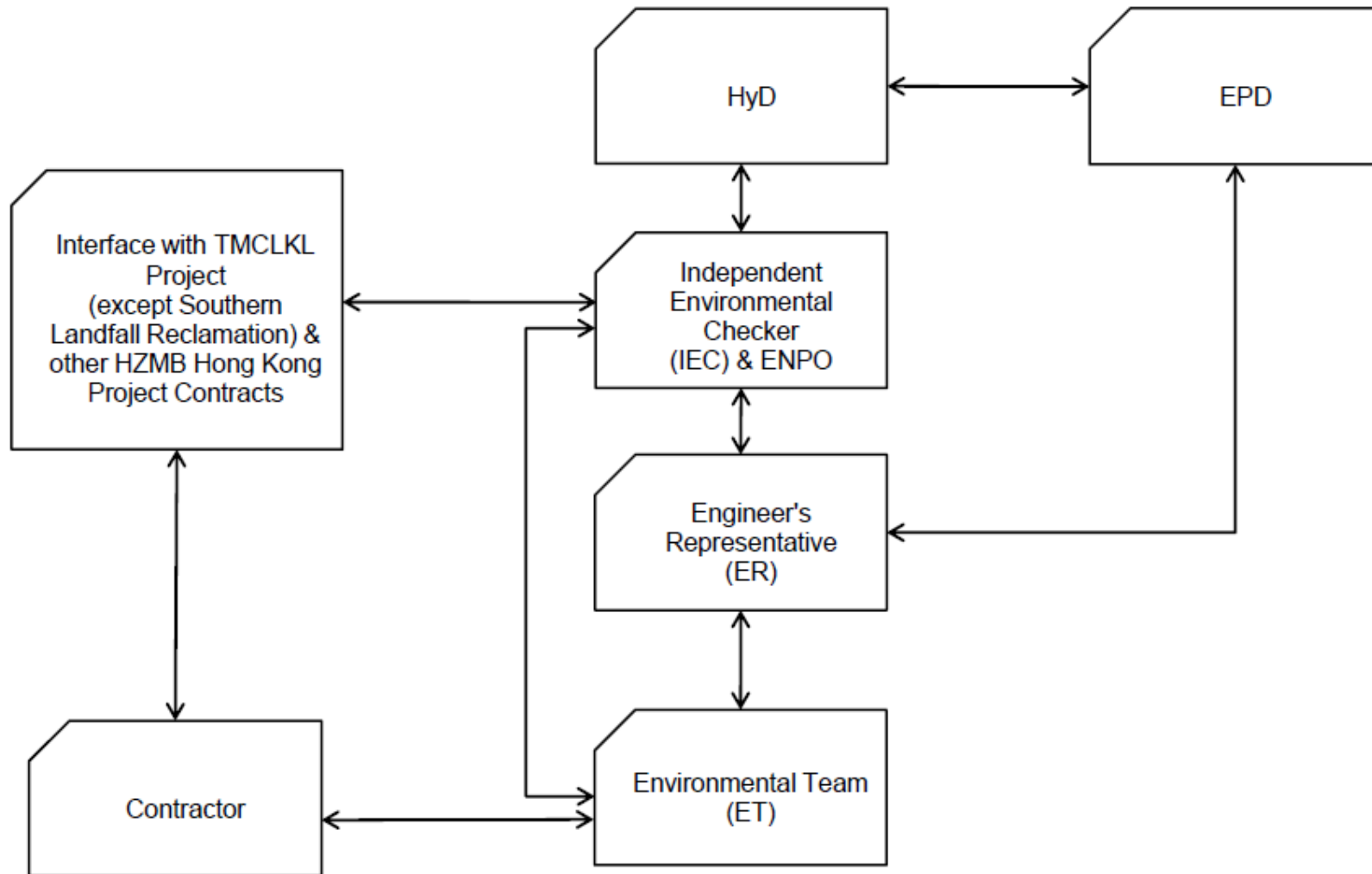
Fourteen weekly environmental site inspections were carried out in the reporting period. Recommendations on remedial actions provided for the deficiencies identified during the site audits were properly implemented by the Contractor. No non-compliance event was recorded during the reporting period.

One (1) environmental complaint case regarding noise nuisance and water pollution was referred by EPD on 27 March 2017.

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

Appendix A

## Project Organization for Environmental Works



↔ Line of Communication

Appendix B

## Construction Programme

**TMCLK - Northern Connection Sub-Sea Tunnel Section**

**Contract Dates**

**Site Possession Date**

Portions: X1,(N10,11,13 & 14) - Sth Landfall

**General Submissions**

**Environmental**

**Environmental Permit Submissions**

**Supplementary WMP of C&C Tunnel at Sth.Landfall**

Supplementary WMP of C&C Tunnel at Sth.Landfall

**Sediment Quality Report/Dumping Permit**

**Southern Landfall**

Southern landfall - Commencement of Shaft & C&C Tunnel Dwall

Southern Landfall - Commencement of Retrieval Shaft Excavation

**PAYMENT MILESTONE**

**Design and Design Checking of the Works**

MS 2.6 Approve AIP for seawall modification works at Southern Landfall by the Supervising Officer

MS 2.7 Submit DDA for seawall modification works at Southern Landfall

MS 2.44 Approve DDA for South Ventilation Building by the Supervising Officer

MS 2.52 Approve DDA for Facilities Provision for TCSS by the Supervising Officer

MS 2.60 Approve DDA for Drainage, Sewerage, Waterworks and Utilities at Northern Landfall by the Supervising Officer

MS 2.69 Submit draft Operation and Maintenance Manual for all Tunnels and Cross Passgases

MS 2.70 Accept Operation and Maintenance Manual for all Tunnels and Cross Passgases by the Supervising Officer

MS 2.71 Submit draft Operation and Maintenance Manual for all works except Tunnels and Cross Passgases

MS 2.72 Accept Operation and Maintenance Manual for all works except Tunnels and Cross Passgases by the Supervising Officer

**Tunnel Boring Machine (TBM) and Back-up Equipment for TBM Tunnel**

MS 3.1.6 Removal of TBM for Southbound Tunnel from Site after the completion of TBM Tunnel

MS 3.1.12 Removal of TBM for Northbound Tunnel from Site after the completion of TBM Tunnel

MS 3.1.25 Demolition of Slurry Treatment Plant on completion

MS 3.1.26 Complete the whole of the activities under this Cost Centre Part to the satisfaction of the Supervising Officer

**TBM Tunnel**

MS 3.3.4 Complete walls of retrieval shaft

MS 3.3.5 Complete excavation to formation level for retrieval shaft and complete casting of base slab

MS 3.3.6 Complete all necessary works of retrieval shaft to facilitate retrieval of TBM

MS 3.3.47 Completion of excavation, support and permanent lining for 65% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.48 Completion of excavation, support and permanent lining for 67.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.49 Completion of excavation, support and permanent lining for 70% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.50 Completion of excavation, support and permanent lining for 72.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.51 Completion of excavation, support and permanent lining for 75% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.52 Completion of excavation, support and permanent lining for 77.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.53 Completion of excavation, support and permanent lining for 80% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.54 Completion of excavation, support and permanent lining for 82.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.55 Completion of excavation, support and permanent lining for 85% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.56 Completion of excavation, support and permanent lining for 87.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.57 Completion of excavation, support and permanent lining for 90% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.58 Completion of excavation, support and permanent lining for 92.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.59 Completion of excavation, support and permanent lining for 95% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.60 Completion of excavation, support and permanent lining for 97.5% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.61 Completion of excavation, support and permanent lining for 100% of the total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.118 Complete tunnel internal structures for 50% of total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.119 Complete tunnel internal structures for 75% of total length (measured on plan) of the Northbound TBM Tunnel

MS 3.3.122 Complete tunnel internal structures for 50% of total length (measured on plan) of the Southbound TBM Tunnel

MS 3.3.123 Complete tunnel internal structures for 75% of total length (measured on plan) of the Southbound TBM Tunnel

**Cross Passages for TBM Tunnel**

MS 3.3.1 Complete 50% of ground treatment for excavation of all Type 1 Cross Passages(Percentage to be certified for 50% completion)

MS 3.3.2 Complete 100% of ground treatment for excavation of all Type 1 Cross Passages(Percentage to be certified for 100% completion)

MS 3.3.3 Complete 50% of ground treatment for excavation of all Type 2 Cross Passages(Percentage to be certified for 50% completion)

MS 3.3.4 Complete 100% of ground treatment for excavation of all Type 2 Cross Passages(Percentage to be certified for 100% completion)

MS 3.3.5 Complete 50% of excavation and support for all Type 1 Cross Passages(Percentage to be certified for 50% completion)

MS 3.3.6 Complete 100% of excavation and support for all Type 1 Cross Passages(Percentage to be certified for 100% completion)

MS 3.3.7 Complete 50% of excavation and support for all Type 2 Cross Passages(Percentage to be certified for 50% completion)

MS 3.3.8 Complete 100% of excavation and support for all Type 2 Cross Passages(Percentage to be certified for 100% completion)

MS 3.3.11 Complete 50% of permanent lining and internal structures for all Type 2 Cross Passages(Percentage to be certified for 50% completion)

**Cut-and-cover Tunnels at Southern Landfalls**

MS 4.1.1 Complete 10% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.2 Complete 20% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.3 Complete 30% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.4 Complete 40% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.5 Complete 50% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.6 Complete 60% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.7 Complete 70% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.8 Complete 80% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.9 Complete 90% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.10 Complete 100% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel

MS 4.1.11 Complete 100% of excavation for Cut-and-cover tunnel

MS 4.1.12 Complete 40% of excavation for Cut-and-cover tunnel

MS 4.1.13 Complete 60% of excavation for Cut-and-cover tunnel

MS 4.1.14 Complete 80% of excavation for Cut-and-cover tunnel

MS 4.1.15 Complete 100% of excavation for Cut-and-cover tunnel

MS 4.1.16 Complete permanent tunnel structure for 10% of the total length (measured on plan) of Cut-and-cover Tunnel

MS 4.1.17 Complete permanent tunnel structure for 20% of the total length (measured on plan) of Cut-and-cover Tunnel

MS 4.1.18 Complete permanent tunnel structure for 30% of the total length (measured on plan) of Cut-and-cover Tunnel

MS 4.1.19 Complete permanent tunnel structure for 40% of the total length (measured on plan) of Cut-and-cover Tunnel

■ Planned Bar  
■ Planned Bar - Critical  
◆ Planned Milestone  
■ Progress bar  
◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN.PRG.98507	WYu	SPo
08-Apr-14	TMCLKDBJGEN.PRG.98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGEN.PRG.98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN.PRG.98507 Rev.F	WYu	



Activity Name	2017							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
MS 4.1.20 Complete permanent tunnel structure for 50% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.21 Complete permanent tunnel structure for 60% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.22 Complete permanent tunnel structure for 70% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.23 Complete permanent tunnel structure for 80% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.24 Complete permanent tunnel structure for 90% of the total length (measured on plan) of Cut-and-cover Tunnel			◆ MS 4.1.24 Complete permanent tunnel structure for 90% of the total length (measured on plan) of Cut-and-cover Tunnel					
MS 4.1.25 Complete permanent tunnel structure for 100% of the total length (measured on plan) of Cut-and-cover Tunnel						◆ MS 4.1.25 Complete permanent tunnel structure for 100% of the total length (measured on plan) of Cut-and-cover Tunnel		
MS 4.1.26 Complete excavation for 50% of total length (measured on plan) of all Cross Passages								
MS 4.1.27 Complete excavation for 100% of total length (measured on plan) of all Cross Passages								
MS 4.1.28 Complete permanent junction structure at interface between Cut-and-cover Tunnel and TBM Tunnel								◆ MS 4.1.28 Complete permanent junction structure at interface between Cut-and-cover Tunnel and TBM Tunnel
MS 4.1.29 Complete pavement for 50% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.30 Complete pavement for 100% of the total length (measured on plan) of Cut-and-cover Tunnel								◆ MS 4.1.30 Complete pavement for 100% of the total length (measured on plan) of Cut-and-cover Tunnel
MS 4.1.31 Complete the whole of the activities under this Cost Centre to the satisfaction of the Supervising Officer								◆ MS 4.1.31 Complete the whole of the activities under this Cost Centre to the satisfaction of the Supervising Officer
<b>Cut-and-cover Tunnel at Northern Landfall</b>								
MS 4.2.23 Complete tunnel internal structure for 100% of NB Northern Landfall TBM Tunnel								
MS 4.2.25 Complete tunnel internal structure for 100% of SB Northern Landfall TBM Tunnel								
MS 4.2.29 Complete 100% of permanent lining and internal structures for all Northern Landfall Cross Passages								
MS 4.2.30 Complete Permanent tunnel structure for 25% of Cut and Cover Tunnel								
MS 4.2.31 Complete Permanent tunnel structure for 50% of Cut and Cover Tunnel								
MS 4.2.32 Complete Permanent tunnel structure for 75% of Cut and Cover Tunnel								
MS 4.2.34 Complete Permanent junction structure at interface between Cut-and-cover and TBM Tunnel								
<b>Approach Ramp Structures to Cut-and-cover Tunnel at Southern Landfall</b>								
MS 5.1.2 Complete 40% of excavation for approach ramp structures								
MS 5.1.3 Complete 60% of excavation for approach ramp structures								
MS 5.1.4 Complete 80% of excavation for approach ramp structures								
MS 5.1.5 Complete 100% of excavation for approach ramp structures								
MS 5.1.6 Complete retaining wall foundation for 10% of the total length (measured on plan) of approach ramp								
MS 5.1.7 Complete retaining wall foundation for 20% of the total length (measured on plan) of approach ramp								
MS 5.1.8 Complete retaining wall foundation for 30% of the total length (measured on plan) of approach ramp								
MS 5.1.9 Complete retaining wall foundation for 40% of the total length (measured on plan) of approach ramp								
MS 5.1.10 Complete retaining wall foundation for 50% of the total length (measured on plan) of approach ramp								
MS 5.1.11 Complete retaining wall foundation for 60% of the total length (measured on plan) of approach ramp								
MS 5.1.12 Complete retaining wall foundation for 70% of the total length (measured on plan) of approach ramp								
MS 5.1.13 Complete retaining wall foundation for 80% of the total length (measured on plan) of approach ramp								
MS 5.1.14 Complete retaining wall foundation for 90% of the total length (measured on plan) of approach ramp								
MS 5.1.15 Complete retaining wall foundation for 100% of the total length (measured on plan) of approach ramp								
MS 5.1.16 Complete retaining wall structure for 10% of the total length (measured on plan) of approach ramp								◆ MS 5.1.16 Complete retaining wall structure for 10% of the total length (measured on plan) of approach ramp
MS 5.1.17 Complete retaining wall structure for 20% of the total length (measured on plan) of approach ramp								◆ MS 5.1.17 Complete retaining wall structure for 20% of the total length (measured on plan) of approach ramp
MS 5.1.18 Complete retaining wall structure for 30% of the total length (measured on plan) of approach ramp								◆ MS 5.1.18 Complete retaining wall structure for 30% of the total length (measured on plan) of approach ramp
MS 5.1.19 Complete retaining wall structure for 40% of the total length (measured on plan) of approach ramp								◆ MS 5.1.19 Complete retaining wall structure for 40% of the total length (measured on plan) of approach ramp
MS 5.1.20 Complete retaining wall structure for 50% of the total length (measured on plan) of approach ramp								◆ MS 5.1.20 Complete retaining wall structure for 50% of the total length (measured on plan) of approach ramp
<b>Approach Ramp Structures to Cut-and-cover Tunnel at Northern Landfall</b>								
MS 5.2.6 Complete retaining wall foundation for 10% of the total length (measured on plan) of approach ramp								◆ MS 5.2.6 Complete retaining wall foundation for 10% of the total length (measured on plan) of approach ramp
MS 5.2.7 Complete retaining wall foundation for 20% of the total length (measured on plan) of approach ramp								◆ MS 5.2.7 Complete retaining wall foundation for 20% of the total length (measured on plan) of approach ramp
MS 5.2.8 Complete retaining wall foundation for 30% of the total length (measured on plan) of approach ramp								◆ MS 5.2.8 Complete retaining wall foundation for 30% of the total length (measured on plan) of approach ramp
MS 5.2.9 Complete retaining wall foundation for 40% of the total length (measured on plan) of approach ramp								◆ MS 5.2.9 Complete retaining wall foundation for 40% of the total length (measured on plan) of approach ramp
MS 5.2.10 Complete retaining wall foundation for 50% of the total length (measured on plan) of approach ramp								◆ MS 5.2.10 Complete retaining wall foundation for 50% of the total length (measured on plan) of approach ramp
MS 5.2.11 Complete retaining wall foundation for 60% of the total length (measured on plan) of approach ramp								◆ MS 5.2.11 Complete retaining wall foundation for 60% of the total length (measured on plan) of approach ramp
MS 5.2.12 Complete retaining wall foundation for 70% of the total length (measured on plan) of approach ramp								◆ MS 5.2.12 Complete retaining wall foundation for 70% of the total length (measured on plan) of approach ramp
MS 5.2.13 Complete retaining wall foundation for 80% of the total length (measured on plan) of approach ramp								◆ MS 5.2.13 Complete retaining wall foundation for 80% of the total length (measured on plan) of approach ramp
<b>At grade Roads at Southern Landfall</b>								
MS 6.1.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes								◆ MS 6.1.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes
<b>At grade Roads at Northern Landfall</b>								
MS 6.2.1 Complete sub-base works of 20% of total area of at grade roads								◆ MS 6.2.1 Complete sub-base works of 20% of total area of at grade roads
MS 6.2.5 Complete pavement of 20% of total area of at grade roads								◆ MS 6.2.5 Complete pavement of 20% of total area of at grade roads
MS 6.2.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes			◆ MS 6.2.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes					
MS 6.2.17 Complete sewerage installation of 20% length of total length (measured on plan) of sewerage pipes			◆ MS 6.2.17 Complete sewerage installation of 20% length of total length (measured on plan) of sewerage pipes					
MS 6.2.21 Complete watermains installation of 20% length of total length (measured on plan) of watermains								◆ MS 6.2.21 Complete watermains installation of 20% length of total length (measured on plan) of watermains
<b>South Ventilation Buildings</b>								
MS 7.1.1 Complete 100% of cofferdam for excavation								
MS 7.1.2 Complete 100% of excavation to the formation level								
MS 7.1.3 Complete 100% of foundation for the ventilation building								
MS 7.1.4 Complete concreting works of 25% area of the total construction floor area for the ventilation building								
MS 7.1.5 Complete concreting works of 50% area of the total construction floor area for the ventilation building								
MS 7.1.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building								◆ MS 7.1.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building
MS 7.1.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building								◆ MS 7.1.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building
<b>North Ventilation Buildings</b>								
MS 7.2.4 Complete concreting works of 25% area of the total construction floor area for the ventilation building								
MS 7.2.5 Complete concreting works of 50% area of the total construction floor area for the ventilation building								
MS 7.2.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building								
MS 7.2.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building								◆ MS 7.2.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building
<b>Facilities Provision for TCSS for At Grade Roads at Northern Landfall</b>								
MS 8.2.5 Complete 25% of support foundation, ductings, drawpits for at grade roads								◆ MS 8.2.5 Complete 25% of support foundation, ductings, drawpits for at grade roads
<b>Facilities Provision for E&amp;M Works for TBM Tunnel, Cut &amp; Cover Tunnels and Cross Passages</b>								
MS 9.1.1 Complete 25% of bonding terminal, opening and accessories, etc.								
MS 9.1.2 Complete 25% of plinth, hoisting facilities and accessories, etc.								
MS 9.1.3 Complete 50% of bonding terminal, opening and accessories, etc.								
MS 9.1.4 Complete 50% of plinth, hoisting facilities and accessories, etc.								
MS 9.1.5 Complete 75% of bonding terminal, opening and accessories, etc.								◆ MS 9.1.5 Complete 75% of bonding terminal, opening and accessories, etc.
MS 9.1.6 Complete 75% of plinth, hoisting facilities and accessories, etc.								◆ MS 9.1.6 Complete 75% of plinth, hoisting facilities and accessories, etc.
<b>Facilities Provision for E&amp;M Works for South Ventilation Building</b>								
MS 9.4.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, concealment, etc.								◆ MS 9.4.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, concealment, etc.
MS 9.4.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.								◆ MS 9.4.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.

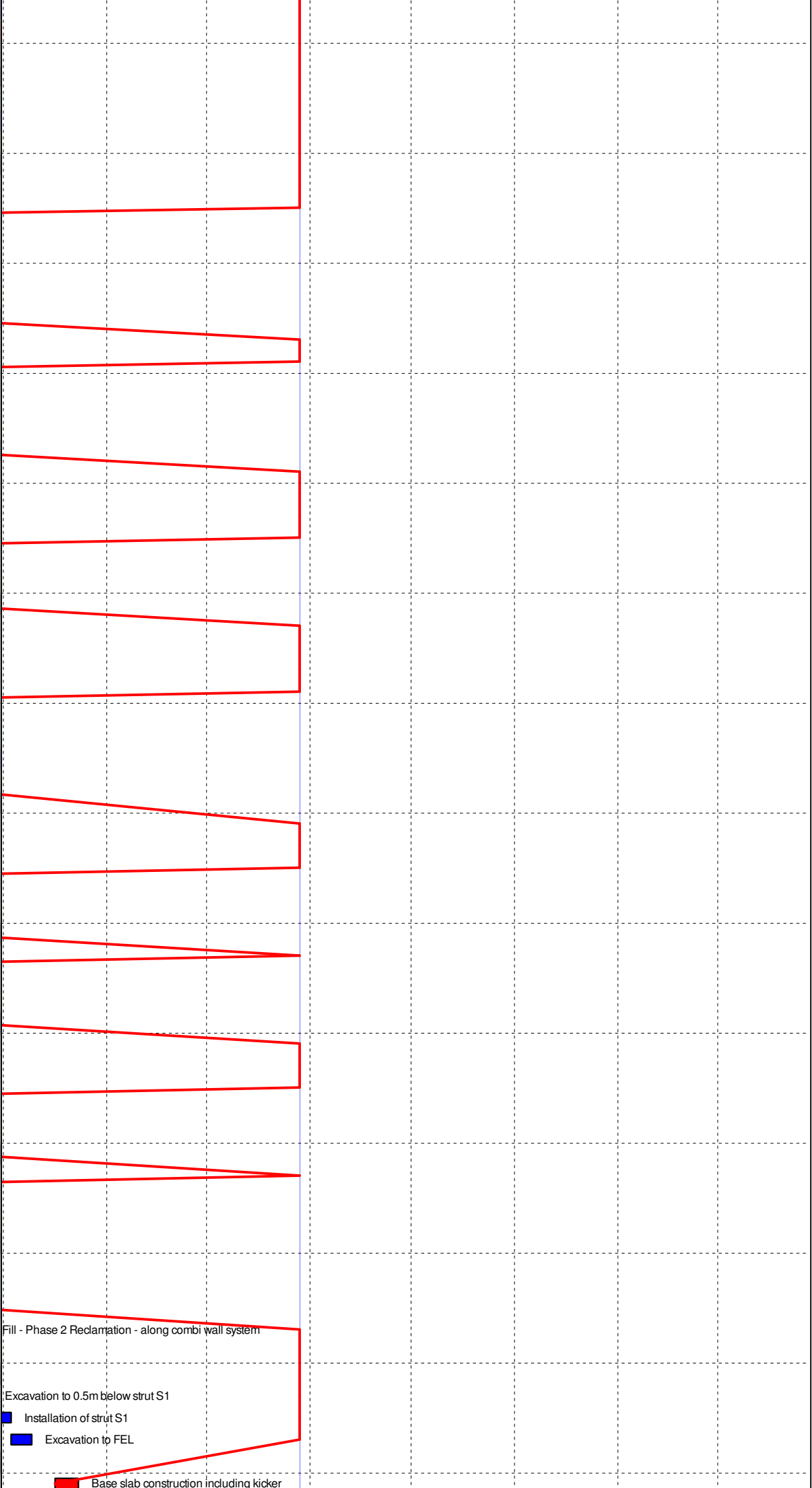
- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJEN-PRG98507	WYu	SPa
08-Apr-14	TMCLKDBJEN-PRG98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJEN-PRG98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJEN-PRG98507 Rev.F	WYu	

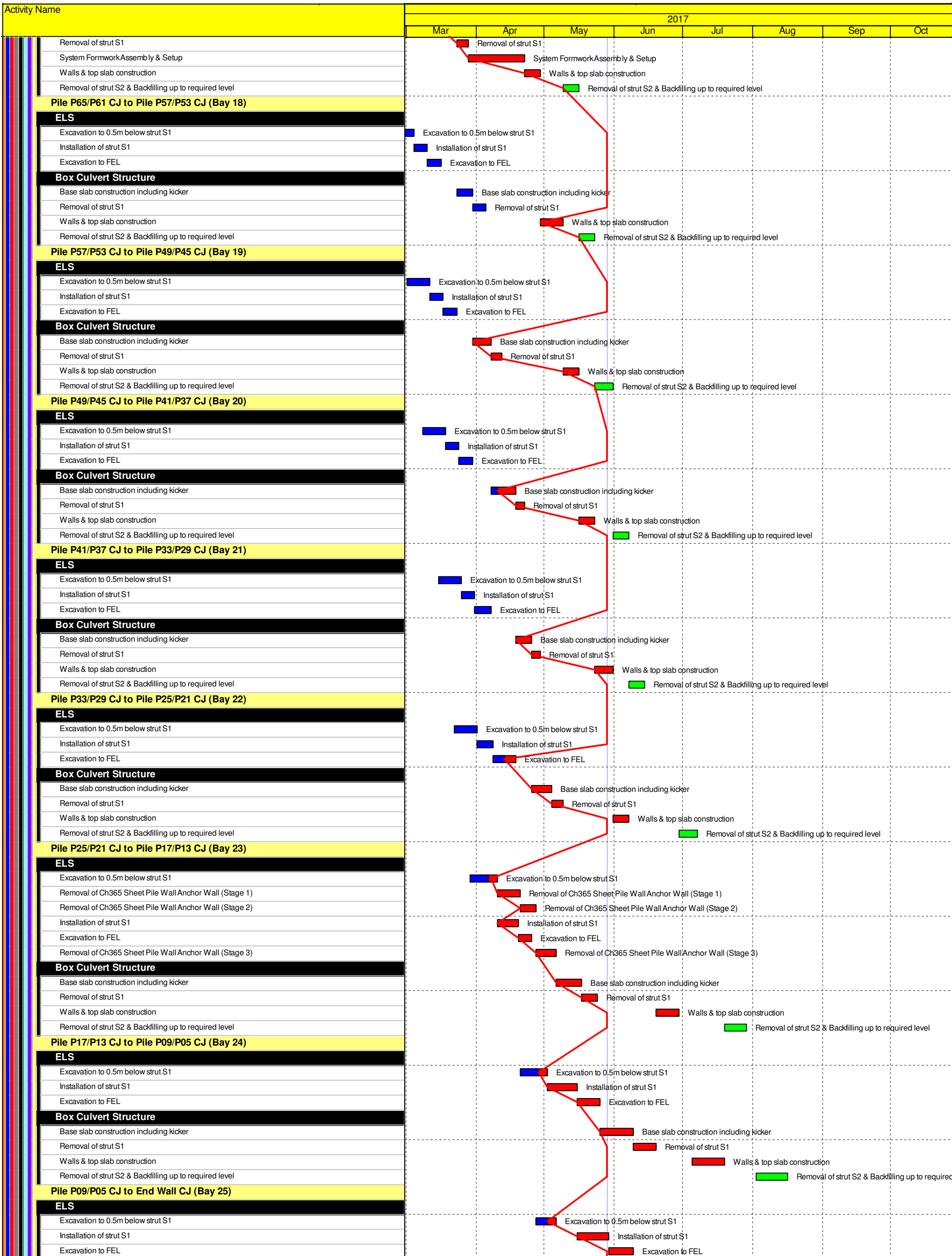
Activity Name	2017								
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
MS 9.4.3 Complete 25% of floor drain, water tank and accessories, etc.				◆ MS 9.4.3 Complete 25% of floor drain, water tank and accessories, etc.					
MS 9.4.4 Complete 50% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal						◆ MS 9.4.4 Complete 50% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal			
MS 9.4.5 Complete 50% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.						◆ MS 9.4.5 Complete 50% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.			
MS 9.4.6 Complete 50% of floor drain, water tank and accessories, etc.						◆ MS 9.4.6 Complete 50% of floor drain, water tank and accessories, etc.			
<b>Facilities Provision for E&amp;M Works for North Ventilation Building</b>									
MS 9.5.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal			◆ MS 9.5.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal						
MS 9.5.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.			◆ MS 9.5.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.						
MS 9.5.3 Complete 25% of floor drain, water tank and accessories, etc.			◆ MS 9.5.3 Complete 25% of floor drain, water tank and accessories, etc.						
MS 9.5.4 Complete 50% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal					◆ MS 9.5.4 Complete 50% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal				
MS 9.5.5 Complete 50% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.					◆ MS 9.5.5 Complete 50% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.				
MS 9.5.6 Complete 50% of floor drain, water tank and accessories, etc.					◆ MS 9.5.6 Complete 50% of floor drain, water tank and accessories, etc.				
MS 9.5.7 Complete 75% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal						◆ MS 9.5.7 Complete 75% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal			
MS 9.5.8 Complete 75% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.						◆ MS 9.5.8 Complete 75% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.			
MS 9.5.9 Complete 75% of floor drain, water tank and accessories, etc.						◆ MS 9.5.9 Complete 75% of floor drain, water tank and accessories, etc.			

<b>Construction</b>
<b>Northern Landfall</b>
<b>Box Culvert Extension</b>
<b>Construction</b>
<b>CH100-150 Land Section</b>
<b>ELS &amp; Structure</b>
<b>Pile A41/A39 CJ to Pile A39/A37 CJ (Bay 7)</b>
<b>Box Culvert Structure</b>
Base slab construction including kicker
Removal of strut S1
Sliding formworks 1st assembly
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile A39/A37 CJ to Pile A37/A35 CJ (Bay 8)</b>
<b>Box Culvert Structure</b>
Base slab construction including kicker
Removal of strut S1
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile A37/A35 CJ to Pile A35/A33 CJ (Bay 9)</b>
<b>Box Culvert Structure</b>
Pile cap construction
Base slab construction including kicker
Removal of strut S1
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile A35/A33 CJ to Pile A33/P117 CJ (Bay 10)</b>
<b>Box Culvert Structure</b>
Pile cap construction
Base slab construction including kicker
Removal of strut S1
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Ch150-250 Marine Section</b>
<b>ELS &amp; Structure</b>
<b>Pile A33/P117 CJ to Pile P113/P109 CJ (Bay 11)</b>
<b>Box Culvert Structure</b>
Base slab construction including kicker
Removal of strut S1
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile P113/P109 CJ to Pile P105/P101 CJ (Bay 12)</b>
<b>Box Culvert Structure</b>
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile P105/P101 CJ to Pile P97/P93 CJ (Bay 13)</b>
<b>Box Culvert Structure</b>
Base slab construction including kicker
Removal of strut S1
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile P97/P93 CJ to Pile P89/P85 CJ (Bay 14)</b>
<b>Box Culvert Structure</b>
Walls & top slab construction
Removal of strut S2 & Backfilling up to required level
<b>Pile P89/P85 CJ to Pile P81/P77 CJ (Bay 15)</b>
<b>Box Culvert Structure</b>
Removal of strut S2 & Backfilling up to required level
<b>Ch250-380 Marine Section</b>
<b>ELS &amp; Structure</b>
Public Fill - Phase 2 Reclamation - along combi wall system
<b>Pile P73/P69 CJ to Pile P65/P61 CJ (Bay17)</b>
<b>ELS</b>
Excavation to 0.5m below strut S1
Installation of strut S1
Excavation to FEL
<b>Box Culvert Structure</b>
Base slab construction including kicker



	Planned Bar
	Planned Bar - Critical
	Planned Milestone
	Progress bar
	Progress Milestone

Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN/PRG/98507	WYu	SPo
08-Apr-14	TMCLKDBJGEN/PRG/98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN/PRG/98507 Rev.F	WYu	

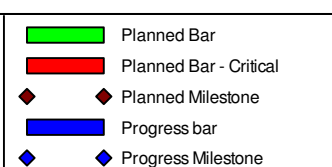
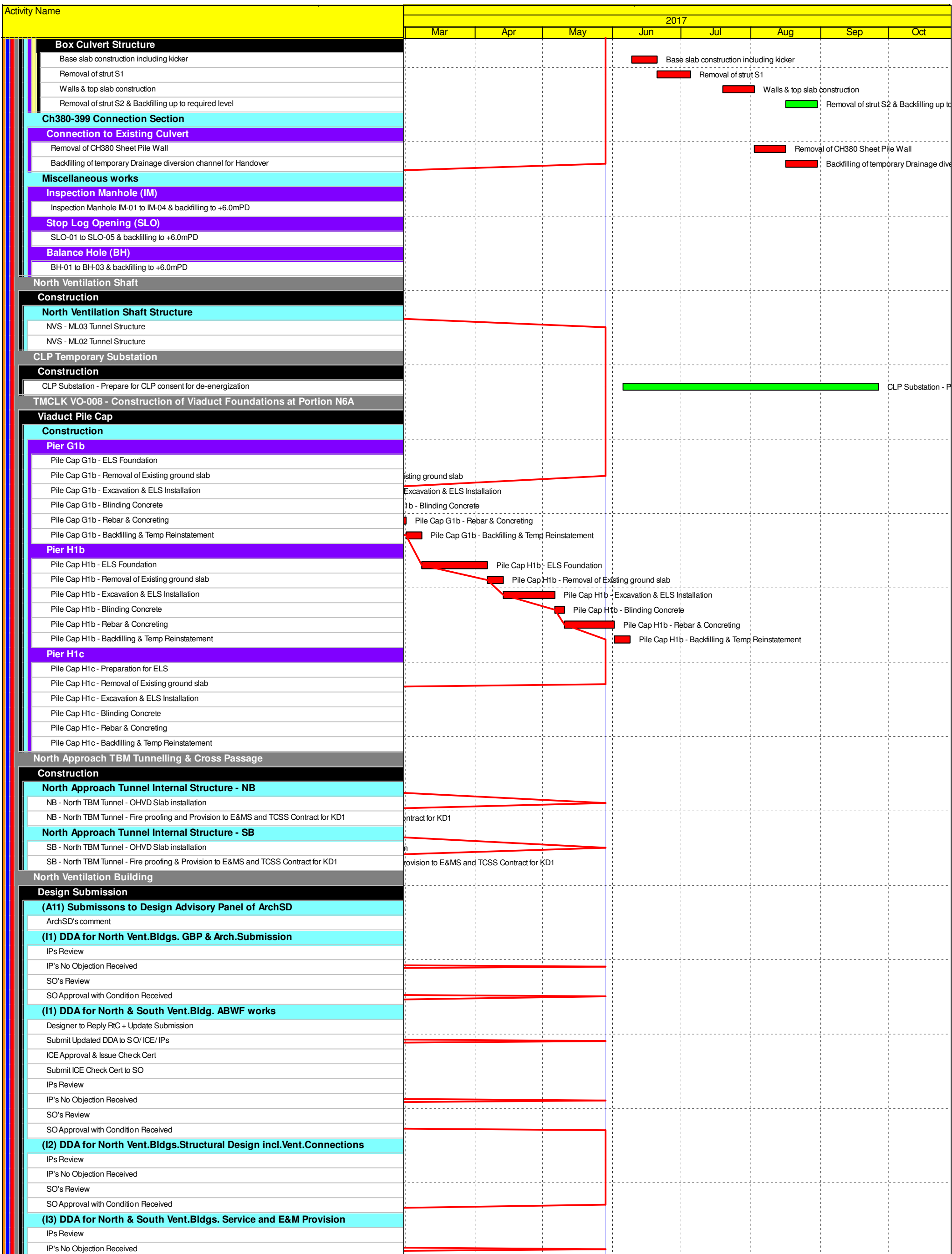


- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone

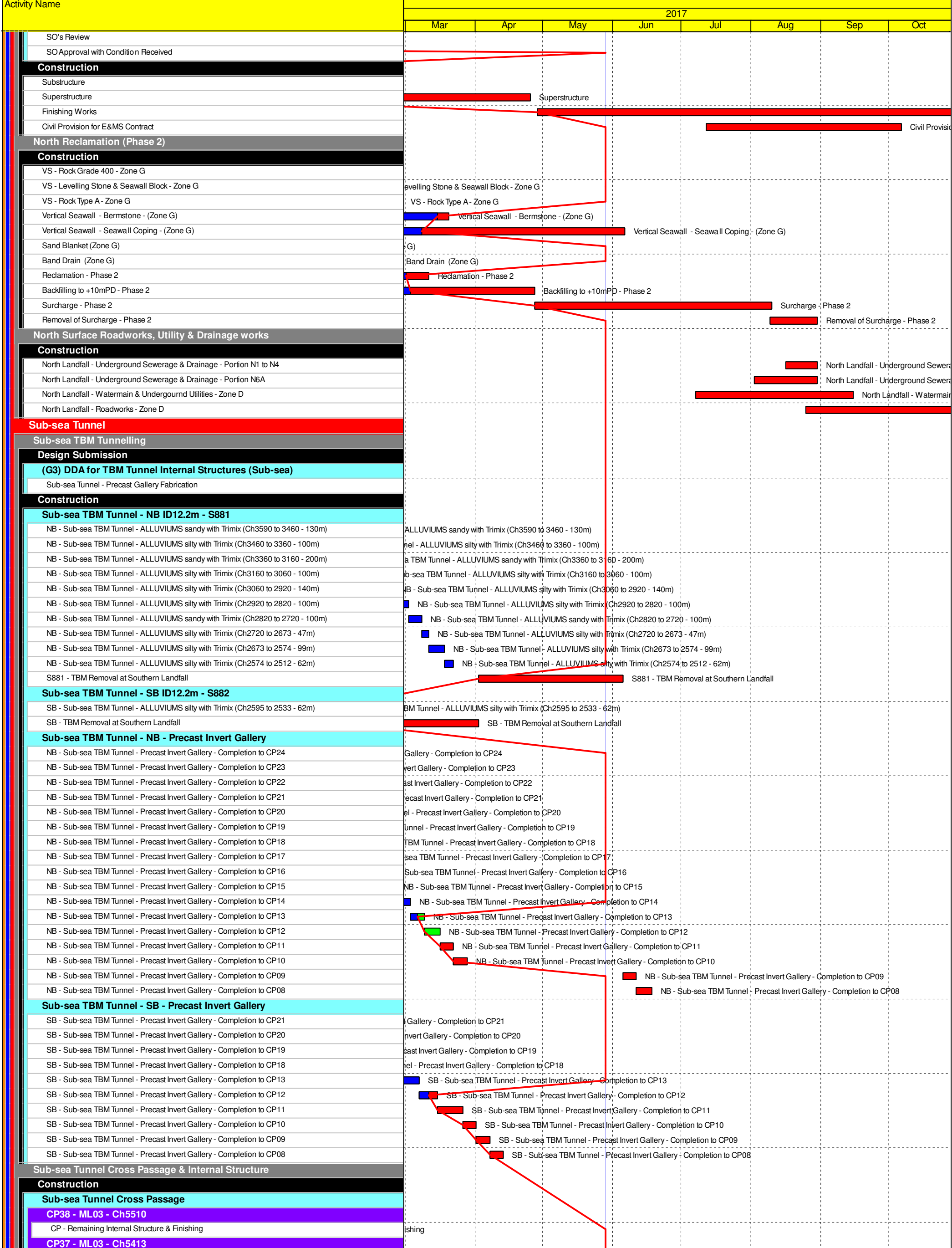


Date	Revision	Checked	Approved
12-Feb-14	TMCLKD/BGEN/PRG/98507	WYu	SPo
08-Apr-14	TMCLKD/BGEN/PRG/98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKD/BGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKD/BGEN/PRG/98507 Rev.F	WYu	





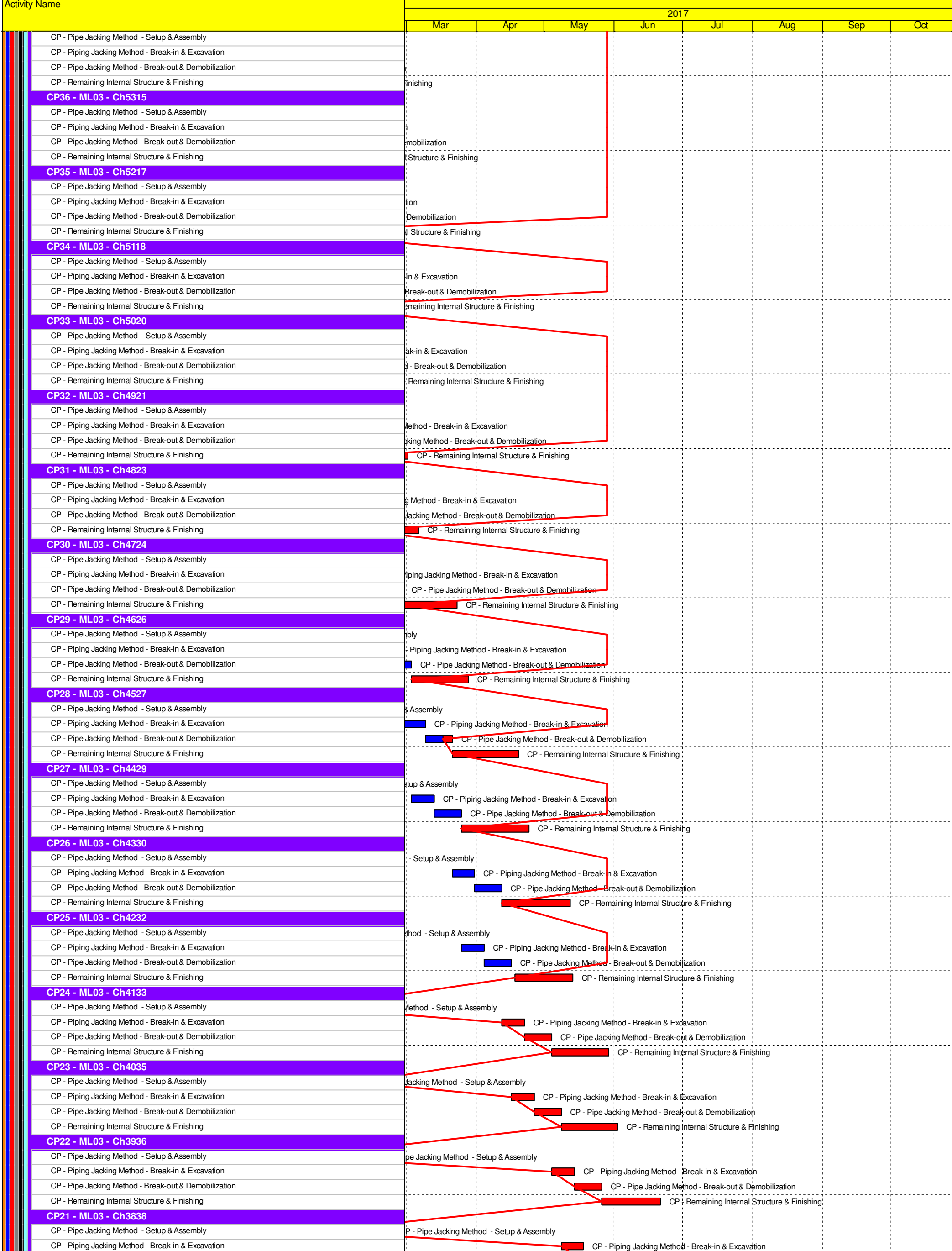
Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN/PRG/98507	WYu	SPo
08-Apr-14	TMCLKDBJGEN/PRG/98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN/PRG/98507 Rev.F	WYu	



■ Planned Bar  
■ Planned Bar - Critical  
◆ Planned Milestone  
■ Progress bar  
◆ Progress Milestone



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12-Feb-14	TMCLKDBJGEN/PRG/98507	WYu	SPo
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28-Aug-14	TMCLKDBJGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN/PRG/98507 Rev.F	WYu	



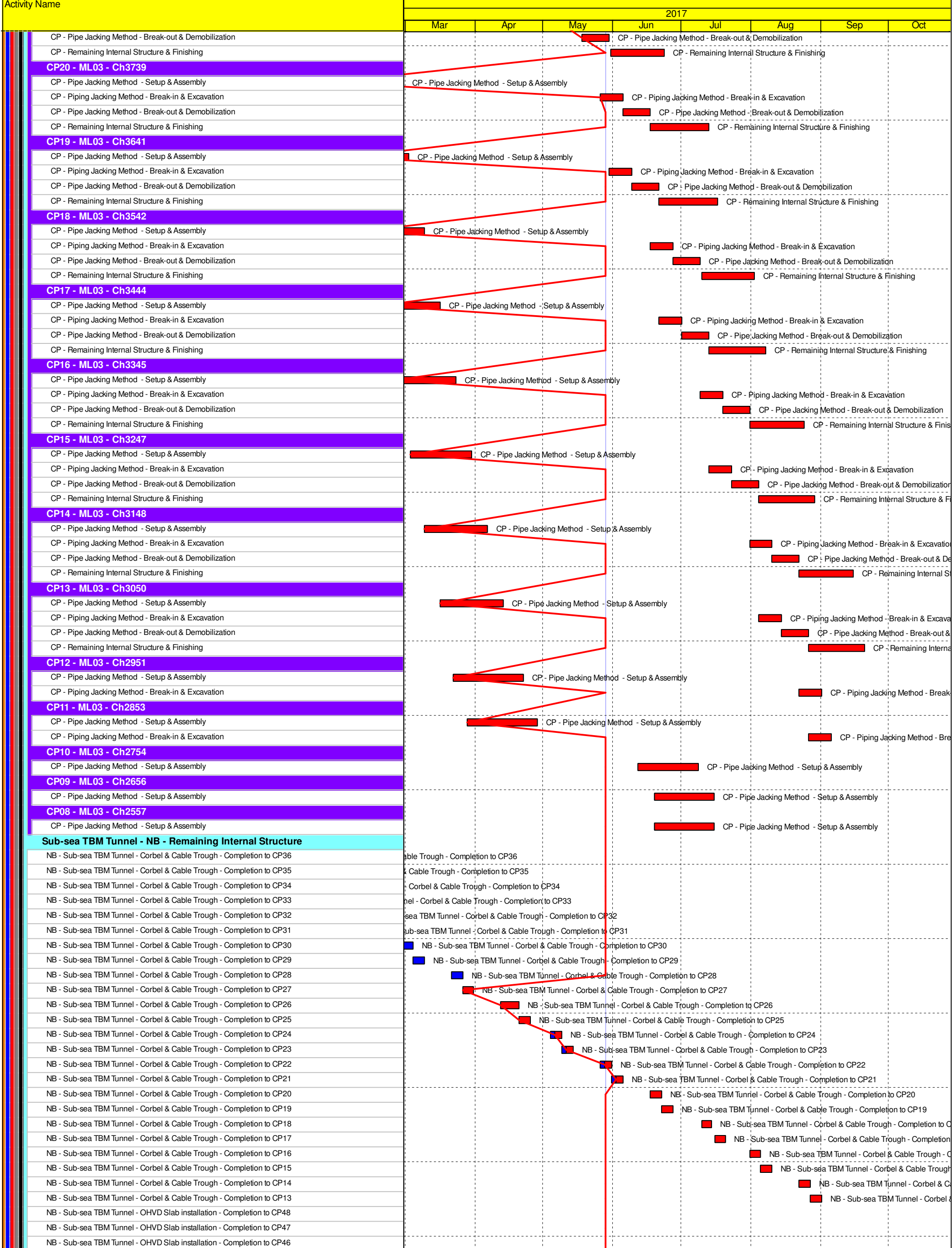
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- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone

**TMCLK - Northern Connection Sub-Sea Tunnel Section**  
 Detailed Works Programme (Rev. F)  
 Three Months Rolling Programme  
 Progress as of 28-May-17



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGENPRG98507	WYu	SPo
08-Apr-14	TMCLKDBJGENPRG98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGENPRG98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGENPRG98507 Rev.F	WYu	

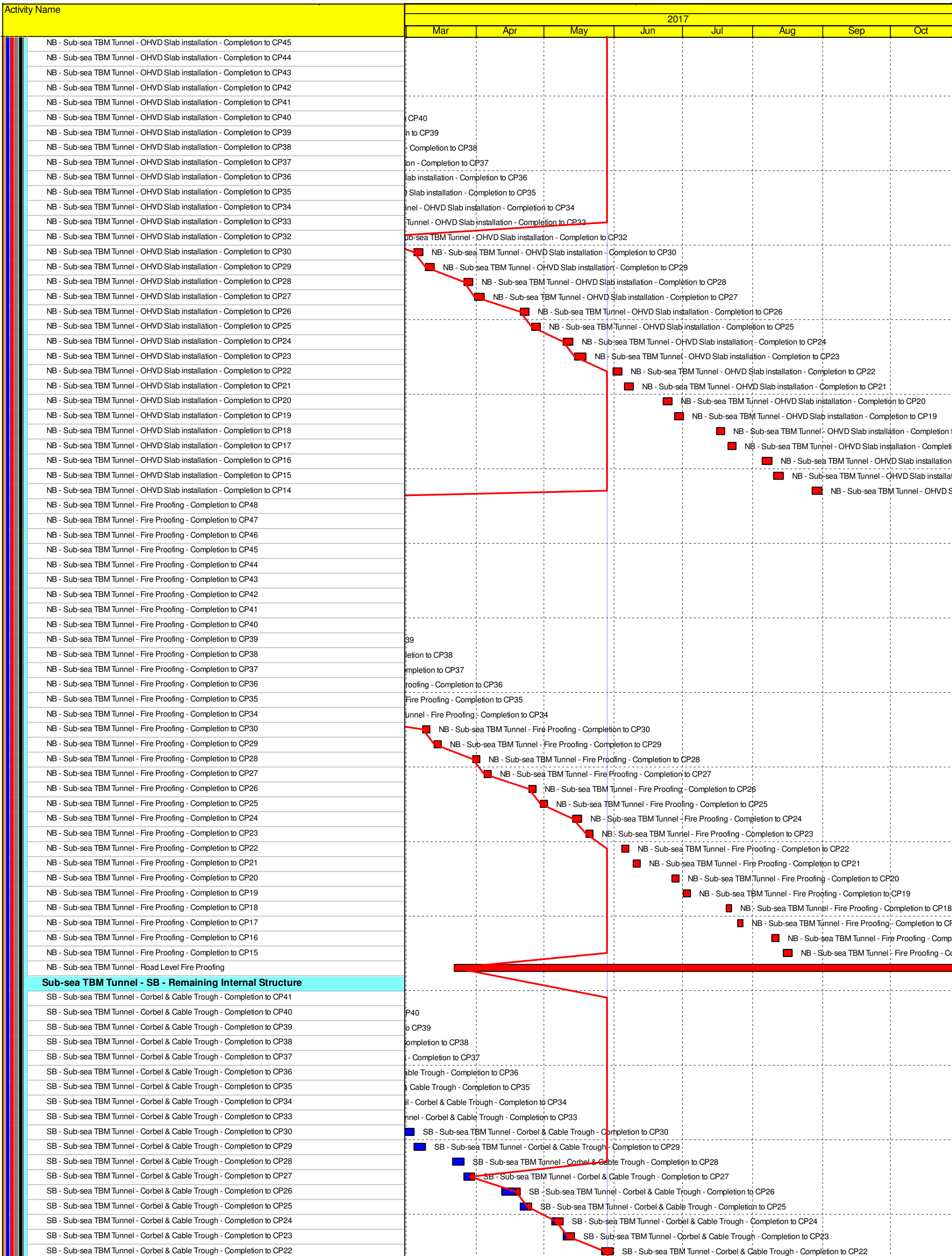




- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDUBGEN/PRG/98507	WYu	SPa
08-Apr-14	TMCLKDUBGEN/PRG/98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDUBGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDUBGEN/PRG/98507 Rev.F	WYu	



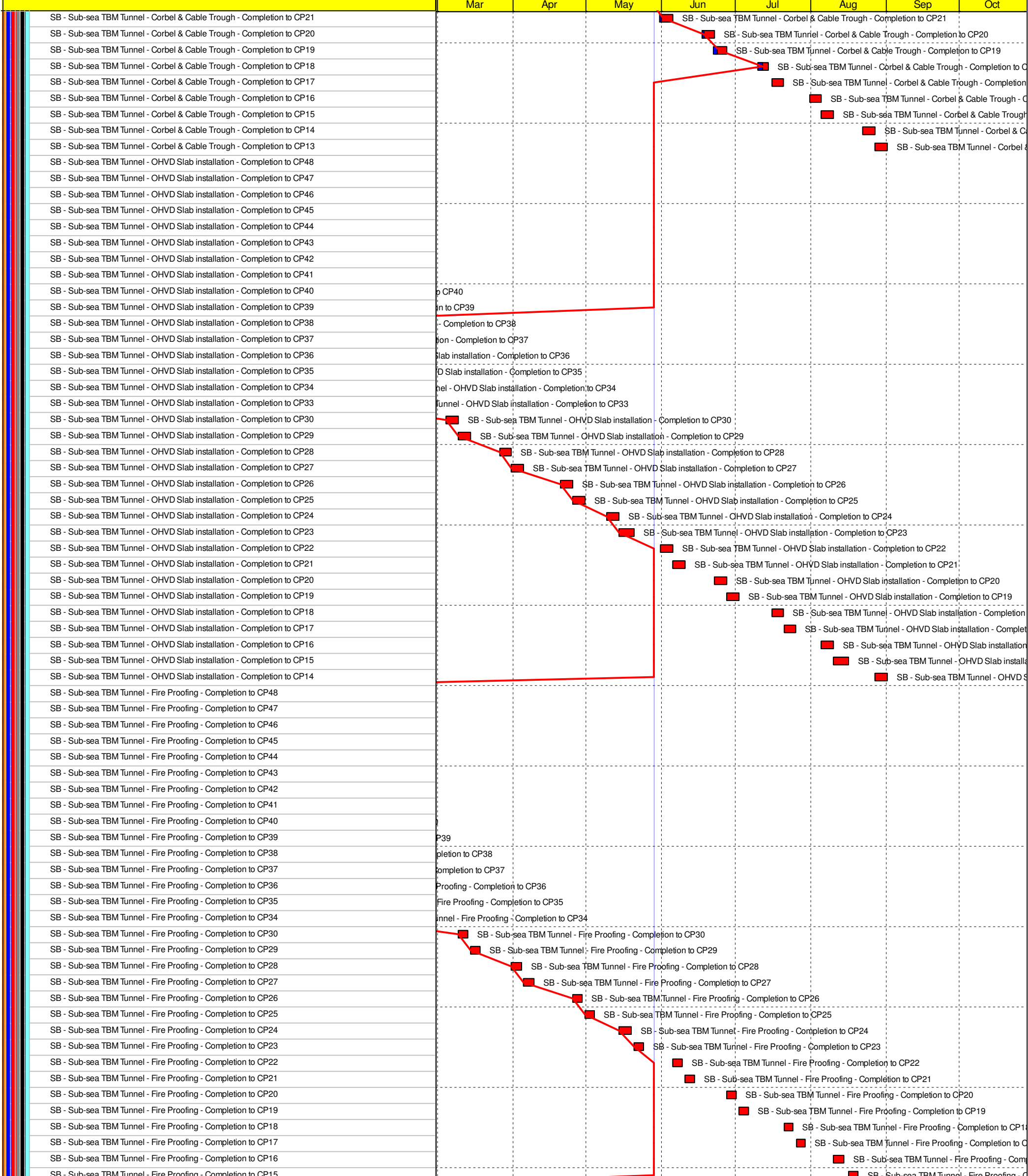
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- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone

TMCLK - Northern Connection Sub-Sea Tunnel Section  
 Detailed Works Programme (Rev. F)  
 Three Months Rolling Programme  
 Progress as of 28-May-17



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGENPRG98507	WYu	SPo
08-Apr-14	TMCLKDBJGENPRG98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGENPRG98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGENPRG98507 Rev.F	WYu	





<b>Southern Landfall</b>	
<b>South Cut &amp; Cover Tunnel</b>	
<b>Design Submission</b>	
<b>(E2) DDA for South C&amp;C Box &amp; Approach Ramp</b>	
Review & Comment by JV	
Designer prepare DDA	
Formal Submission of DDA to ICE/ IPs	
Advanced Submission to SO	
IPs/ SO's Advance Comments/ ICE Comments	

- Planned Bar
- Planned Bar - Critical
- Planned Milestone
- Progress bar
- Progress Milestone

TMCLK - Northern Connection Sub-Sea Tunnel Section  
 Detailed Works Programme (Rev. F)  
 Three Months Rolling Programme  
 Progress as of 28-May-17



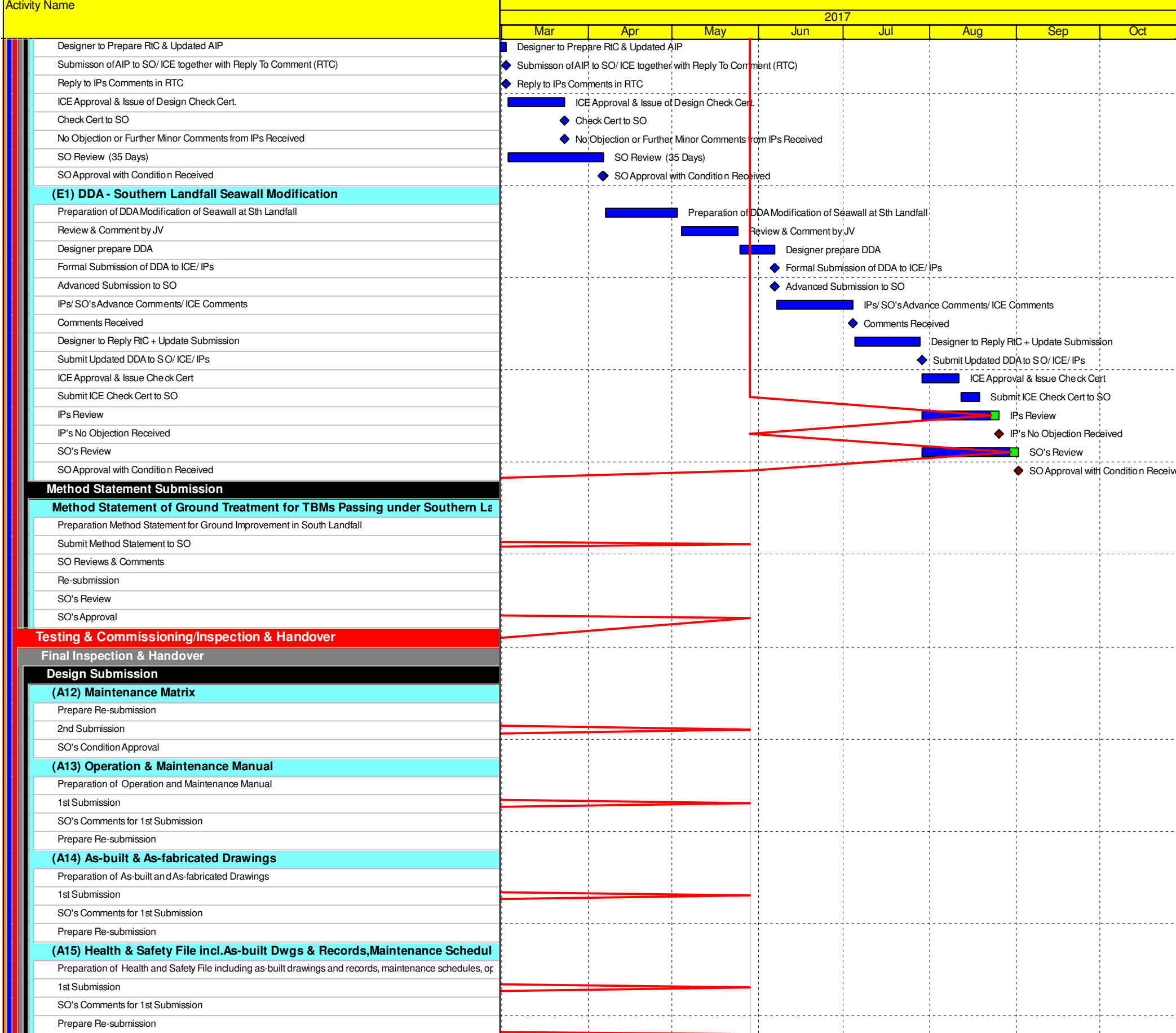
Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN/PRG/98507	WYu	SPo
08-Apr-14	TMCLKDBJGEN/PRG/98507 Rev.B	SPa	WYu
28-Aug-14	TMCLKDBJGEN/PRG/98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN/PRG/98507 Rev.F	WYu	

Activity Name	2017							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Comments Received								
Designer to Reply RtC + Update Submission								
Submit Updated DDA to SO/ ICE/ IPs								
ICE Approval & Issue Check Cert								
Submit ICE Check Cert to SO								
IPs Review								
SO's Review								
<b>Method Statement Submission</b>								
<b>Method Statement of Construction Methodology of C&amp;C Tunnels</b>								
Preparation Method Statement for C&C Tunnels								
Submit Method Statement to SO								
SO Reviews & Comments								
Re-submission								
SO's Review								
<b>Construction</b>								
Provision for TCSS/E&M for Stage 2								Provision for TCSS
<b>South Retrieval Shaft</b>								
<b>Design Submission</b>								
<b>(F4) Gantry Crane Support/Foundations in Southern Landfall</b>								
Designer to Reply RtC + Update Submission								
Submit Updated IFA to SO/ ICE/ IPs								
ICE Approval & Issue Check Cert								
IPs Review								
IP's No Objection Received								
SO's Review								
SO Approval with Condition Received								
<b>Method Statement Submission</b>								
<b>Method Statement of Construction Methodology of Retrieval Shaft</b>								
Preparation Method Statement for Retrieval Shaft								
Submit Method Statement to SO								
SO Reviews & Comments								
Re-submission								
SO's Review								
<b>Construction</b>								
Retrieval Shaft - Excavation - Soft by ramp								
Retrieval Shaft - Excavation - Soft by vertical mean (Fill material)								
Retrieval Shaft - Excavation - Soft (other than Fill)								
Retrieval Shaft - Temp. Slab/Prepare for TBM Breakthrough								
<b>South Ventilation Building</b>								
<b>Design Submission</b>								
<b>(I1) DDA for South Vent.Bldg. GBP &amp; Arch.Submission</b>								
IPs Review								
IP's No Objection Received								
SO's Review								
SO Approval with Condition Received								
<b>(I2) DDA for South Vent.Bldg. Foundation Design</b>								
Review & Comment by JV								
Designer prepare DDA								
Formal Submission of DDA to ICE/ IPs								
Advanced Submission to SO								
IPs/ SO's Advance Comments/ ICE Comments								
Comments Received								
Designer to Reply RtC + Update Submission								
Submit Updated DDA to SO/ ICE/ IPs								
ICE Approval & Issue Check Cert								
Submit ICE Check Cert to SO								
IPs Review								
SO's Review								
<b>(I2) DDA for South Vent.Bldg. Structural Design incl. Vent. Connections</b>								
Review & Comment by JV								
Designer prepare DDA								
Formal Submission of DDA to ICE/ IPs								
Advanced Submission to SO								
IPs/ SO's Advance Comments/ ICE Comments								
Comments Received								
Designer to Reply RtC + Update Submission								
Submit Updated DDA to SO/ ICE/ IPs								
ICE Approval & Issue Check Cert								
IPs Review								
SO's Review								
<b>(J1) DDA Temp.works for Construction of Sth.Vent.Bldg.</b>								
Designer to Reply RtC + Update Submission								
Submit Updated DDA to SO/ ICE/ IPs								
ICE Approval & Issue Check Cert								
Submit ICE Check Cert to SO								
IPs Review								
IP's No Objection Received								
SO's Review								
SO Approval with Condition Received								
<b>South Surface Roadworks, Utility &amp; Drainage works</b>								
<b>Design Submission</b>								
<b>(E1) AIP - Southern Landfall Seawall Modification</b>								

- Planned Bar
- Planned Bar - Critical
- Planned Milestone
- Progress bar
- Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN.PRG.98507	WYu	SPo
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30-Oct-15	TMCLKDBJGEN.PRG.98507 Rev.F	WYu	



- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone



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28-Aug-14	TMCLKDBJGEN.PRG.98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDBJGEN.PRG.98507 Rev.F	WYu	

Appendix C

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	
<b>Air Quality</b>									
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

**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	
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	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		✓

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



*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	
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	Annex A  Figure 6.2b Appendix D6b	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;	TM-CLKL northern landfall, Portion D of HKBCF and HKLR	Contractor	TM-EIAO		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

**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	
		- Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and - 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		✓
<i>General Marine Works</i>									
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		Y		✓

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						D	C	O	
					conditions.				
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 Guidelines. DASO permit conditions.		Y		✓
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		Y		N/A

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						D	C	O	
					conditions.				
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 conditions.		Y		✓
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		✓
<i>Land Works</i>									
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		✓

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						D	C	O	
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		✓
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		✓

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						D	C	O	
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
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		✓
<i>Water Quality Monitoring</i>									
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.	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	Contractor	EM&A Manual		Y	Y	✓

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						D	C	O	
		One year operation phase water quality monitoring at designated stations.	monitoring for a year.						
<b>ECOLOGY</b>									
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		✓

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						D	C	O	
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
7.13	6.5	Construction activities should be restricted to the proposed works boundary.	All areas / Throughout construction period	Contractor	TMEIA		Y		✓
<b>LANDSCAPE AND VISUAL</b>									
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
<b>WASTE</b>									

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						D	C	O	
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		✓
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.		Y		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures including waste reduction, reuse and recycling.	Contract Mobilisation	Contractor	TMEIA		Y		✓
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	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		✓

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						D	C	O	
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		<>
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			✓
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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						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:  f suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed;  f Having a capacity of <450L unless the specifications have been approved by the EPD; and  f Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations.  f Clearly labelled and used solely for the storage of chemical wastes;  f Enclosed with at least 3 sides;  f 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;  f Adequate ventilation;	All areas / throughout construction period	Contractor	TMEIA		Y		<>

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						D	C	O	
		f Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and f 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		✓

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						D	C	O	
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		✓
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		✓
<b>CULTURAL HERITAGE</b>									
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

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Appendix D

## Summary of Action and Limit Levels

Appendix D

## Summary of Action and Limit Levels

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

<b>Parameters</b>	<b>Action</b>	<b>Limit</b>
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	ASR1 = 213 ASR5 = 238 AQMS1 = 213 ASR6 = 238 ASR10 = 214	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	ASR1 = 331 ASR5 = 340 AQMS1 = 335 ASR6 = 338 ASR10 = 337	500

**Table D2** *Action and Limit Levels for Water Quality*

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

**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 D3** *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 D4** *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 E

## EM&A Monitoring Schedules



**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Air Quality Impact Monitoring Schedule - March 2017**

Air quality monitoring stations: ASR1, ASR5, ASR6, ASR10, AQMS1

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1-Mar	2-Mar	3-Mar	4-Mar
			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM
5-Mar	6-Mar	7-Mar	8-Mar	9-Mar	10-Mar	11-Mar
		1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM	
12-Mar	13-Mar	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar
	1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM		
19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	24-Mar	25-Mar
1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM
26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	
		1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM	

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Air Quality Impact Monitoring Schedule - April 2017**

Air quality monitoring stations: ASR1, ASR5, ASR6, ASR10, AQMS1

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-Apr
2-Apr	3-Apr	4-Apr	5-Apr	6-Apr	7-Apr	8-Apr
	1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM		
9-Apr	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr
1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM
16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr
		1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM	
23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr
	1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM		
30-Apr						
1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM						

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Air Quality Impact Monitoring Schedule - May 2017**

Air quality monitoring stations: ASR1, ASR5, ASR6, ASR10, AQMS1

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1-May	2-May	3-May	4-May	5-May	6-May
			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM
7-May	8-May	9-May	10-May	11-May	12-May	13-May
		1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM	
14-May	15-May	16-May	17-May	18-May	19-May	20-May
	1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM		
21-May	22-May	23-May	24-May	25-May	26-May	27-May
1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM			1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM
28-May	29-May	30-May	31-May			
		1-hour TSP - 3 times 24-hour TSP - 1 time  Impact AQM				

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Impact Dolphin Monitoring Survey Monitoring Schedule - March 2017**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1-Mar	2-Mar	3-Mar	4-Mar
				<b>Impact Dolphin Monitoring</b>		
5-Mar	6-Mar	7-Mar	8-Mar	9-Mar	10-Mar	11-Mar
		<b>Impact Dolphin Monitoring</b>				
12-Mar	13-Mar	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar
				<b>Impact Dolphin Monitoring</b>		
19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	24-Mar	25-Mar
26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	
		<b>Impact Dolphin Monitoring</b>				

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Impact Dolphin Monitoring Survey Monitoring Schedule - April 2017**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1-Apr
2-Apr	3-Apr	4-Apr	5-Apr	6-Apr	7-Apr	8-Apr
9-Apr	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr
			<b>Impact Dolphin Monitoring</b>			
16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr
				<b>Impact Dolphin Monitoring</b>		
23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr
	<b>Impact Dolphin Monitoring</b>		<b>Impact Dolphin Monitoring</b>			
30-Apr						

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link  
Northern Connection Sub-sea Tunnel Section  
Impact Dolphin Monitoring Survey Monitoring Schedule - May 2017**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1-May	2-May	3-May	4-May	5-May	6-May
7-May	8-May	9-May	10-May	11-May	12-May	13-May
14-May	15-May	16-May	17-May	18-May	19-May	20-May
				<b>Impact Dolphin Monitoring</b>		
21-May	22-May	23-May	24-May	25-May	26-May	27-May
	<b>Impact Dolphin Monitoring</b>		<b>Impact Dolphin Monitoring</b>		<b>Impact Dolphin Monitoring</b>	
28-May	29-May	30-May	31-May			

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-sea Tunnel Section  
Impact Marine Water Quality Monitoring (WQM) Schedule (March 2017)**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			01-Mar	02-Mar	03-Mar	04-Mar
				<b>WQM</b> Mid-Flood 9:22 (07:37 - 11:07) Mid-Ebb 15:31 (13:46 - 17:16)		<b>WQM</b> Mid-Flood 10:33 (08:48 - 12:18) Mid-Ebb 17:16 (15:31 - 19:01)
05-Mar	06-Mar	07-Mar	08-Mar	09-Mar	10-Mar	11-Mar
		<b>WQM</b> Mid-Ebb 8:29 (07:10 - 09:45) Mid-Flood 13:36 (11:51 - 15:21)		<b>WQM</b> Mid-Ebb 11:08 (09:23 - 12:53) Mid-Flood 16:24 (14:39 - 18:09)		<b>WQM</b> Mid-Ebb 12:31 (10:46 - 14:16) Mid-Flood 18:11 (16:26 - 19:56)
12-Mar	13-Mar	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar
		<b>WQM</b> Mid-Flood 8:13 (06:28 - 09:58) Mid-Ebb 14:04 (12:19 - 15:49)		<b>WQM</b> Mid-Flood 9:00 (07:15 - 10:45) Mid-Ebb 15:07 (13:22 - 16:52)		<b>WQM</b> Mid-Flood 9:52 (08:07 - 11:37) Mid-Ebb 16:22 (14:37 - 18:07)
19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	24-Mar	25-Mar
		<b>WQM</b> Mid-Flood 6:44 (04:59 - 08:29) Mid-Ebb 19:42 (17:57 - 21:27)		<b>WQM</b> Mid-Ebb 10:12 (08:45 - 11:40) Mid-Flood 14:50 (13:05 - 16:35)		<b>WQM</b> Mid-Ebb 11:37 (09:52 - 13:22) Mid-Flood 16:57 (15:12 - 18:42)
26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	
		<b>WQM</b> Mid-Ebb 13:15 (11:30 - 15:00) Mid-Flood 19:18 (17:33 - 21:03)		<b>WQM</b> Mid-Flood 8:14 (06:29 - 09:59) Mid-Ebb 14:31 (12:46 - 16:16)		

**HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-sea Tunnel Section  
Impact Marine Water Quality Monitoring (WQM) Schedule (April 2017)**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26-Mar	27-Mar	28-Mar	29-Mar	30-Mar	31-Mar	01-Apr
						<b>WQM</b> Mid-Flood 9:21 (07:36 - 11:06) Mid-Ebb 16:03 (14:18 - 17:48)
02-Apr	03-Apr	04-Apr	05-Apr	06-Apr	07-Apr	08-Apr
		<b>WQM</b> Mid-Flood 11:46 (10:01 - 13:31) Mid-Ebb 19:23 (17:38 - 21:08)		<b>WQM</b> Mid-Ebb 10:09 (08:24 - 11:54) Mid-Flood 15:15 (13:30 - 17:00)		<b>WQM</b> Mid-Ebb 11:38 (09:53 - 13:23) Mid-Flood 17:20 (15:35 - 19:05)
09-Apr	10-Apr	11-Apr	12-Apr	13-Apr	14-Apr	15-Apr
		<b>WQM</b> Mid-Ebb 13:11 (11:26 - 14:56) Mid-Flood 19:29 (17:44 - 21:14)		<b>WQM</b> Mid-Flood 7:53 (06:08 - 09:38) Mid-Ebb 14:11 (12:26 - 15:56)		<b>WQM</b> Mid-Flood 8:44 (06:59 - 10:29) Mid-Ebb 15:17 (13:32 - 17:02)
16-Apr	17-Apr	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr
		<b>WQM</b> Mid-Flood 10:02 (08:17 - 11:47) Mid-Ebb 17:27 (15:42 - 19:12)		<b>WQM</b> Mid-Flood 7:12 (05:27 - 08:57) Mid-Ebb 19:50 (18:05 - 21:35)		<b>WQM</b> Mid-Ebb 10:30 (08:45 - 12:15) Mid-Flood 15:38 (13:53 - 17:23)
23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr
		<b>WQM</b> Mid-Ebb 12:16 (10:31 - 14:01) Mid-Flood 18:22 (16:37 - 20:07)		<b>WQM</b> Mid-Ebb 13:34 (11:49 - 15:19) Mid-Flood 20:04 (18:19 - 21:49)		<b>WQM</b> Mid-Flood 8:18 (06:33 - 10:03) Mid-Ebb 15:04 (13:19 - 16:49)
30-Apr						



## HY/2012/08 - Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-sea Tunnel Section Impact Marine Water Quality Monitoring (WQM) Schedule (May 2017)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01-May	02-May	03-May	04-May	05-May	06-May
		<b>WQM</b> Mid-Flood 10:25 (08:40 - 12:10) Mid-Ebb 17:45 (16:00 - 19:30)		<b>WQM</b> Mid-Ebb 8:37 (06:53 - 10:23) Mid-Flood 13:34 (11:49 - 15:19)		<b>WQM</b> Mid-Ebb 10:38 (08:53 - 12:23) Mid-Flood 16:16 (14:31 - 18:01)
07-May	08-May	09-May	10-May	11-May	12-May	13-May
		<b>WQM</b> Mid-Ebb 12:19 (10:34 - 14:04) Mid-Flood 18:43 (16:58 - 20:28)		<b>WQM</b> Mid-Ebb 13:22 (11:37 - 15:07) Mid-Flood 20:04 (18:19 - 21:49)		<b>WQM</b> Mid-Flood 7:42 (05:57 - 09:27) Mid-Ebb 14:26 (14:19 - 17:49)
14-May	15-May	16-May	17-May	18-May	19-May	20-May
		<b>WQM</b> Mid-Flood 9:09 (07:24 - 10:54) Mid-Ebb 16:16 (14:31 - 18:01)		<b>WQM</b> Mid-Flood 10:32 (08:47 - 12:17) Mid-Ebb 17:52 (16:07 - 19:37)		<b>WQM</b> Mid-Ebb 8:59 (07:14 - 10:44) Mid-Flood 13:49 (12:04 - 15:34)
21-May	22-May	23-May	24-May	25-May	26-May	27-May
		<b>WQM</b> Mid-Ebb 11:11 (09:26 - 12:56) Mid-Flood 17:16 (15:31 - 19:01)		<b>WQM</b> Mid-Ebb 12:35 (10:50 - 14:20) Mid-Flood 19:10 (17:25 - 20:55)		<b>WQM</b> Mid-Flood 7:14 (05:29 - 08:59) Mid-Ebb 14:08 (12:23 - 15:53)
28-May	29-May	30-May	31-May			
		<b>WQM</b> Mid-Flood 9:24 (07:39 - 11:09) Mid-Ebb 16:35 (14:50 - 18:20)				

Appendix F

## Impact Air Quality Monitoring Results

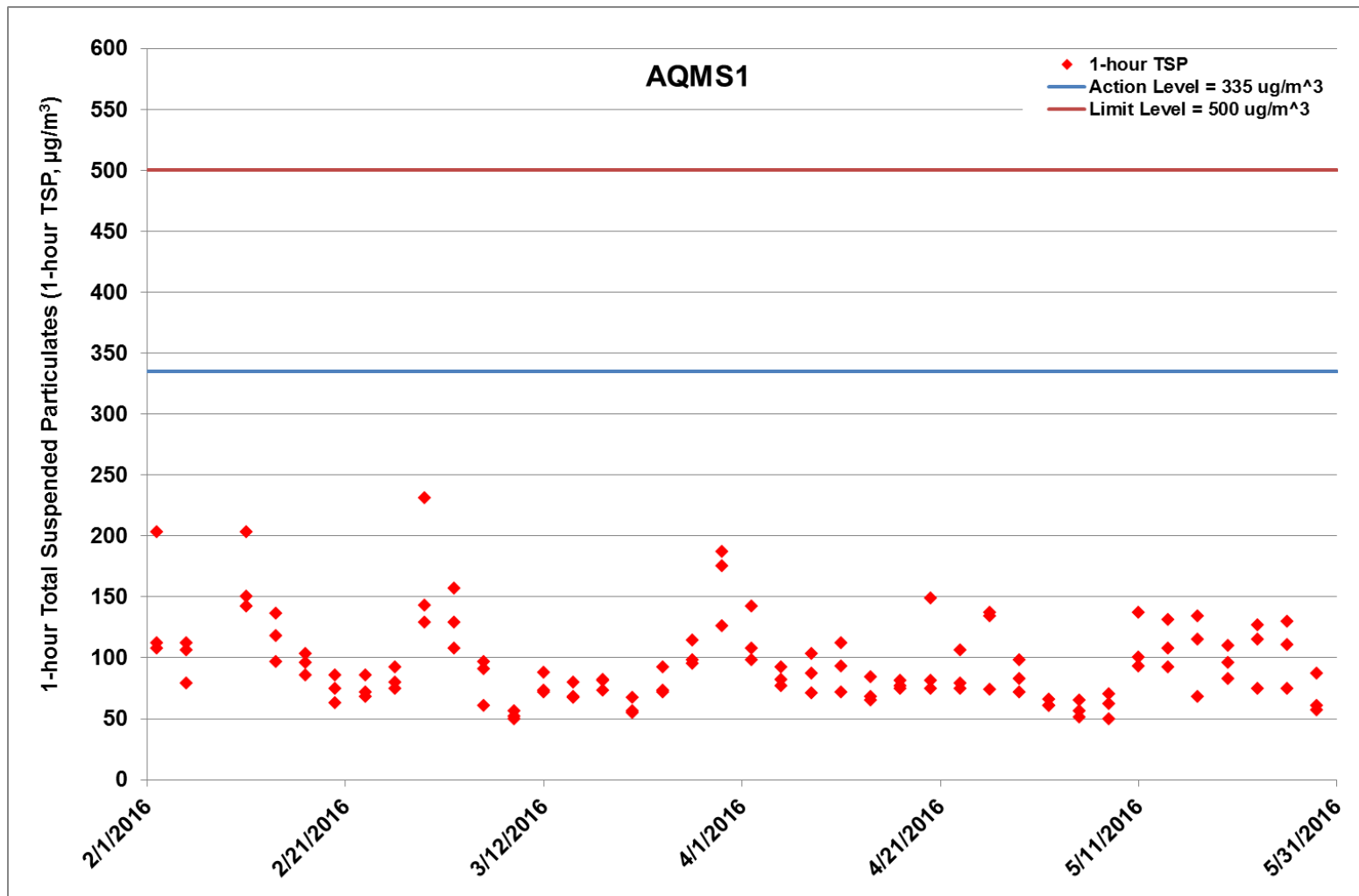


Figure F.1 Impact Monitoring - 1-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at AQMS1 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



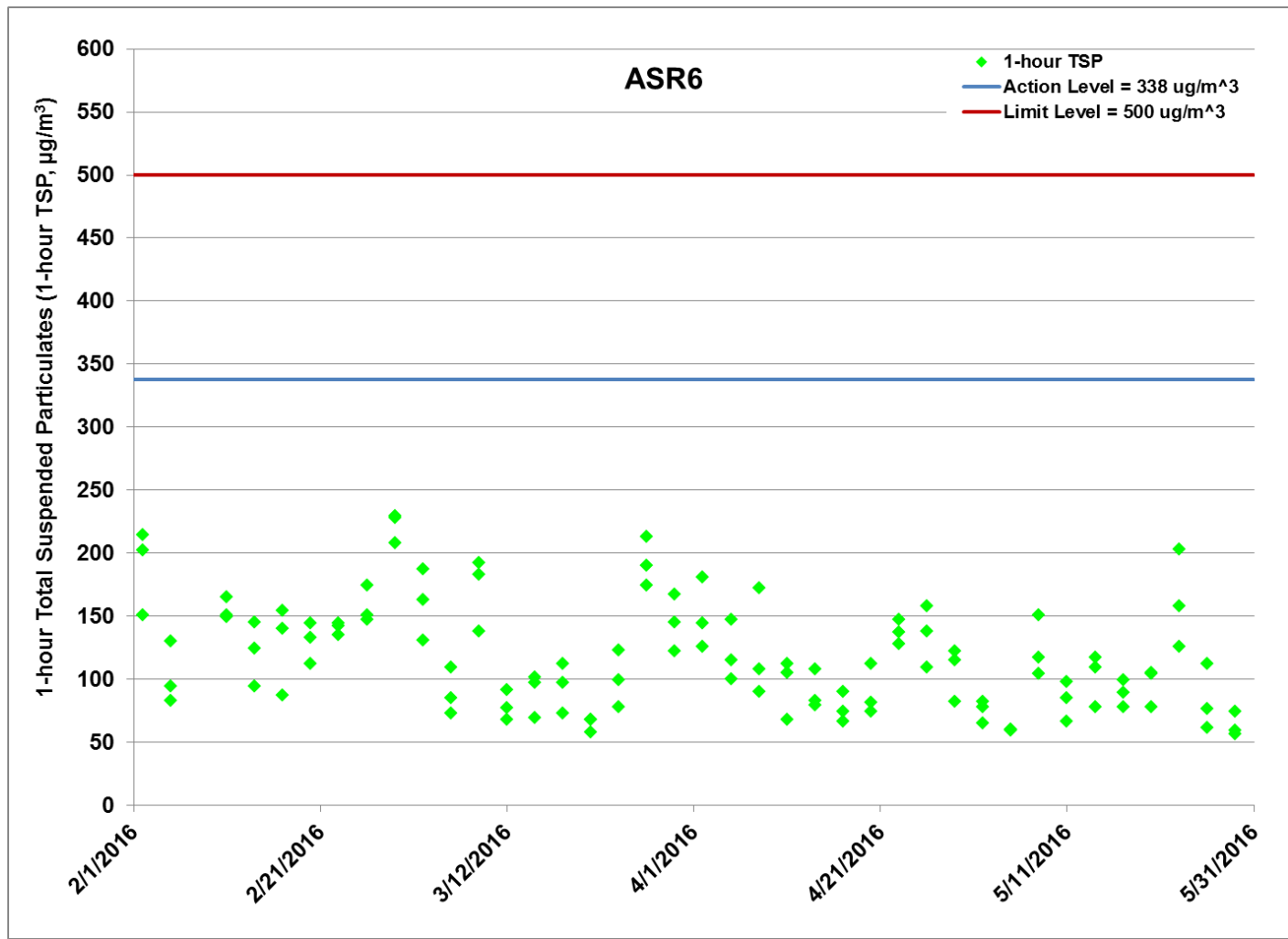


Figure F.2 Impact Monitoring - 1-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR6 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



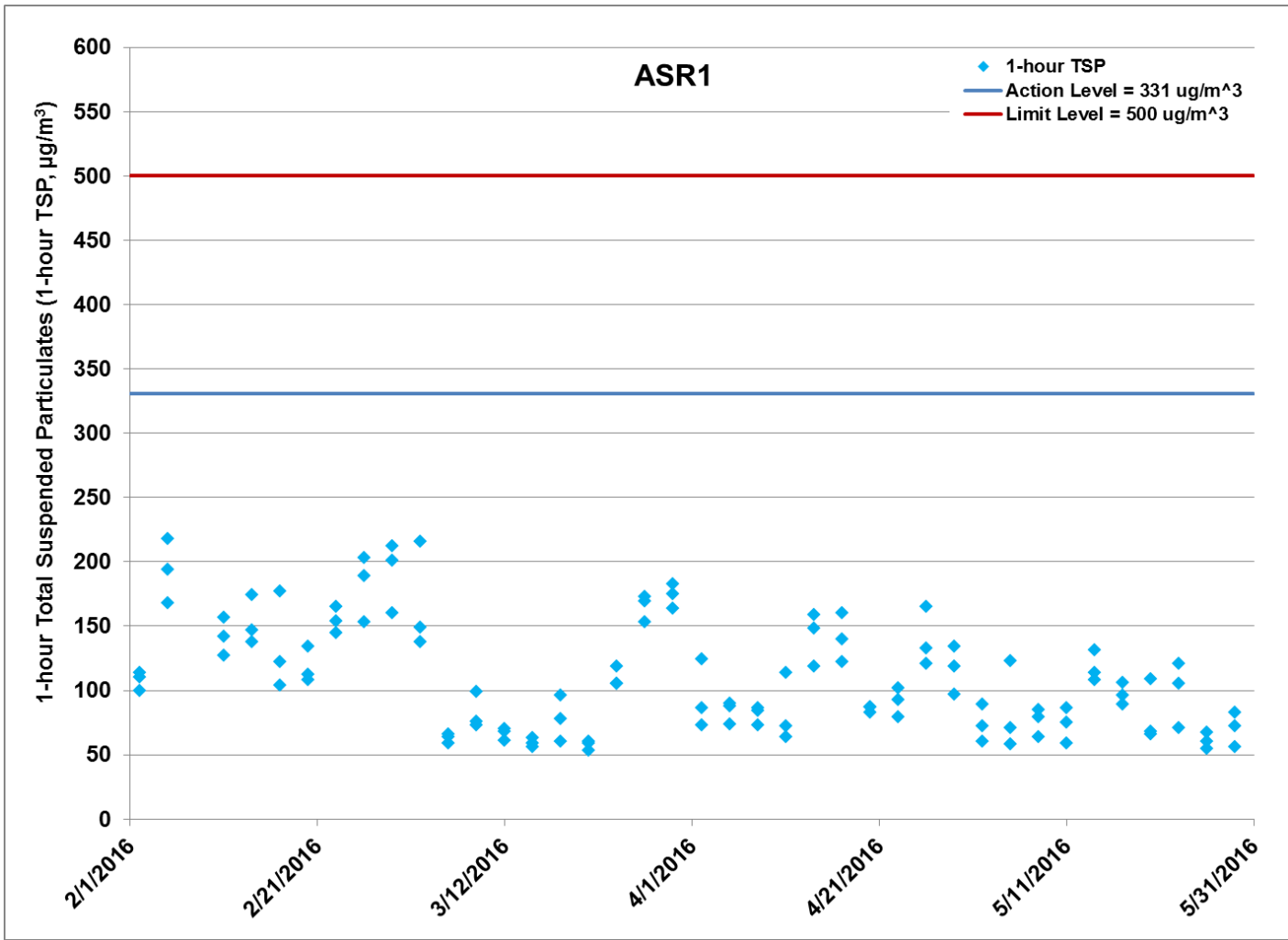


Figure F.3 Impact Monitoring - 1-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR1 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_May 2016\_REV a.xlsx



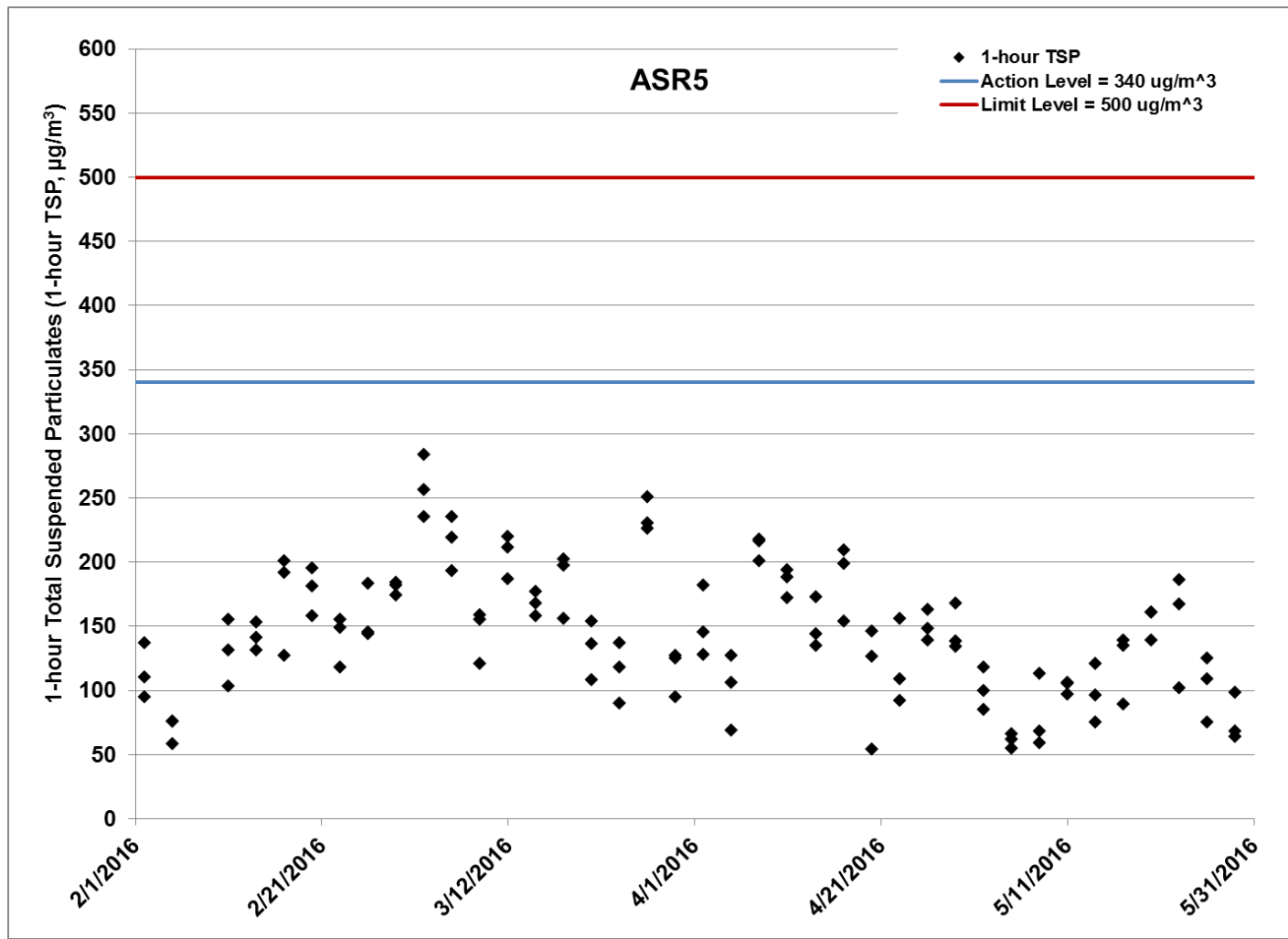


Figure F.4 Impact Monitoring - 1-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR5 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



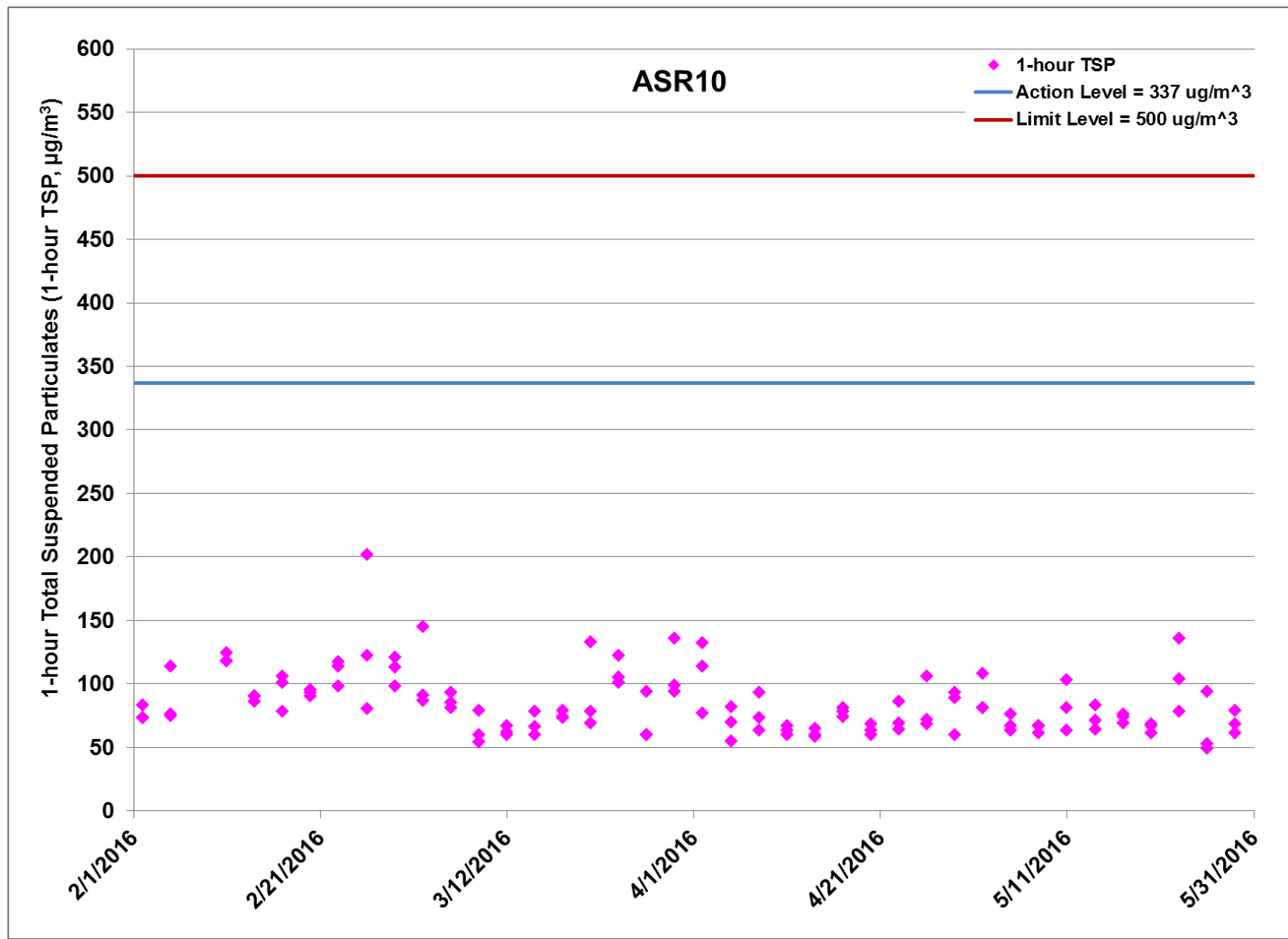


Figure F.5 Impact Monitoring - 1-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR10 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



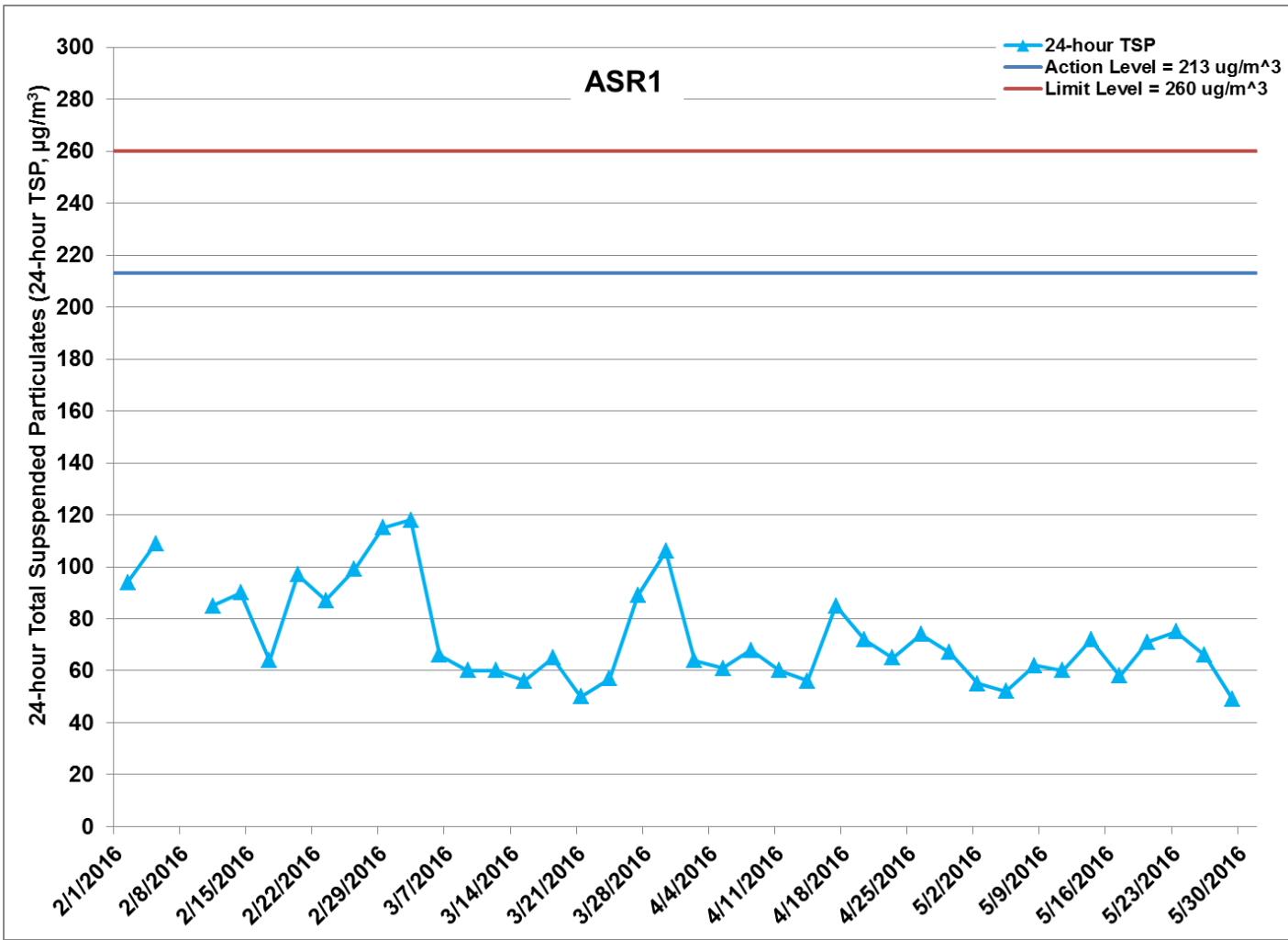


Figure F.6 Impact Monitoring - 24-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR1 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx





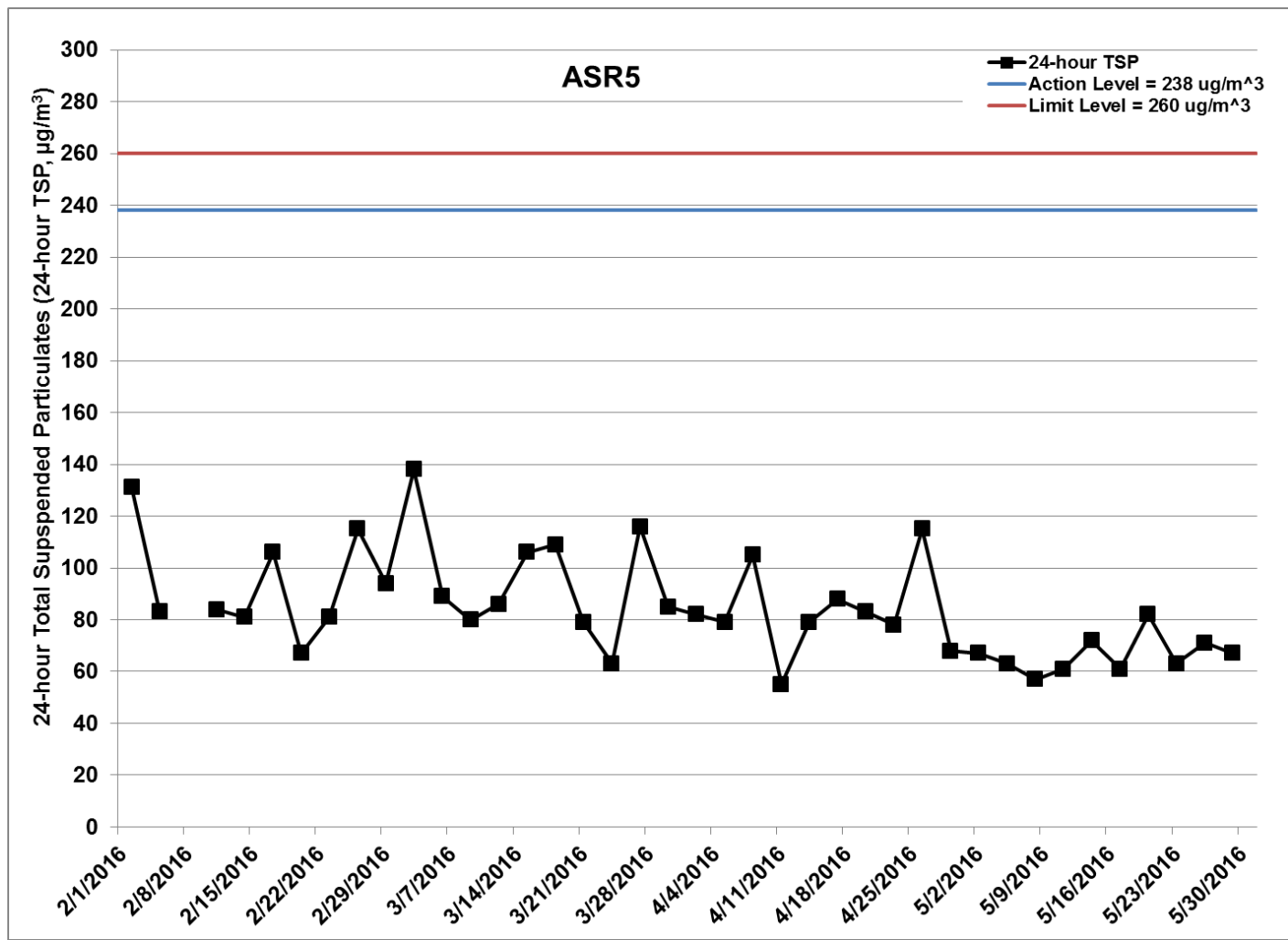


Figure F.7 Impact Monitoring - 24-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR5 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



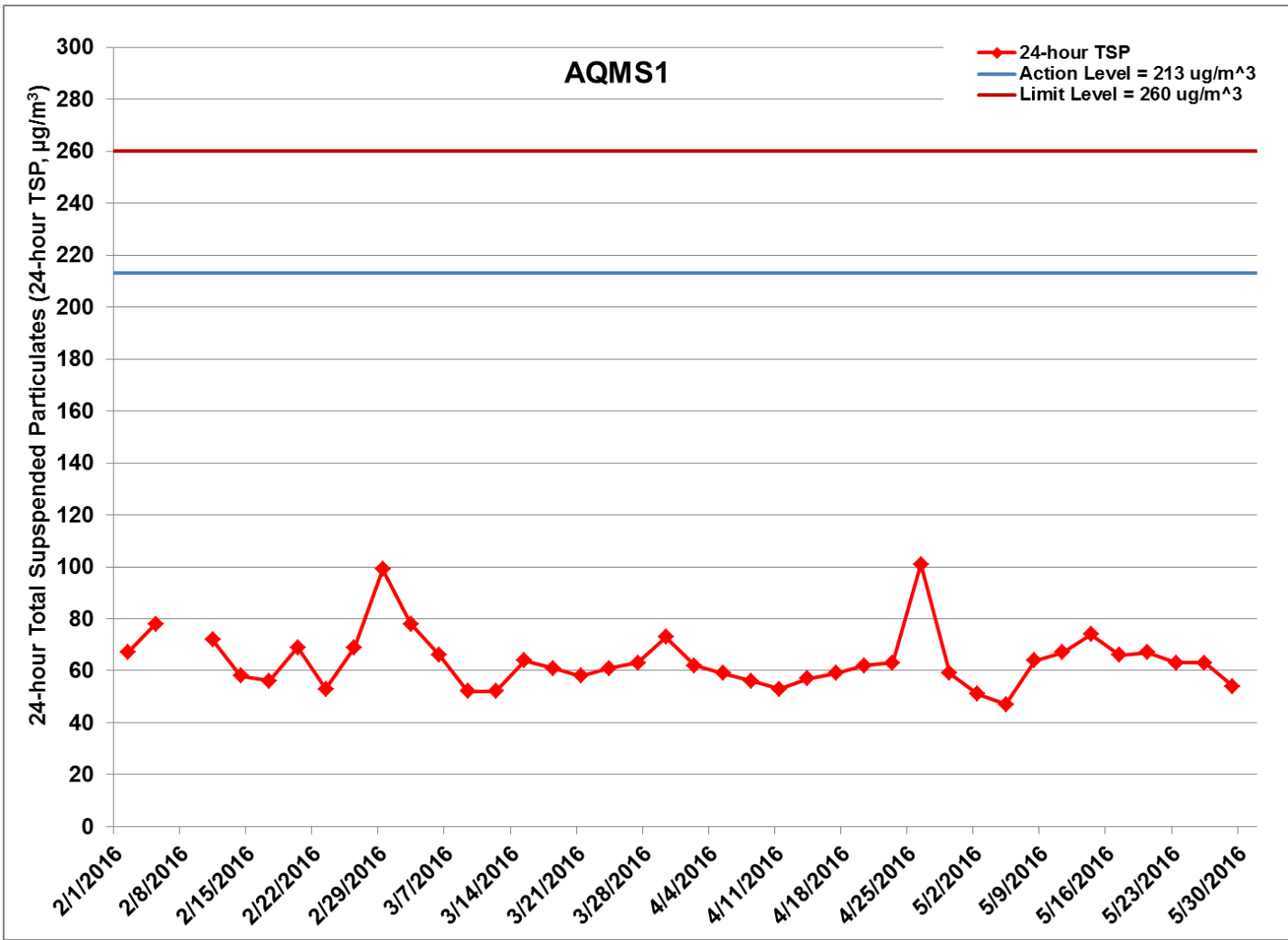


Figure F.8 Impact Monitoring - 24-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at AQMS1 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



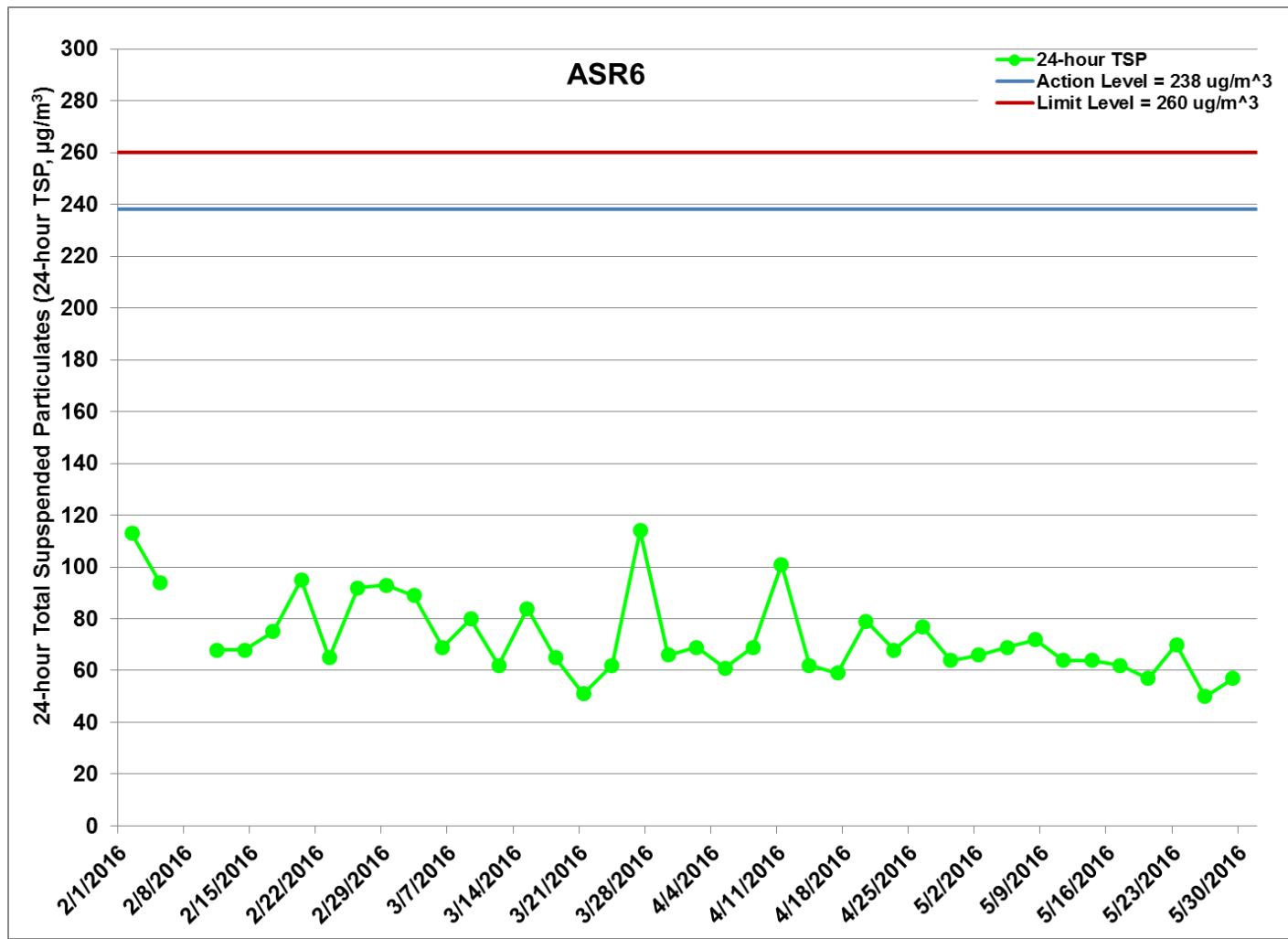


Figure F.9 Impact Monitoring - 24-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR6 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



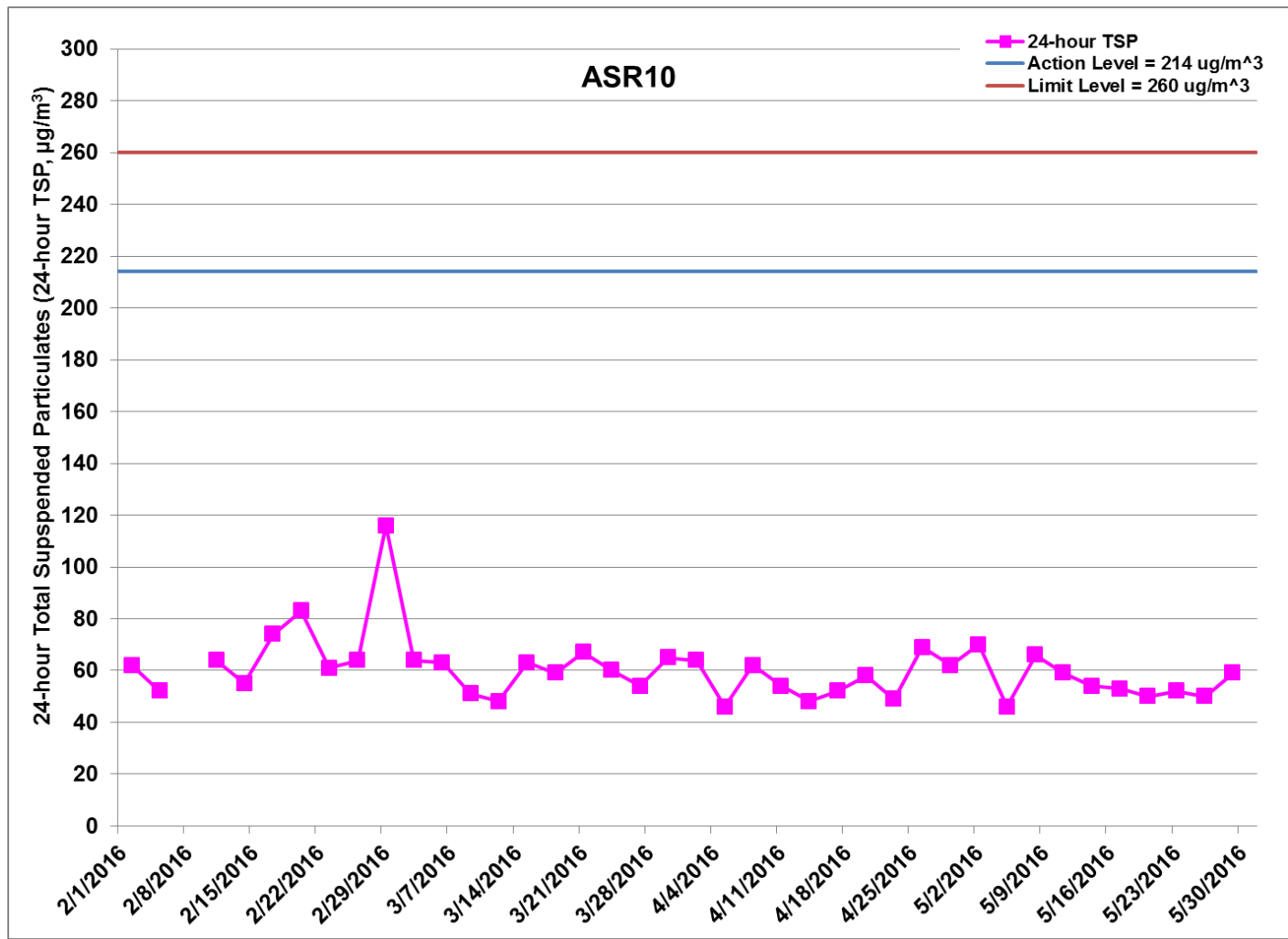


Figure F.10 Impact Monitoring - 24-hour Total Suspended Particulates ( $\mu\text{g}/\text{m}^3$ ) at ASR10 between 1 February 2016 and 31 May 2016 during impact monitoring period. The weather conditions during the monitoring period varied from sunny to cloudy. Major land-based construction activities included: CSM Ground Treatment and Diaphragm Wall Construction (1/4/2016 - 31/5/2016) and Box Culvert Extension (1/2/2016 - 31/5/2016). Ref: 0212330\_Impact AQM graphs\_ May 2016\_REV a.xlsx



Appendix G

## Impact Water Quality Monitoring Results

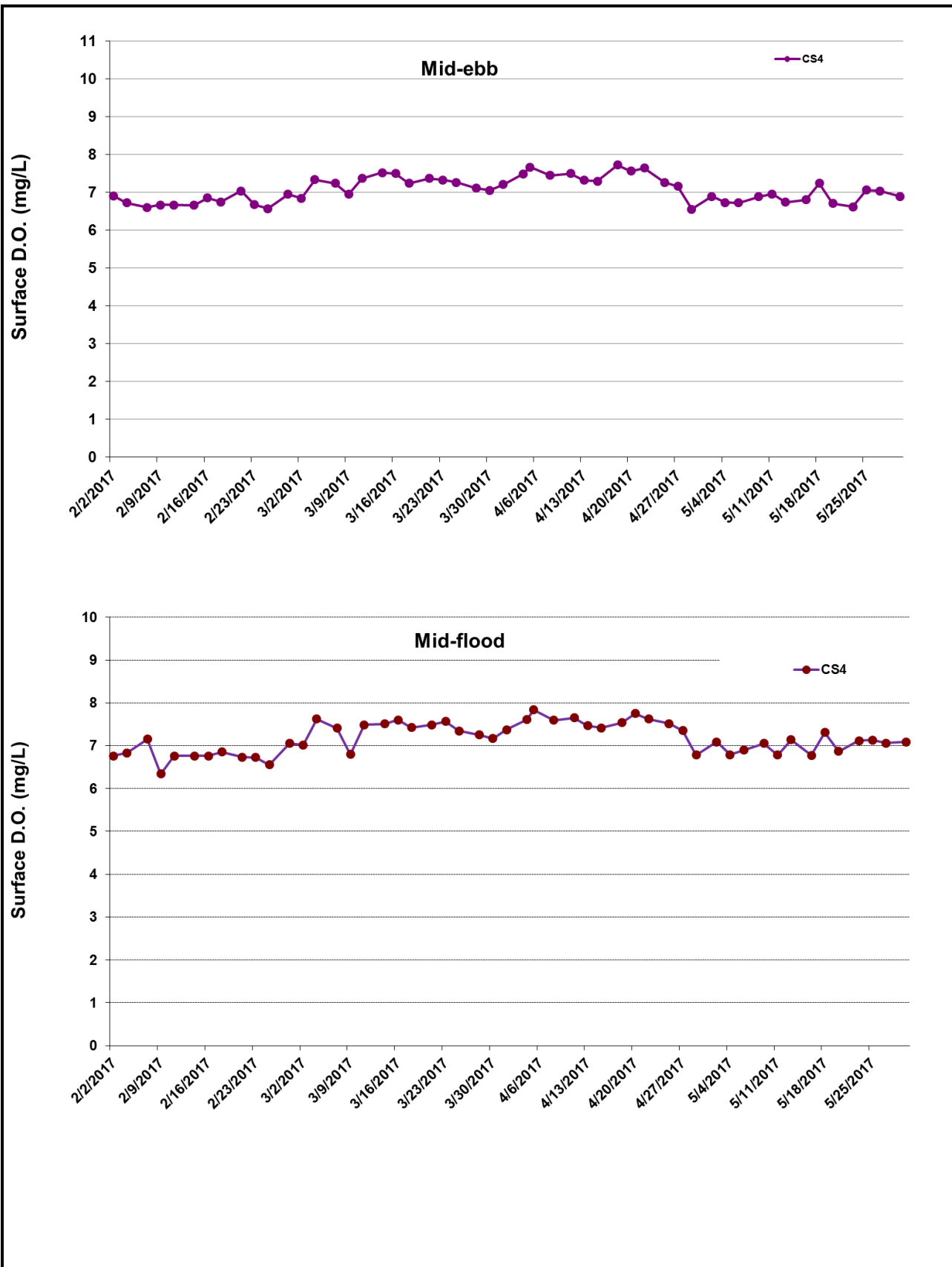


Figure G1 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



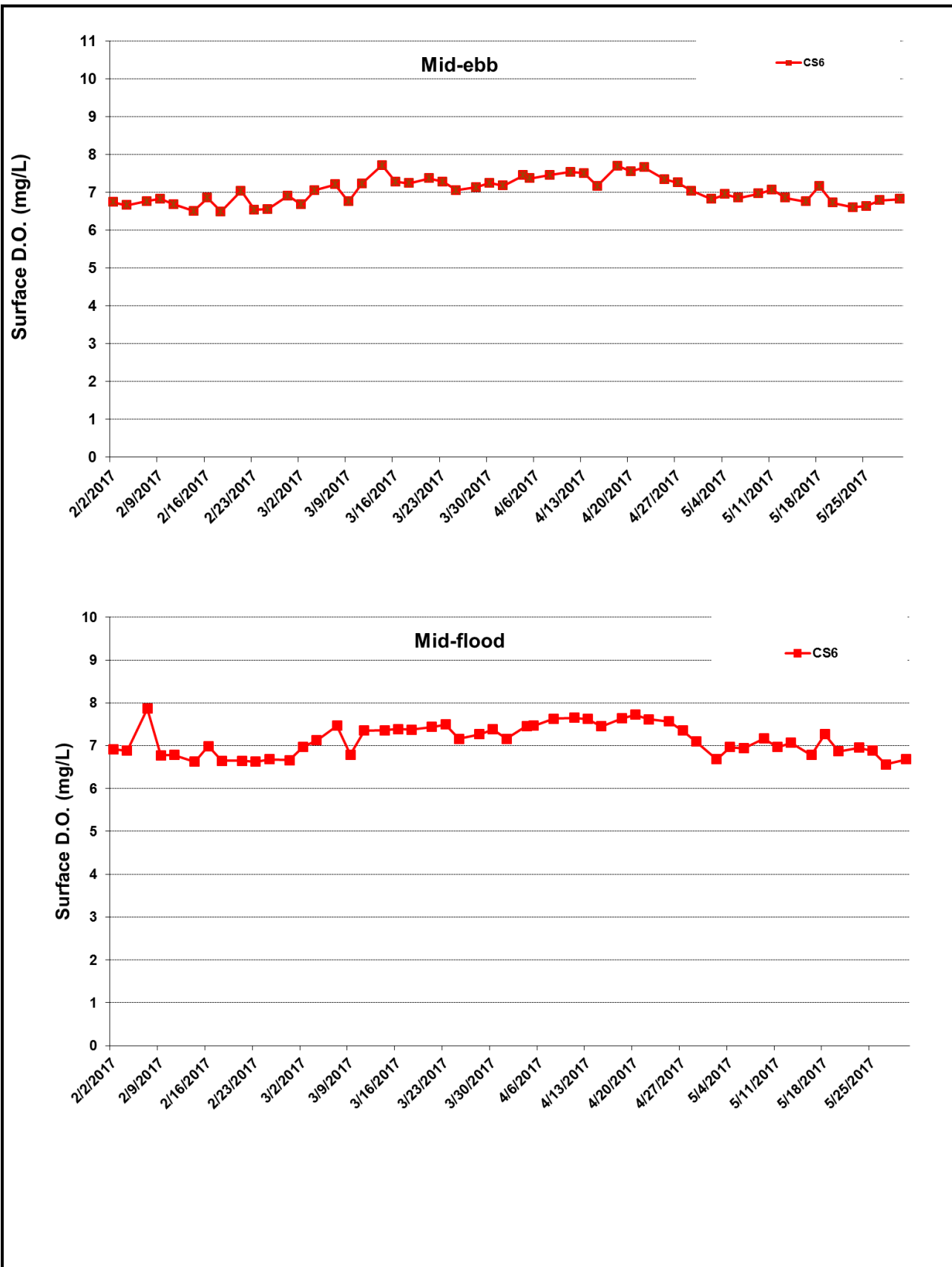


Figure G2 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



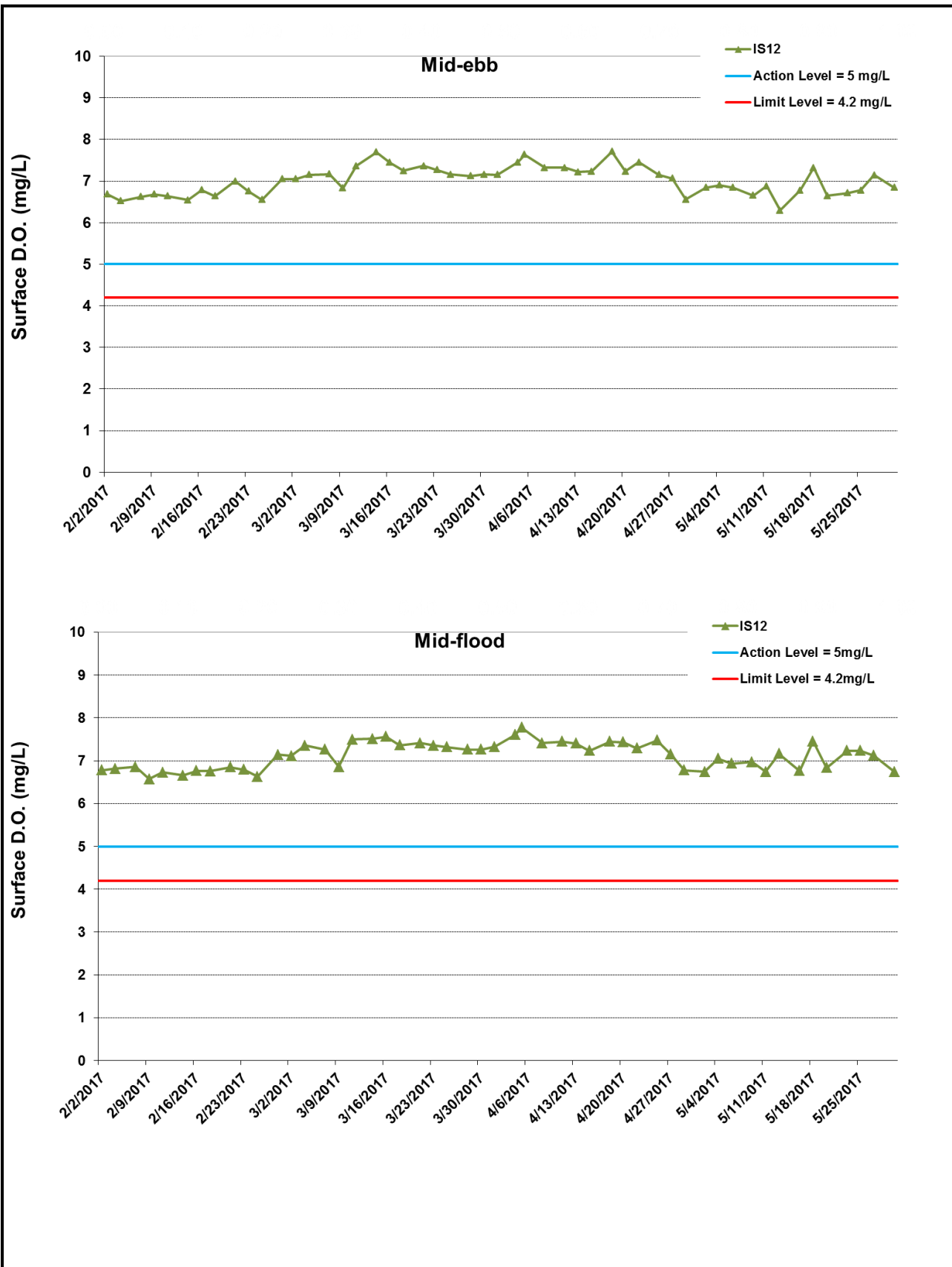


Figure G3 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at IS12. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





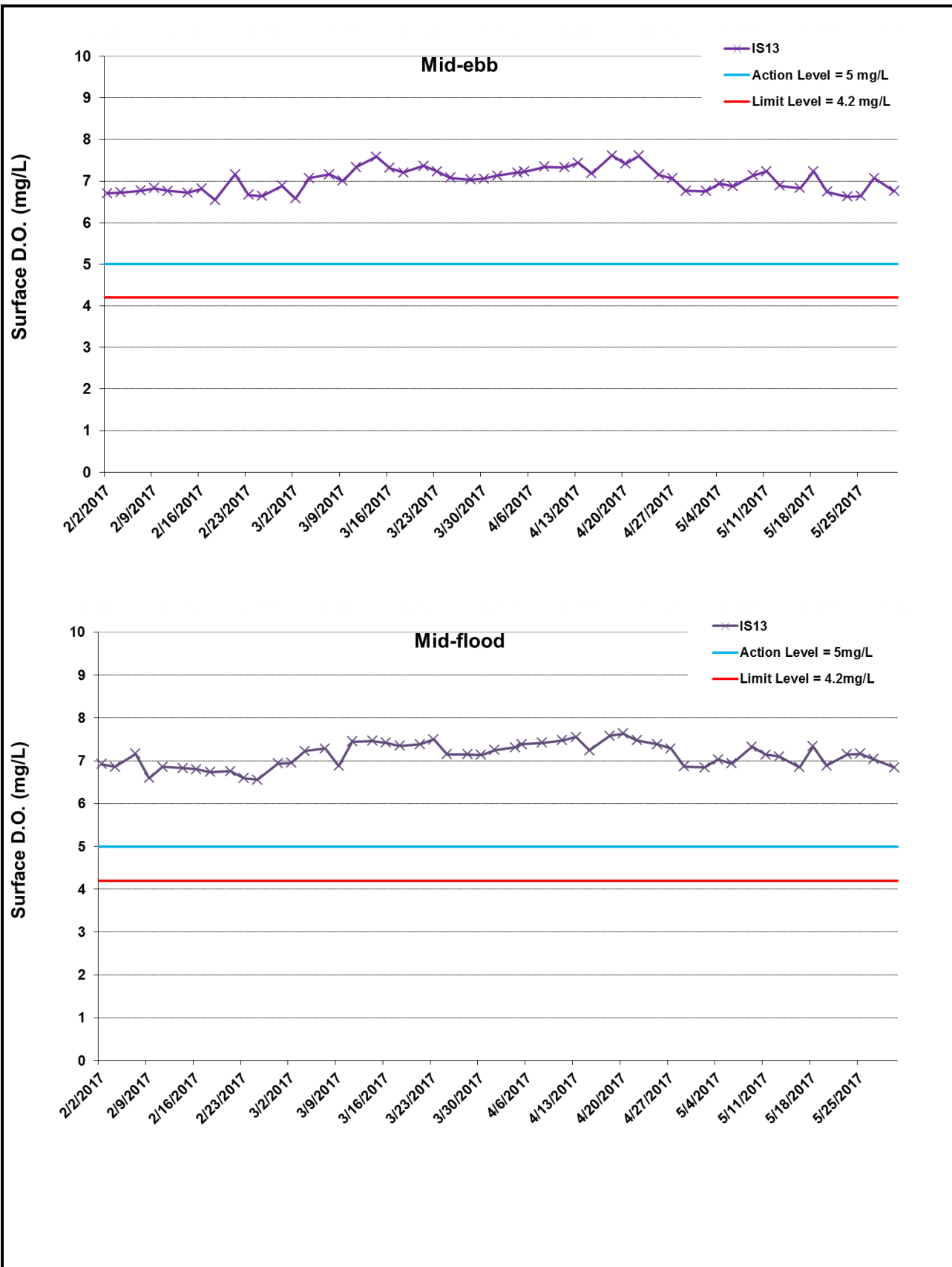


Figure G4 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at IS13. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



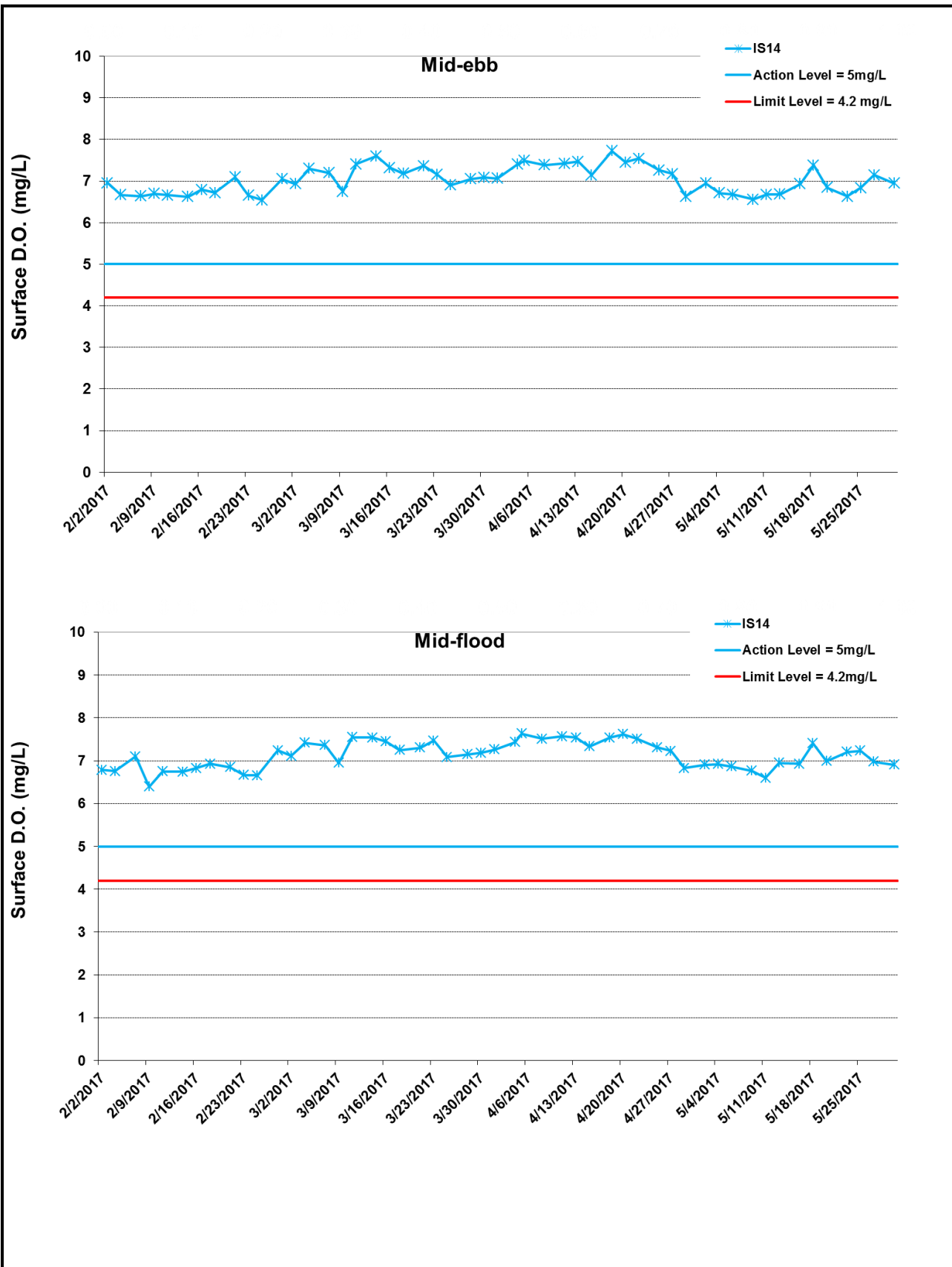


Figure G5 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at IS14. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



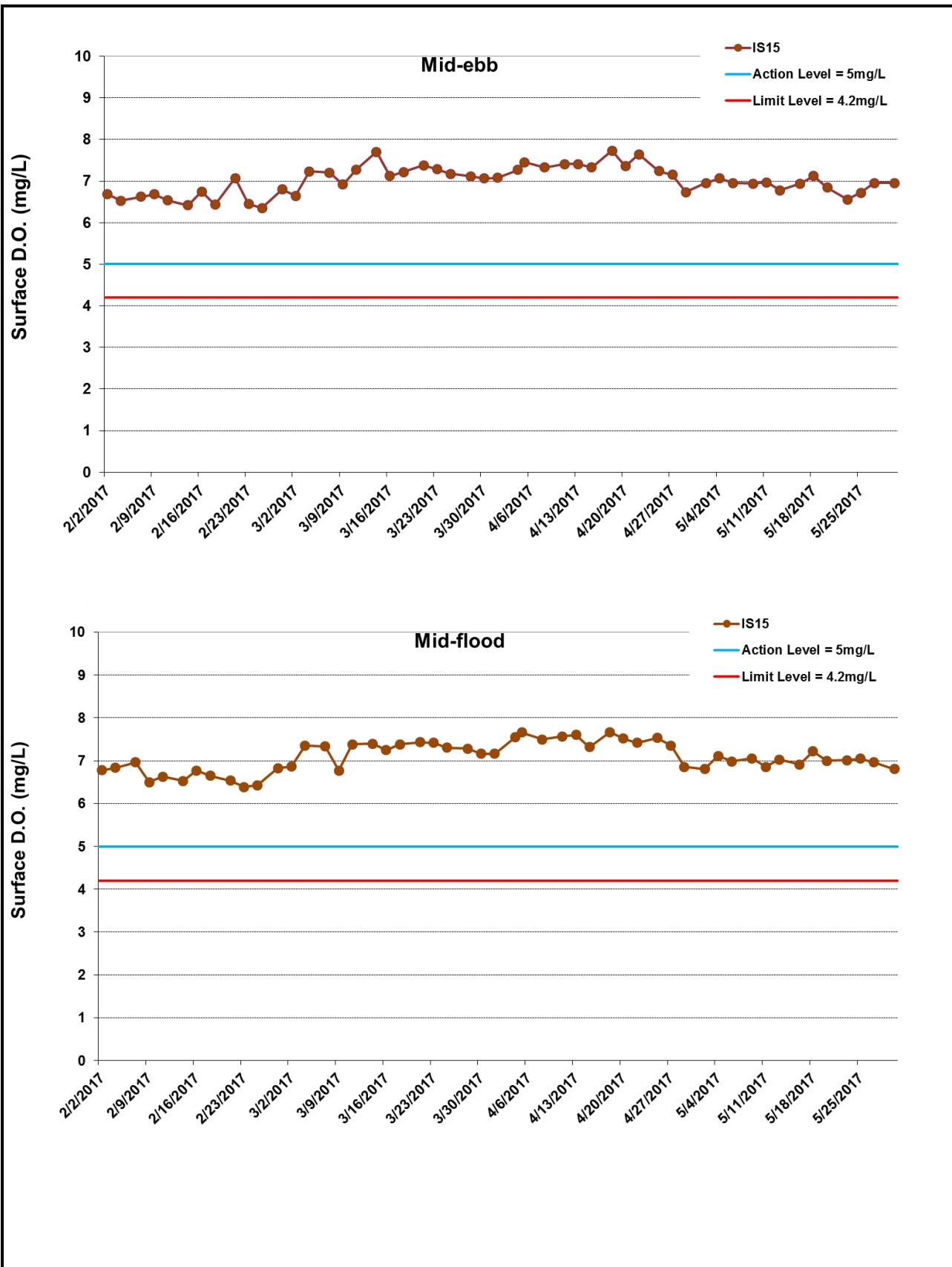


Figure G6 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at IS15. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



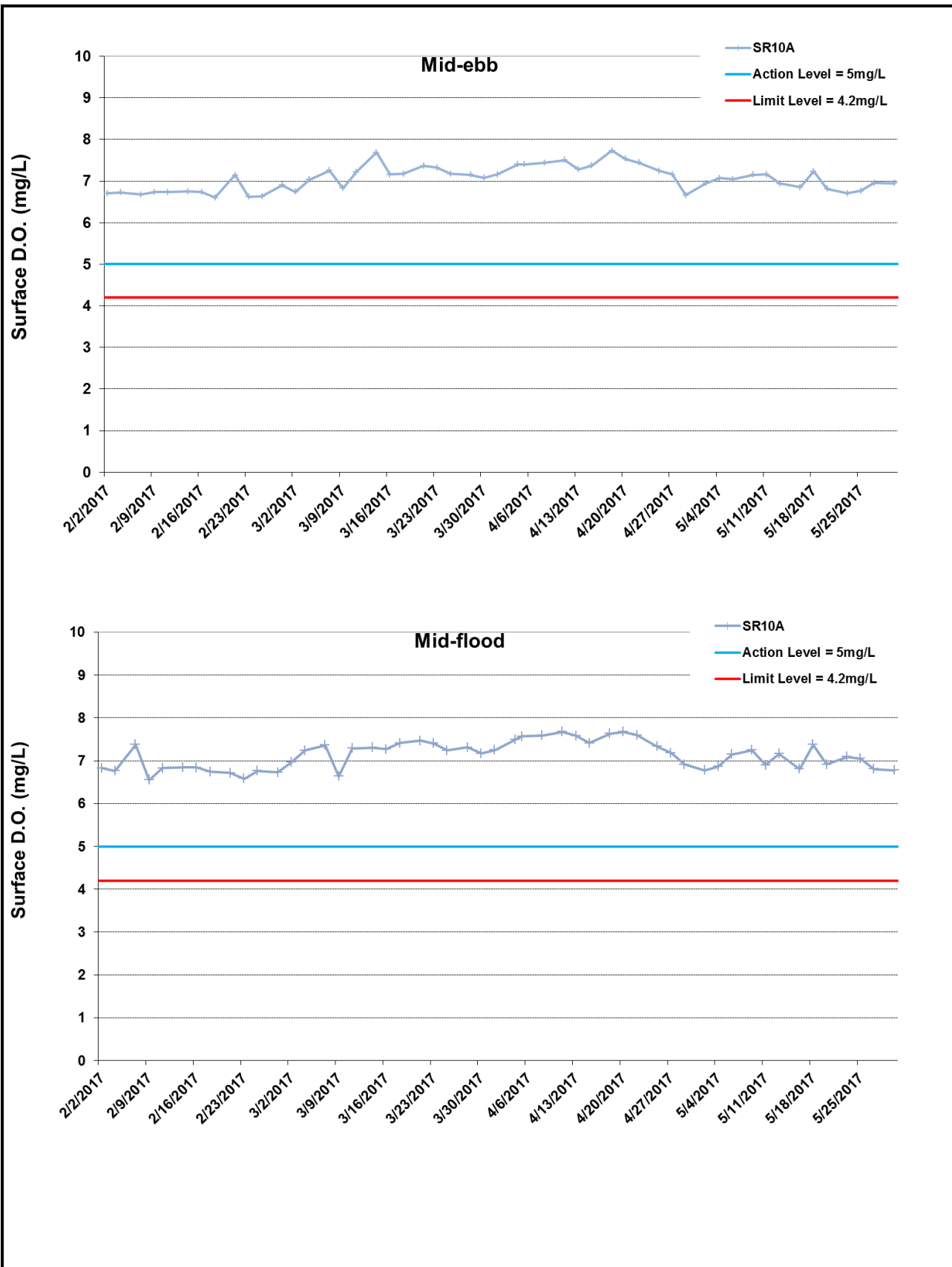


Figure G7 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at SR10A. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



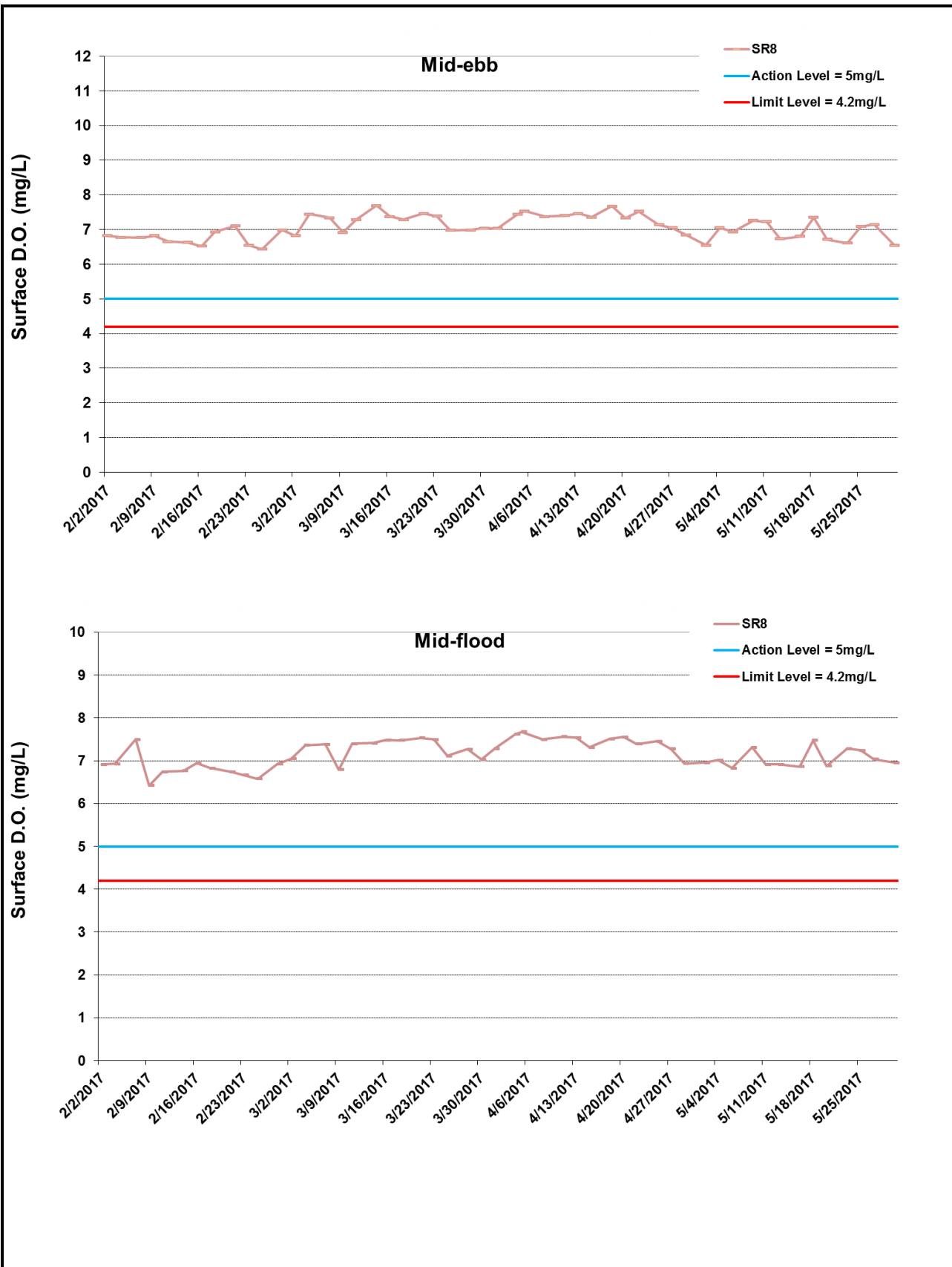


Figure G8 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at SR8. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



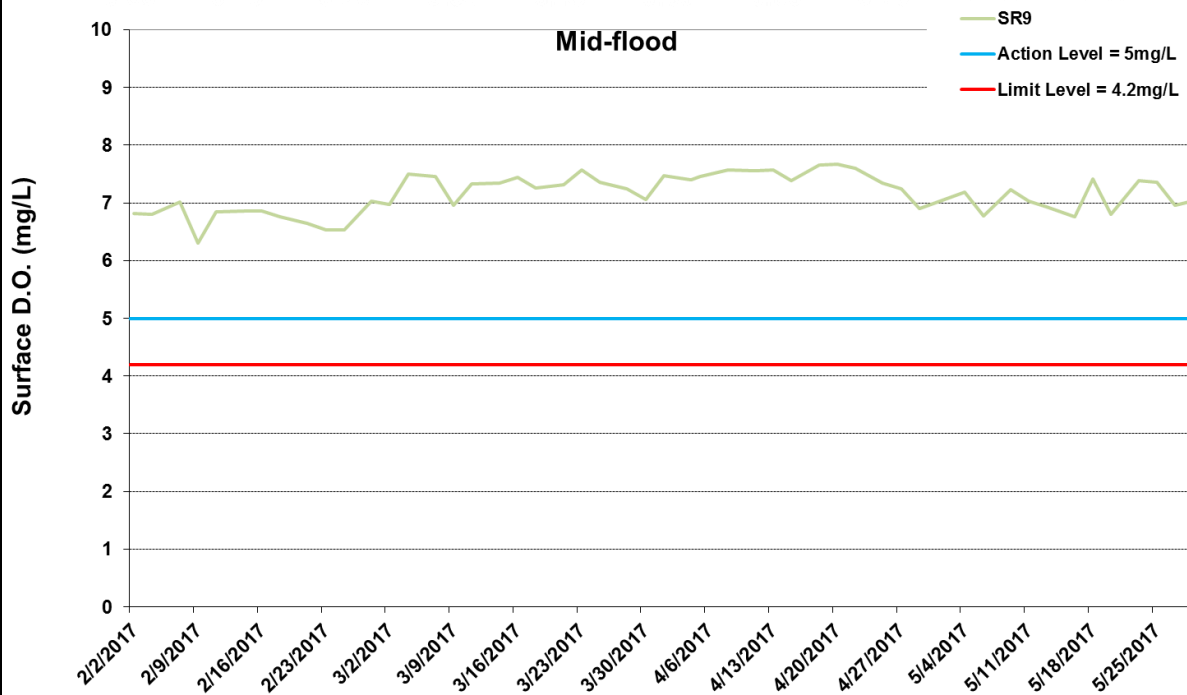
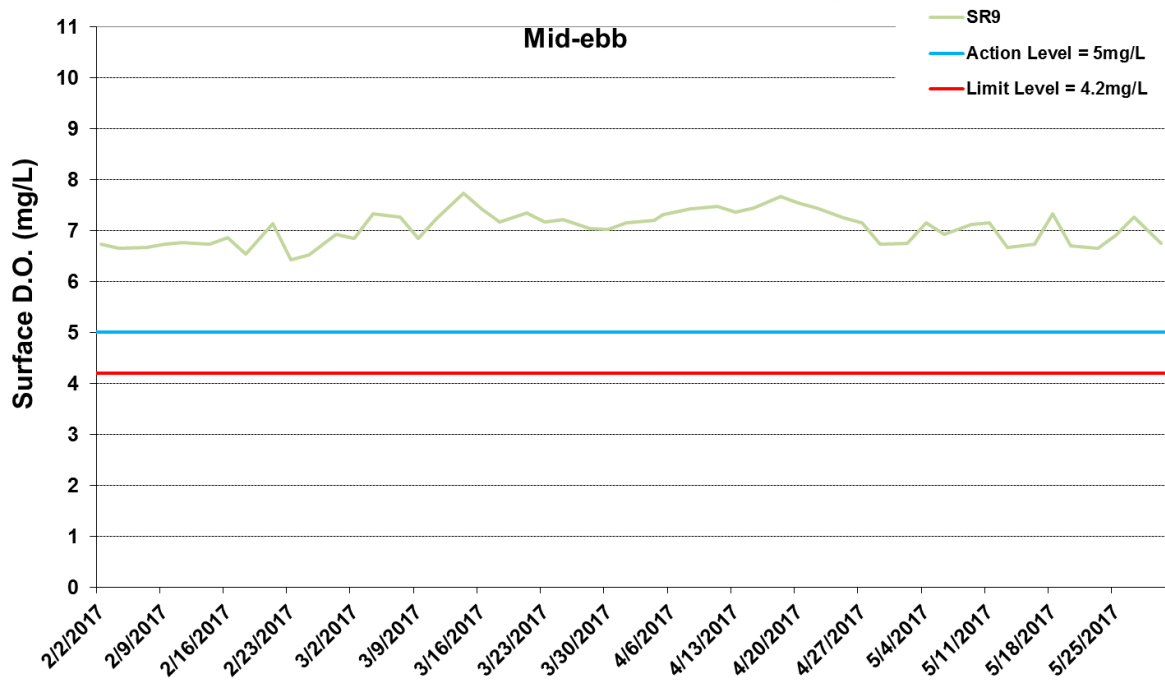
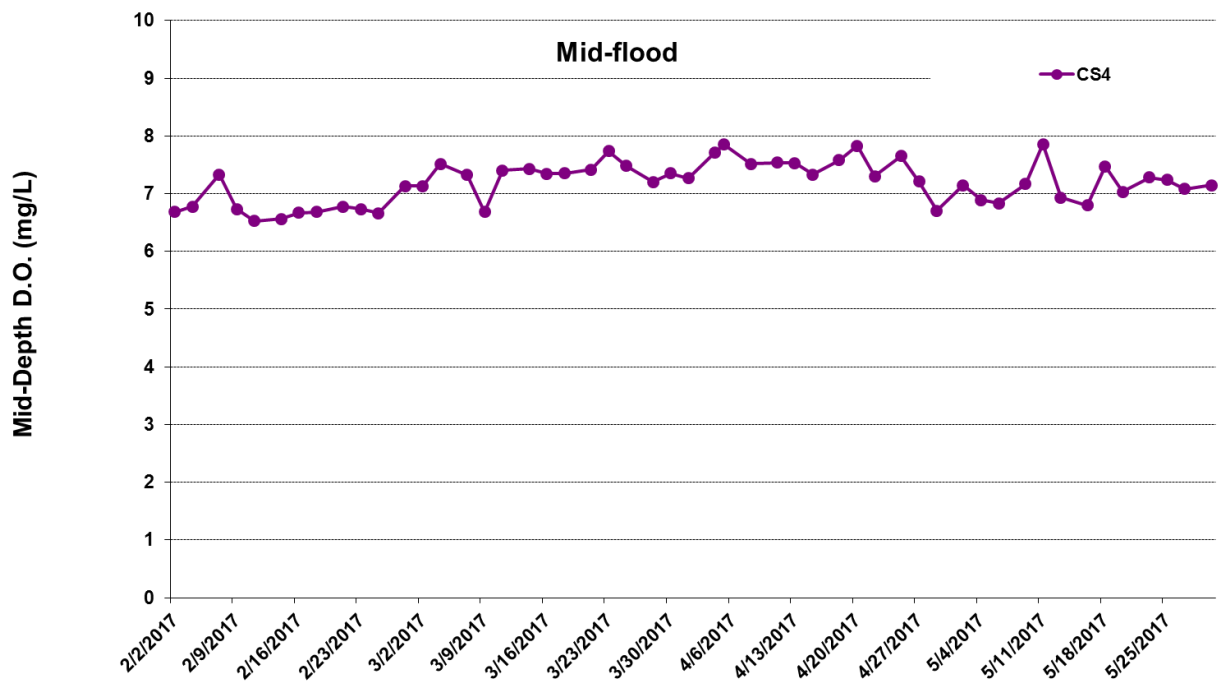
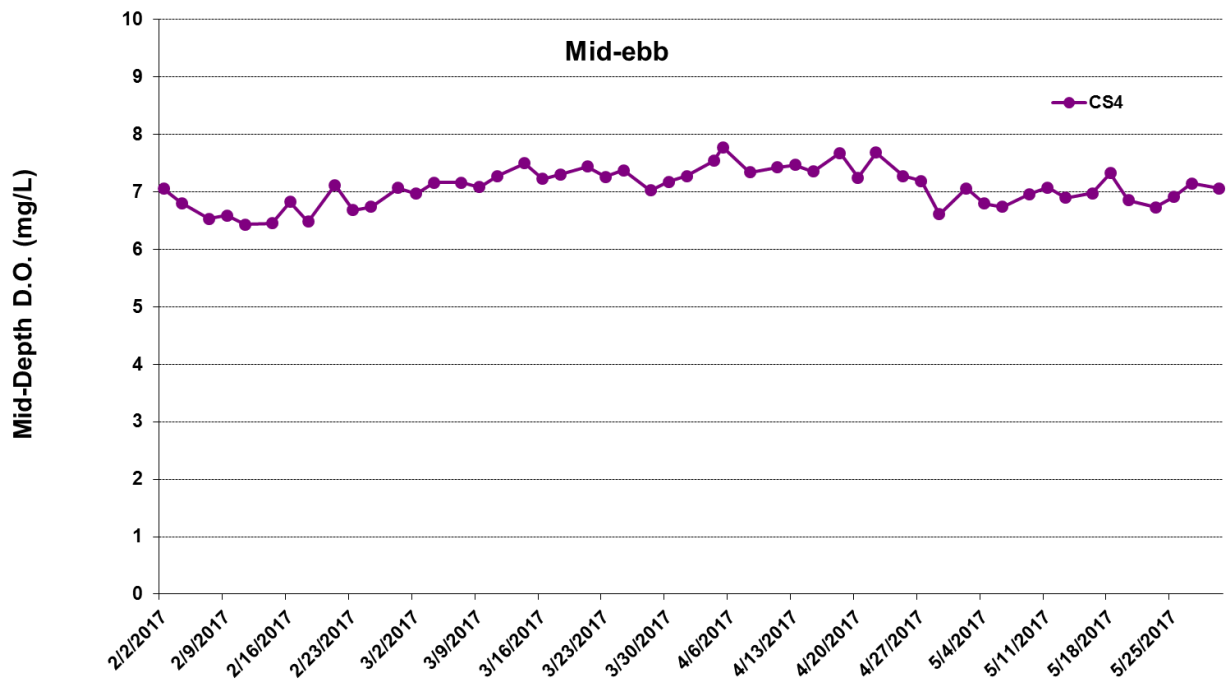


Figure G9 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in surface waters between 1 February 2017 and 31 May 2017 at SR9. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



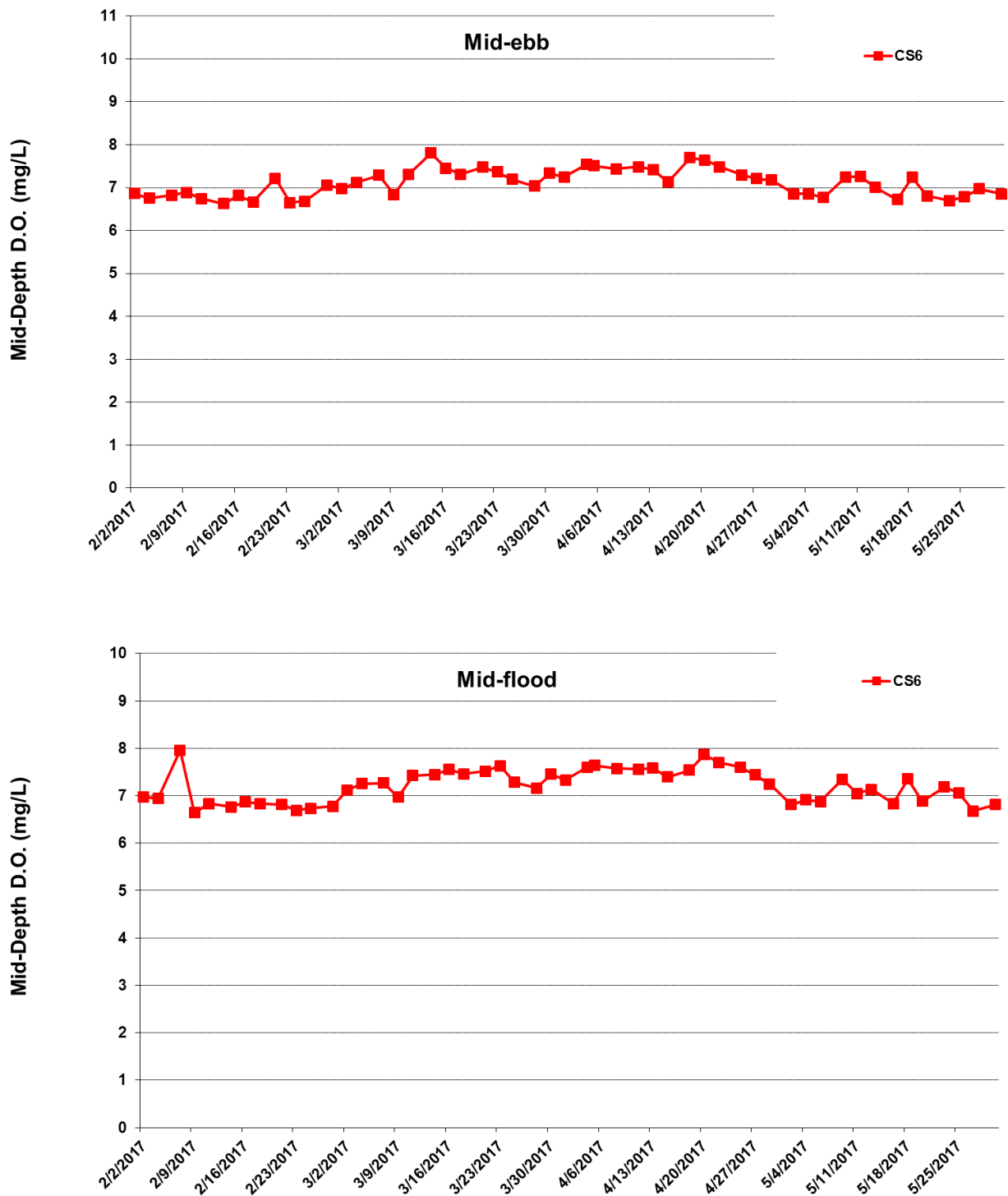


\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G10 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





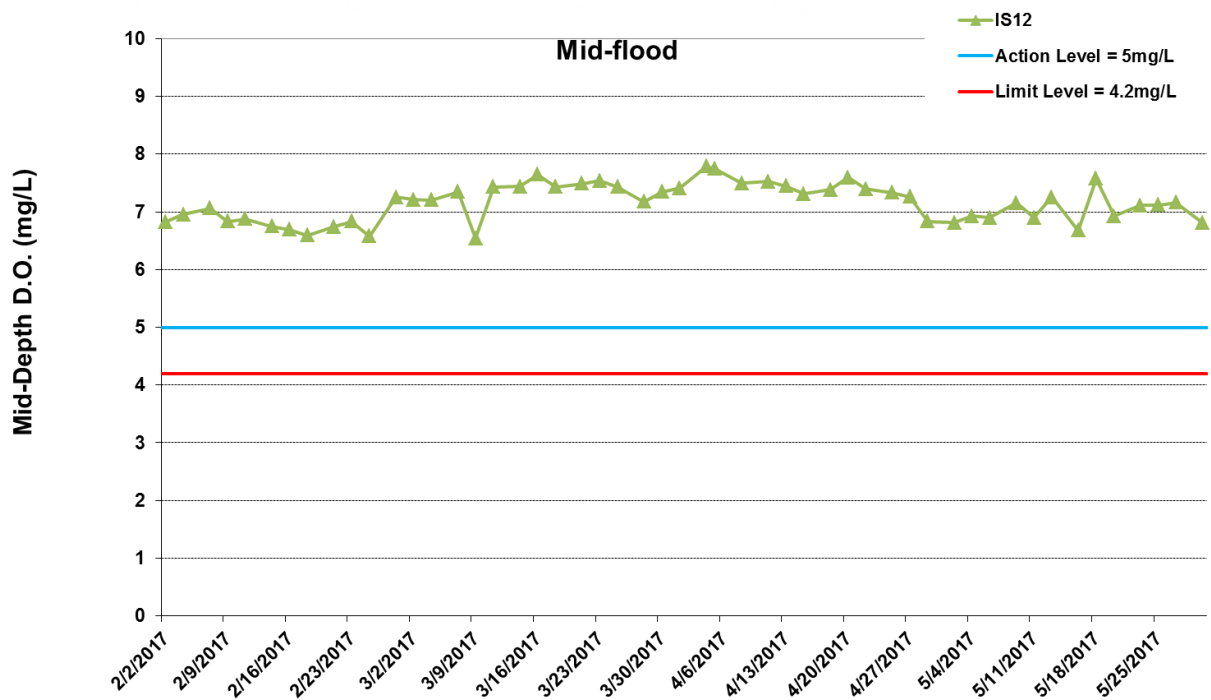
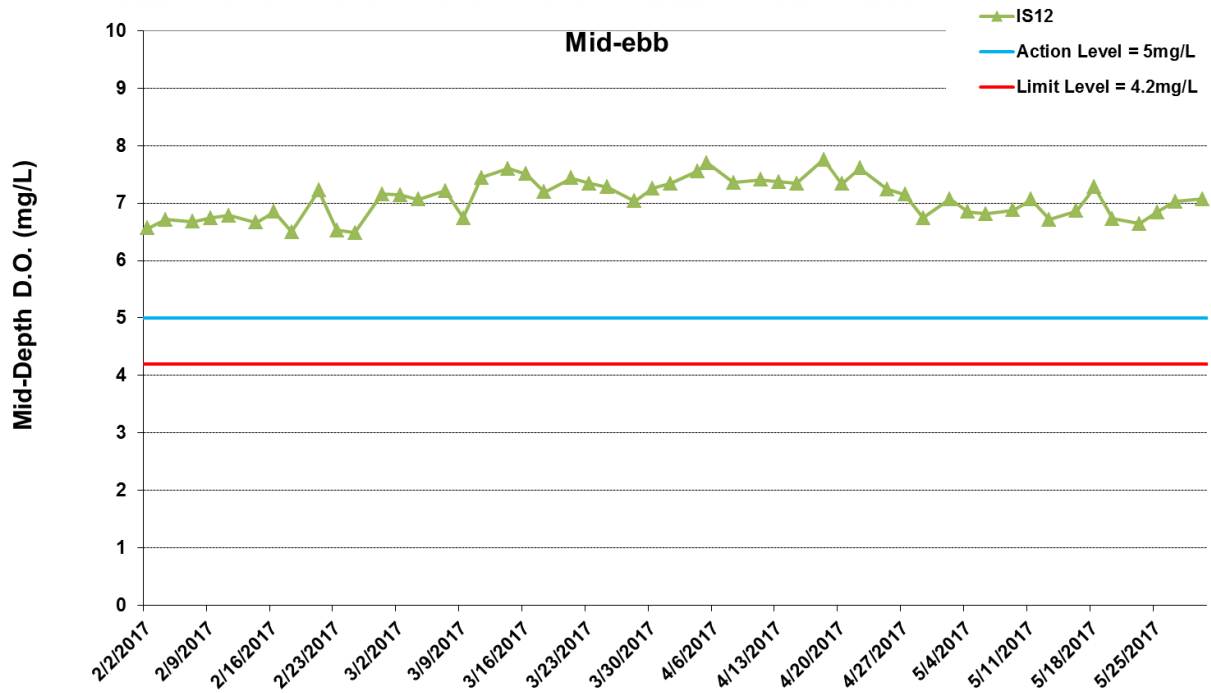
\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G11 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at CS6. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





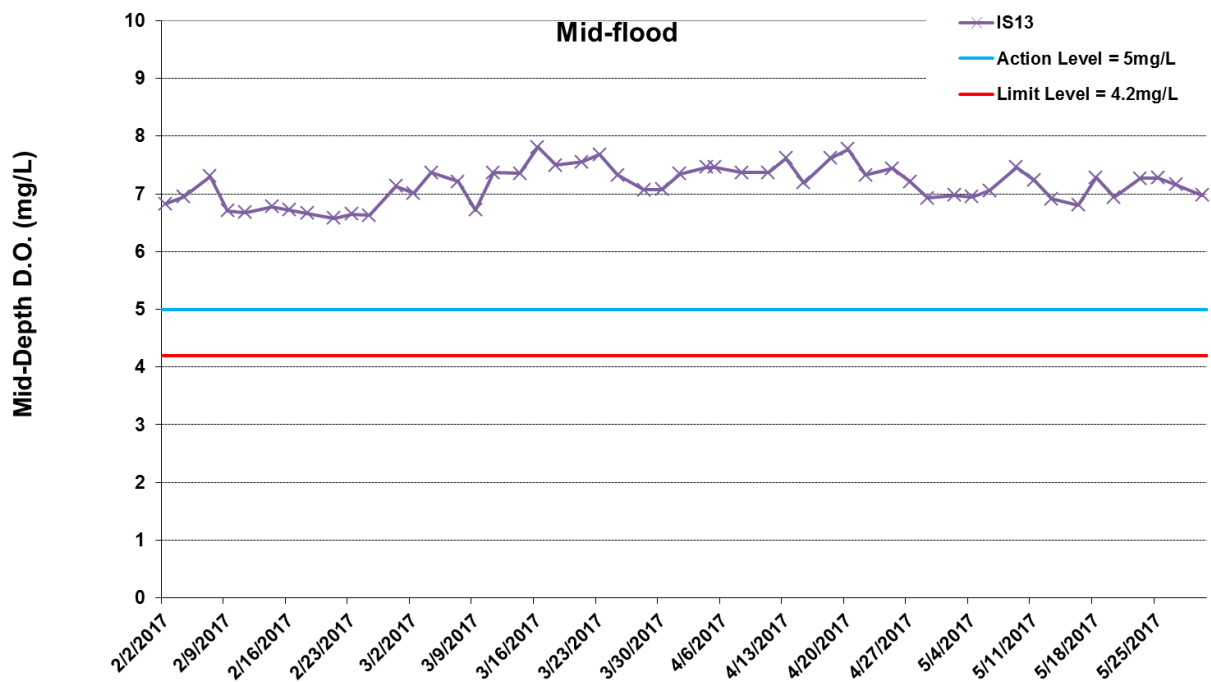
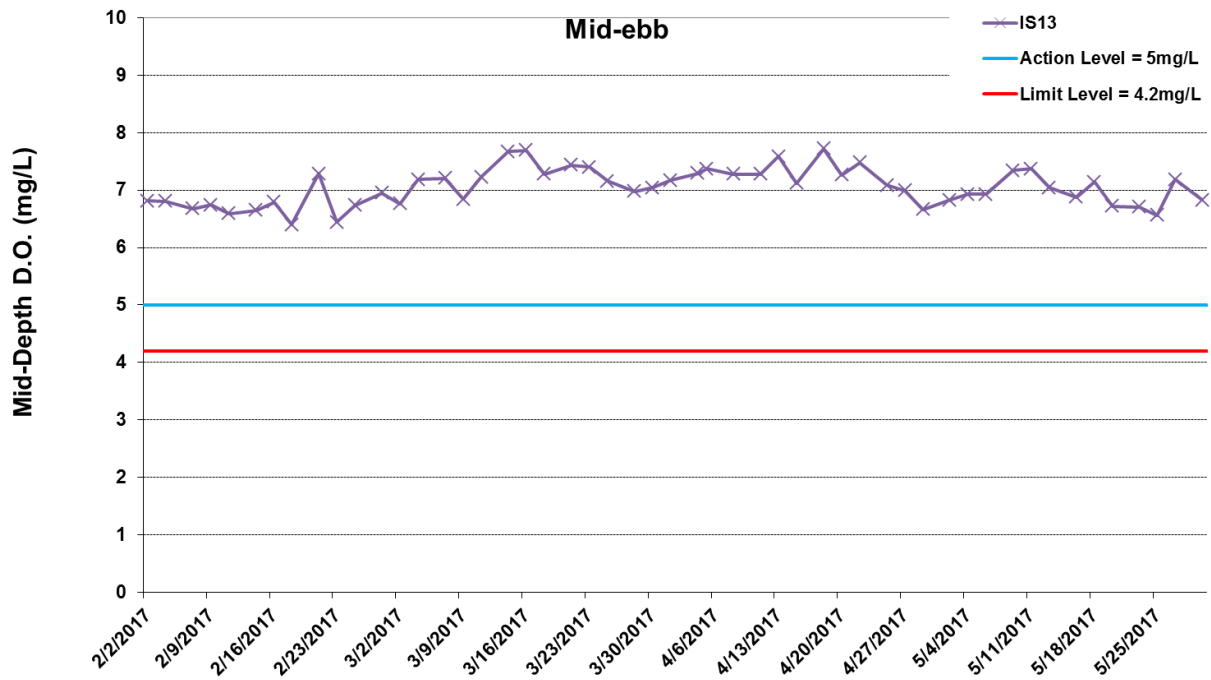


\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G12 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at IS12. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



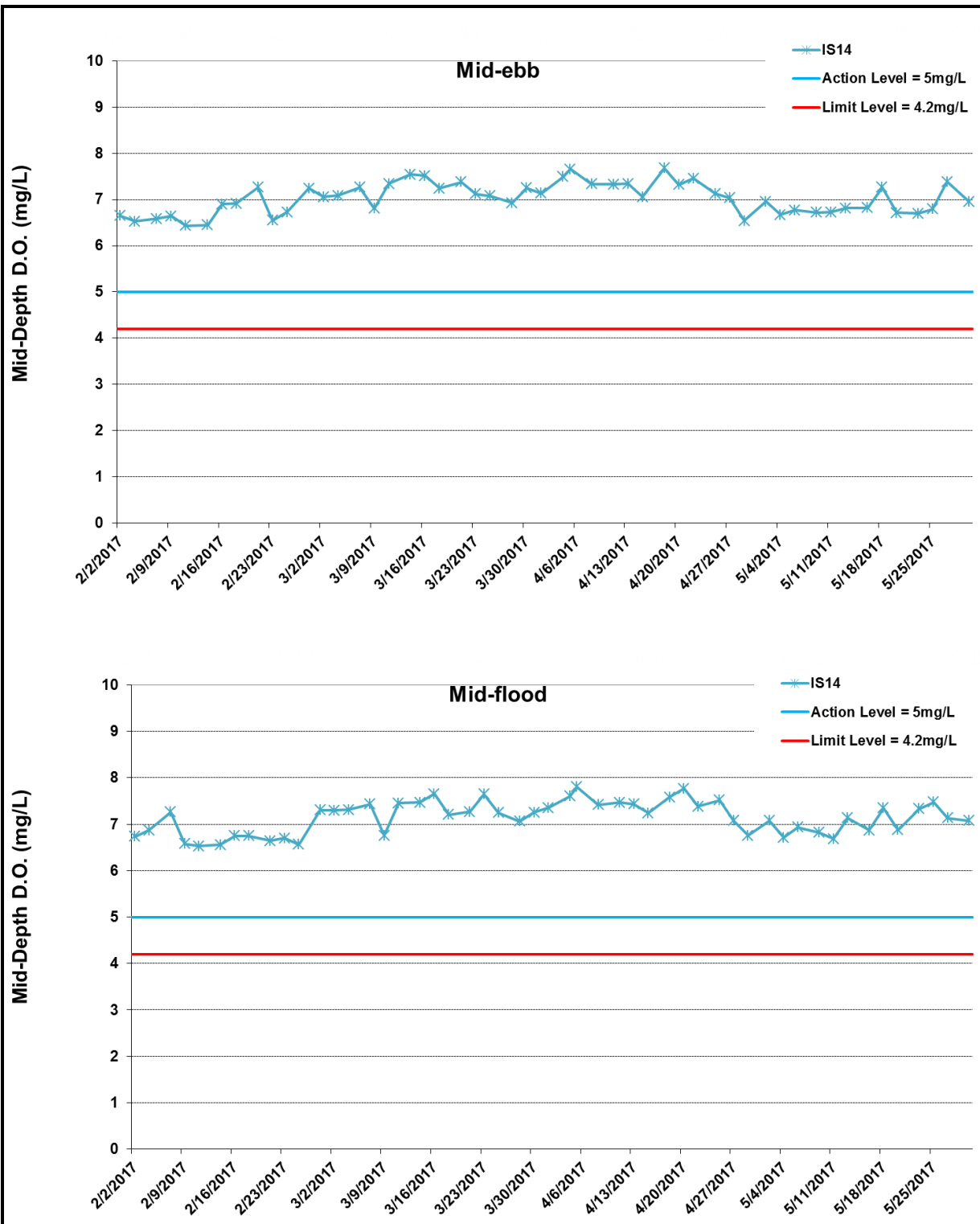


\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G13 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at IS13. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



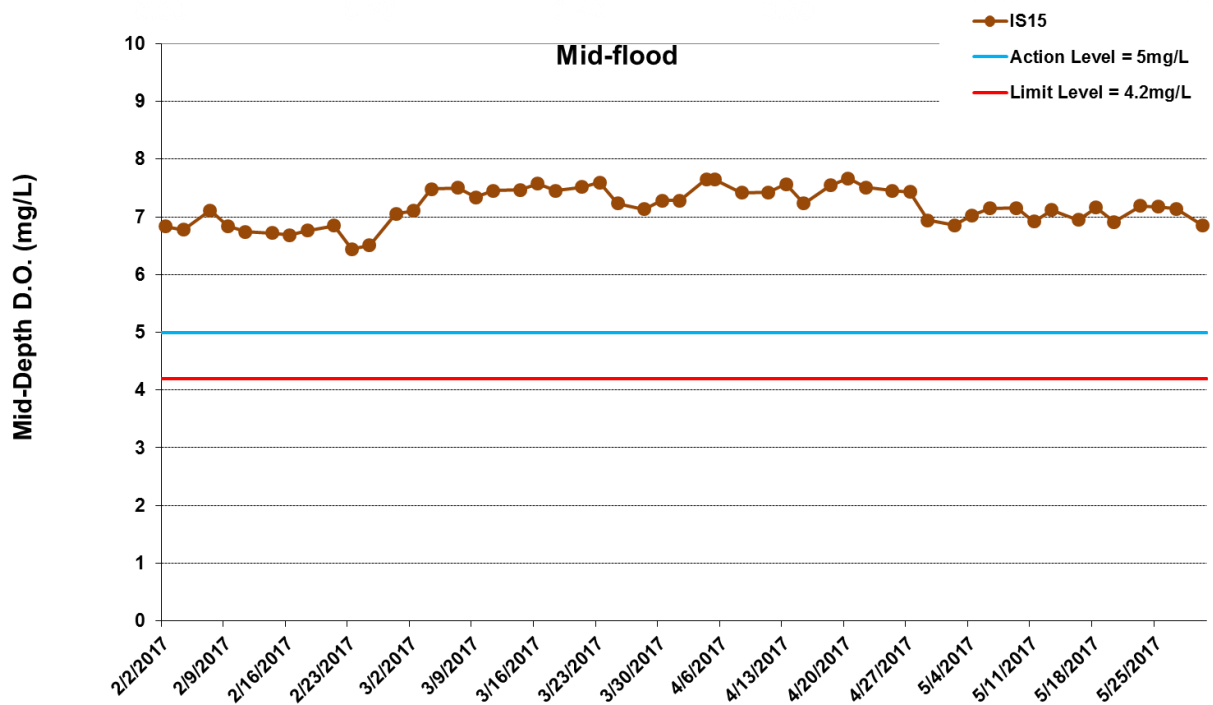
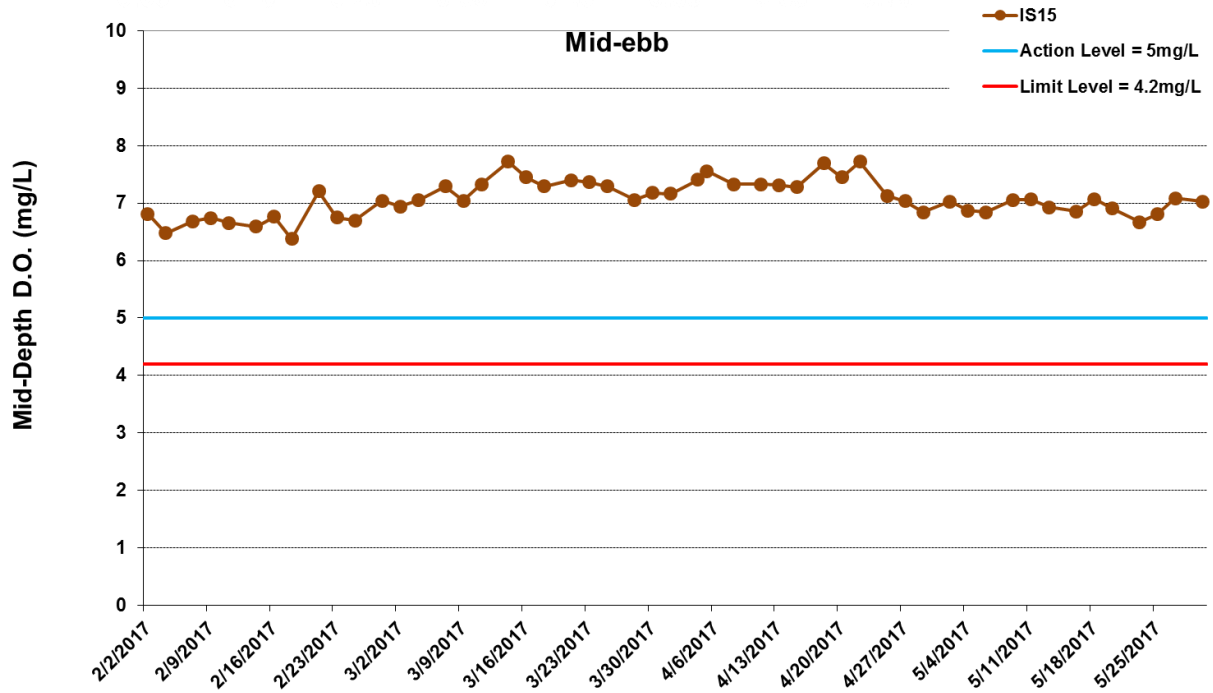


\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G14 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at IS14. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



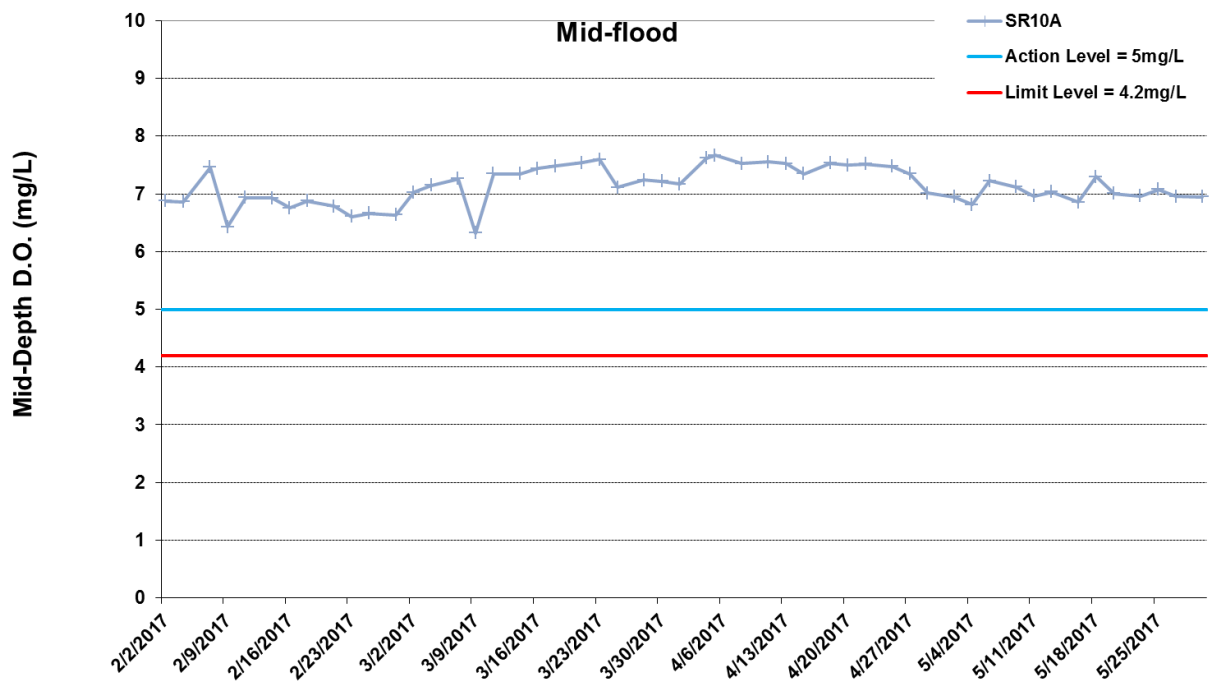
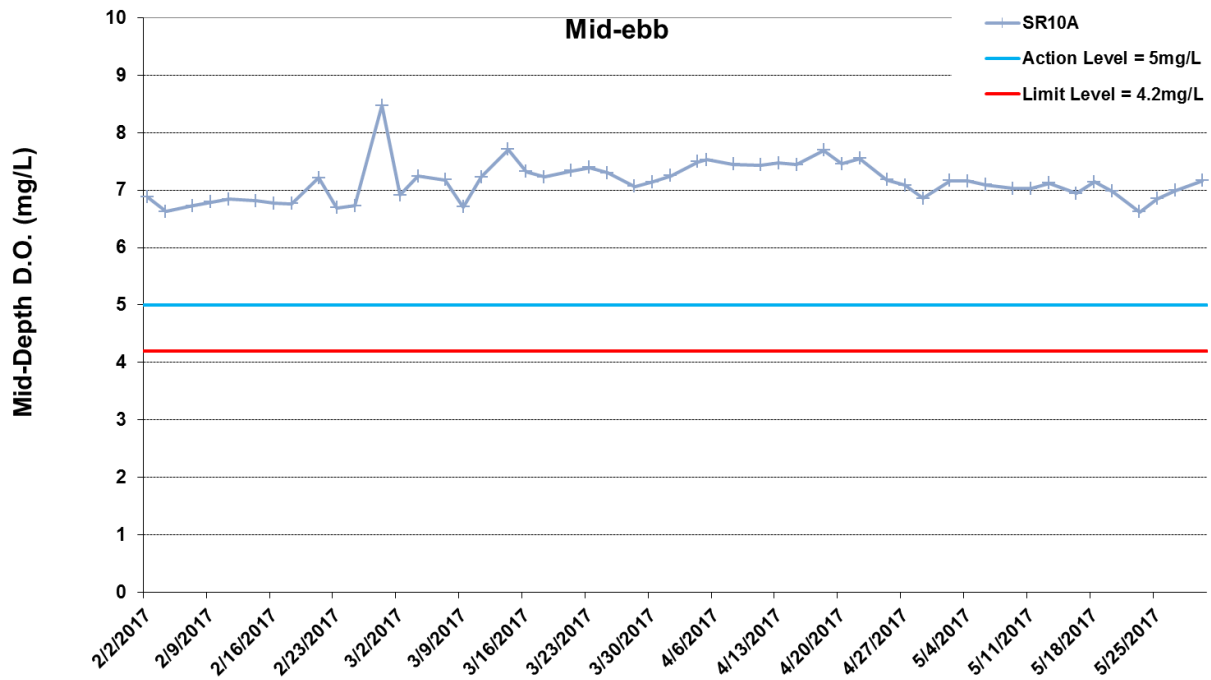


\*No data for Stations SR8 and SR9 due to shallow water depth (< 6m).

**Figure G15 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at IS15. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**



Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



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

**Figure G16 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in mid-depth waters between 1 February 2017 and 31 May 2017 at SR10A. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



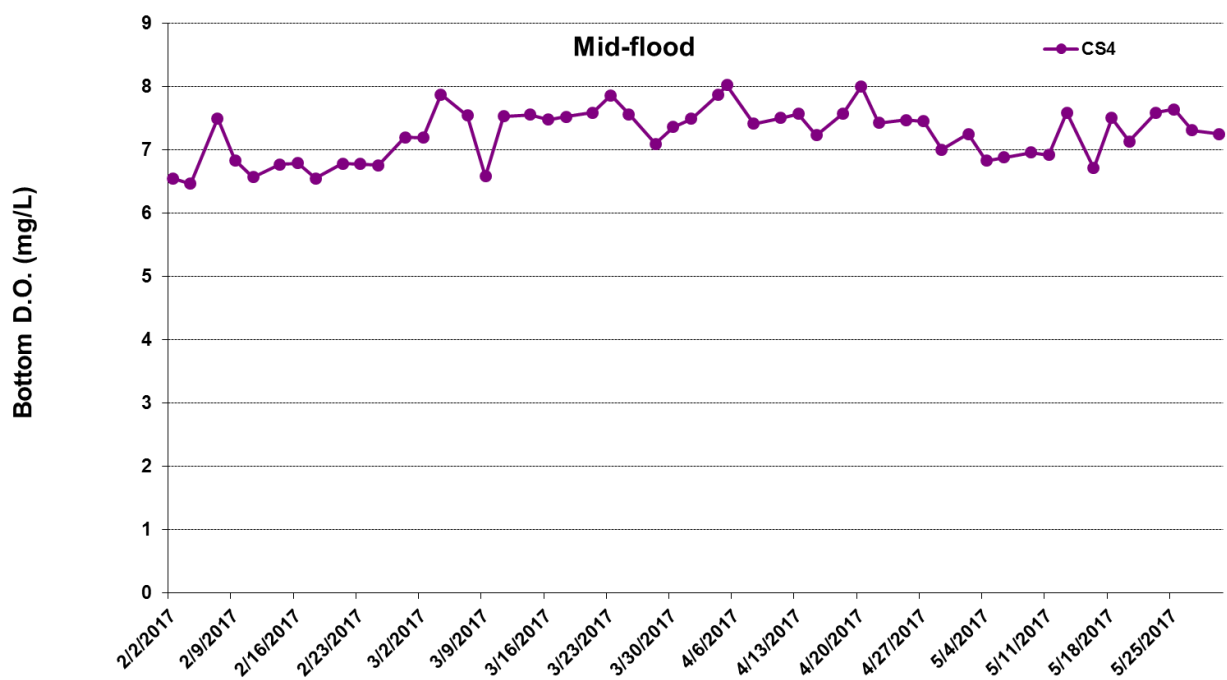
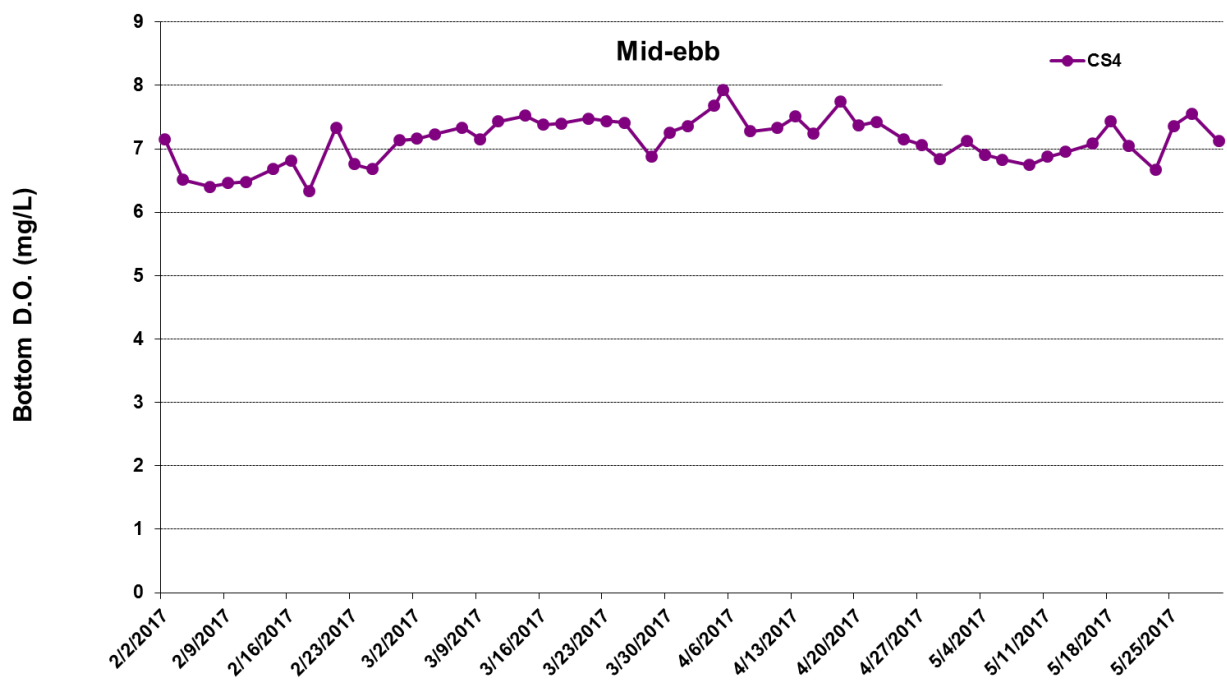
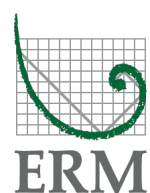


Figure G17 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



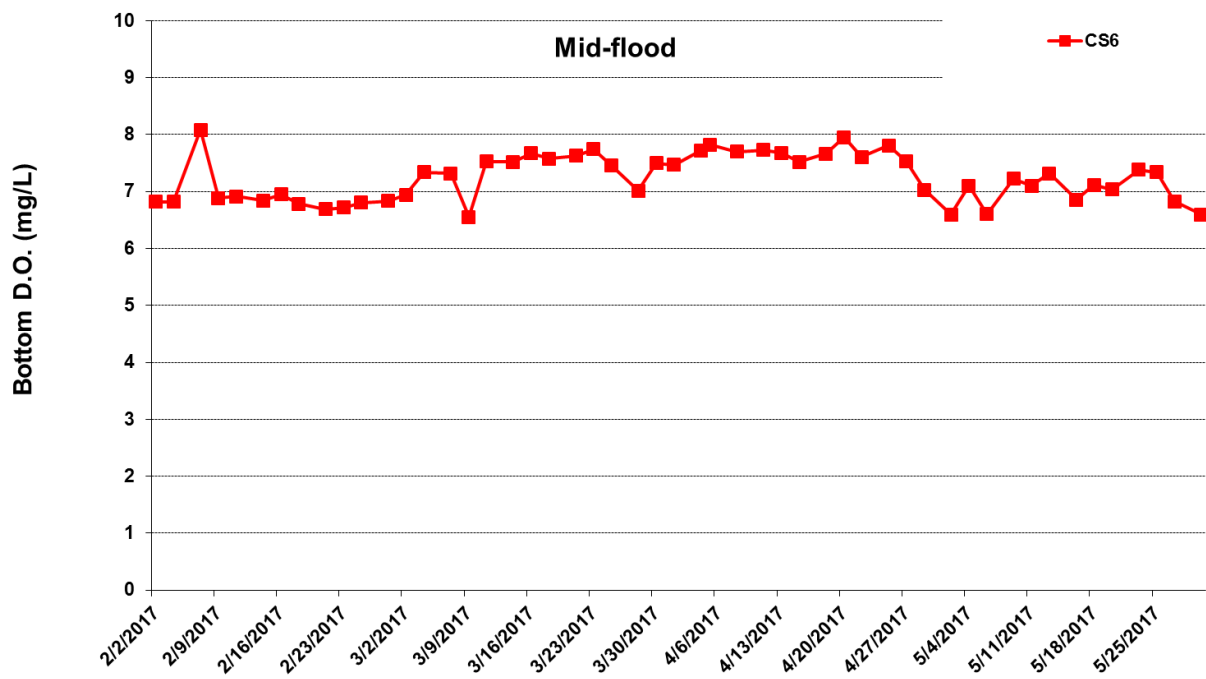
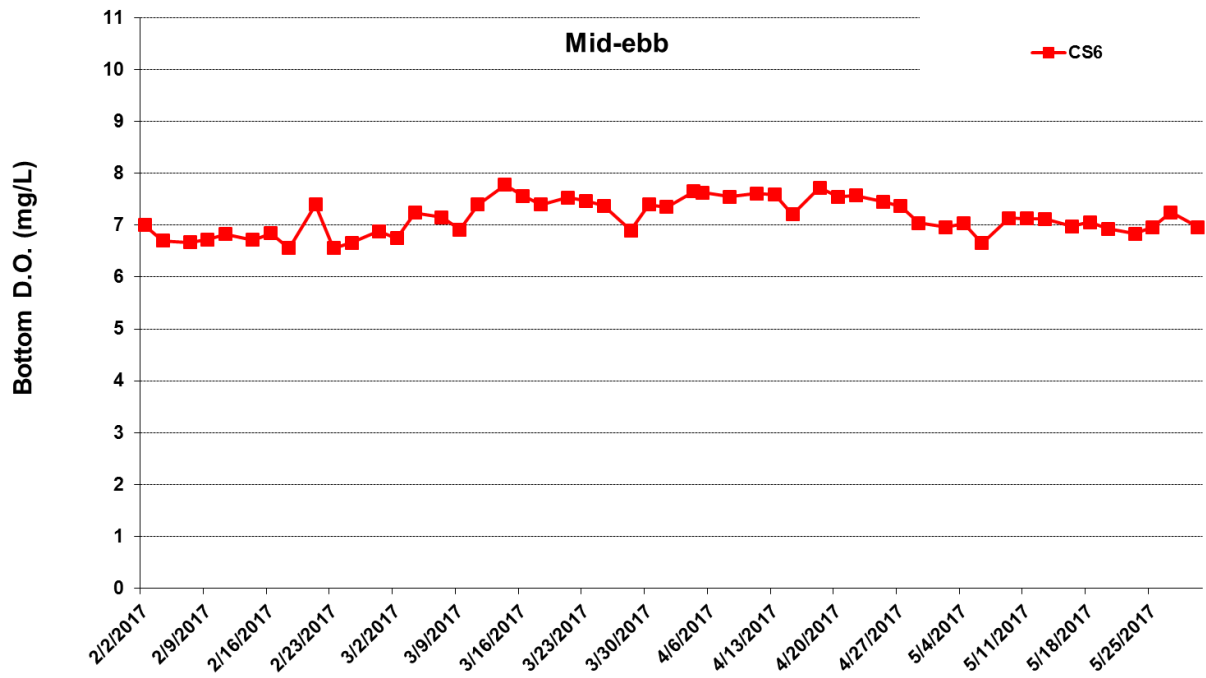


Figure G18 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at CS6. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





Figure G19 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at IS12. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





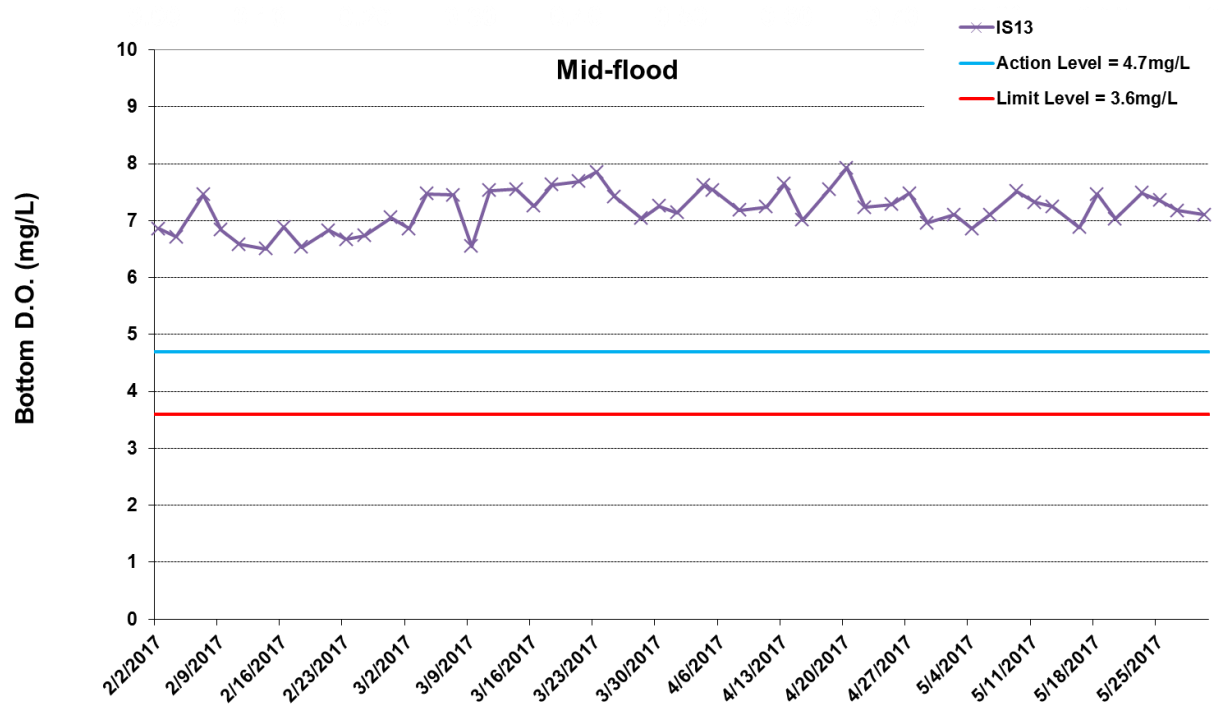
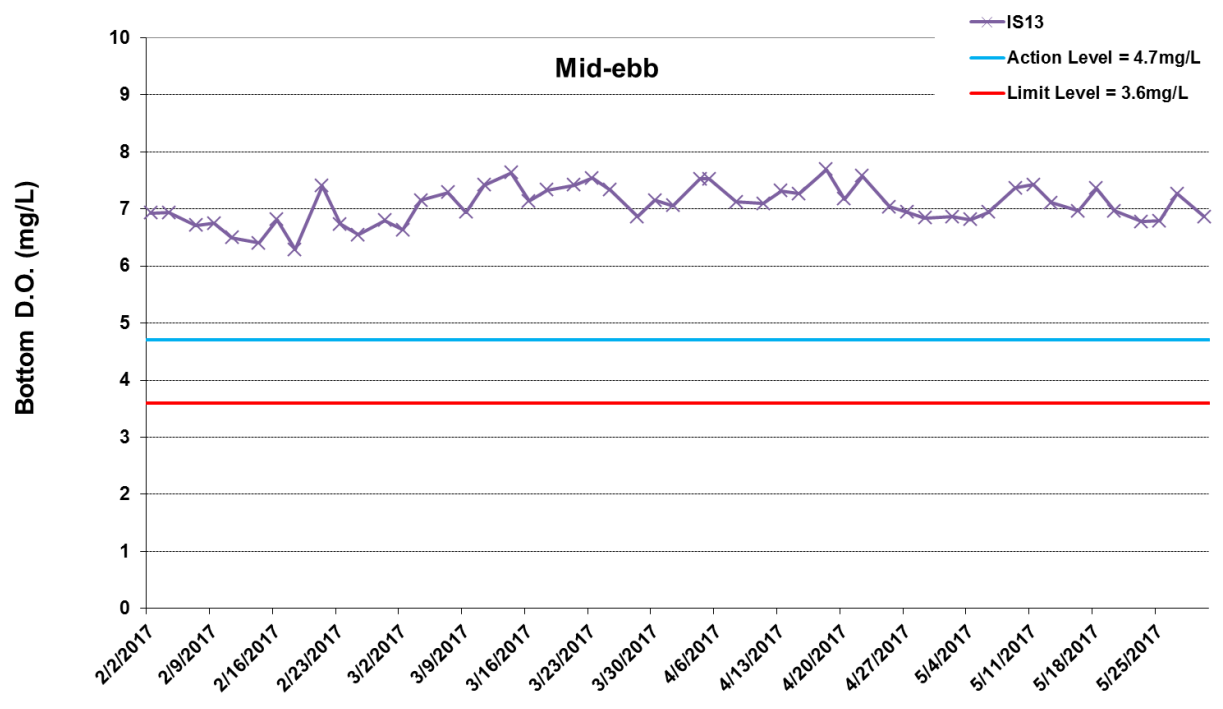


Figure G20 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at IS13. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



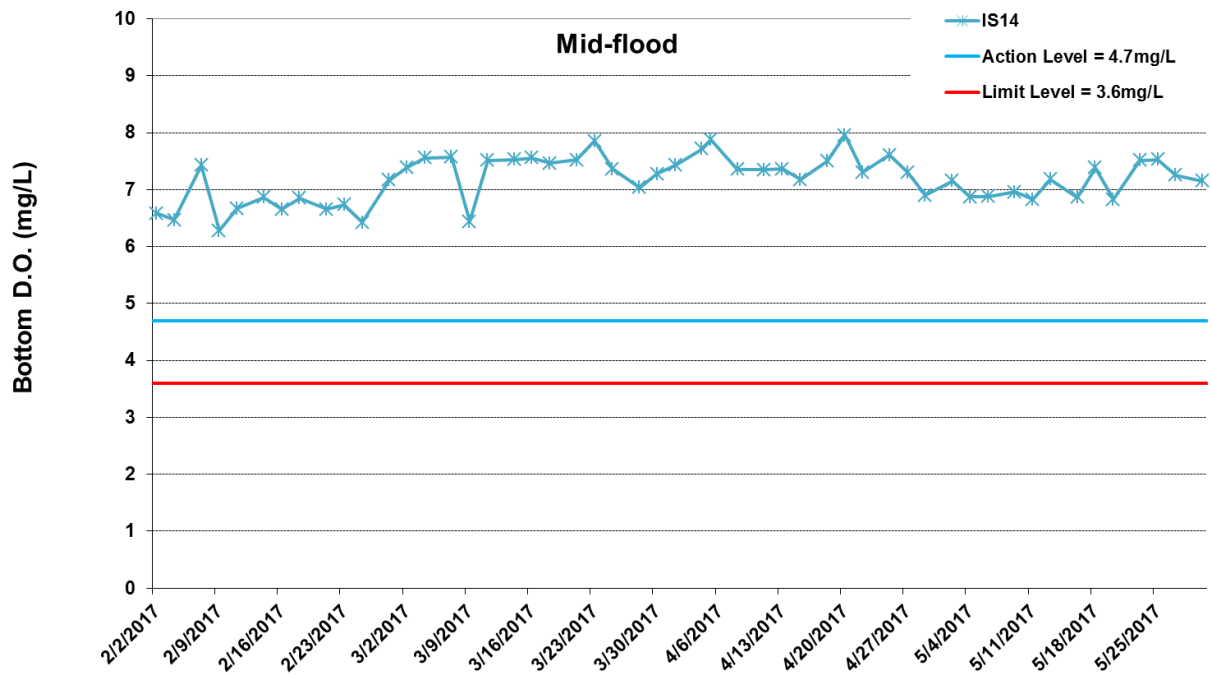
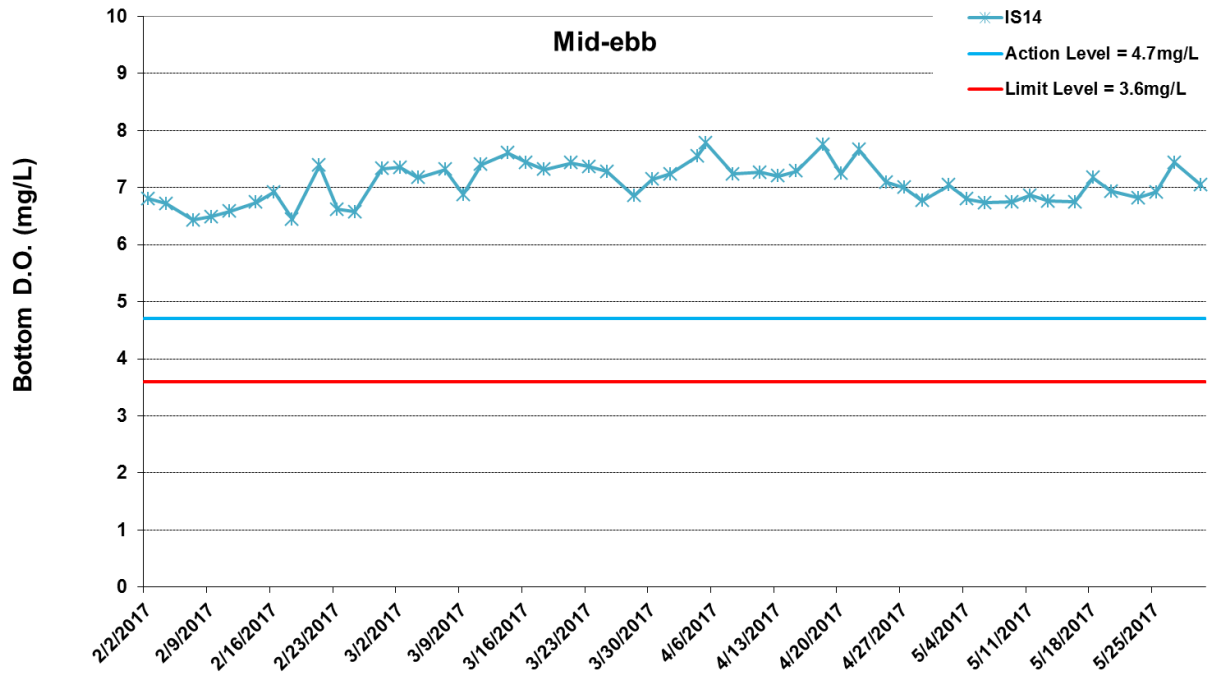


Figure G21 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at IS14. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



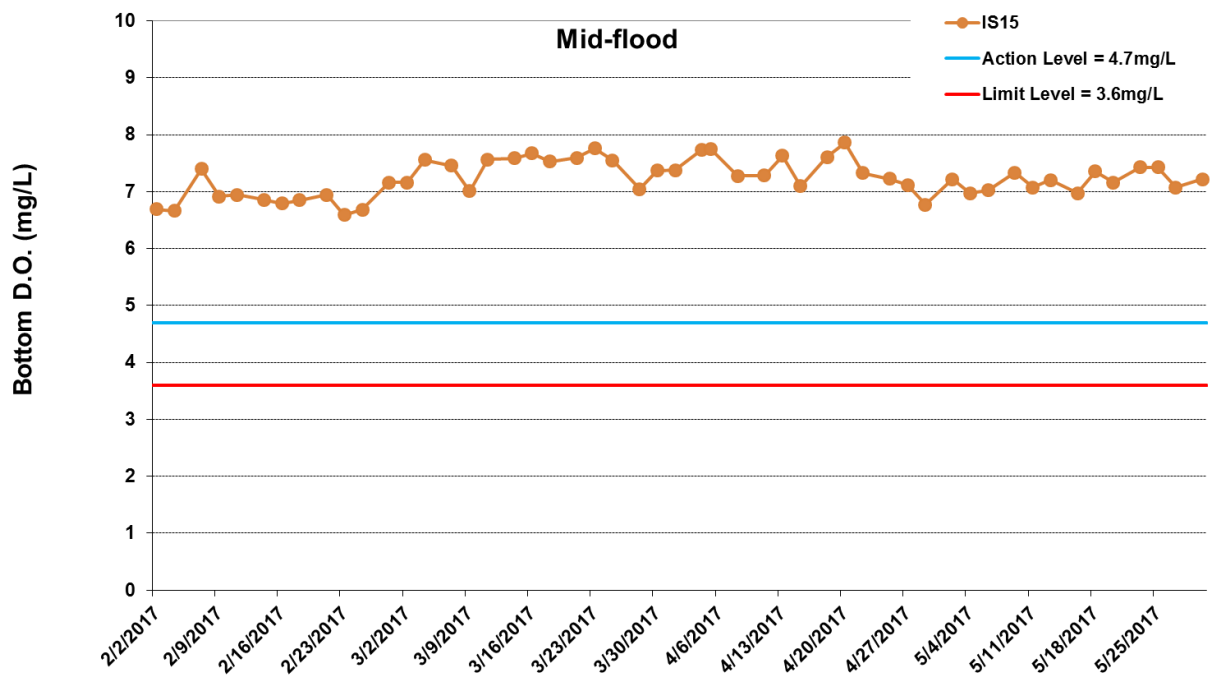
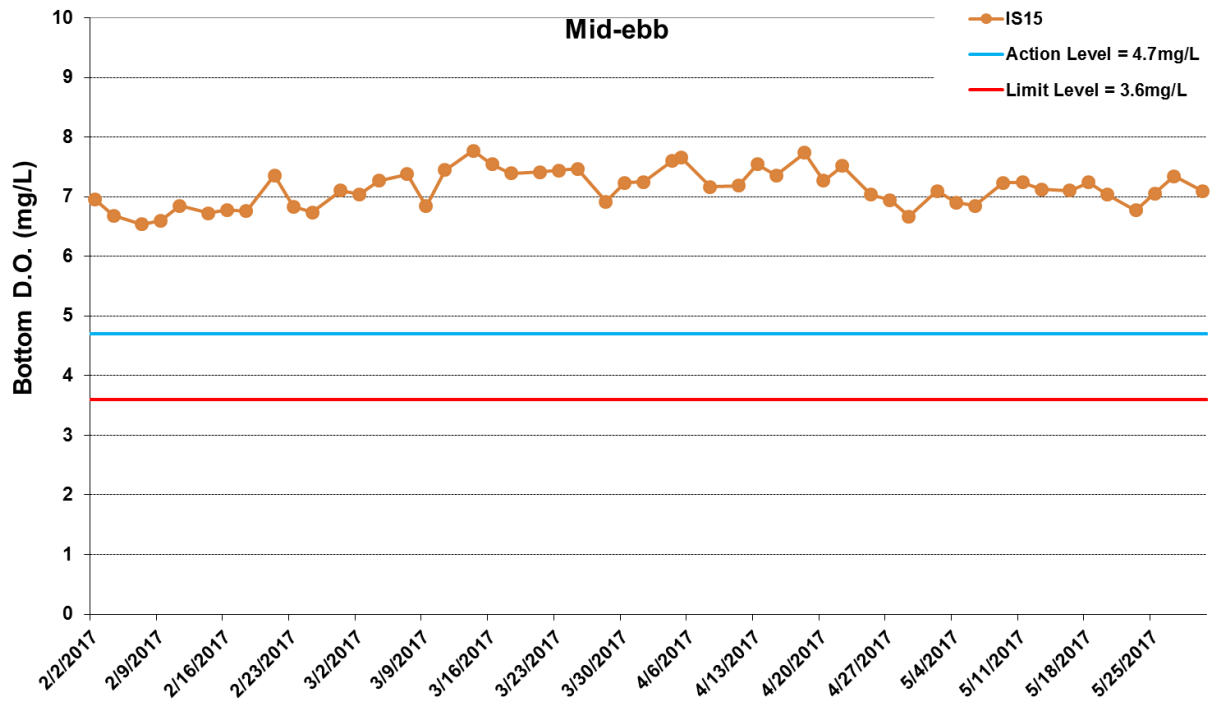


Figure G22 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at IS15. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



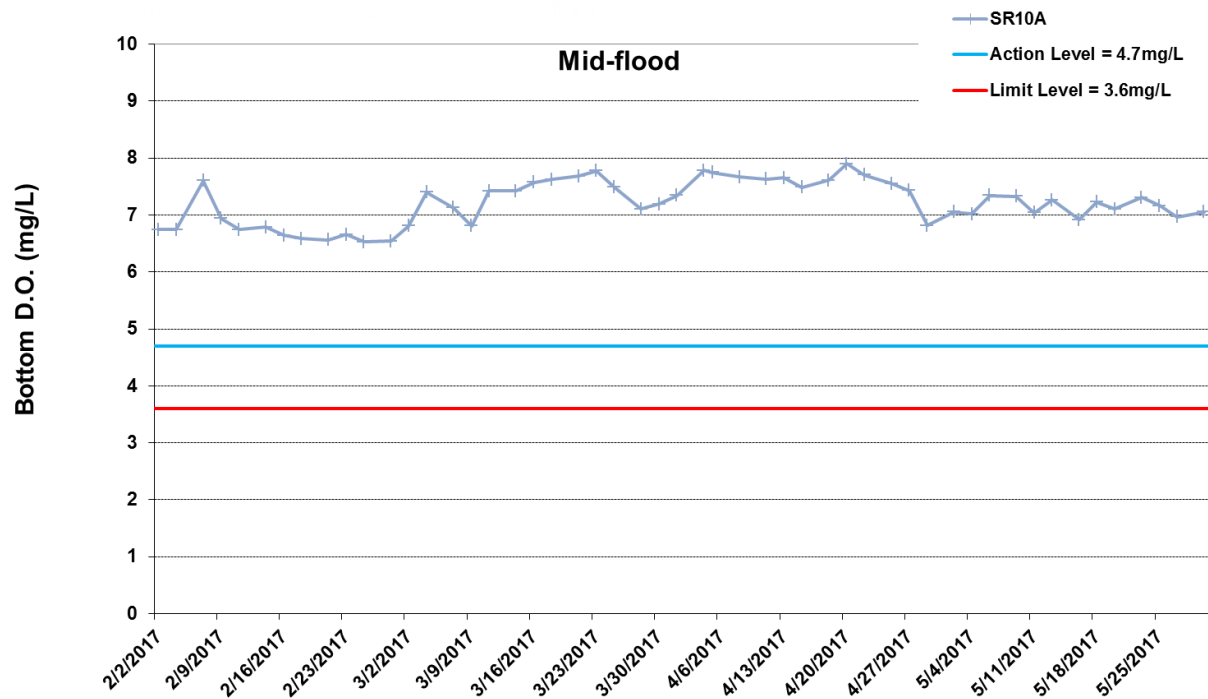
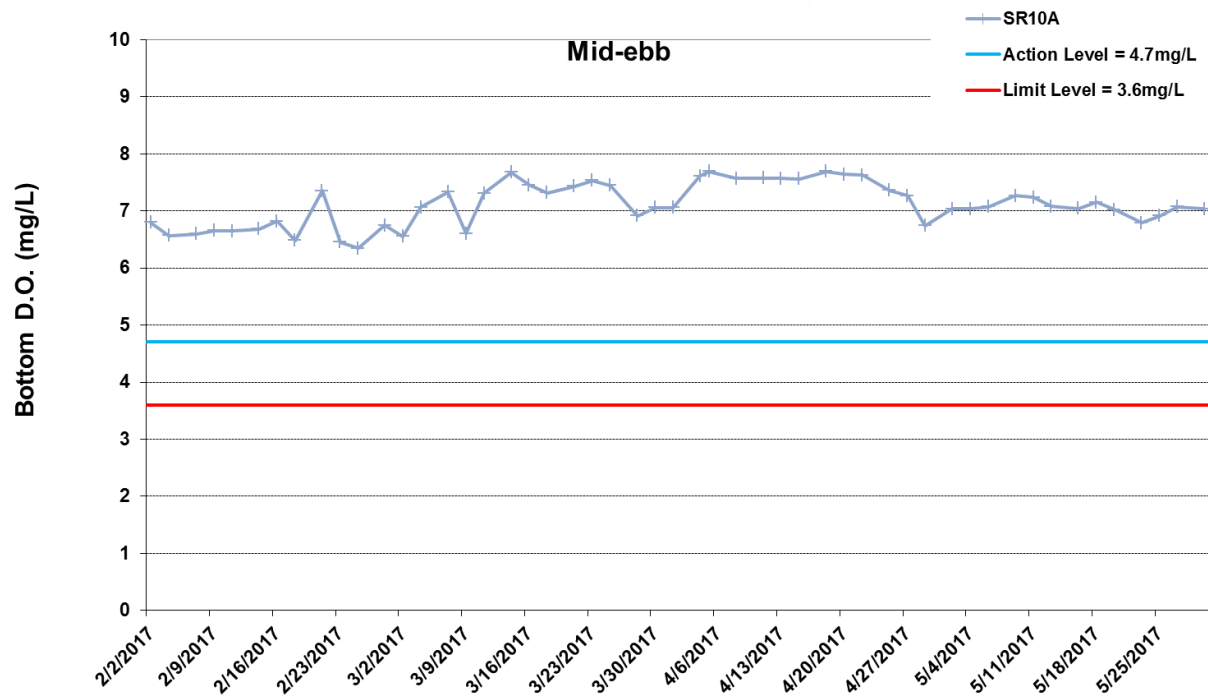


Figure G23 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at SR10A. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



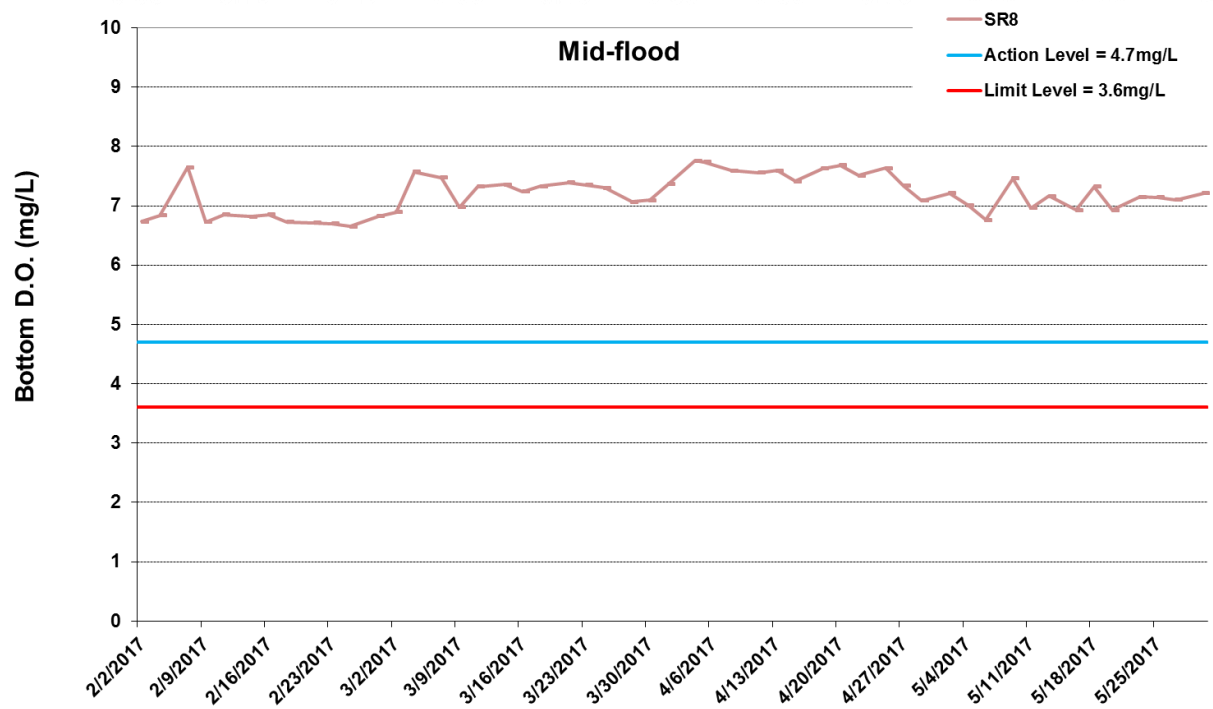
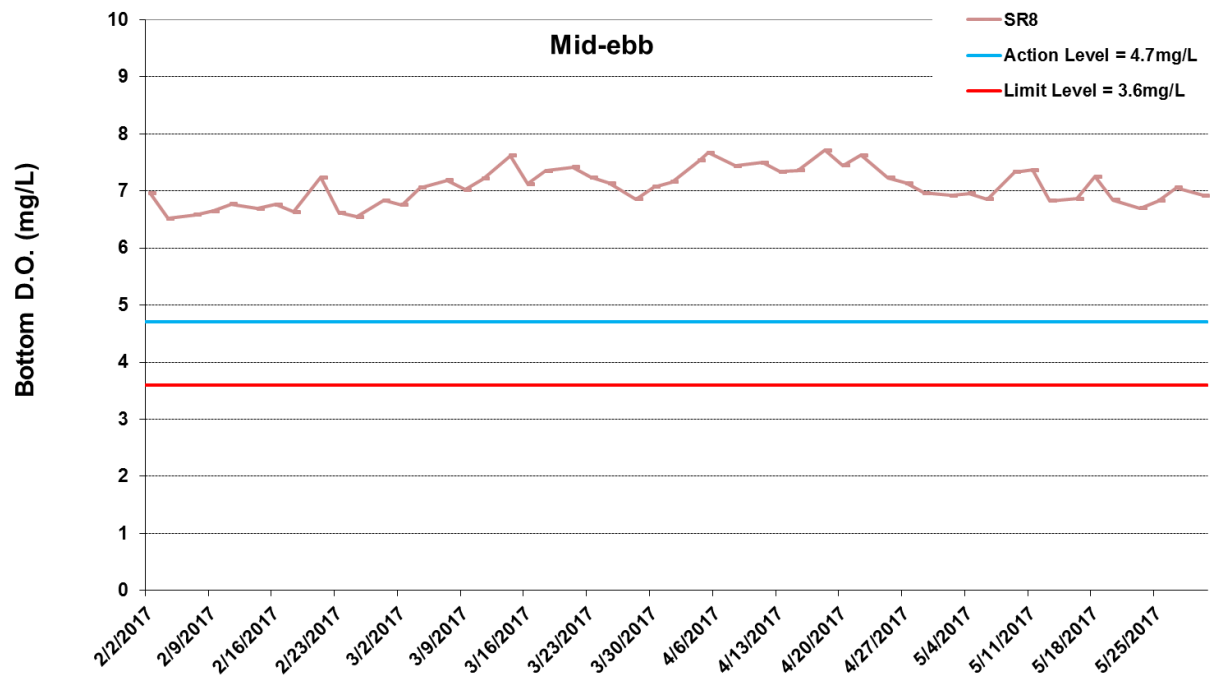


Figure G24 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at SR8. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



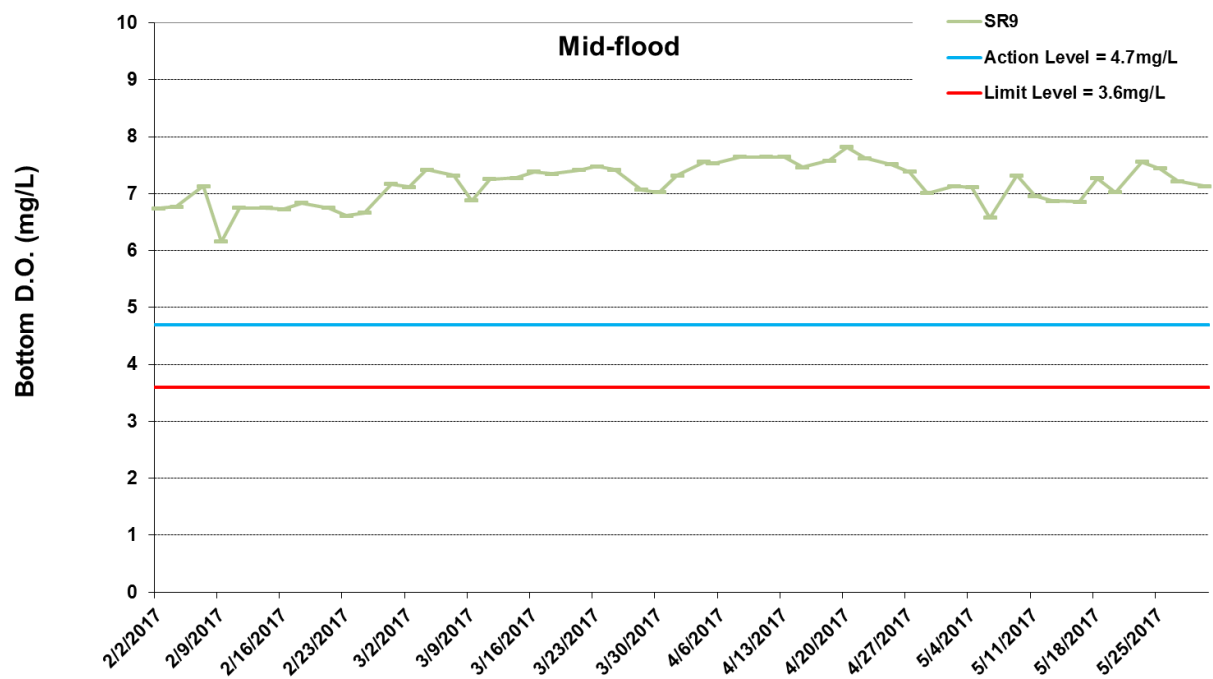
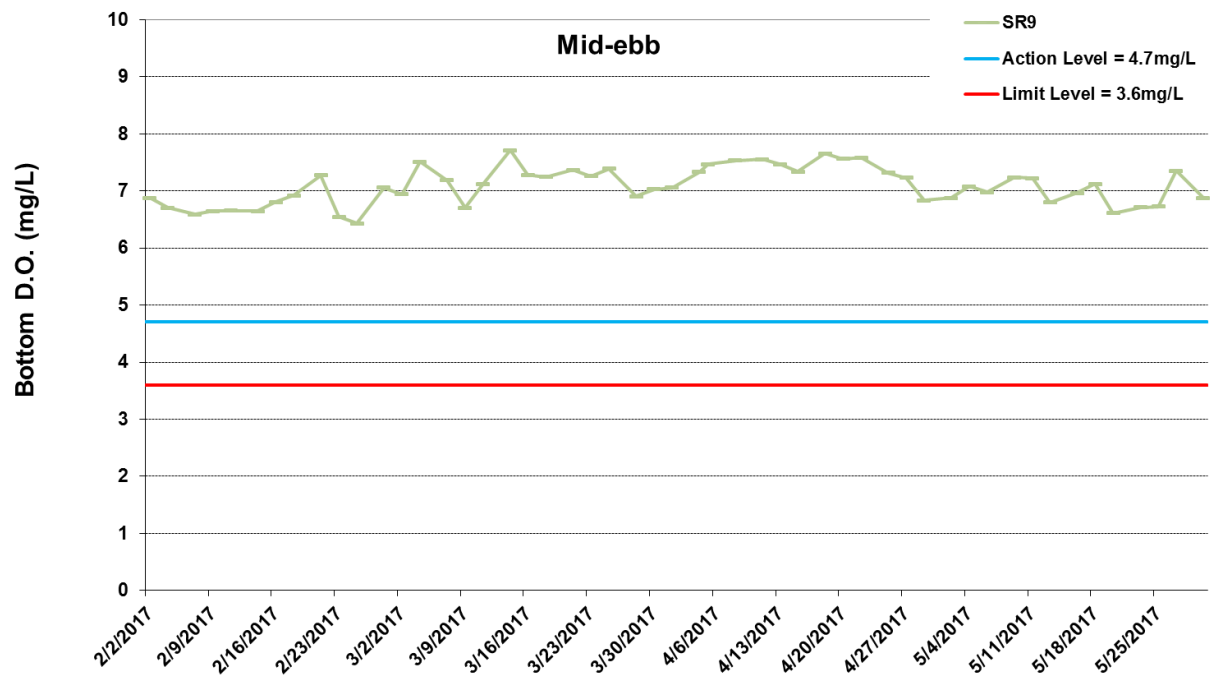
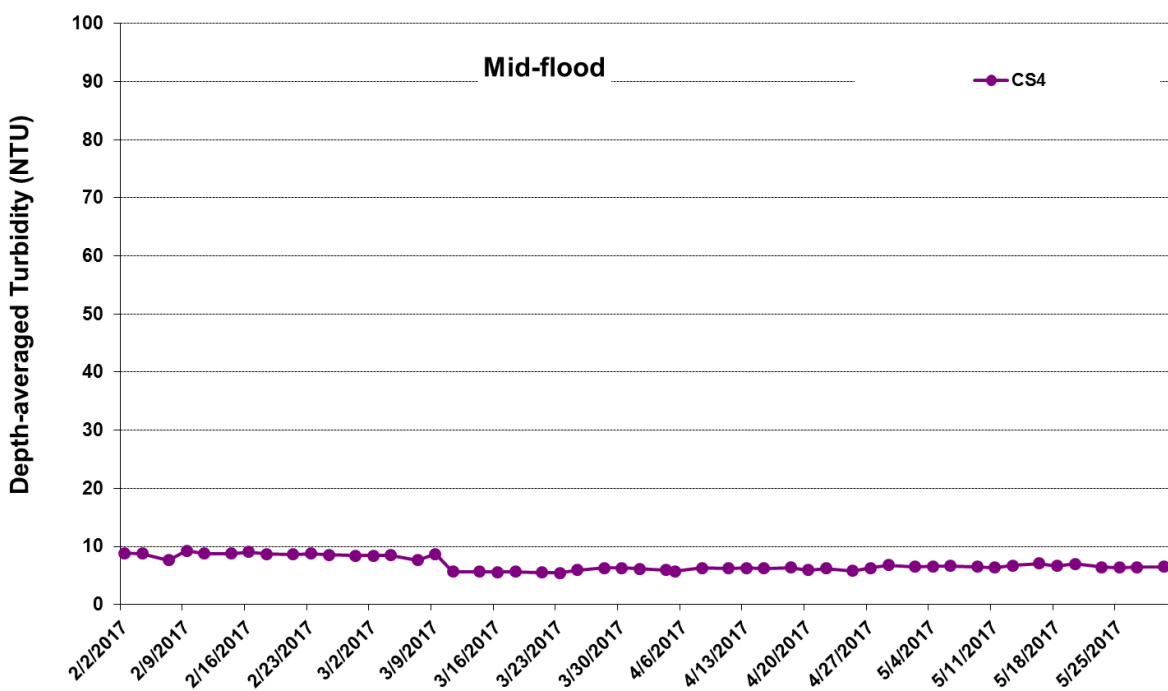
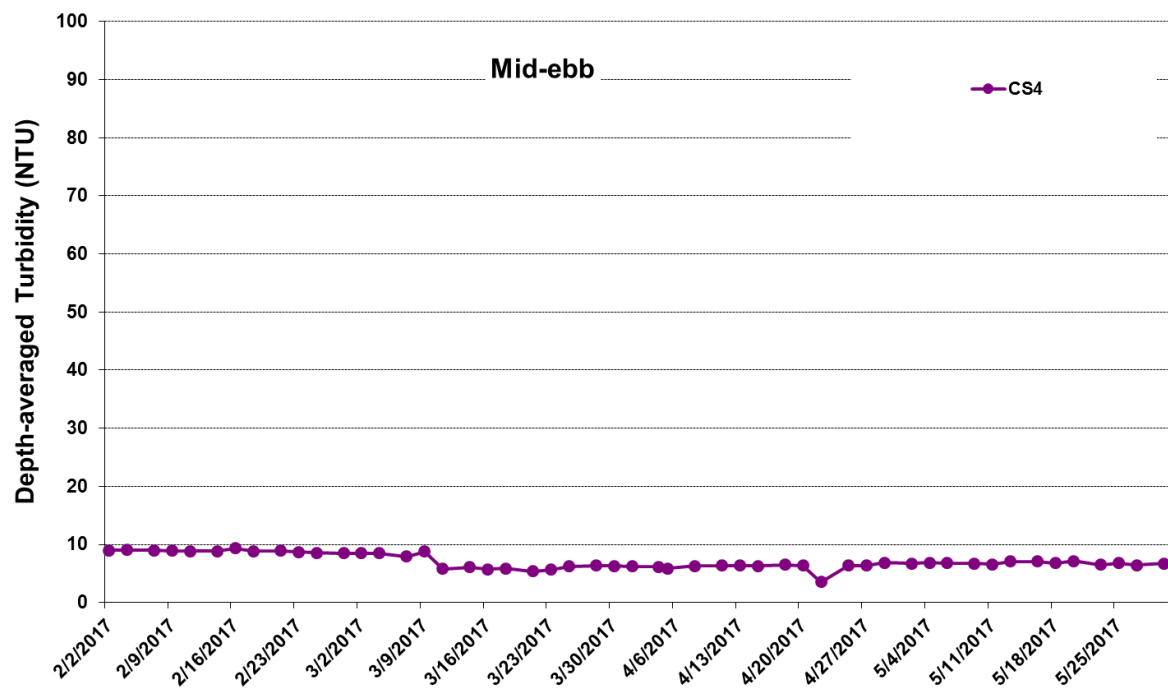


Figure G25 Impact Monitoring - Mean Level of Dissolved Oxygen (mg/L) in bottom water between 1 February 2017 and 31 May 2017 at SR9. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





**Figure G26 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).**

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



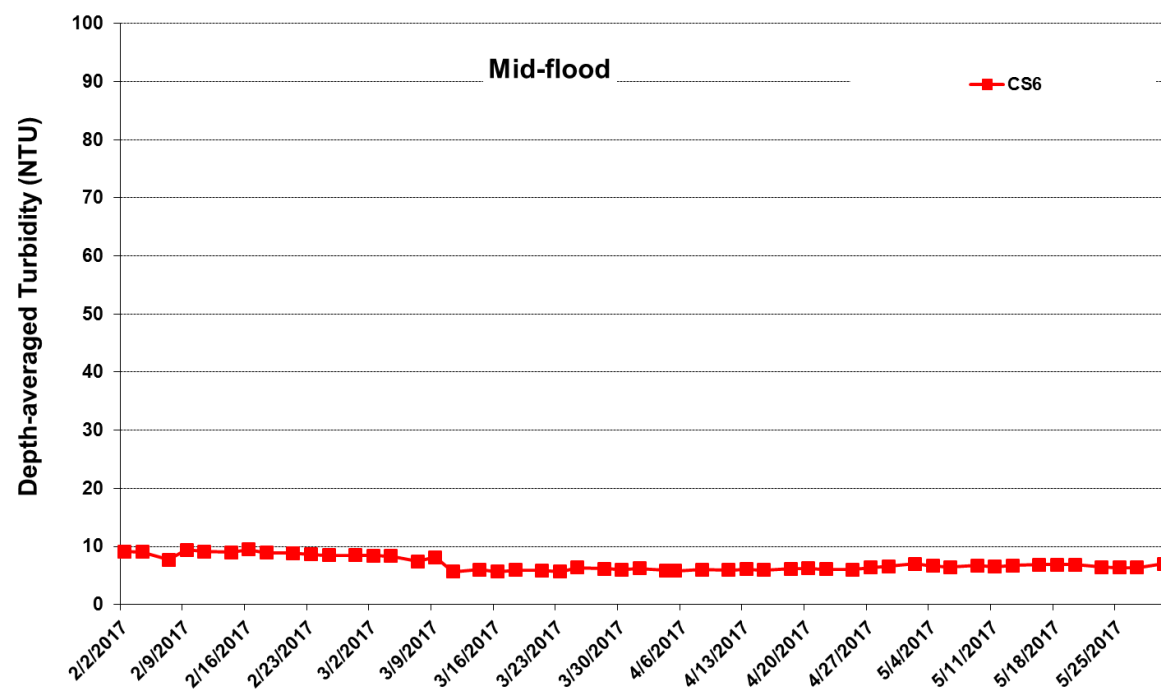
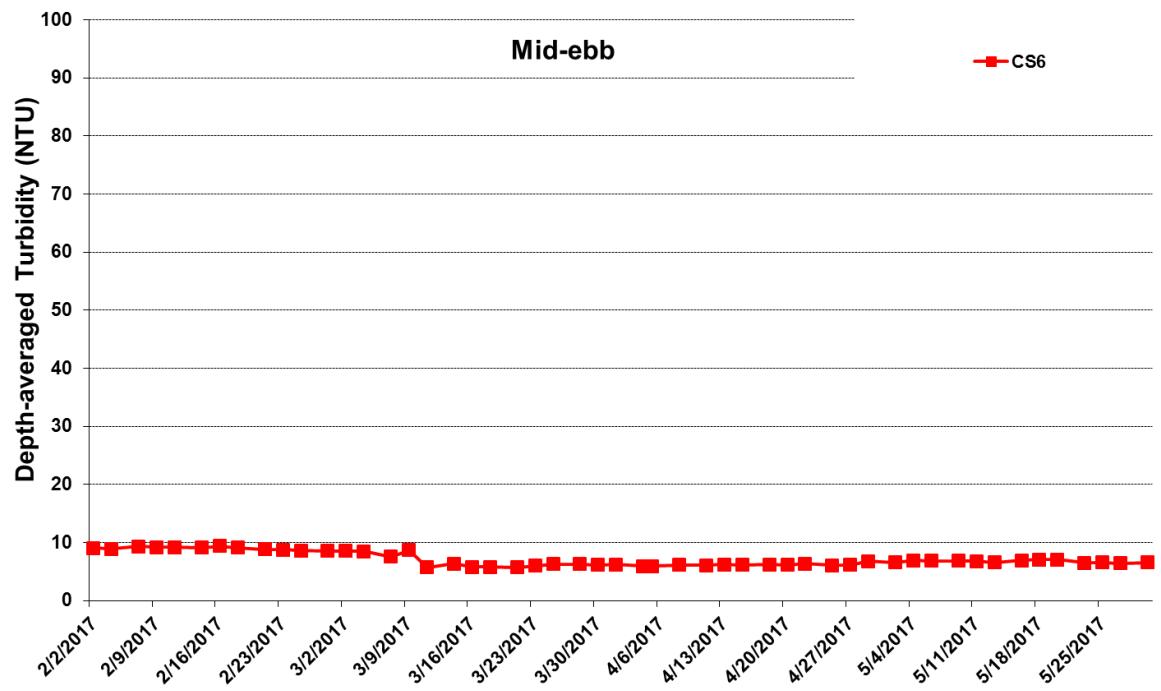


Figure G27 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at CS6. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





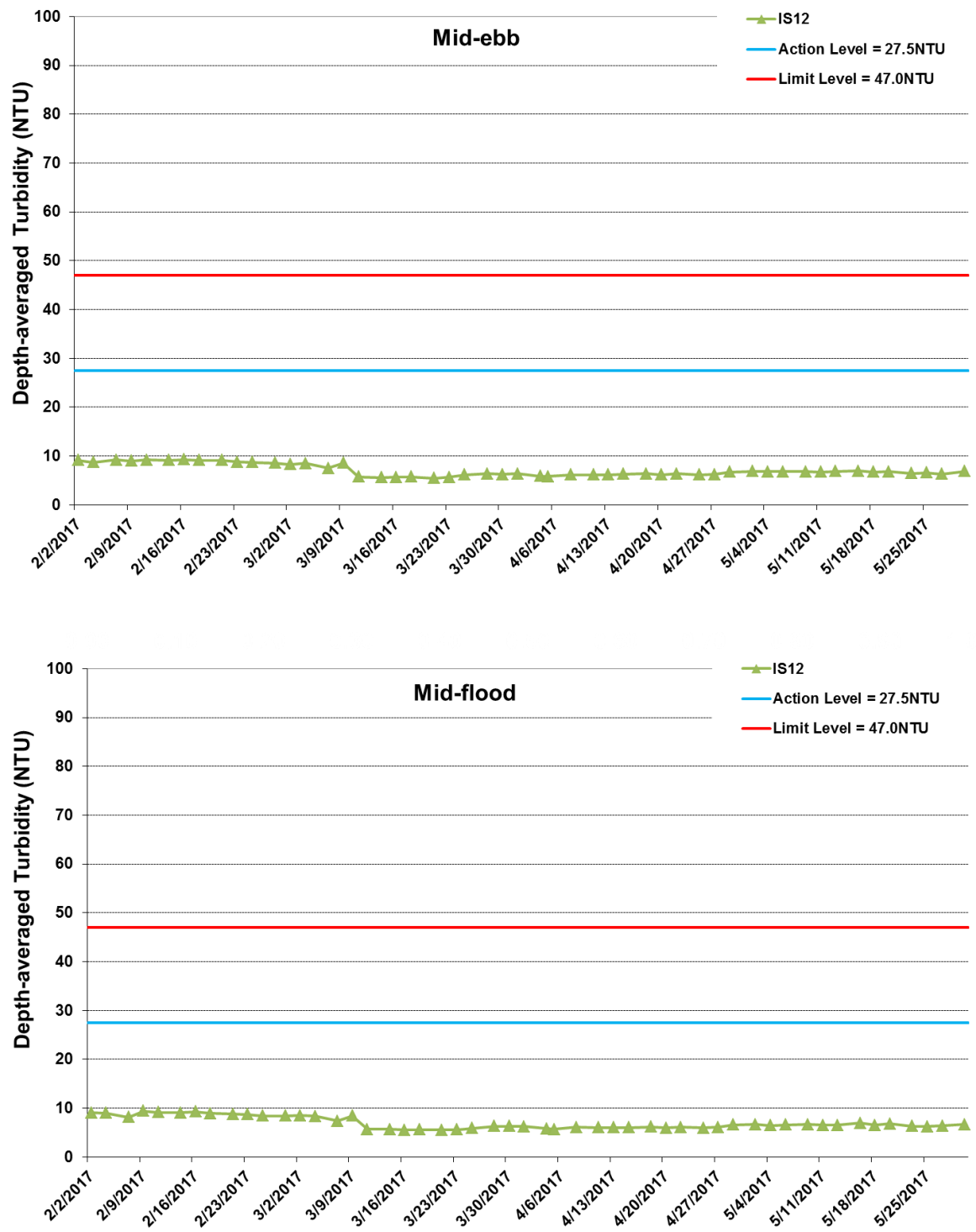


Figure G28 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at IS12. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



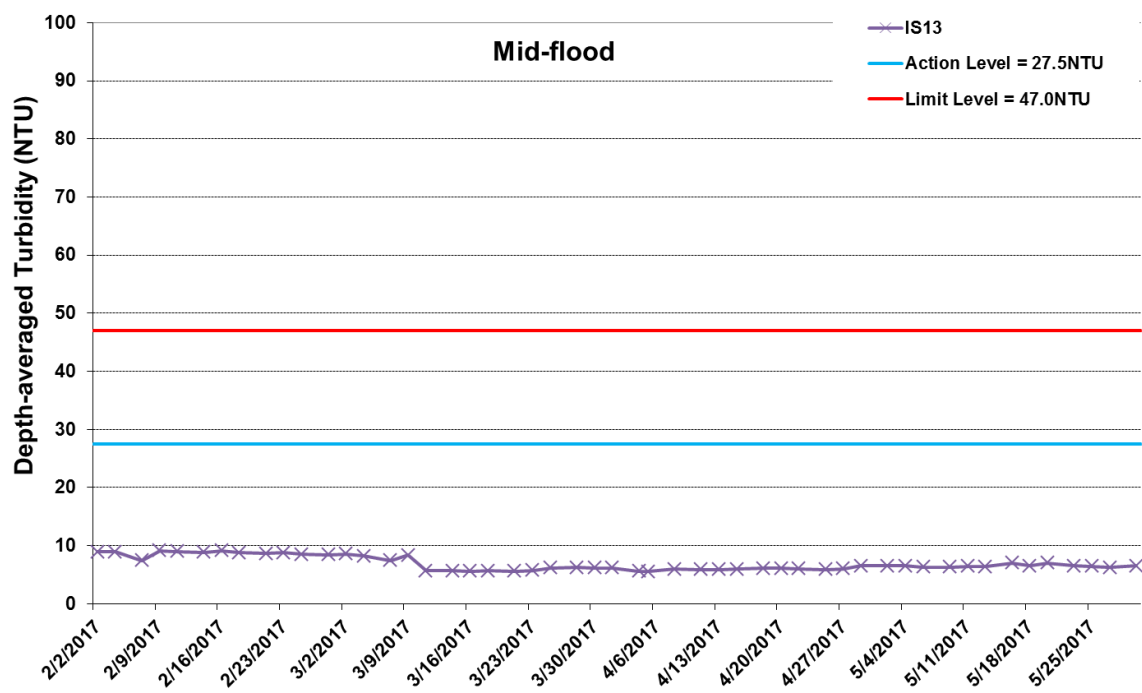
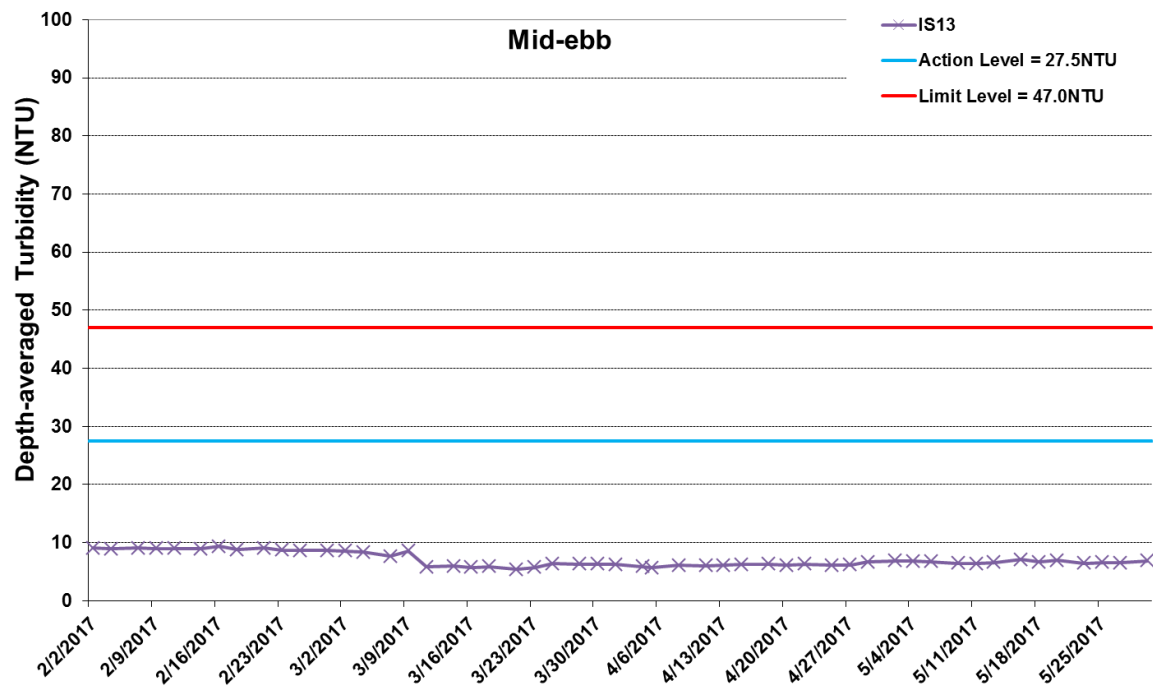


Figure G29 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at IS13. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



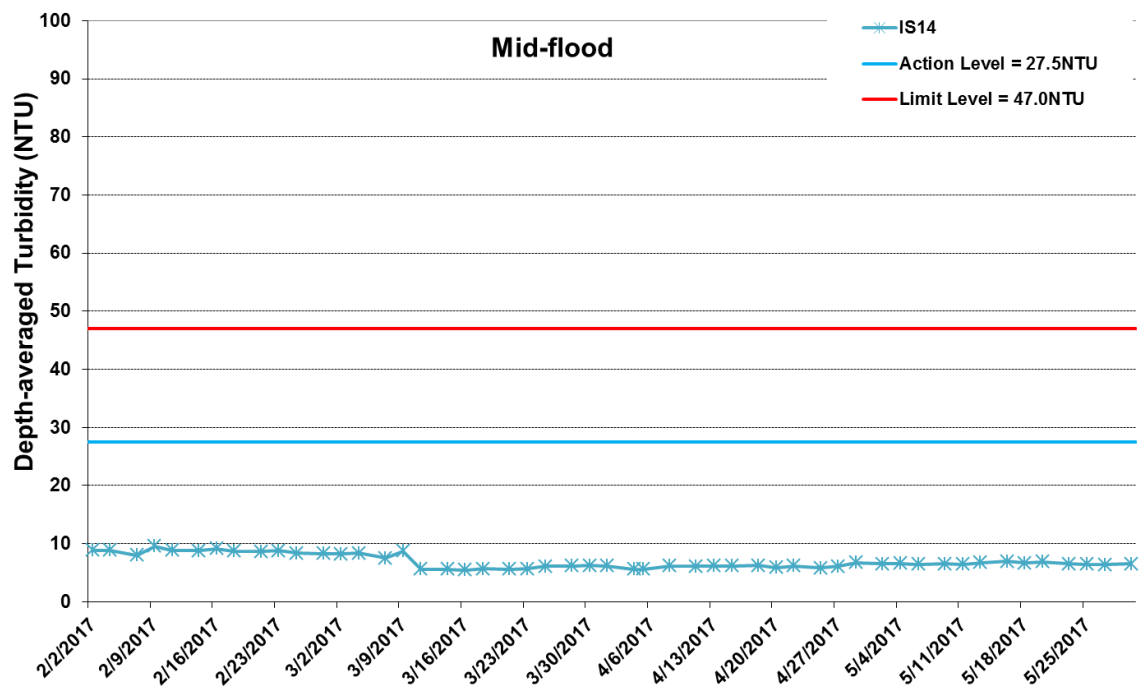
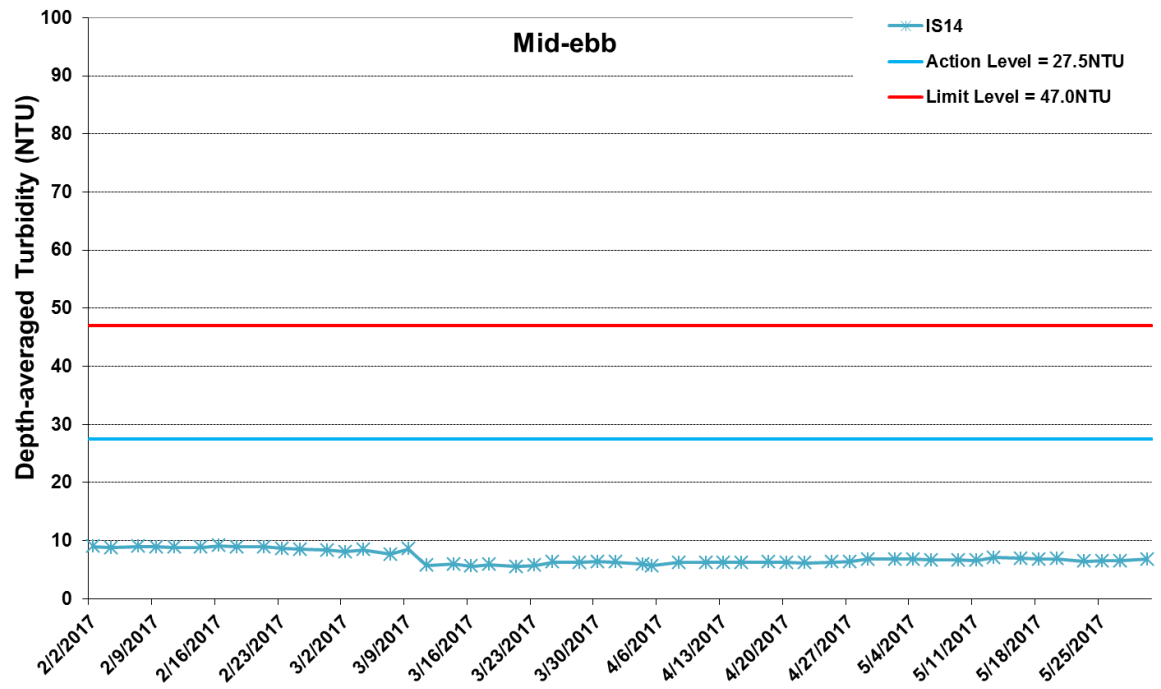


Figure G30 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at IS14. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



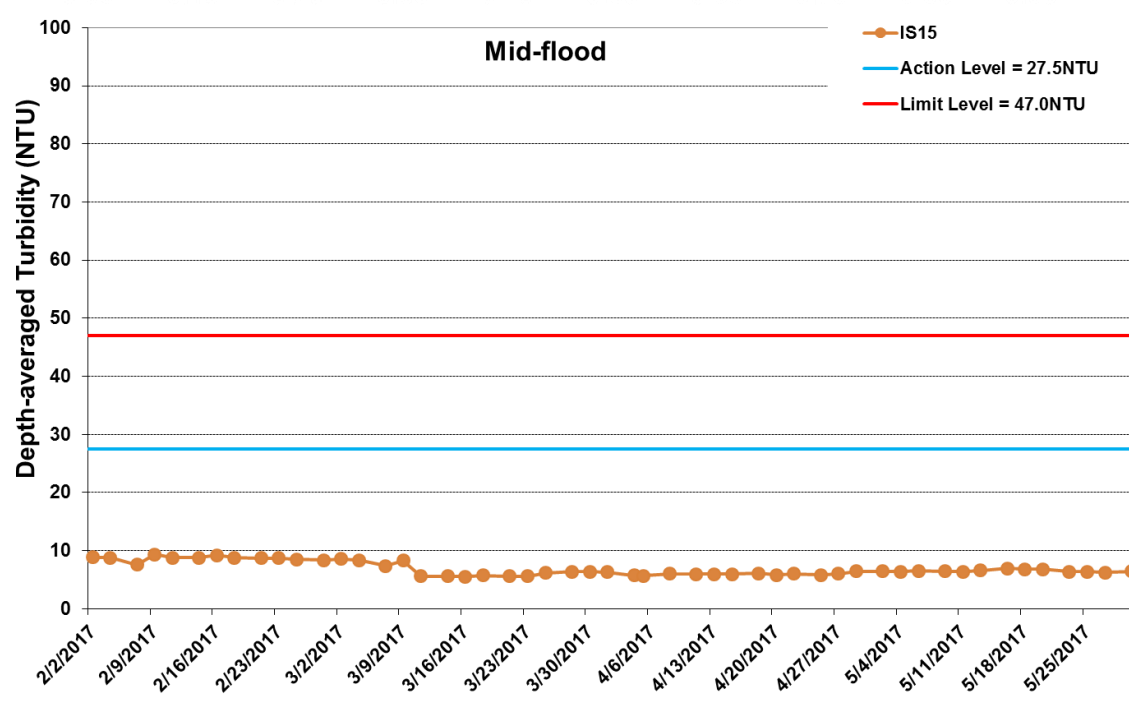
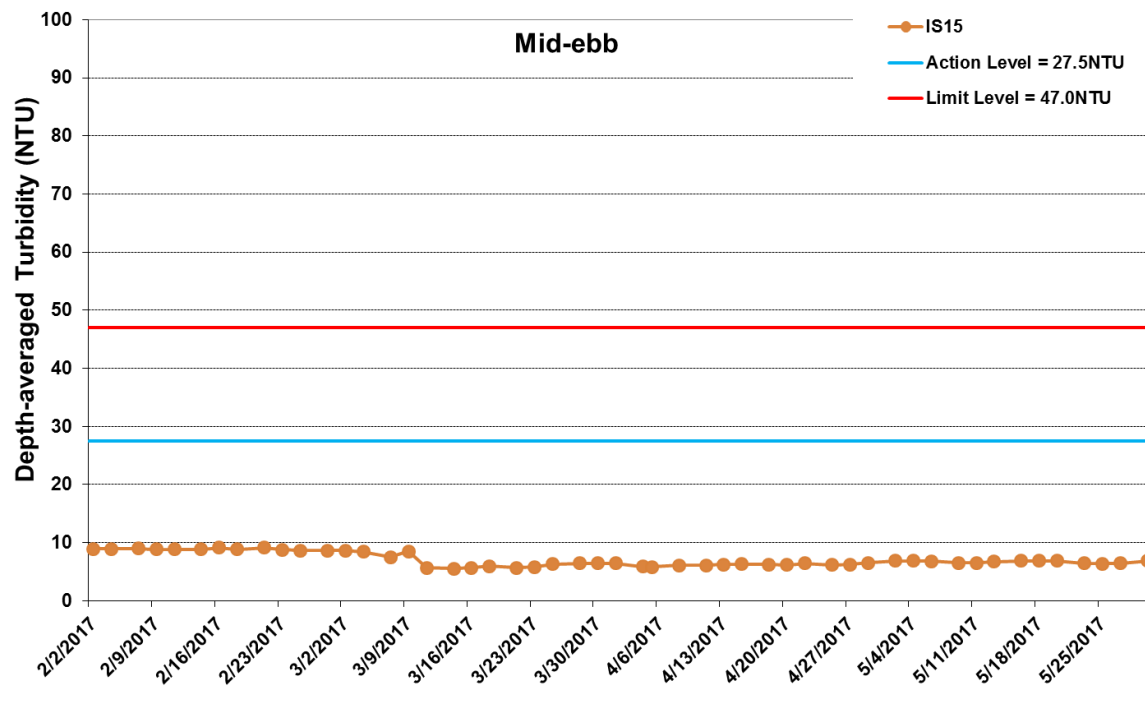


Figure G31 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at IS15. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



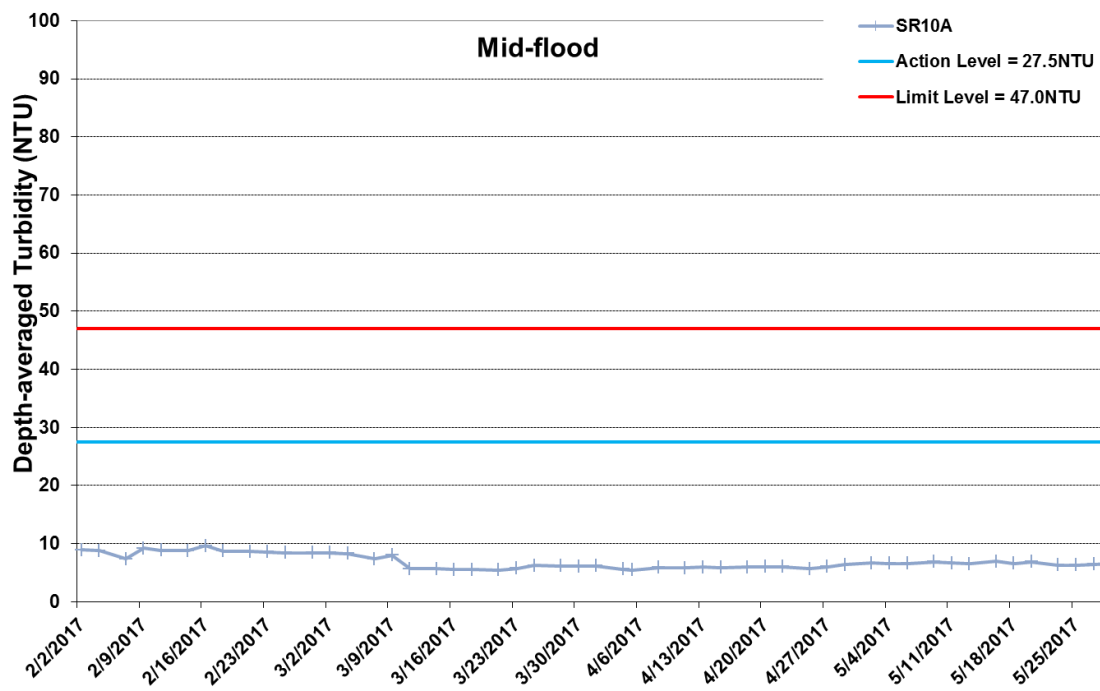
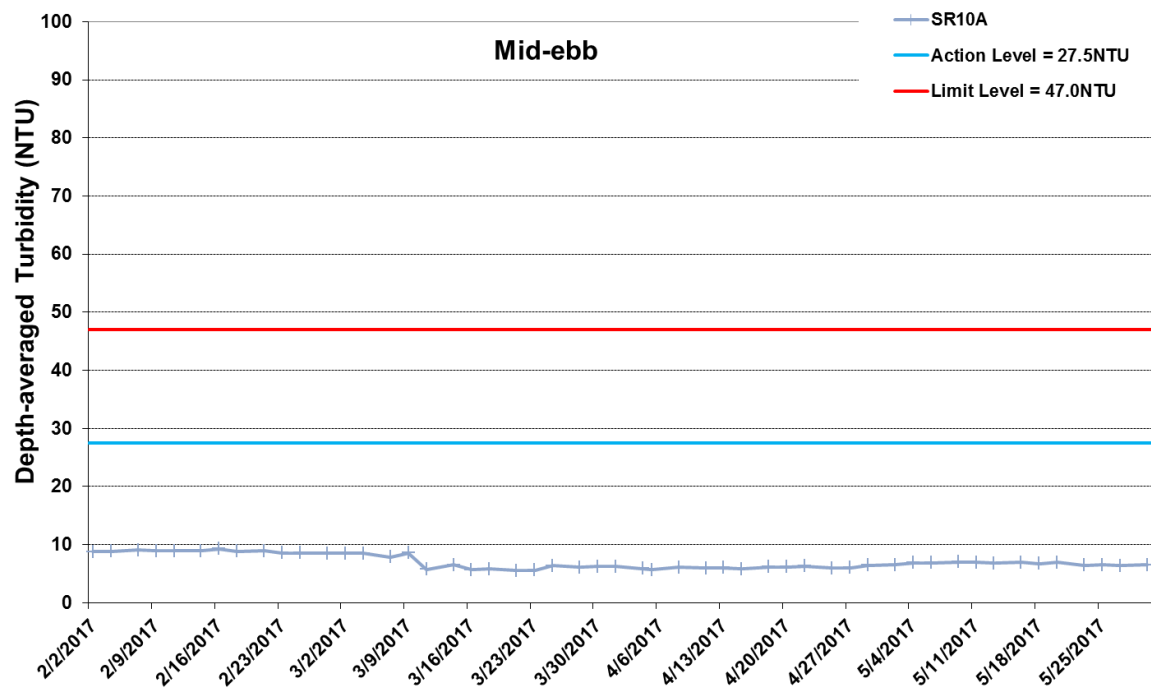


Figure G32 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at SR10A. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



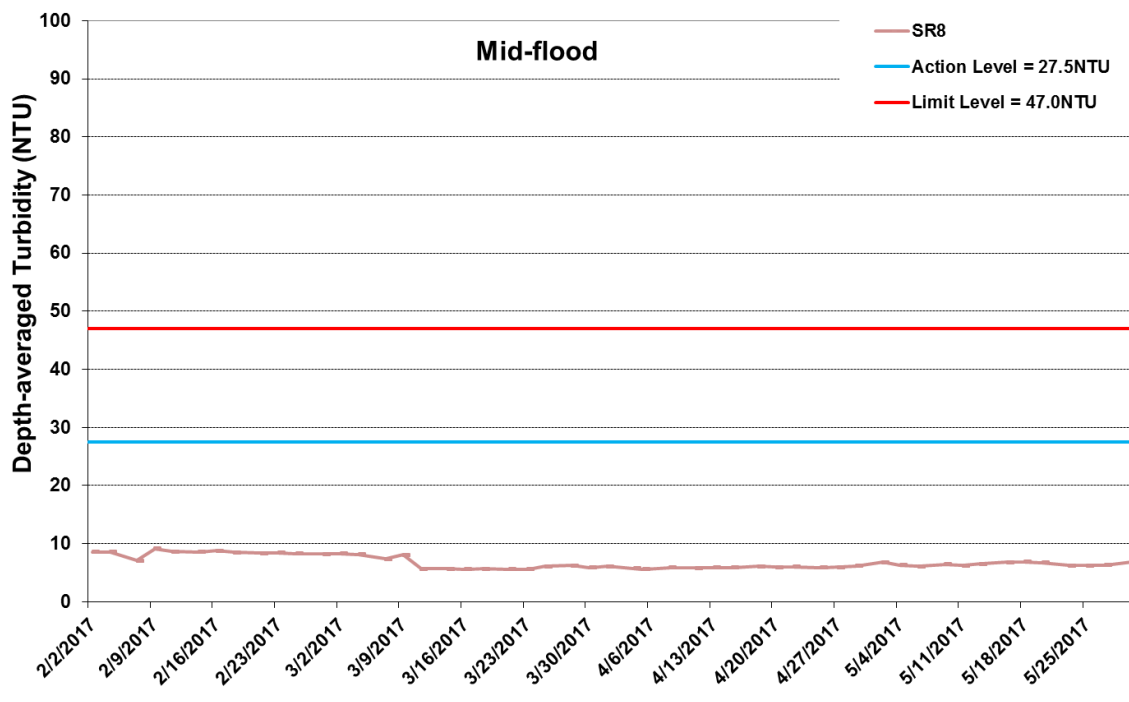
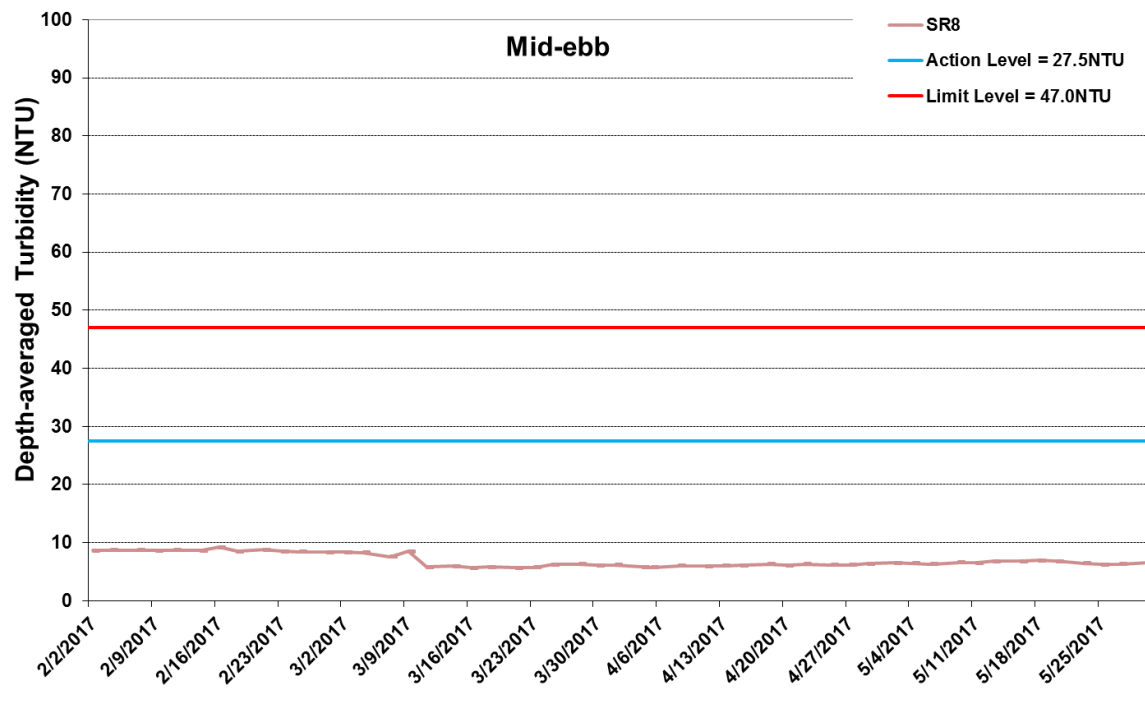


Figure G33 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at SR8. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



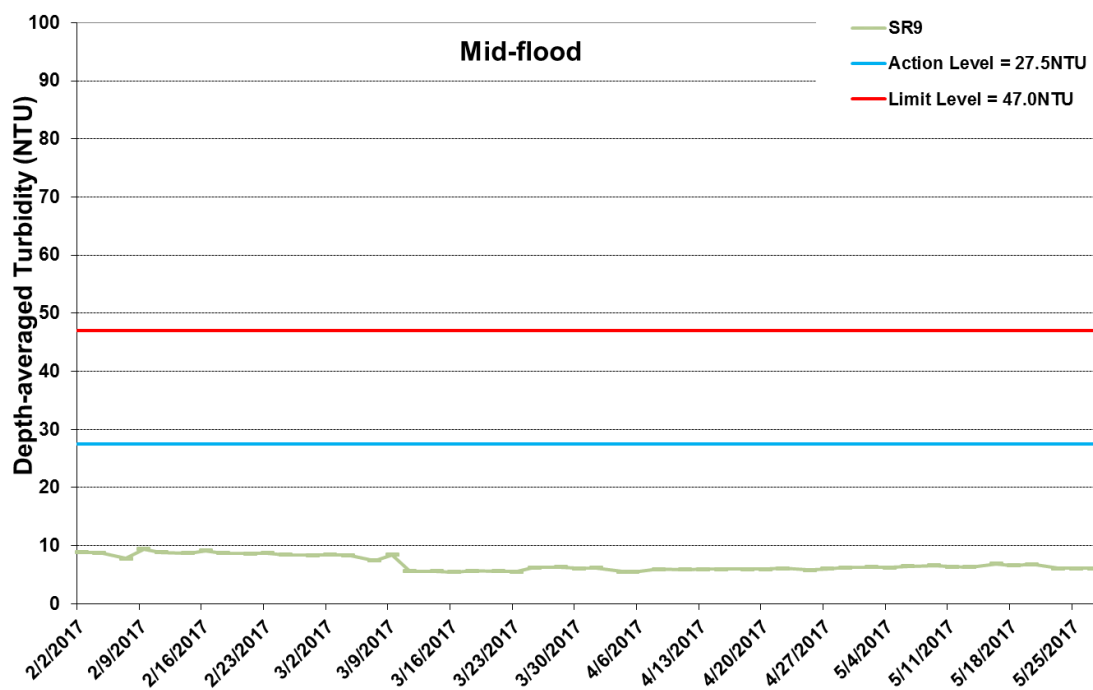
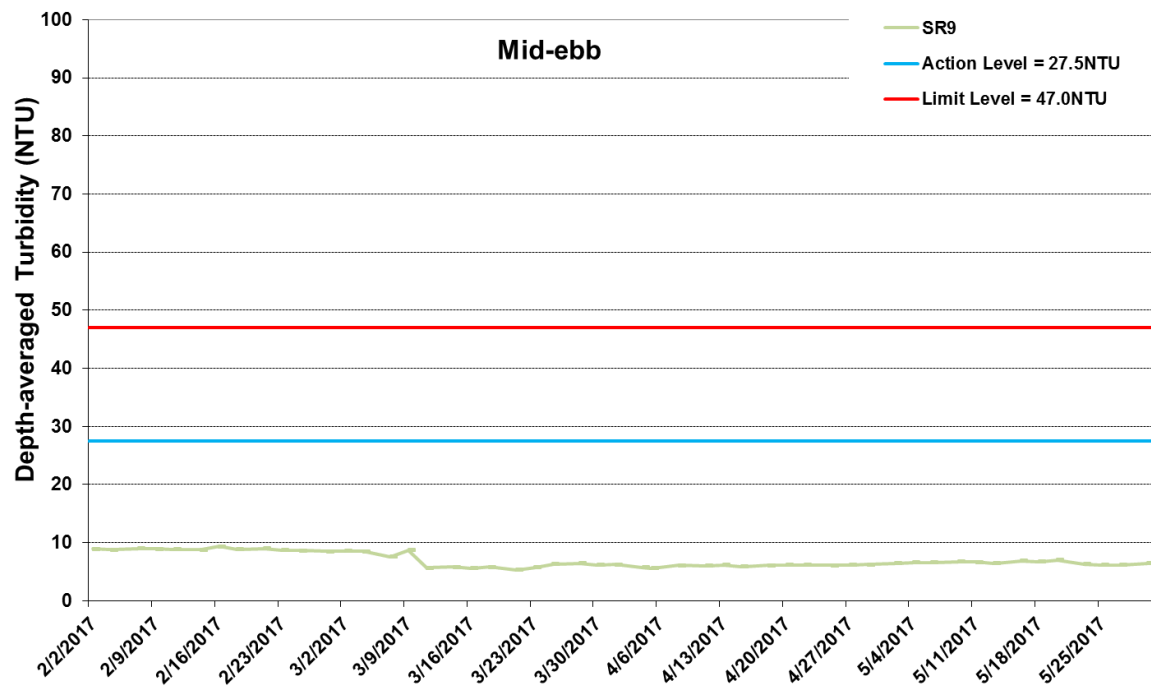


Figure G34 Impact Monitoring - Mean Depth-averaged Level of Turbidity (NTU) between 1 February 2017 and 31 May 2017 at SR9. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



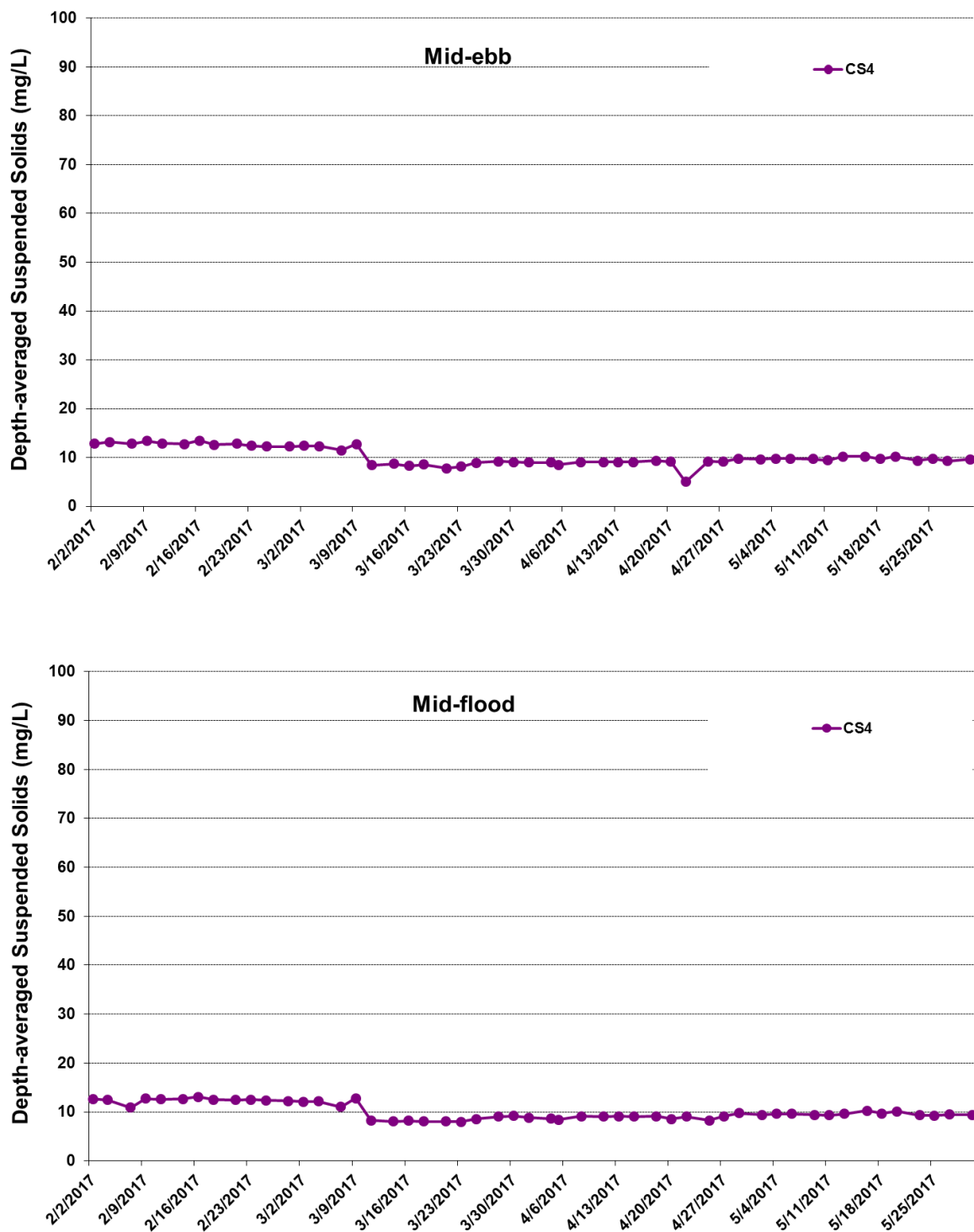


Figure G35 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at CS4. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls





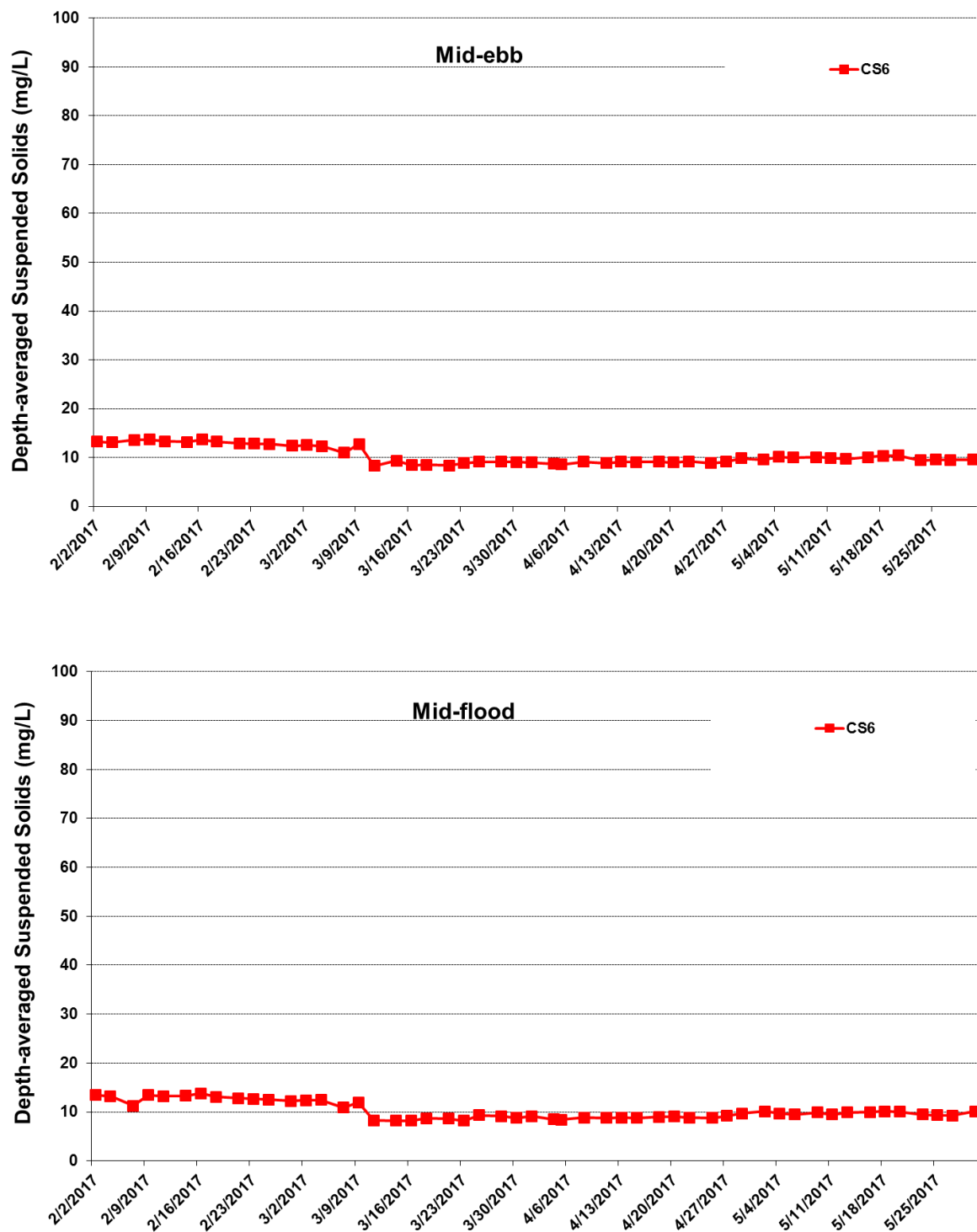


Figure G36 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at CS6. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).



Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls

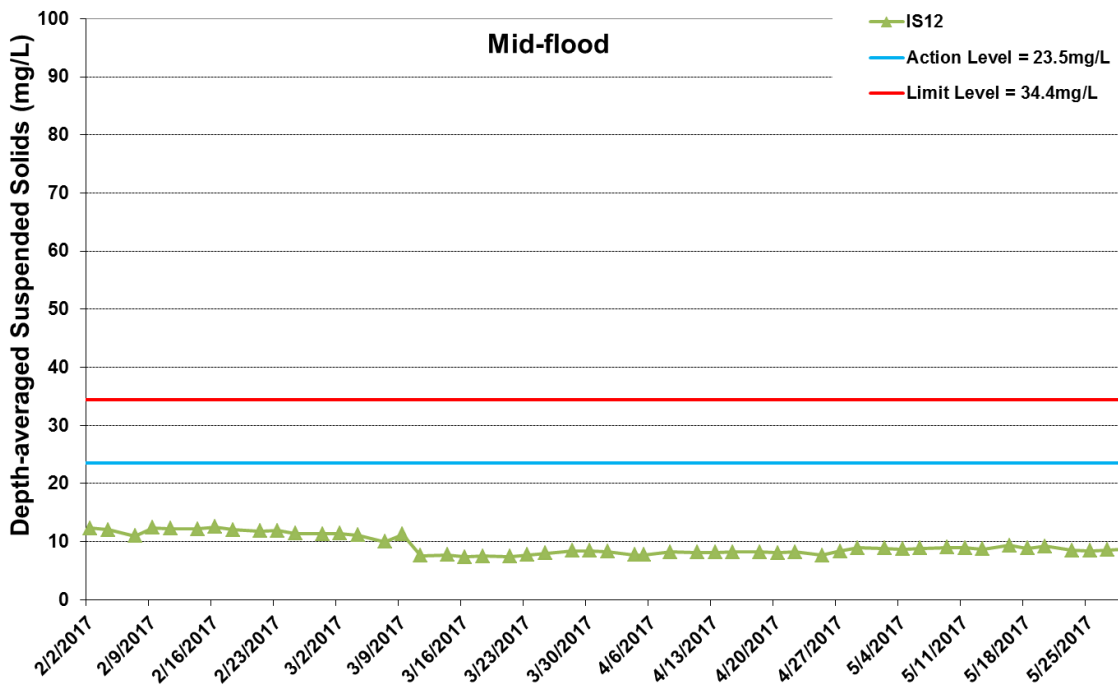
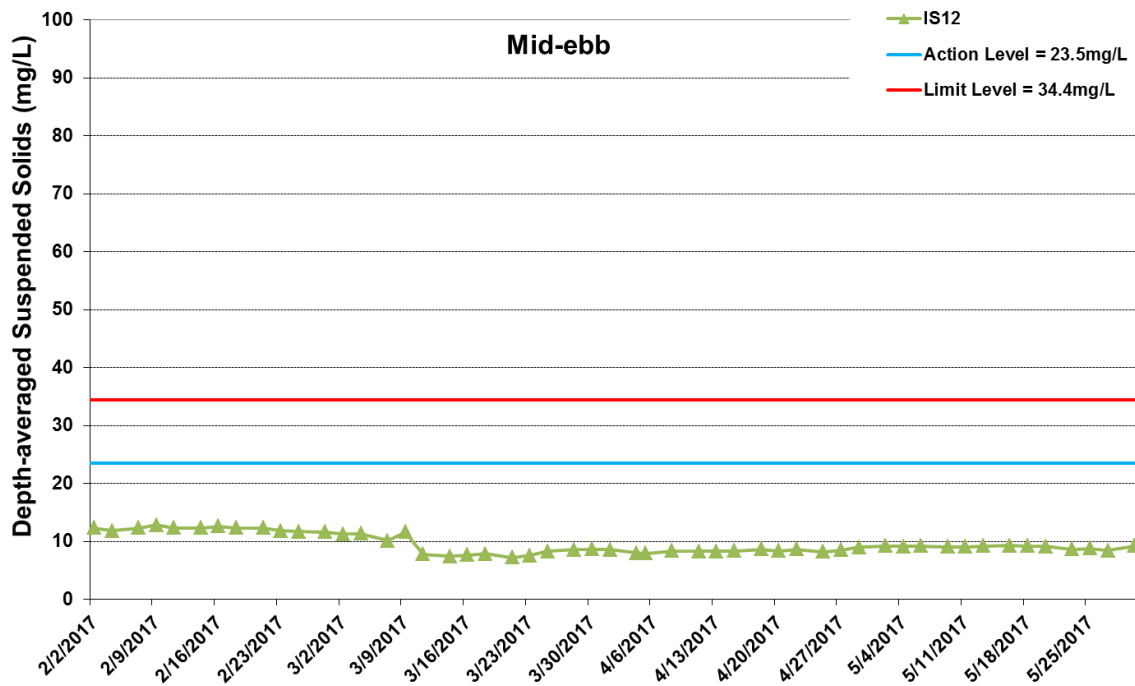


Figure G37 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at IS12. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).



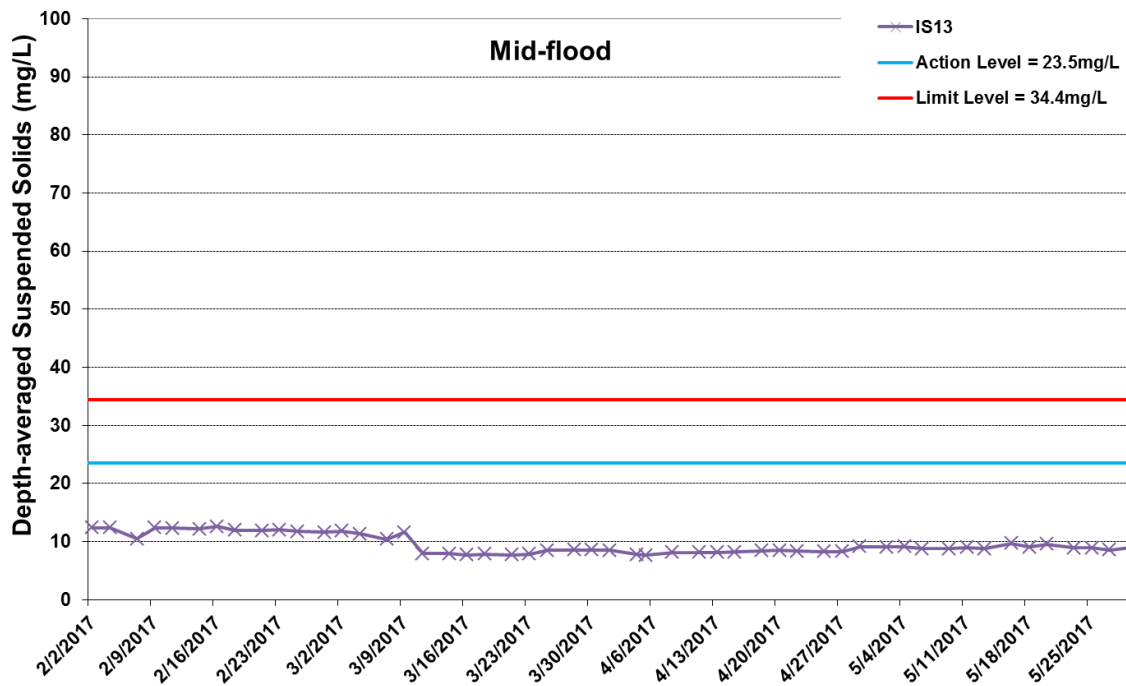
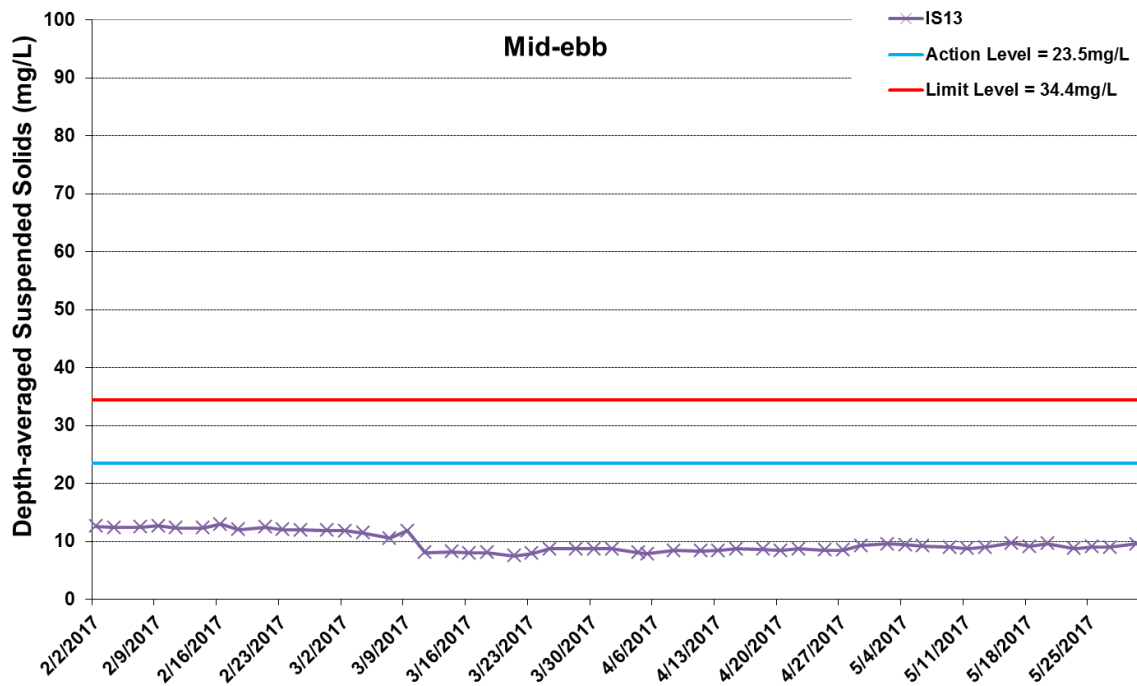


Figure G38 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at IS13. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).



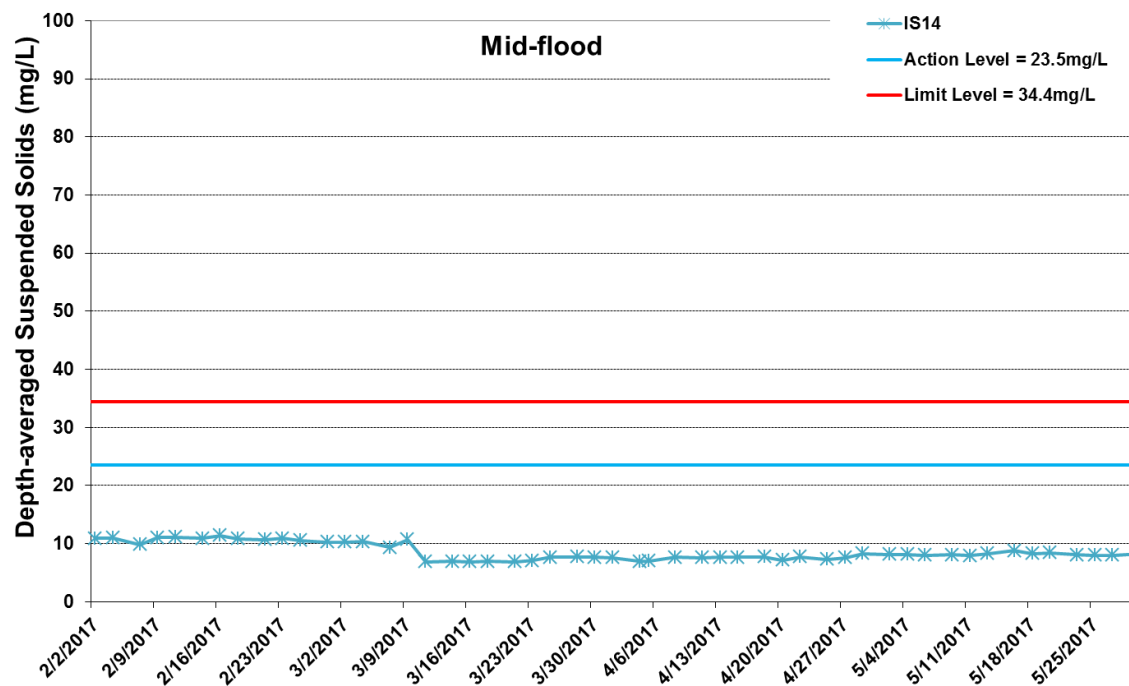
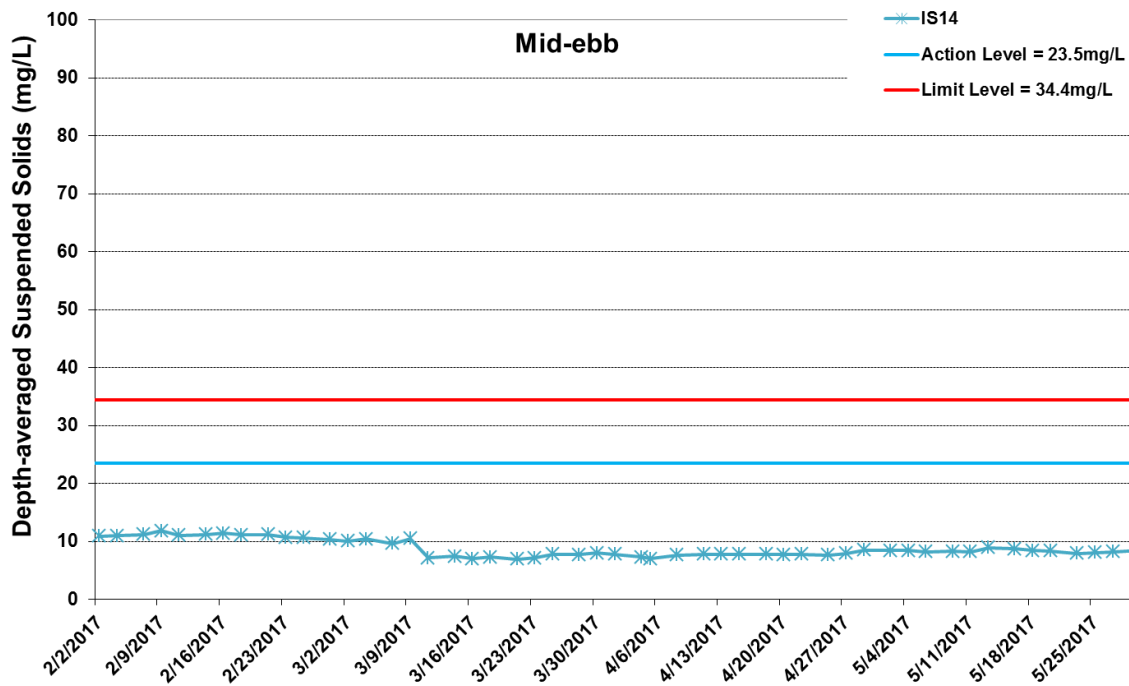


Figure G39 Impact Monitoring – Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at IS14. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 – 20/5/2017).



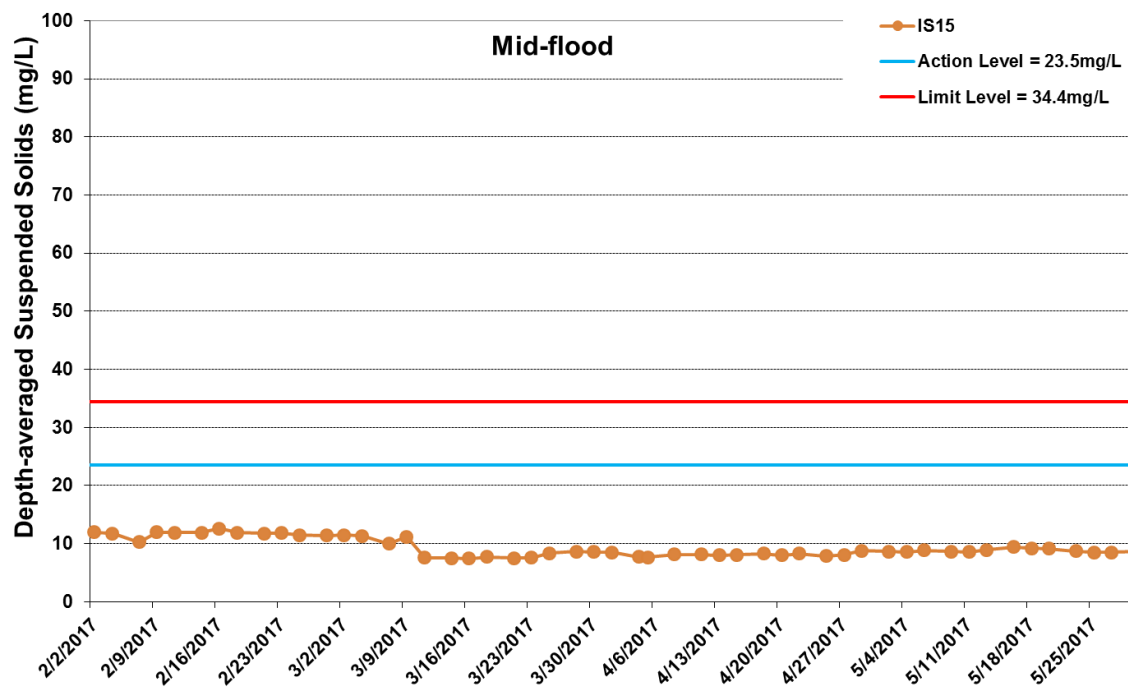
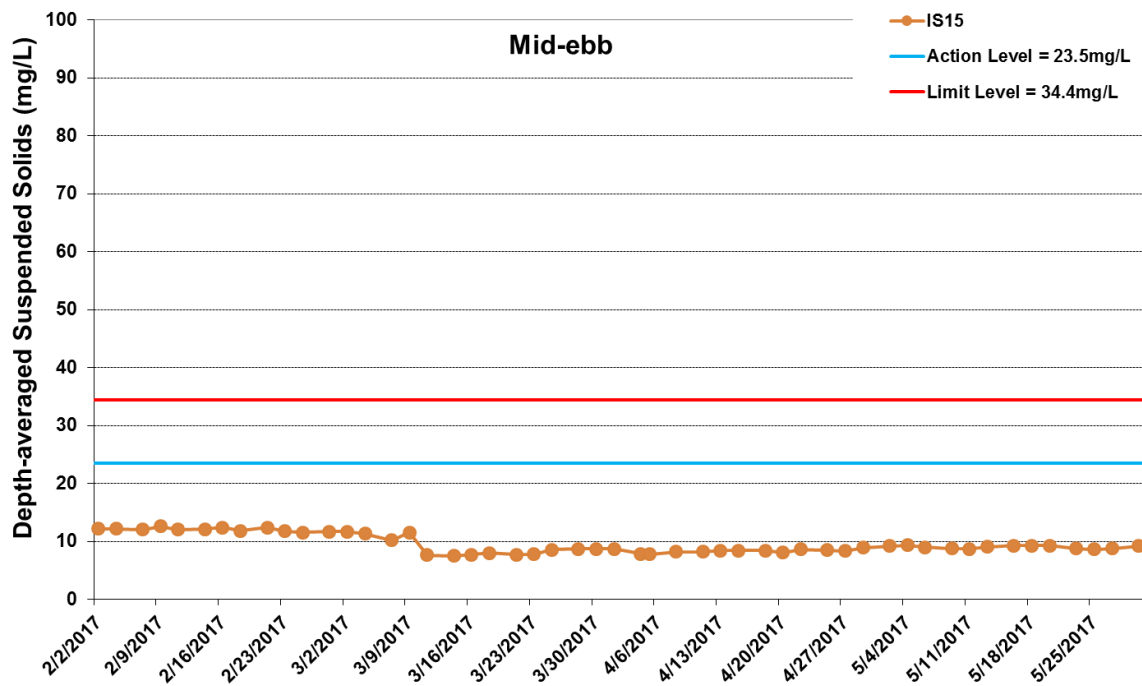


Figure G40 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at IS15. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



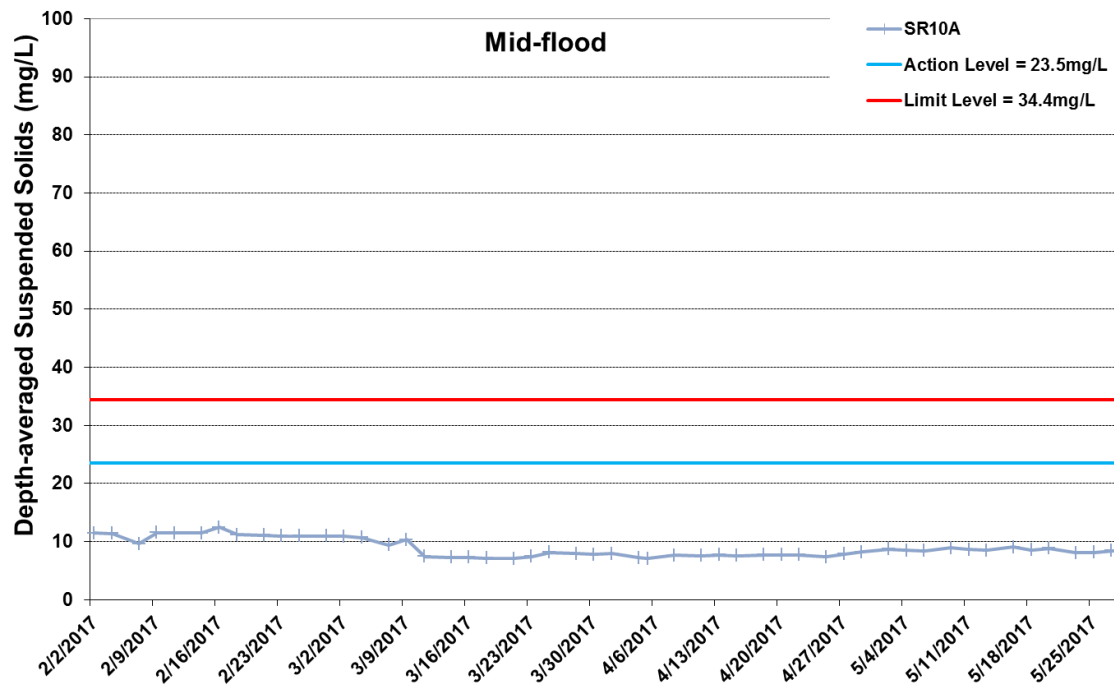
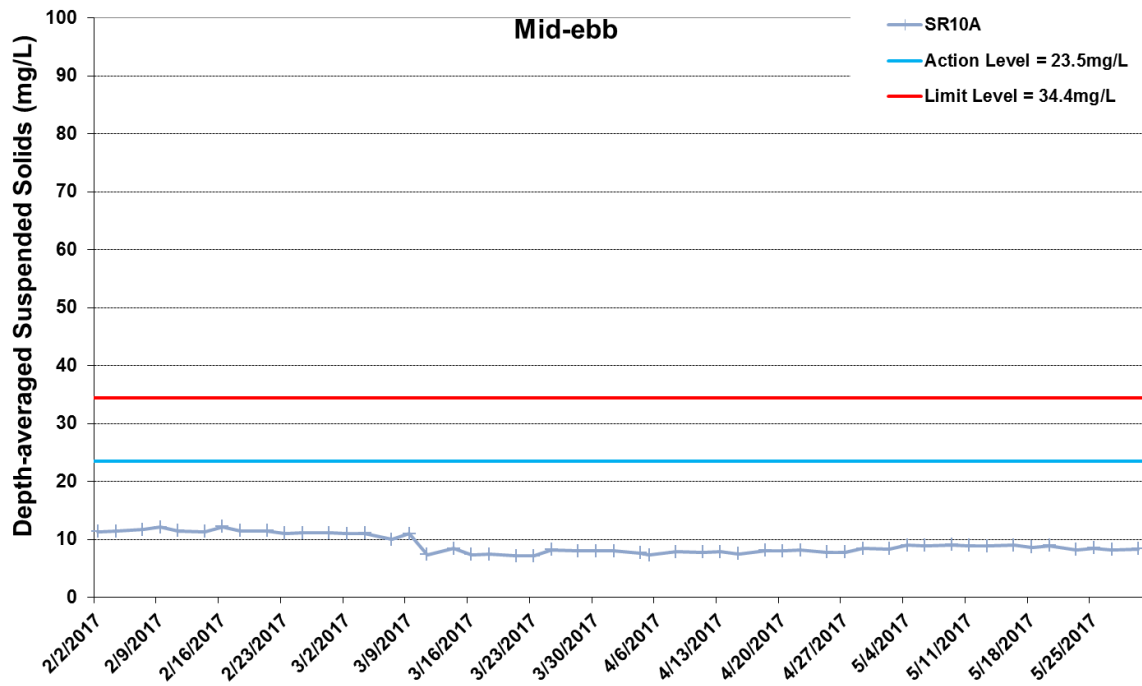


Figure G41 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at SR10A. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).

Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls



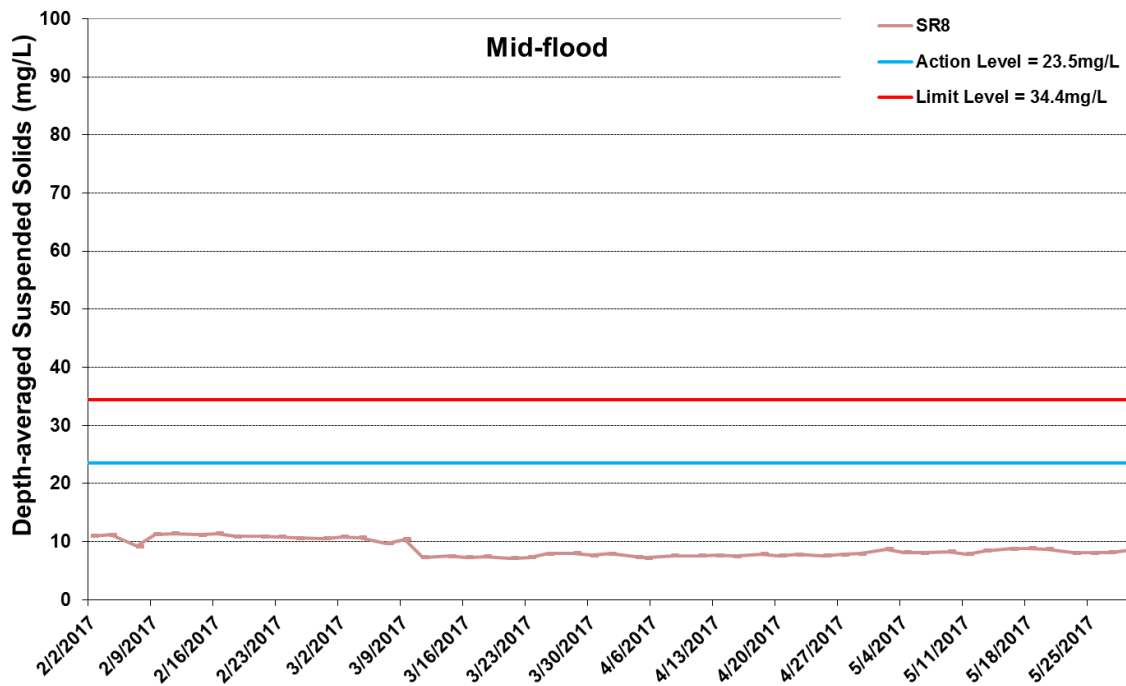
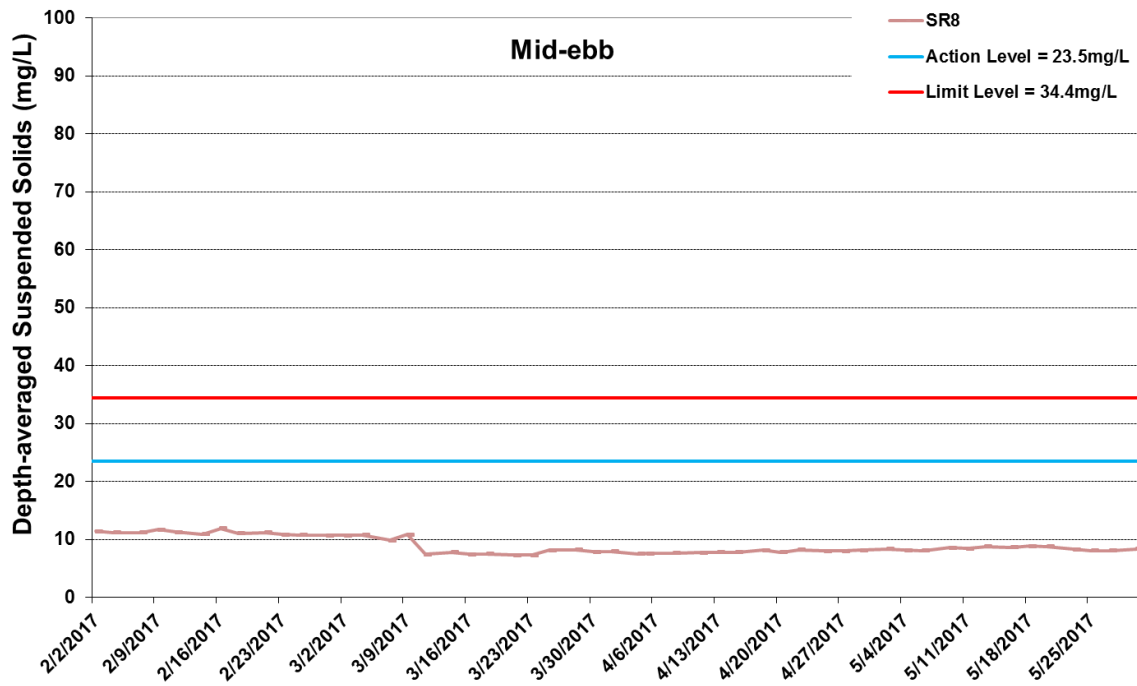


Figure G42 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at SR8. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).



Ref: 0212330\_Impact-WQM\_May2017\_graphs\_Rev a.xls

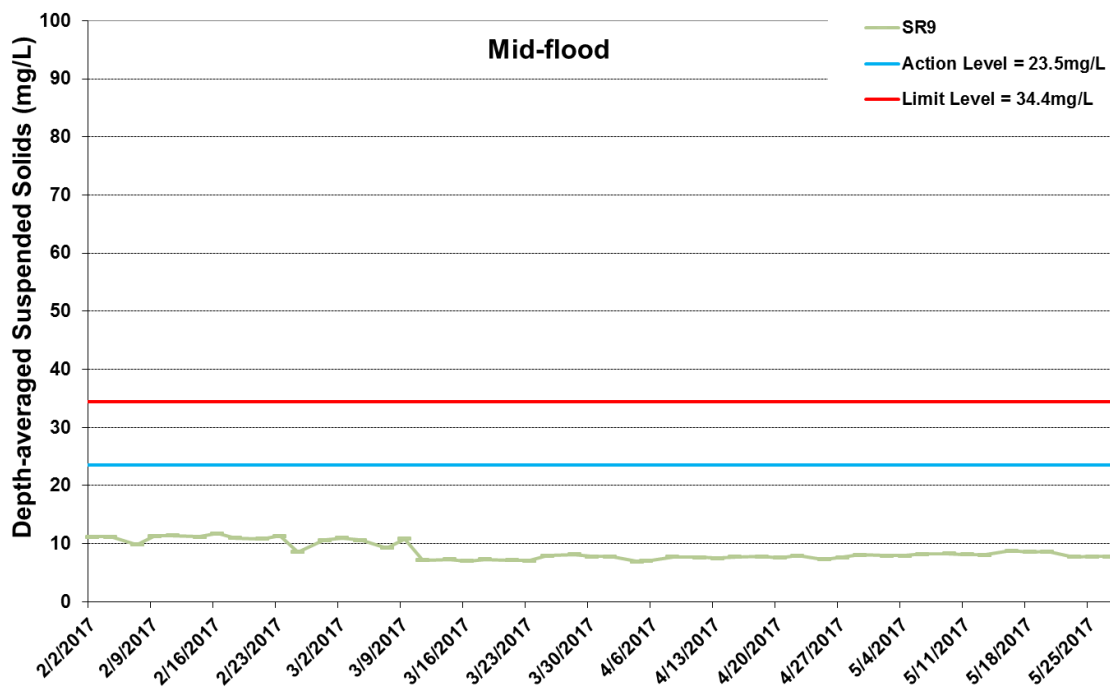
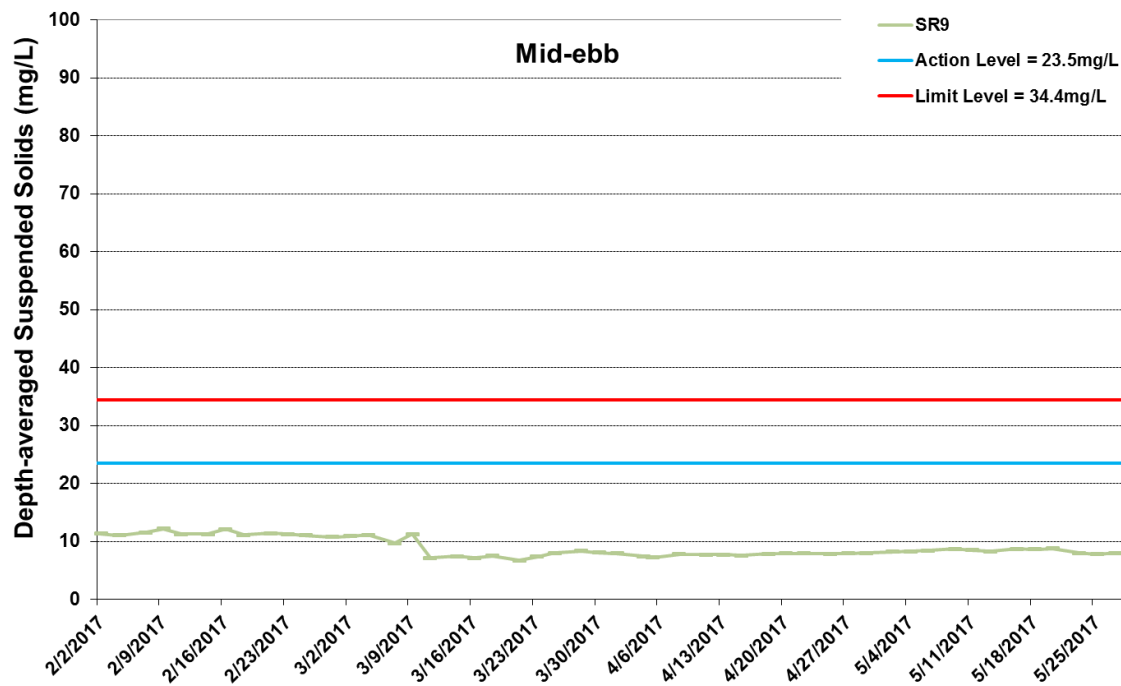


Figure G43 Impact Monitoring - Mean Depth-averaged Level of Suspended Solids (mg/L) between 1 February 2017 and 31 May 2017 at SR9. The weather conditions during the monitoring period varied mostly from sunny to cloudy. Major marine works included: Filling works at Portion N-A (1/3/2017 - 20/5/2017).





Appendix H

## 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)  
Dolphin Quarterly Monitoring**

*14<sup>th</sup> Quarterly Progress Report (March-May 2017)*

*submitted to Dragages – Bouygues Joint Venture & ERM Hong Kong Ltd.*

Submitted by

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

25 August 2017

**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 14<sup>th</sup> quarterly 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 March to May 2017, utilizing the survey data collected by HKLR03 impact phase monitoring project.

## 2. Monitoring Methodology

### 2.1. Vessel-based Line-transect Survey

- 2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines are shown in Table 1.

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

Line No.	Easting	Northing	Line No.	Easting	Northing	
1	Start Point	804671	13	Start Point	816506	819480
1	End Point	804671	13	End Point	816506	824859
2	Start Point	805475	14	Start Point	817537	820220
2	End Point	805477	14	End Point	817537	824613
3	Start Point	806464	15	Start Point	818568	820735
3	End Point	806464	15	End Point	818568	824433
4	Start Point	807518	16	Start Point	819532	821420
4	End Point	807518	16	End Point	819532	824209
5	Start Point	808504	17	Start Point	820451	822125
5	End Point	808504	17	End Point	820451	823671
6	Start Point	809490	18	Start Point	821504	822371
6	End Point	809490	18	End Point	821504	823761
7	Start Point	810499	19	Start Point	822513	823268
7	End Point	810499	19	End Point	822513	824321

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

- 2.1.2. 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 19 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2015, 2016). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.
- 2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.
- 2.1.4. During on-effort survey periods, the survey team recorded effort data including time, positions (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).
- 2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

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

## 2.2. Photo-identification Work

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

## 2.3. Data Analysis

- 2.3.1. Distribution Analysis – The line-transect survey data was integrated with the Geographic Information System (GIS) in order to visualize and interpret different spatial and temporal patterns of dolphin distribution using sighting positions. Location data of dolphin groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView<sup>®</sup> 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, young calves and activities.

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

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

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

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

The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort sightings per 100 units of survey effort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of dolphins per 100 units of survey effort. Among the 1-km<sup>2</sup> 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<sup>2</sup> grid within the study area:



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

where S = total number of on-effort sightings  
D = total number of dolphins from on-effort sightings  
E = total number of units of survey effort  
SA% = percentage of sea area

- 2.3.4. Behavioural analysis – When dolphins were sighted during vessel surveys, their behaviour was observed. Different activities were categorized (i.e. feeding, socializing, traveling, and milling/resting) and recorded on sighting datasheets. This data was then input into a separate database with sighting information, which can be used to determine the distribution of behavioural data with a desktop GIS. Distribution of sightings of dolphins engaged in different activities and behaviours would then be plotted on GIS and carefully examined to identify important areas for different activities of the dolphins.
- 2.3.5. Ranging pattern analysis – Location data of individual dolphins that occurred during the 3-month impact phase monitoring period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home ranges for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, was loaded as an extension with ArcView<sup>®</sup> 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD level.

### 3. Monitoring Results

#### 3.1. Summary of survey effort and dolphin sightings

- 3.1.1. During the period of March to May 2017, six sets of systematic line-transect vessel surveys were conducted under the HKLR03 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these HKLR03 surveys, a total of 830.17 km of survey effort was collected, with 93.4% 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, 333.83 km and 496.34 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 583.29 km, while the effort on secondary lines was 246.88 km. Survey effort conducted on both primary and secondary lines were considered as on-effort survey data. A summary table of the survey effort is shown in Appendix I.
- 3.1.4. During the six sets of HKLR03 monitoring surveys from March to May 2017, only four groups of 24 Chinese White Dolphins were sighted. All four sightings were made

during on-effort during this quarter, while three of the four on-effort dolphin sightings were made on primary lines. A summary table of dolphin sightings is shown in Appendix II.

3.1.5. In this quarterly period, all dolphin groups were sighted in NWL, and no dolphin was sighted at all in NEL. In fact, since August 2014, only two sightings of two lone dolphins were made respectively in NEL during HKLR03 monitoring surveys.

### 3.2. *Distribution*

3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys from March to May 2017 is shown in Figure 1. Two of the dolphin sightings were made at the northwest corner of Lung Kwu Chau, while the other two sightings were located near Black Point and to the east of Sha Chau respectively (Figure 1). On the other hand, the dolphins were completely absent from the central and eastern portions of North Lantau waters as in previous quarters (Figure 1).

3.2.2. Notably, all dolphin sightings were located far away from the alignments of TM-CLKL and HKLR as well as the HKBCF and HKLR reclamation sites (Figure 1).

3.2.3. Sighting distribution of dolphins during the present impact phase monitoring period (March to May 2017) was drastically different from the one during the baseline monitoring period (Figure 1). In the present quarter, dolphins have disappeared from the NEL region, which was in stark contrast to their frequent occurrence around the Brothers Islands, near Shum Shui Kok and in the vicinity of HKBCF reclamation site during the baseline period (Figure 1). The nearly complete abandonment of NEL region by the dolphins has been consistently recorded in the past 16 quarters of HKLR03 monitoring, which has resulted in zero to extremely low dolphin encounter rates in this area.

3.2.4. In NWL survey area, dolphin occurrence was also significantly different between the baseline and impact phase periods. During the present impact monitoring period, only a handful of dolphin sightings were made in this survey area, which was in stark contrast with their frequent occurrences throughout the area during the baseline period (Figure 1).

3.2.5. Another comparison in dolphin distribution was made between the five quarterly periods of spring months in 2013-17 (Figure 2). Among the five spring periods, dolphins were regularly sighted in NWL waters in 2013 and 2014, but their usage there was dramatically reduced in the three subsequent spring periods, with the only occurrences mostly concentrated within and around the Sha Chau and Lung Kwu Chau Marine Park (Figure 2).

### 3.3. *Encounter rate*

3.3.1. During the present quarterly period, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data from the primary transect lines under favourable conditions (Beaufort 3 or below) for each set of the HKLR03 surveys in NEL and NWL are shown in Table 2. The average encounter rates deduced from the six sets of HKLR03 surveys were also compared with the ones deduced from the baseline monitoring period (September – November 2011) (Table 3).



Table 2. Dolphin encounter rates (sightings per 100 km of survey effort) during March-May 2017

SURVEY AREA	DOLPHIN MONITORING DATES	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)
		Primary Lines Only	Primary Lines Only
Northeast Lantau	Set 1 (2 & 7 Mar 2017)	0.00	0.00
	Set 2 (16 & 28 Mar 2017)	0.00	0.00
	Set 3 (12 & 20 Apr 2017)	0.00	0.00
	Set 4 (24 & 26 Apr 2017)	0.00	0.00
	Set 5 (18 & 22 May 2017)	0.00	0.00
	Set 6 (24 & 26 May 2017)	0.00	0.00
Northwest Lantau	Set 1 (2 & 7 Mar 2017)	0.00	0.00
	Set 2 (16 & 28 Mar 2017)	2.03	24.37
	Set 3 (12 & 20 Apr 2017)	1.71	3.41
	Set 4 (24 & 26 Apr 2017)	0.00	0.00
	Set 5 (18 & 22 May 2017)	1.85	3.70
	Set 6 (24 & 26 May 2017)	0.00	0.00

Table 3. Comparison of average dolphin encounter rates from impact monitoring period (March-May 2017) and baseline monitoring period (September-November 2011) (Note: encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions;  $\pm$  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)	
	March-May 2017	September – November 2011	March-May 2017	September – November 2011
Northeast Lantau	0.0	6.00 $\pm$ 5.05	0.0	22.19 $\pm$ 26.81
Northwest Lantau	0.93 $\pm$ 1.03	9.85 $\pm$ 5.85	5.25 $\pm$ 9.53	44.66 $\pm$ 29.85

3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present quarter using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 0.87 sightings and 5.23 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil for this quarter.

3.3.3. In NEL, the average dolphin encounter rates (both STG and ANI) in the present three-month impact monitoring period were both zero with no on-effort sighting being made, and such extremely low occurrence of dolphins in NEL have been consistently recorded in the past 16 quarters of HKLR03 monitoring (Table 4). This is a serious

concern as the dolphin occurrence in NEL in the past few years (0.0-1.0 for ER(STG) and 0.0-3.9 for ER(ANI)) have remained exceptionally low when compared to the baseline period (Table 4). Dolphins have been virtually absent from NEL waters since January 2014, with only three groups of six dolphins sighted there since then despite consistent and intensive survey effort being conducted in this survey area.

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

	<b>Encounter rate (STG)</b> (no. of on-effort dolphin sightings per 100 km of survey effort)	<b>Encounter rate (ANI)</b> (no. of dolphins from all on-effort sightings per 100 km of survey effort)
<b>September-November 2011 (Baseline)</b>	6.00 ± 5.05	22.19 ± 26.81
<b>December 2012-February 2013 (Impact)</b>	3.14 ± 3.21	6.33 ± 8.64
<b>March-May 2013 (Impact)</b>	<b>0.42 ± 1.03</b>	<b>0.42 ± 1.03</b>
<b>June-August 2013 (Impact)</b>	0.88 ± 1.36	3.91 ± 8.36
<b>September-November 2013 (Impact)</b>	1.01 ± 1.59	3.77 ± 6.49
<b>December 2013-February 2014 (Impact)</b>	0.45 ± 1.10	1.34 ± 3.29
<b>March-May 2014 (Impact)</b>	<b>0.00</b>	<b>0.00</b>
<b>June-August 2014 (Impact)</b>	0.42 ± 1.04	1.69 ± 4.15
<b>September-November 2014 (Impact)</b>	0.00	0.00
<b>December 2014-February 2015 (Impact)</b>	0.00	0.00
<b>March-May 2015 (Impact)</b>	<b>0.00</b>	<b>0.00</b>
<b>June-August 2015 (Impact)</b>	0.44 ± 1.08	0.44 ± 1.08
<b>September-November 2015 (Impact)</b>	0.00	0.00
<b>December 2015-February 2016 (Impact)</b>	0.00	0.00
<b>March-May 2016 (Impact)</b>	<b>0.00</b>	<b>0.00</b>
<b>June-August 2016 (Impact)</b>	0.00	0.00
<b>September-November 2016 (Impact)</b>	0.00	0.00
<b>December 2016-February 2017 (Impact)</b>	0.00	0.00
<b>March-May 2017 (Impact)</b>	<b>0.00</b>	<b>0.00</b>

3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present impact phase monitoring period (reductions of 90.5% and 88.2% respectively) were only tiny fractions of the ones recorded during the three-month baseline period, indicating a dramatic decline in dolphin usage of this survey area as well during the

present impact phase period (Table 5).

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

	<b>Encounter rate (STG)</b> (no. of on-effort dolphin sightings per 100 km of survey effort)	<b>Encounter rate (ANI)</b> (no. of dolphins from all on-effort sightings per 100 km of survey effort)
<b>September-November 2011 (Baseline)</b>	9.85 ± 5.85	44.66 ± 29.85
<b>December 2012-February 2013 (Impact)</b>	8.36 ± 5.03	35.90 ± 23.10
<b>March-May 2013 (Impact)</b>	<b>7.75 ± 3.96</b>	<b>24.23 ± 18.05</b>
<b>June-August 2013 (Impact)</b>	6.56 ± 3.68	27.00 ± 18.71
<b>September-November 2013 (Impact)</b>	8.04 ± 1.10	32.48 ± 26.51
<b>December 2013-February 2014 (Impact)</b>	8.21 ± 2.21	32.58 ± 11.21
<b>March-May 2014 (Impact)</b>	<b>6.51 ± 3.34</b>	<b>19.14 ± 7.19</b>
<b>June-August 2014 (Impact)</b>	4.74 ± 3.84	17.52 ± 15.12
<b>September-November 2014 (Impact)</b>	5.10 ± 4.40	20.52 ± 15.10
<b>December 2014-February 2015 (Impact)</b>	2.91 ± 2.69	11.27 ± 15.19
<b>March-May 2015 (Impact)</b>	<b>0.47 ± 0.73</b>	<b>2.36 ± 4.07</b>
<b>June-August 2015 (Impact)</b>	2.53 ± 3.20	9.21 ± 11.57
<b>September-November 2015 (Impact)</b>	3.94 ± 1.57	21.05 ± 17.19
<b>December 2015-February 2016 (Impact)</b>	2.64 ± 1.52	10.98 ± 3.81
<b>March-May 2016 (Impact)</b>	<b>0.98 ± 1.10</b>	<b>4.78 ± 6.85</b>
<b>June-August 2016 (Impact)</b>	1.72 ± 2.17	7.48 ± 10.98
<b>September-November 2016 (Impact)</b>	2.86 ± 1.98	10.89 ± 10.98
<b>December 2016-February 2017 (Impact)</b>	3.80 ± 3.79	14.52 ± 17.21
<b>March-May 2017 (Impact)</b>	<b>0.93 ± 1.03</b>	<b>5.25 ± 9.53</b>

3.3.5. During the same spring quarters, dolphin encounter rates in NWL during spring 2017 was similar to the previous two spring periods, but was much lower than the ones in the spring periods of 2013 and 2014 (Table 5). Such temporal trend should be closely monitored in the upcoming monitoring quarters whether the dolphin occurrence would continue to increase as the construction activities of HZMB works have been mostly completed in coming months.

3.3.6. As recently discussed in Hung (2016), the dramatic decline in dolphin usage of NEL

waters in the past few years (including the declines in abundance, encounter rate and habitat use in NEL, as well as shifts of individual core areas and ranges away from NEL waters) was possibly related to the HZMB construction works that were commenced since 2012. It appeared that such noticeable decline has already extended to NWL waters progressively in the past few years, and with no sign of recovery even the HZMB-related construction activities has well past the peak.

- 3.3.7. A two-way ANOVA with repeated measures and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline and impact monitoring periods. The two variables that were examined included the two periods (baseline and impact phases) and two locations (NEL and NWL).
- 3.3.8. For the comparison between the baseline period and the present quarter (18<sup>th</sup> quarter of the impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.0019 and 0.0186 respectively. If the alpha value is set at 0.05, significant differences were detected between the baseline and present quarters in both the average dolphin encounter rates of STG and ANI.
- 3.3.9. For the comparison between the baseline period and the cumulative quarters in impact phase (i.e. the first 18 quarters of the impact phase being assessed), the p-values for the differences in average dolphin encounter rates of STG and ANI were 0.000001 and 0.000000 respectively. Even if the alpha value is set at 0.00001, significant differences were still detected in both the average dolphin encounter rates of STG and ANI (i.e. between the two periods and the locations).
- 3.3.10. As indicated in both dolphin distribution patterns and encounter rates, dolphin usage has been significantly reduced in both NEL and NWL survey areas during the present quarterly period, and such low occurrence of dolphins has also been consistently documented in previous quarters of the past few years. This raises serious concern, as the timing of the decline in dolphin usage in North Lantau waters coincided well with the construction schedule of the HZMB-related projects (Hung 2016), and apparently there was no sign of recovery of dolphin usage even though most of the marine works associated with the HZMB construction have been completed.
- 3.4. *Group size*
- 3.4.1. Group size of Chinese White Dolphins ranged from one to twelve individuals per group in North Lantau region during March to May 2017. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in Table 6.
- 3.4.2. The average dolphin group size in NWL waters during March to May 2017 was much higher than the one recorded during the three-month baseline period, but it could be partly related to the very small sample size of four groups when compared to the 66 groups sighted during the baseline period (Table 6). Two of these dolphin groups were composed of two individuals respectively, while the other two groups were large with eight and twelve individuals respectively (Appendix II).

Table 6. Comparison of average dolphin group sizes from impact monitoring period (March – May 2017) and baseline monitoring period (September – November 2011) (Note:  $\pm$  denotes the standard deviation of the average group size)

	Average Dolphin Group Size	
	March – May 2017	September – November 2011
<b>Overall</b>	6.00 $\pm$ 4.90 (n = 4)	3.72 $\pm$ 3.13 (n = 66)
<b>Northeast Lantau</b>	---	3.18 $\pm$ 2.16 (n = 17)
<b>Northwest Lantau</b>	6.00 $\pm$ 4.90 (n = 4)	3.92 $\pm$ 3.40 (n = 49)

- 3.4.3. Distribution of the two large dolphin groups (i.e. five individuals or more per group) during the present quarter is shown in Figure 3, with comparison to the one in baseline period. The group of eight individuals was sighted at the northwest corner of Lung Kwu Chau, whereas the group of 12 individuals was sighted to the east of Sha Chau (Figure 3). Such distribution pattern was very different from the baseline period, when the larger dolphin groups were frequently sighted and evenly distributed in NWL waters, with a few also sighted in NEL waters (Figure 3).
- 3.5. *Habitat use*
- 3.5.1. From March to May 2017, the two grids with high dolphin densities were located at Lung Kwu Chau and Sha Chau respectively, while the other two grids recorded low dolphin densities (Figures 4a and 4b). On the contrary, all grids near TMCLKL/HKLR09 alignments as well as HKLR03/HKBCF reclamation sites did not record any presence of dolphins at all during on-effort search in the present quarterly period (Figures 4a and 4b).
- 3.5.2. However, it should be emphasized that the amount of survey effort collected in each grid during the three-month period was fairly low (6-12 units of survey effort for most grids), and therefore the habitat use pattern derived from the three-month dataset should be treated with caution. A more complete picture of dolphin habitat use pattern should be examined when more survey effort for each grid will be collected throughout the impact phase monitoring programme.
- 3.5.3. When compared with the habitat use patterns during the baseline period, dolphin usage in NEL and NWL has drastically diminished in both areas during the present impact monitoring period (Figure 5). During the baseline period, many grids between Siu Mo To and Shum Shui Kok in NEL recorded moderately high to high dolphin densities, which was in stark contrast to the complete absence of dolphins there during the present impact phase period (Figure 5).
- 3.5.4. The density patterns were also very different in NWL between the baseline and impact phase monitoring periods, with high dolphin usage throughout the area, especially around Sha Chau, near Black Point, to the west of the airport, as well as between Pillar Point and airport platform during the baseline period. In contrast, only two grids with high dolphin densities were located at Lung Kwu Chau and Sha Chau during the present impact phase period (Figure 5).

3.6. *Mother-calf pairs*

3.6.1. During the present quarterly period, no young calf was sighted at all among the four groups of dolphins.

3.7. *Activities and associations with fishing boats*

3.7.1. Only one of the four groups was engaged in feeding activities, while none of them was engaged in socializing, traveling or milling/resting activity during the three-month study period.

3.7.2. The percentage of dolphin sightings associated with feeding activity (25.0%) was much higher than the one recorded during the baseline period (11.6%). However, it should be noted the sample size on total numbers of dolphin sightings during the present quarter (four dolphin groups) was much lower than the baseline period (66 dolphin groups).

3.7.3. Distribution of dolphins engaged in various activities during the present impact phase period as well as the baseline period is shown in Figure 6. The only dolphin group engaged in feeding activity was sighted to the west of Sha Chau during the present quarterly period, which was very different from the baseline period when various dolphin activities occurred throughout the North Lantau region (Figure 6).

3.7.4. Notably, one of the four dolphin groups was found to be associated with an operating purse-seiner during the present impact phase period.

3.8. *Summary of photo-identification works*

3.8.1. From March to May 2017, over 1,500 digital photographs of Chinese White Dolphins were taken during the impact phase monitoring surveys for the photo-identification work.

3.8.2. In total, 15 individuals sighted 19 times altogether were identified (see summary table in Appendix III and photographs of identified individuals in Appendix IV). All of these re-sightings were made in NWL. Two individuals (NL123 and NL286) were re-sighted twice, while one individual (NL202) was re-sighted thrice during the three-month period (Appendix III).

3.8.3. Notably, two of these 15 individuals (NL226 and NL259) were also sighted in West Lantau waters during the HKLR09 monitoring surveys from March to May 2017, showing their extensive individual movements across different survey areas.

3.9. *Individual range use*

3.9.1. Ranging patterns of the 15 individuals identified during the three-month study period were determined by fixed kernel method, and are shown in Appendix V.

3.9.2. All identified dolphins sighted in the present quarter were utilizing NWL waters only, but have completely avoided NEL waters where many of them have utilized as their core areas in the past (Appendix V). This is in contrary to the extensive movements between NEL and NWL survey areas observed in the earlier impact monitoring quarters as well as the baseline period.



3.9.3. On the other hand, two individuals (NL226 and NL259) consistently utilized North Lantau waters in the past have extended their range use to WL during the present quarter. In the upcoming quarters, individual range use and movements should be continuously monitored to examine whether there has been any consistent shifts of individual home ranges from North Lantau to West or Southwest Lantau, as such shift could possibly be related to the HZMB-related construction works (see Hung 2015, 2016).

#### 4. Conclusion

- 4.1. During this quarter of dolphin monitoring, no adverse impact from the activities of the TMCLKL construction project on Chinese White Dolphins was noticeable from general observations.
- 4.2. Although the dolphins infrequently occurred along the alignment of TMCLKL 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 in the upcoming quarters, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

#### 5. References

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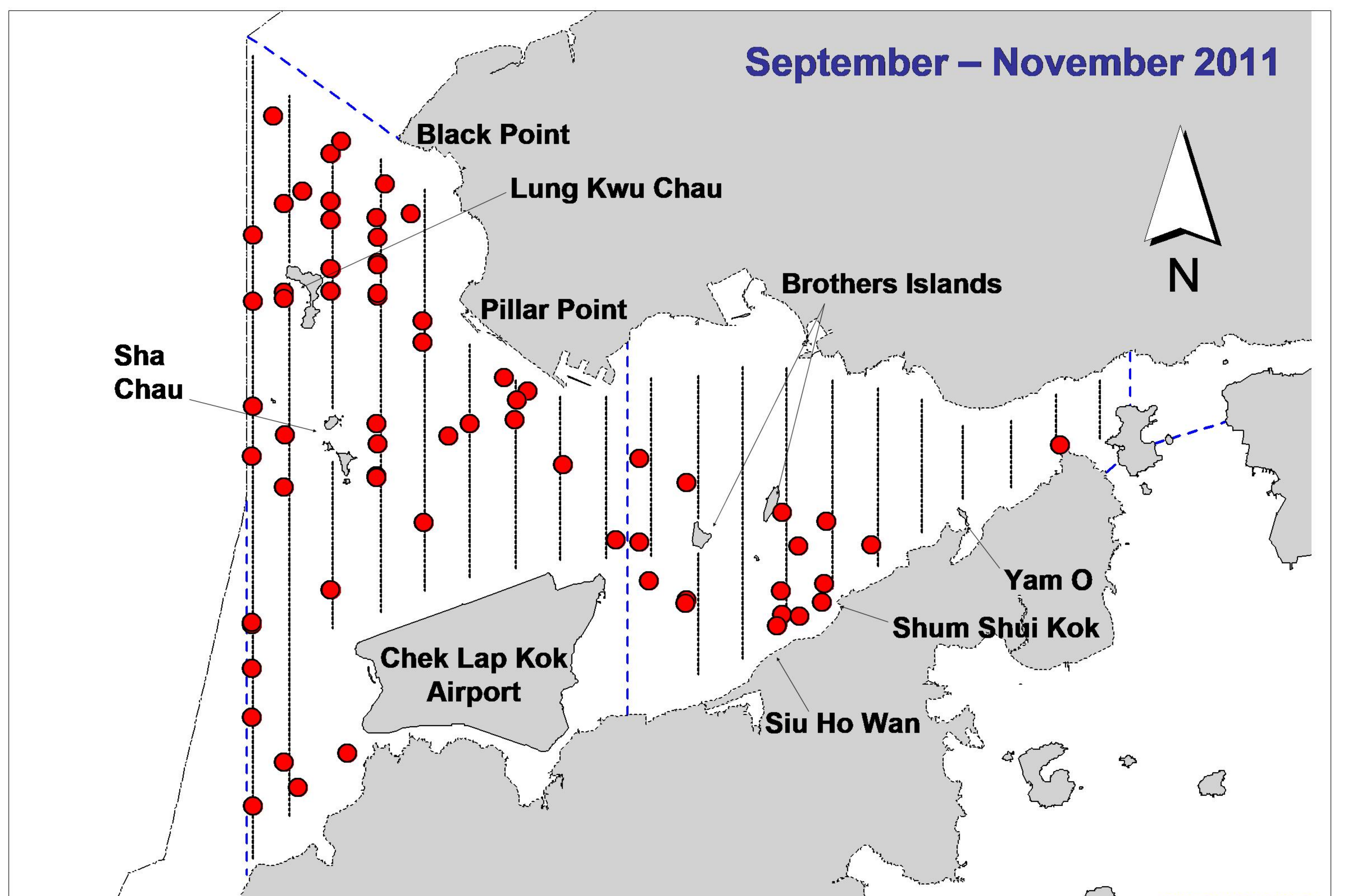
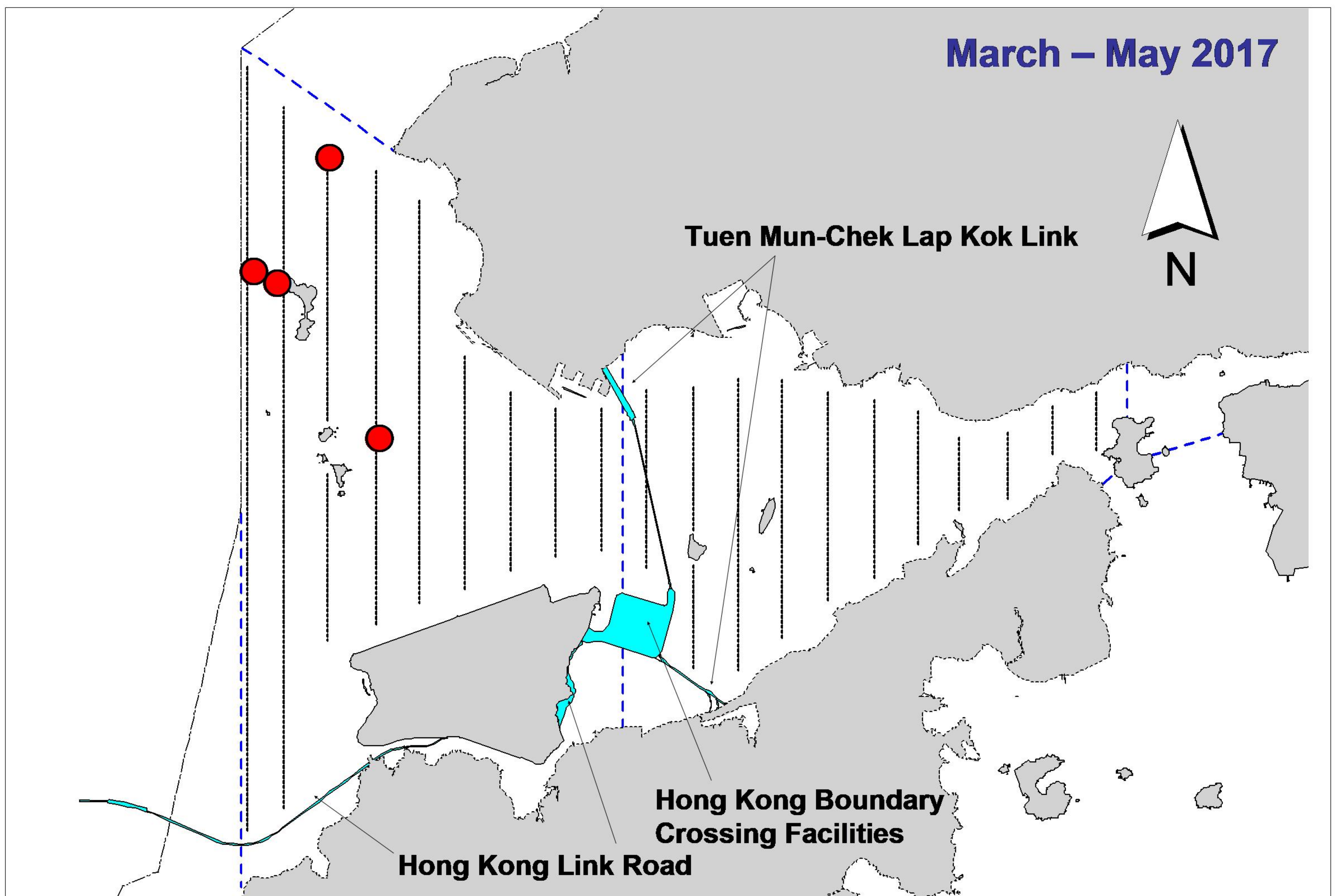


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during impact phase (top) and baseline monitoring surveys (bottom)



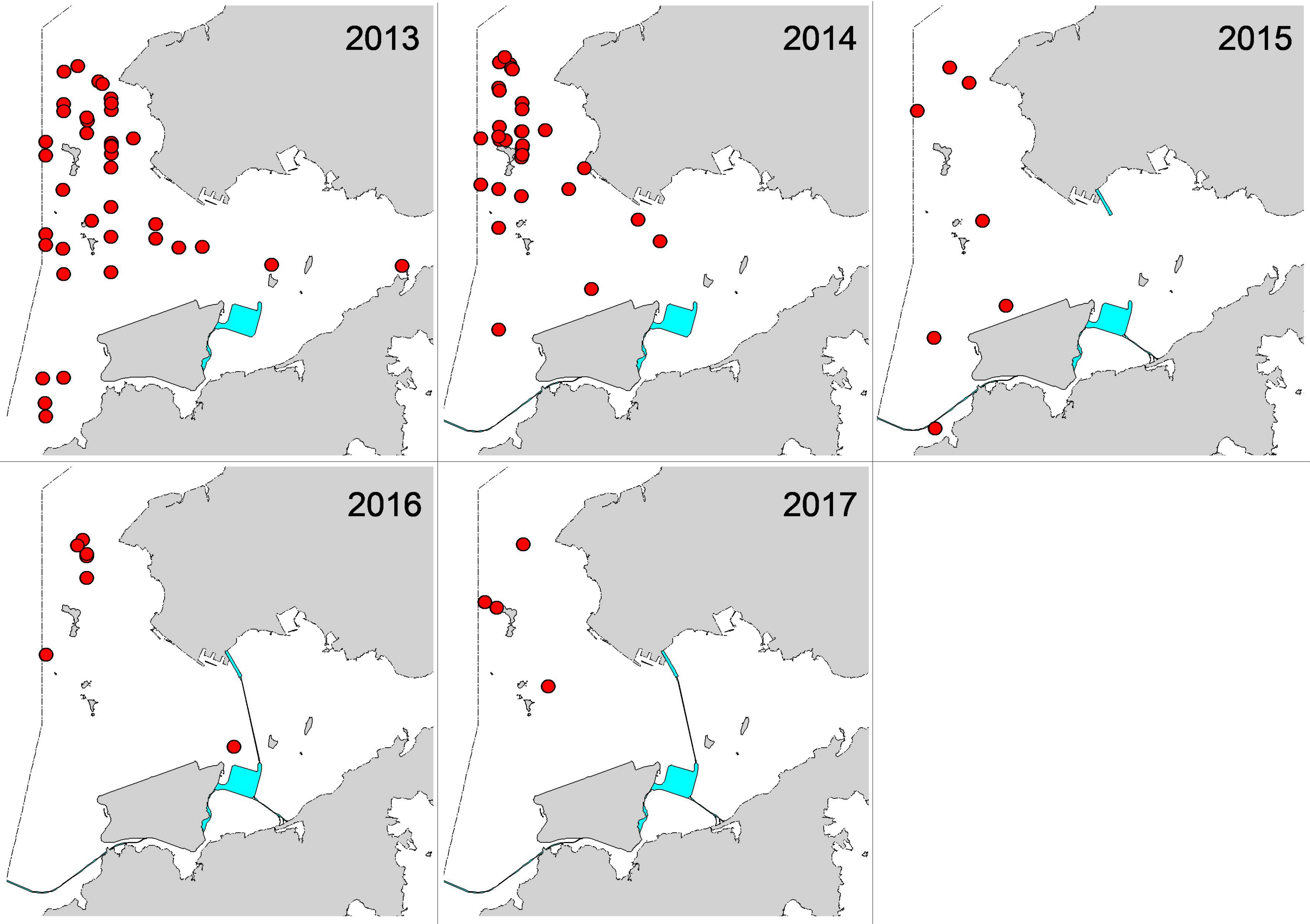


Figure 2. Distribution of Chinese white dolphin sightings in Northwest and Northeast Lantau during the past five spring quarters (March-May) of impact phase in 2013-17



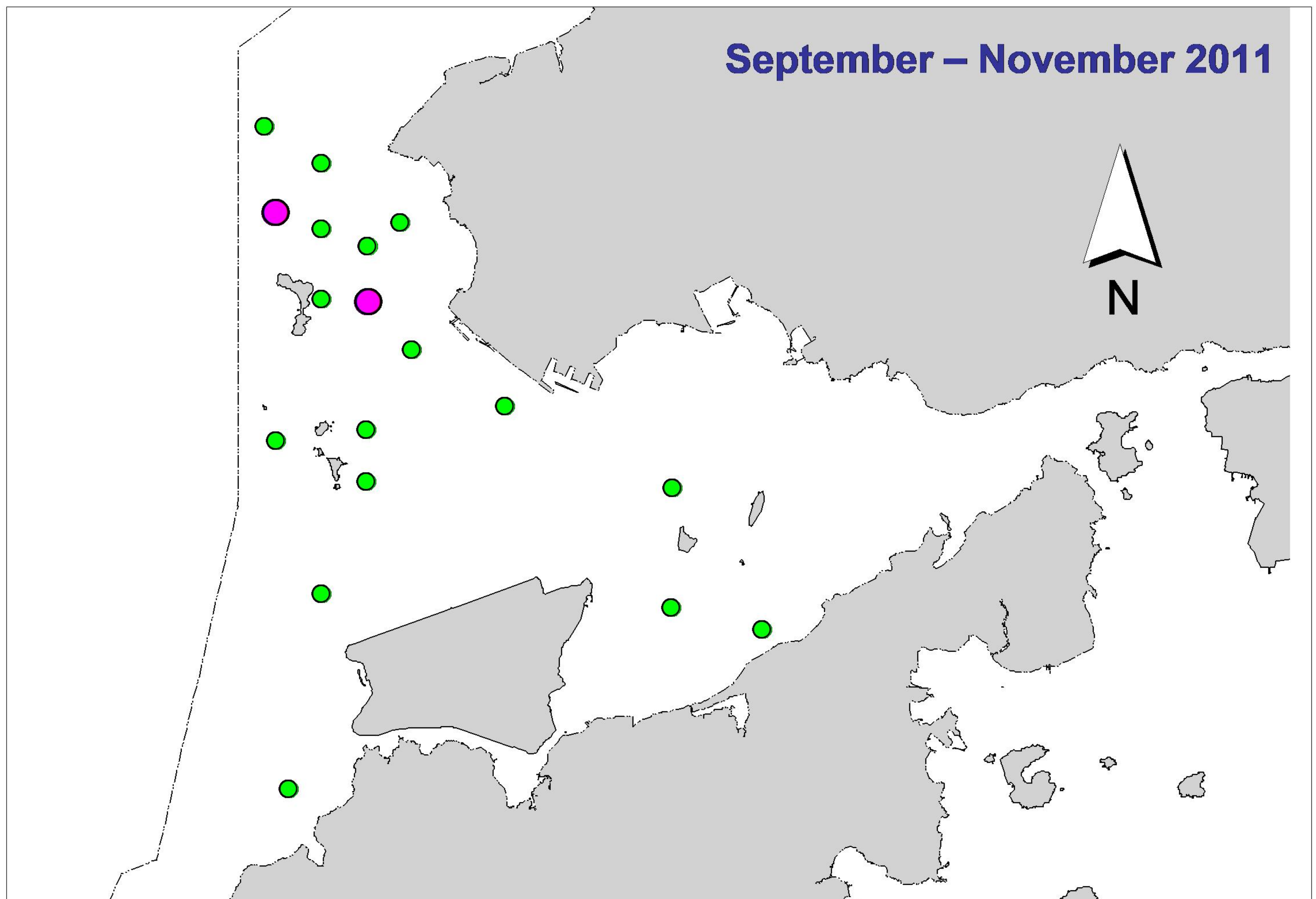
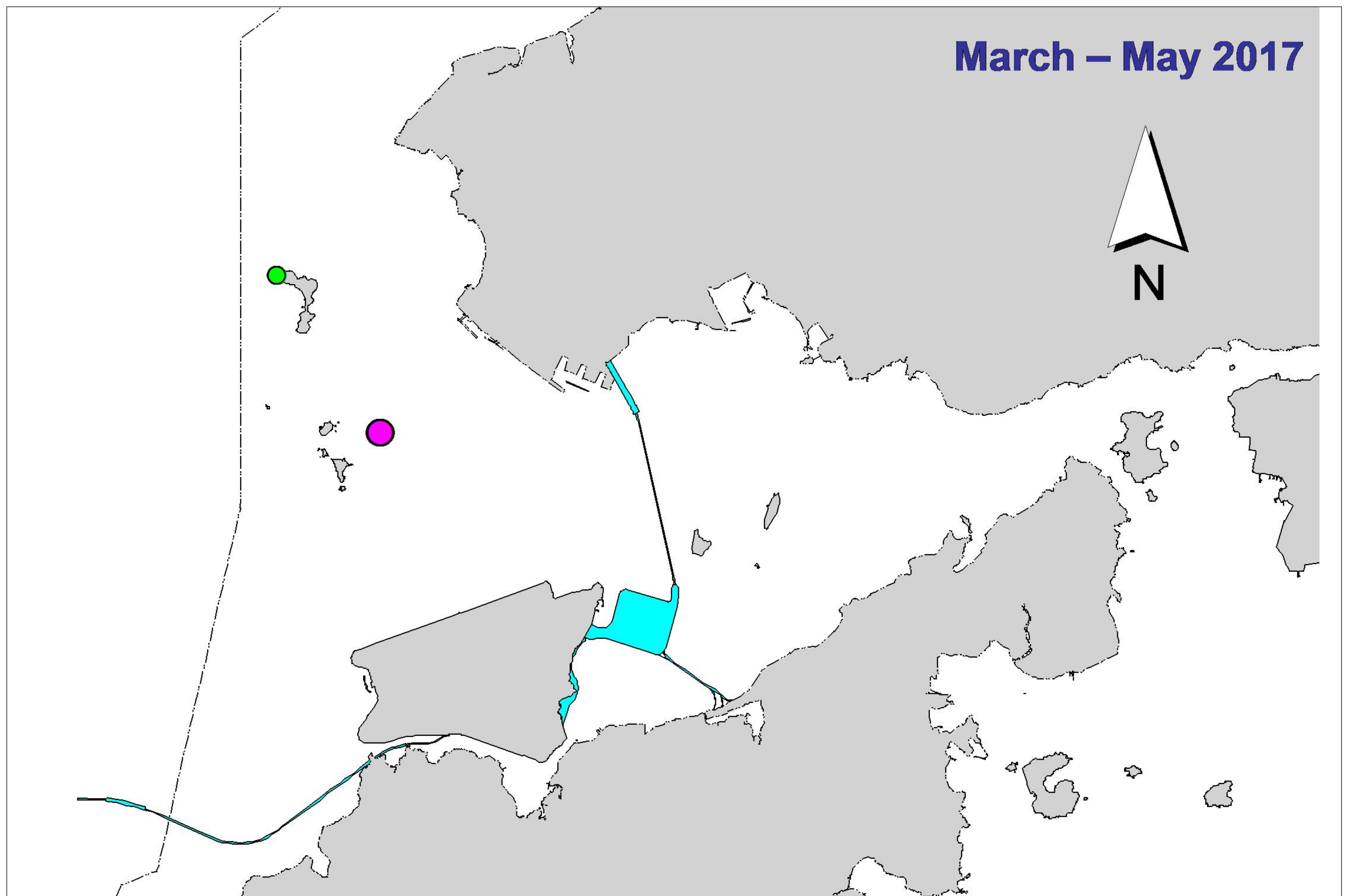


Figure 3. Distribution of Chinese white dolphins with larger group sizes during impact phase (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)



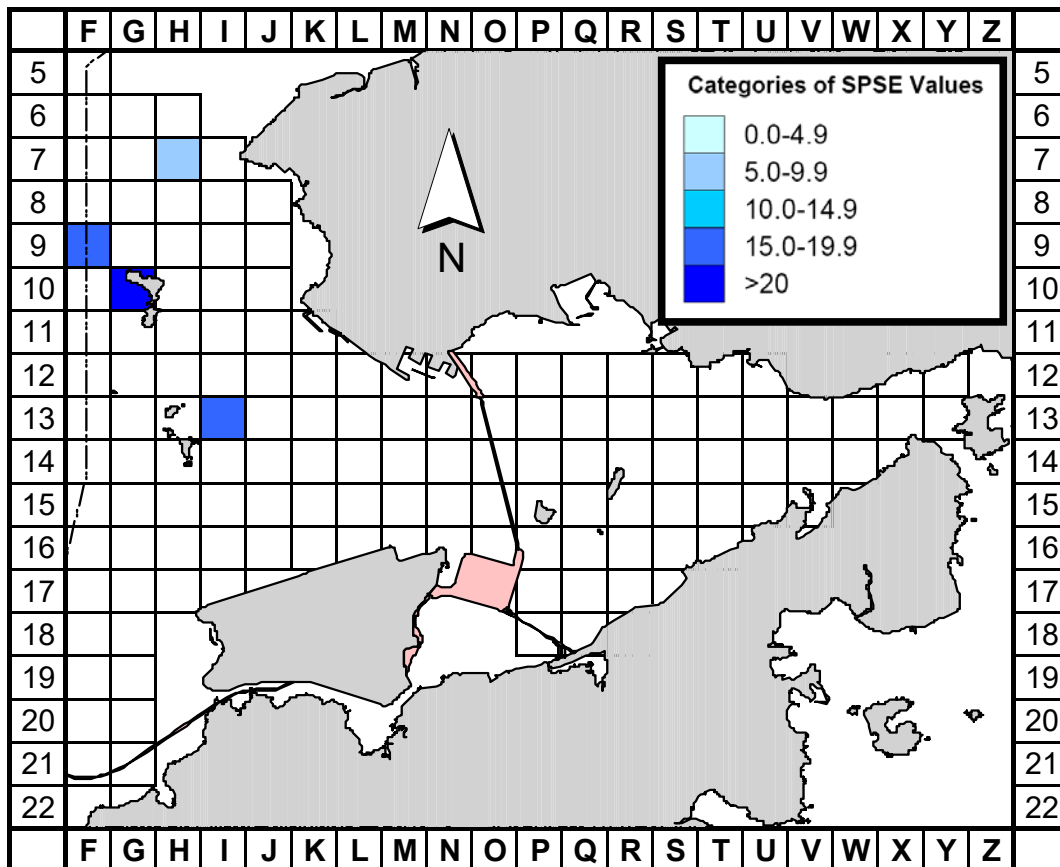


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during impact monitoring period (March-May 2017) (SPSE = no. of on-effort sightings per 100 units of survey effort)

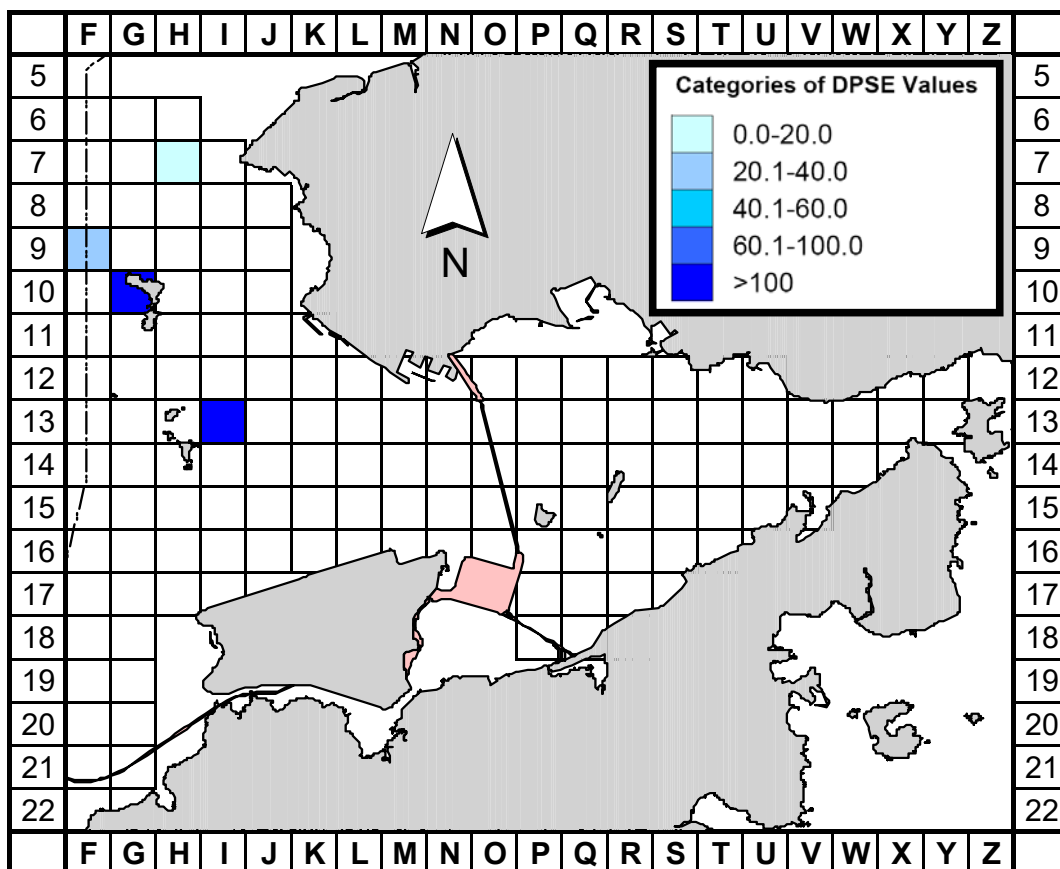


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during impact monitoring period (March-May 2017) (DPSE = no. of dolphins per 100 units of survey effort)

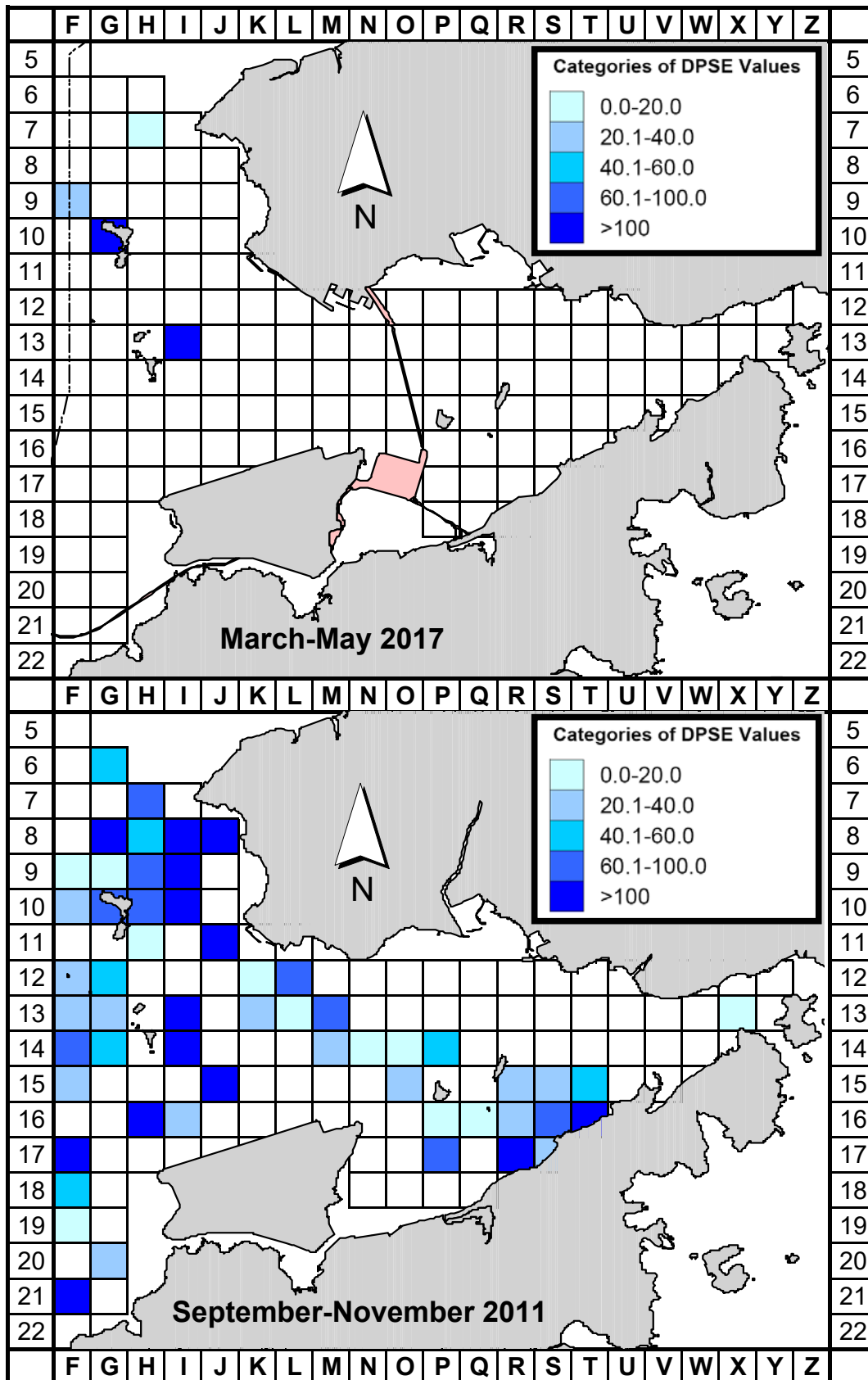


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northwest and Northeast Lantau survey area between the impact monitoring period (March-May 2017) and baseline monitoring period (September-November 2011) (DPSE = no. of dolphins per 100 units of survey effort)



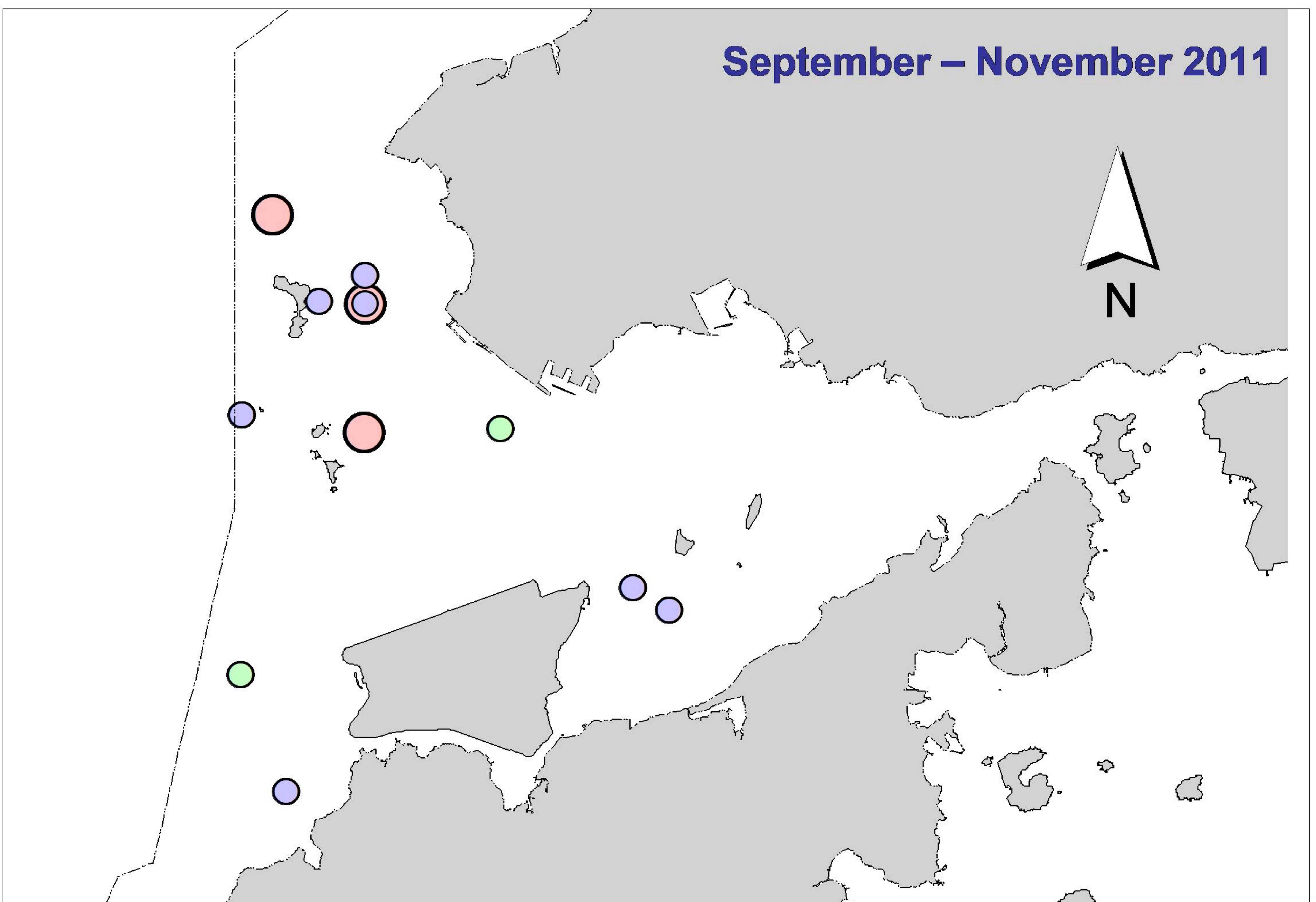
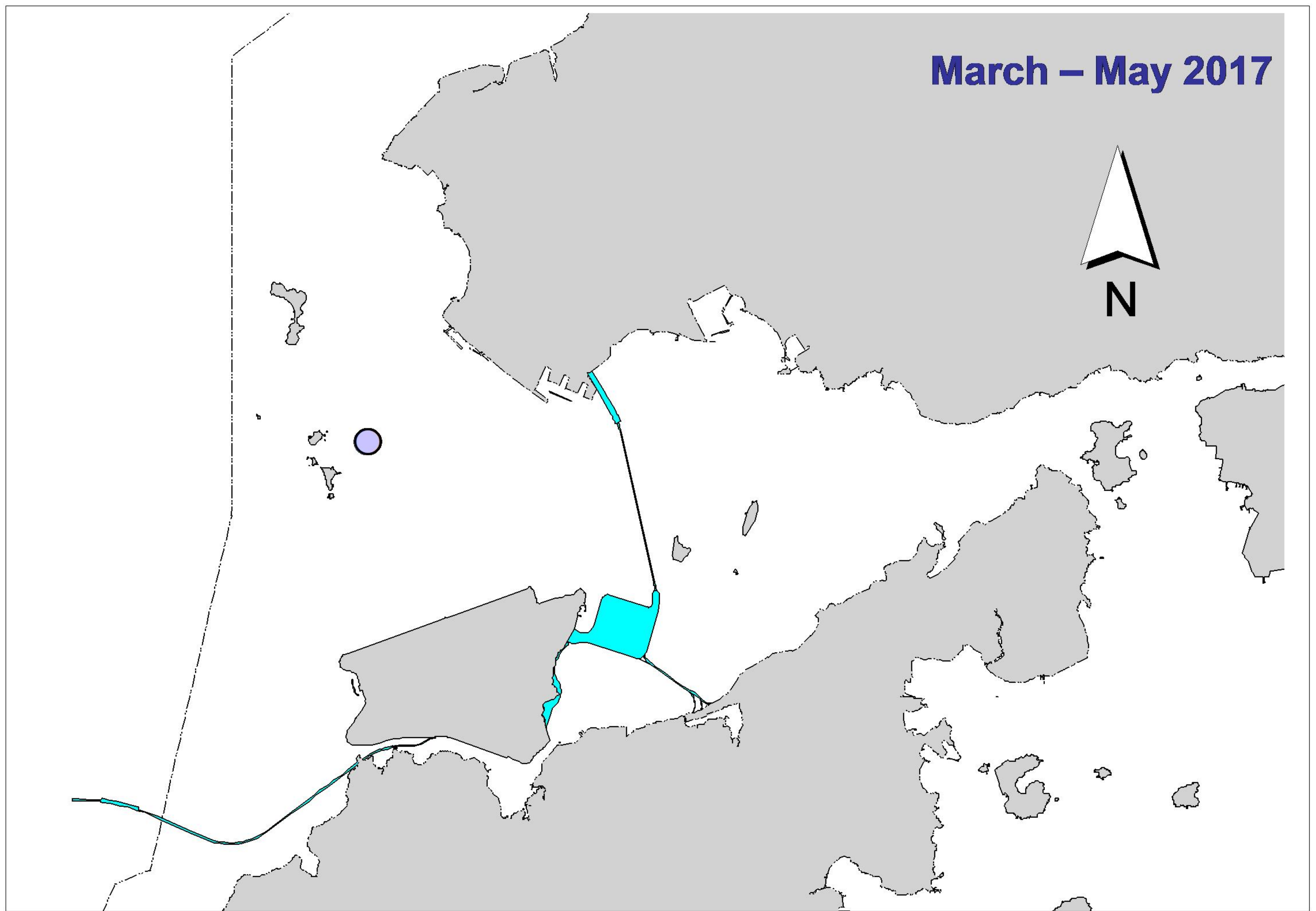


Figure 6. Distribution of Chinese white dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during impact phase (top) and baseline monitoring surveys (bottom)



## Appendix I. HKLR03 Survey Effort Database (March - May 2017)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-Mar-17	NW LANTAU	2	0.80	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NW LANTAU	3	14.47	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NW LANTAU	4	10.64	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NW LANTAU	5	4.59	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NW LANTAU	2	1.90	SPRING	STANDARD36826	HKLR	S
2-Mar-17	NW LANTAU	3	2.40	SPRING	STANDARD36826	HKLR	S
2-Mar-17	NW LANTAU	4	2.71	SPRING	STANDARD36826	HKLR	S
2-Mar-17	NW LANTAU	5	0.69	SPRING	STANDARD36826	HKLR	S
2-Mar-17	NE LANTAU	2	14.49	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NE LANTAU	3	4.75	SPRING	STANDARD36826	HKLR	P
2-Mar-17	NE LANTAU	2	10.16	SPRING	STANDARD36826	HKLR	S
7-Mar-17	NE LANTAU	2	16.13	SPRING	STANDARD36826	HKLR	P
7-Mar-17	NE LANTAU	2	10.67	SPRING	STANDARD36826	HKLR	S
7-Mar-17	NW LANTAU	2	30.59	SPRING	STANDARD36826	HKLR	P
7-Mar-17	NW LANTAU	3	8.40	SPRING	STANDARD36826	HKLR	P
7-Mar-17	NW LANTAU	2	12.91	SPRING	STANDARD36826	HKLR	S
16-Mar-17	NE LANTAU	2	20.88	SPRING	STANDARD36826	HKLR	P
16-Mar-17	NE LANTAU	2	10.92	SPRING	STANDARD36826	HKLR	S
16-Mar-17	NW LANTAU	2	31.93	SPRING	STANDARD36826	HKLR	P
16-Mar-17	NW LANTAU	2	7.27	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NW LANTAU	2	3.40	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NW LANTAU	3	13.92	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NW LANTAU	4	9.78	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NW LANTAU	2	3.00	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NW LANTAU	3	1.50	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NW LANTAU	4	3.40	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NE LANTAU	2	1.30	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NE LANTAU	3	5.50	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NE LANTAU	4	13.23	SPRING	STANDARD36826	HKLR	P
28-Mar-17	NE LANTAU	2	1.20	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NE LANTAU	3	6.67	SPRING	STANDARD36826	HKLR	S
28-Mar-17	NE LANTAU	4	3.30	SPRING	STANDARD36826	HKLR	S
12-Apr-17	NW LANTAU	2	17.47	SPRING	STANDARD36826	HKLR	P
12-Apr-17	NW LANTAU	3	14.07	SPRING	STANDARD36826	HKLR	P
12-Apr-17	NW LANTAU	2	11.46	SPRING	STANDARD36826	HKLR	S
12-Apr-17	NW LANTAU	3	2.50	SPRING	STANDARD36826	HKLR	S
12-Apr-17	NE LANTAU	2	12.53	SPRING	STANDARD36826	HKLR	P
12-Apr-17	NE LANTAU	3	2.88	SPRING	STANDARD36826	HKLR	P
12-Apr-17	NE LANTAU	1	1.80	SPRING	STANDARD36826	HKLR	S
12-Apr-17	NE LANTAU	2	3.34	SPRING	STANDARD36826	HKLR	S
12-Apr-17	NE LANTAU	3	4.45	SPRING	STANDARD36826	HKLR	S
20-Apr-17	NW LANTAU	2	7.19	SPRING	STANDARD33706	HKLR	P
20-Apr-17	NW LANTAU	3	19.91	SPRING	STANDARD33706	HKLR	P
20-Apr-17	NW LANTAU	2	2.00	SPRING	STANDARD33706	HKLR	S
20-Apr-17	NW LANTAU	3	5.60	SPRING	STANDARD33706	HKLR	S
20-Apr-17	NE LANTAU	2	19.55	SPRING	STANDARD33706	HKLR	P
20-Apr-17	NE LANTAU	1	1.00	SPRING	STANDARD33706	HKLR	S
20-Apr-17	NE LANTAU	2	7.68	SPRING	STANDARD33706	HKLR	S
20-Apr-17	NE LANTAU	3	2.00	SPRING	STANDARD33706	HKLR	S
24-Apr-17	NW LANTAU	1	3.80	SPRING	STANDARD36826	HKLR	P
24-Apr-17	NW LANTAU	2	22.86	SPRING	STANDARD36826	HKLR	P

## Appendix I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
24-Apr-17	NW LANTAU	3	7.94	SPRING	STANDARD36826	HKLR	P
24-Apr-17	NW LANTAU	2	13.00	SPRING	STANDARD36826	HKLR	S
24-Apr-17	NE LANTAU	2	12.28	SPRING	STANDARD36826	HKLR	P
24-Apr-17	NE LANTAU	3	3.22	SPRING	STANDARD36826	HKLR	P
24-Apr-17	NE LANTAU	2	9.70	SPRING	STANDARD36826	HKLR	S
26-Apr-17	NW LANTAU	2	20.36	SPRING	STANDARD36826	HKLR	P
26-Apr-17	NW LANTAU	3	9.44	SPRING	STANDARD36826	HKLR	P
26-Apr-17	NW LANTAU	2	9.50	SPRING	STANDARD36826	HKLR	S
26-Apr-17	NW LANTAU	3	1.20	SPRING	STANDARD36826	HKLR	S
26-Apr-17	NE LANTAU	2	15.56	SPRING	STANDARD36826	HKLR	P
26-Apr-17	NE LANTAU	2	9.04	SPRING	STANDARD36826	HKLR	S
18-May-17	NW LANTAU	2	9.22	SPRING	STANDARD36826	HKLR	P
18-May-17	NW LANTAU	3	24.53	SPRING	STANDARD36826	HKLR	P
18-May-17	NW LANTAU	2	6.90	SPRING	STANDARD36826	HKLR	S
18-May-17	NW LANTAU	3	5.55	SPRING	STANDARD36826	HKLR	S
18-May-17	NE LANTAU	2	2.50	SPRING	STANDARD36826	HKLR	P
18-May-17	NE LANTAU	3	14.14	SPRING	STANDARD36826	HKLR	P
18-May-17	NE LANTAU	2	4.76	SPRING	STANDARD36826	HKLR	S
18-May-17	NE LANTAU	3	4.10	SPRING	STANDARD36826	HKLR	S
22-May-17	NE LANTAU	2	2.29	SPRING	STANDARD36826	HKLR	P
22-May-17	NE LANTAU	3	16.57	SPRING	STANDARD36826	HKLR	P
22-May-17	NE LANTAU	4	0.89	SPRING	STANDARD36826	HKLR	P
22-May-17	NE LANTAU	2	4.37	SPRING	STANDARD36826	HKLR	S
22-May-17	NE LANTAU	3	7.08	SPRING	STANDARD36826	HKLR	S
22-May-17	NW LANTAU	2	1.70	SPRING	STANDARD36826	HKLR	P
22-May-17	NW LANTAU	3	18.57	SPRING	STANDARD36826	HKLR	P
22-May-17	NW LANTAU	4	5.37	SPRING	STANDARD36826	HKLR	P
22-May-17	NW LANTAU	2	4.94	SPRING	STANDARD36826	HKLR	S
22-May-17	NW LANTAU	3	6.42	SPRING	STANDARD36826	HKLR	S
24-May-17	NW LANTAU	2	13.73	SPRING	STANDARD33706	HKLR	P
24-May-17	NW LANTAU	3	12.79	SPRING	STANDARD33706	HKLR	P
24-May-17	NW LANTAU	2	5.14	SPRING	STANDARD33706	HKLR	S
24-May-17	NW LANTAU	3	2.48	SPRING	STANDARD33706	HKLR	S
24-May-17	NE LANTAU	2	18.50	SPRING	STANDARD33706	HKLR	P
24-May-17	NE LANTAU	2	10.90	SPRING	STANDARD33706	HKLR	S
26-May-17	NW LANTAU	1	1.90	SPRING	STANDARD36826	HKLR	P
26-May-17	NW LANTAU	2	30.88	SPRING	STANDARD36826	HKLR	P
26-May-17	NW LANTAU	3	0.82	SPRING	STANDARD36826	HKLR	P
26-May-17	NW LANTAU	1	0.80	SPRING	STANDARD36826	HKLR	S
26-May-17	NW LANTAU	2	12.00	SPRING	STANDARD36826	HKLR	S
26-May-17	NE LANTAU	1	5.55	SPRING	STANDARD36826	HKLR	P
26-May-17	NE LANTAU	2	7.88	SPRING	STANDARD36826	HKLR	P
26-May-17	NE LANTAU	3	1.60	SPRING	STANDARD36826	HKLR	P
26-May-17	NE LANTAU	1	3.47	SPRING	STANDARD36826	HKLR	S
26-May-17	NE LANTAU	2	5.00	SPRING	STANDARD36826	HKLR	S

## Appendix II. HKLR03 Chinese White Dolphin Sighting Database (March - May 2017)

(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 Line)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
2-Mar-17	1	1049	8	NW LANTAU	3	60	ON	HKLR	826885	805324	SPRING	NONE	S
16-Mar-17	1	1242	12	NW LANTAU	2	509	ON	HKLR	823647	807563	SPRING	PURSE-SEINE	P
12-Apr-17	1	1123	2	NW LANTAU	2	20	ON	HKLR	829496	806462	SPRING	NONE	P
18-May-17	1	1057	2	NW LANTAU	3	265	ON	HKLR	827119	804799	SPRING	NONE	P



**Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in March - May 2017**

<b>ID#</b>	<b>DATE</b>	<b>STG#</b>	<b>AREA</b>
NL49	16/03/17	1	NW LANTAU
NL98	02/03/17	1	NW LANTAU
NL104	16/03/17	1	NW LANTAU
NL105	16/03/17	1	NW LANTAU
NL123	02/03/17	1	NW LANTAU
	16/03/17	1	NW LANTAU
NL202	02/03/17	1	NW LANTAU
	16/03/17	1	NW LANTAU
	18/05/17	1	NW LANTAU
NL210	12/04/17	1	NW LANTAU
NL226	16/03/17	1	NW LANTAU
NL259	02/03/17	1	NW LANTAU
NL286	02/03/17	1	NW LANTAU
	18/05/17	1	NW LANTAU
NL301	16/03/17	1	NW LANTAU
NL321	16/03/17	1	NW LANTAU
WL05	02/03/17	1	NW LANTAU
WL17	16/03/17	1	NW LANTAU
WL214	16/03/17	1	NW LANTAU

Appendix IV. Fifteen individual dolphins that were identified during March to May 2017 under HKLR03 impact phase monitoring surveys



Appendix IV. (cont'd)

NL123



NL202



NL210



NL226



Appendix IV. (cont'd)

NL259



NL286



NL301



NL321





Appendix IV. (cont'd)

WL05



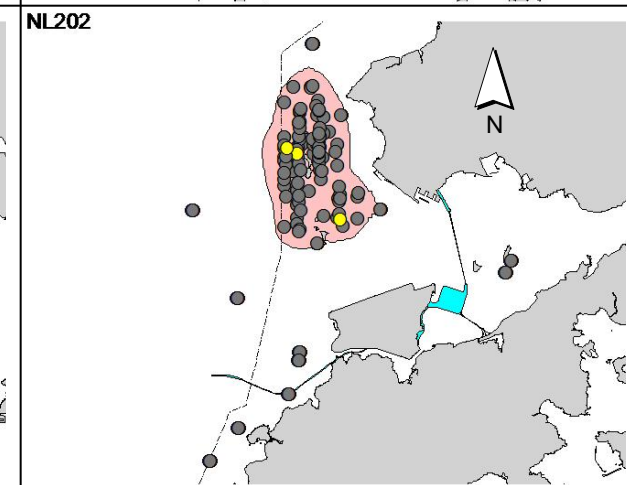
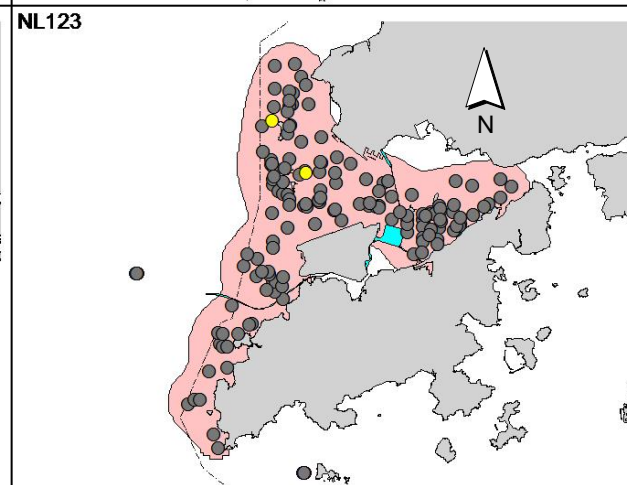
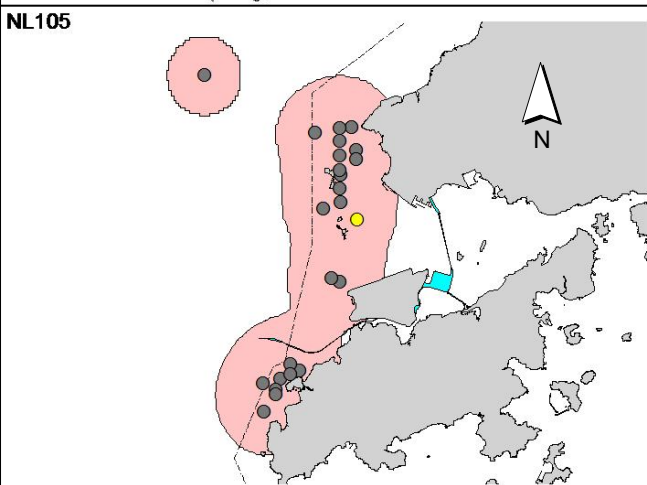
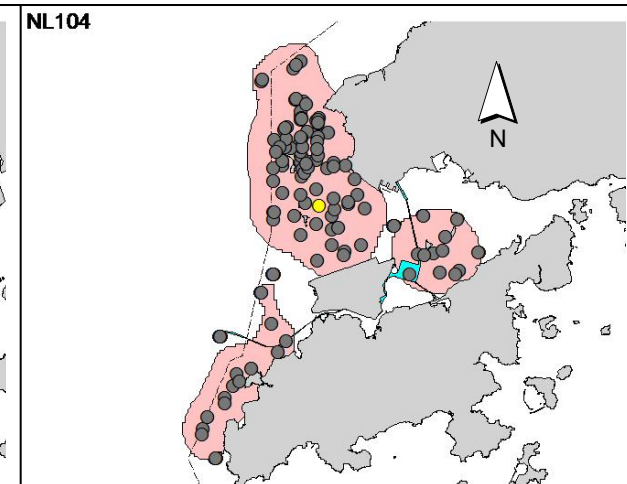
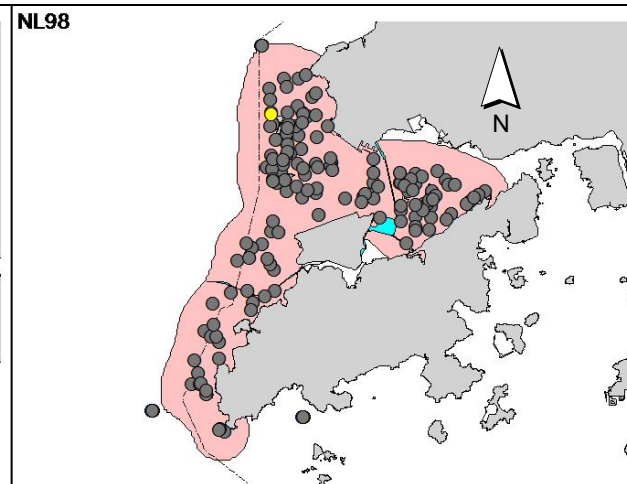
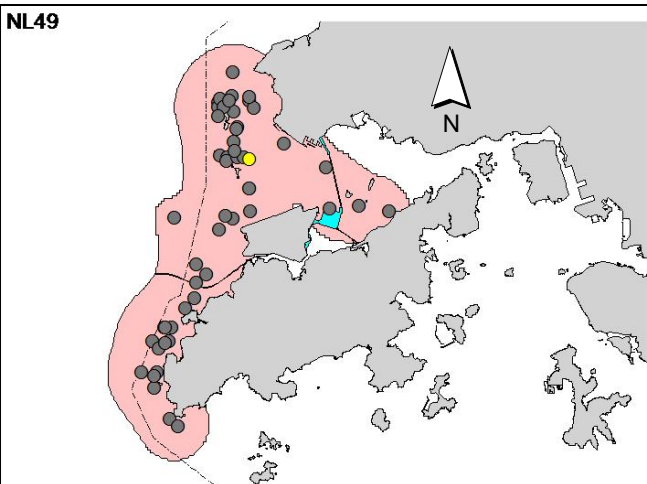
WL17



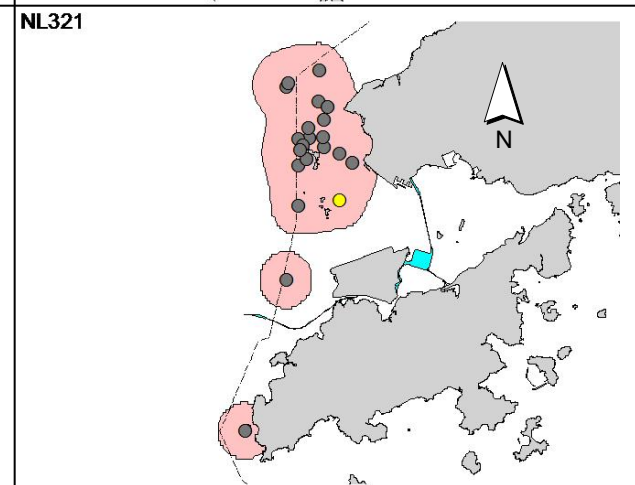
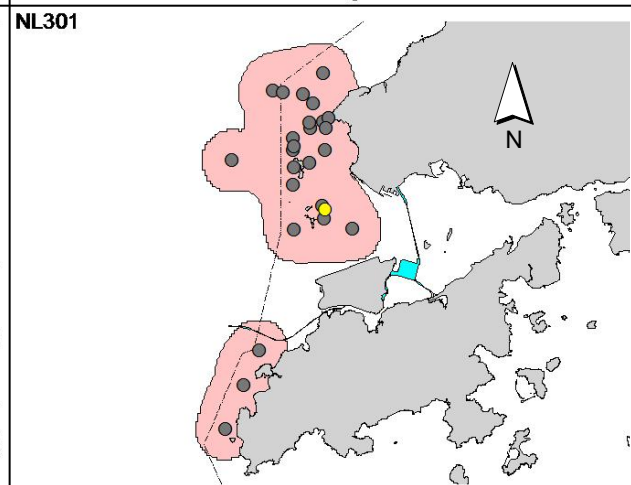
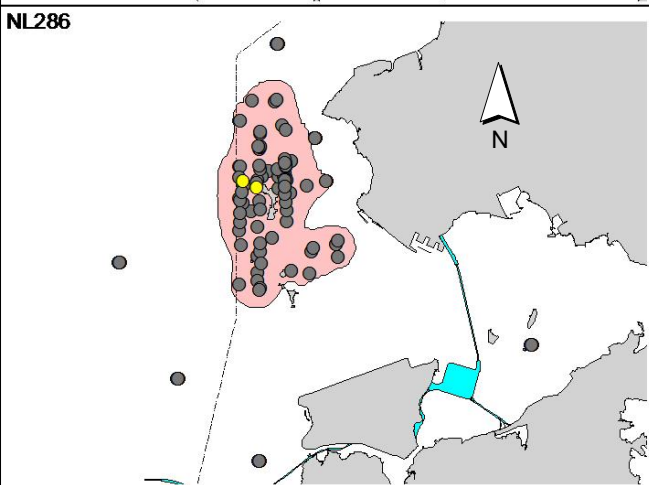
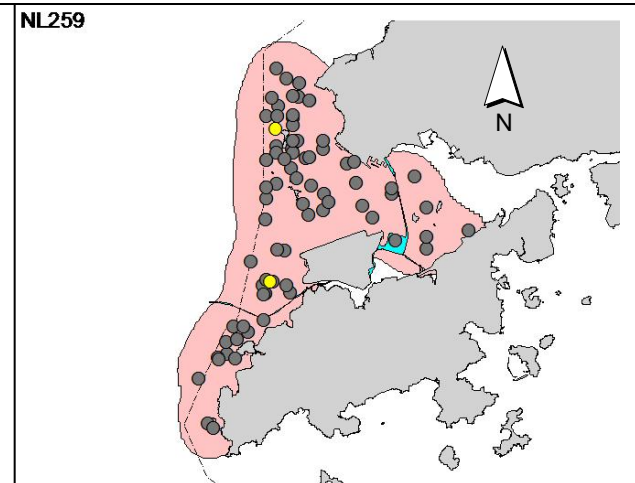
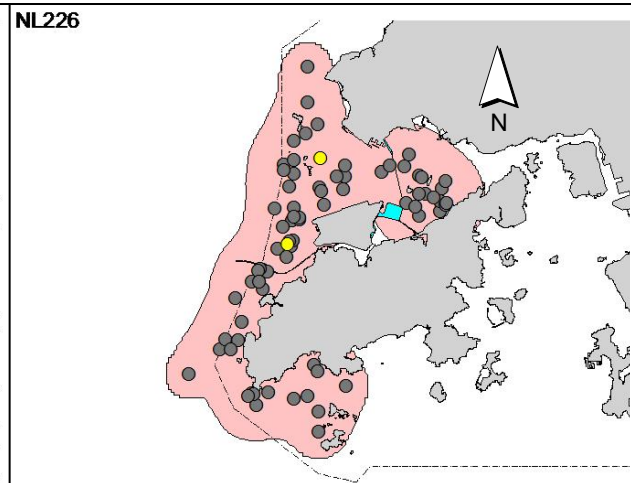
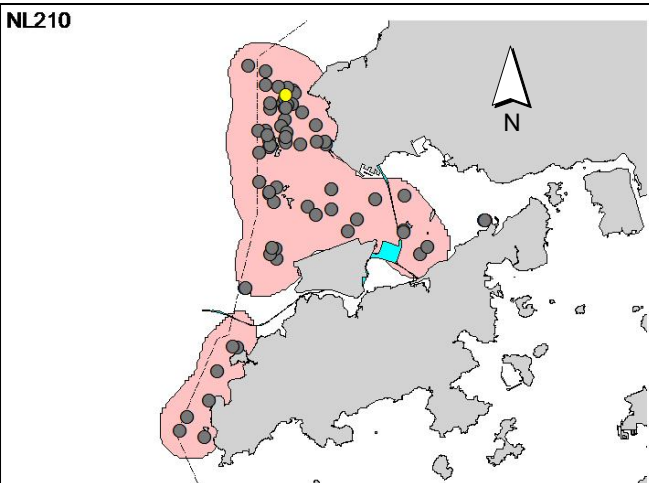
WL214



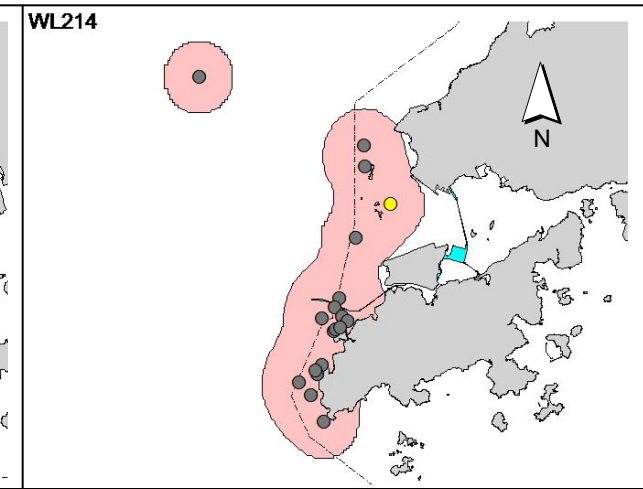
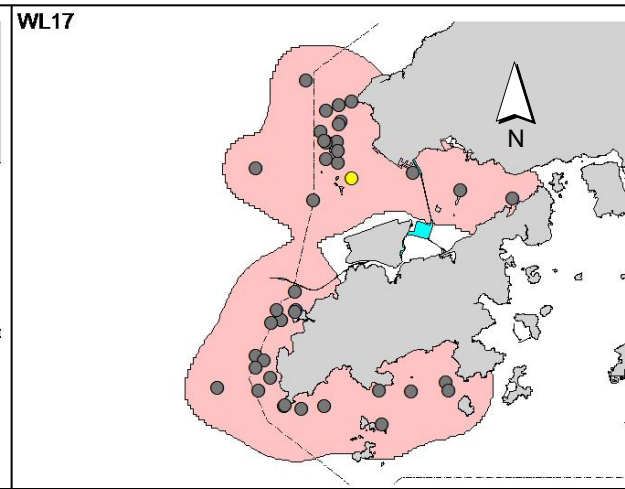
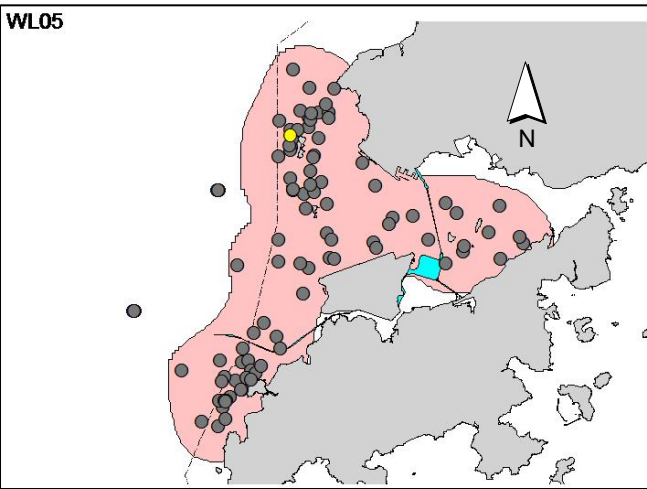
Appendix V. Ranging patterns (95% kernel ranges) of 15 individual dolphins that were sighted during impact phase monitoring period (note: yellow dots indicates sightings made in March – May 2017 during HZMB-related monitoring surveys)



Appendix V. (cont'd)



Appendix V. (cont'd)





Appendix I

## Event and Action Plan

*Event and Action Plan for Impact Air Monitoring*

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

	<b>Action</b>			
	ET (a)	IEC (a)	SOR (a)	Contractor(s)
<b>Limit Level Exceedance</b>				
	<ol style="list-style-type: none"> <li>1. Identify the source.</li> <li>2. Repeat measurement to confirm finding. If two consecutive measurements exceed Limit Level, the exceedance is then confirmed.</li> <li>3. Inform the IEC, the SOR, the DEP and the Contractor.</li> <li>4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented.</li> <li>5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily.</li> <li>6. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented.</li> <li>7. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken.</li> <li>8. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results.</li> <li>9. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by the ET.</li> <li>2. Check Contractor's working method.</li> <li>3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures.</li> <li>4. Advise the SOR on the effectiveness of the proposed remedial measures.</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing.</li> <li>2. Notify the Contractor.</li> <li>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.</li> <li>4. Ensure remedial measures are properly implemented.</li> <li>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.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance.</li> <li>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.</li> <li>3. Implement the agreed proposals.</li> <li>4. Amend proposal if appropriate.</li> <li>5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.</li> </ol>

Note: (a) 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	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, SOR and Contractor;</li> <li>5. Check monitoring data.</li> <li>6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and finding with the ET and the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the IEC and any other measures proposed by the ET;</li> <li>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.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the SOR and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR;</li> <li>3. Implement the agreed measures.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and findings with the ET and the Contractor;</li> <li>3. Attend the meeting to discuss with ET, SOR and</li> </ol>	<ol style="list-style-type: none"> <li>1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>2. If SOR is satisfied with the</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the SOR and confirm notification of the non-compliance in writing;</li> <li>2. Attend the meeting to discuss with ET, IEC and SOR the necessity of additional dolphin monitoring and any other</li> </ol>

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 J

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

**Table J1** *Cumulative Statistics on Exceedances*

<b>Monitoring Parameters</b>	<b>Action/Limit Level</b>	<b>Total No. recorded in this reporting quarter</b>	<b>Total No. recorded since project commencement</b>
1-Hr TSP	Action	0	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	0	9
	Limit	1	9

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

<b>Reporting Period</b>	<b>Cumulative Statistics</b>		
	<b>Complaints</b>	<b>Notifications of Summons</b>	<b>Successful Prosecutions</b>
This Reporting Period (March 2017 to May 2017)	1	1	0
Total No. received since project commencement	14	1	0

Email  
message

**Environmental  
Resources  
Management**

*To* Ramboll Environ - Hong Kong, Limited (ENPO)

*From* ERM- Hong Kong, Limited

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

*Subject* Notification of Exceedance for Impact Dolphin  
Monitoring

*Date* 31 August 2017

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



**ERM**

---

Dear Sir or Madam,

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

0212330\_Mar2017/May2017\_dolphin\_STG&ANI\_NEL&NWL

A total of one limit level exceedance was recorded in the quarterly impact  
dolphin monitoring data between March 2017 and May 2017.

Regards,



Mr Jovy Tam  
Environmental Team Leader

---

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ERM-Hong Kong, Limited

CONTRACT NO. HY/2012/08

TUEN MUN – CHEK LAP KOK LINK –  
NORTHERN CONNECTION SUB-SEA TUNNEL SECTION

Impact Dolphin Monitoring  
Notification of Exceedance

Log No.	0212330_Mar2017/May2017_dolphin_STG&ANI_NEL&NWL [Total No. of Exceedances = 1 Limit Level Exceedance]	
Date	Mar 2017 to May 2017 (monitored) 25 August 2017 (results received by ERM)	
Monitoring Area	Northeast Lantau (NEL) and Northwest Lantau (NWL)	
Parameter(s) with Exceedance(s)	Quarterly encounter rate of dolphin sightings (STG) Quarterly encounter rate of total number of dolphins (ANI)	
Action Levels	North Lantau Social cluster	NEL: STG < 4.2 & ANI < 15.5 or NWL: STG < 6.9 & ANI < 31.3
Limit Levels		NEL: STG < 2.4 & ANI < 8.9 and NWL: STG < 3.9 & ANI < 17.9
Recorded Levels	NEL	STG = 0.0 & ANI = 0.0
	NWL	STG = 0.93 & ANI = 5.25
	One Limit Level Exceedance was recorded in the quarterly impact dolphin monitoring at NEL and NWL between March 2017 and May 2017. The exceedance was reported in the approved <i>Forty-third Monthly EM&amp;A Report</i> dated 12 June 2017.	
Statistical Analyses	<p>Further to the review of the available and relevant dolphin monitoring data in the EM&amp;A programme by this Contract, statistical analyses were conducted as follows:</p> <ul style="list-style-type: none"> <li>A two-way ANOVA with repeated measures and unequal sample size was conducted using Period (2 levels: baseline vs impact – present quarter, March 2017 to May 2017) and Location (2 levels: NEL and NWL) as fixed factors to examine whether there were any significant differences in the average encounter rates between the baseline and present impact monitoring quarter. By setting <math>\alpha = 0.05</math> as the significance level in the statistical tests, significant differences in STG (<math>p = 0.0019</math>) and ANI (<math>p = 0.0186</math>) were detected between Periods.</li> <li>A two-way ANOVA with repeated measures and unequal sample size was conducted using Cumulative Period (2 levels: baseline vs impact – cumulative quarters*, December 2012 to May 2017) and Location (2 levels: NEL and NWL) as fixed factors to examine whether there were any significant differences in the average encounter rates between the baseline and cumulative impact monitoring quarters. By setting <math>\alpha = 0.00005</math> as the significance level in the statistical tests, significant difference in STG (<math>p = 0.000001</math>) and in ANI (<math>p = 0.000000</math>) between Cumulative Period and Location were detected.</li> </ul> <p>*Note: The commencement date under <i>Contract No. HY/2012/08</i> is 1 November 2013.</p>	
Works Undertaken (in the monitoring quarter)	<p>In the quarter between March 2017 and May 2017, the major marine works under <i>Contract No. HY/2012/08</i> included:</p> <ul style="list-style-type: none"> <li>Construction of Vertical Seawall;</li> <li>Band drain installation; and</li> <li>Filling works.</li> </ul>	

<p><b>Possible Reason for Action or Limit Level Exceedance(s)</b></p>	<p>The potential factors that may have contributed to the observed exceedance are reviewed below:</p> <ul style="list-style-type: none"> <li>• Blocking of CWD travelling corridor: The <i>Monitoring of Marine Mammals in Hong Kong Waters (2016 – 17)</i> <sup>(1)</sup> reported that dolphin usage and traveling activities to the northern side of the airport (dolphin traveling corridor) are affected by frequent high-speed ferry traffic from Sky Pier (not related to this Contract), which is likely a major factor resulting in the decrease in dolphin abundances in North Lantau.</li> <li>• Marine works of the Contract: As per the findings from the EIA report (<i>Section 8.11.9</i>), the major influences on the Chinese White Dolphin (CWD) <i>Sousa chinensis</i> under this Contract are marine traffics, reclamation and dredging works. The Contractor implemented the marine traffic control in the reporting period as per the requirements in the <i>EP-354/2009/D</i> and the updated <i>EM&amp;A Manual</i>. Most of the vessels of this Contract also worked within the site boundary, in which the area is seldom used by CWD. Disturbance from vessels of this Contract is considered minor. The reclamation and dredging works of this Contract (Phase 2) commenced on 27<sup>th</sup> December 2016. Filling works were undertaken within 200m leading seawall throughout the filling period and the working rate described in the EP and the approved EIA Report were strictly followed. After reviewing of the daily filling records, all daily filling work rates in this quarter are under the maximum work rate described in the EP. During this quarter of dolphin monitoring, no adverse impact on CWD due to the activities under this Contract was observed.</li> <li>• Impact on water quality: According to the findings in the water quality monitoring results at the impact monitoring stations between March 2017 and May 2017, there was no exceedance on WQM. Impact mean levels of depth-averaged SS at all sampling stations during both mid-ebb and mid-flood tides were well below the corresponding ambient levels. The WQM results imply that no unacceptable impact on water quality was associated with the marine works under this Contract, and thus no indirect impacts on marine habitat quality due to change in water quality is observed in this Contract.</li> </ul> <p>In view of the above, marine ecological mitigation measures were considered properly implemented, and thus no unacceptable impact on CWD or its habitat was associated with this Contract in this quarter from March 2017 and May 2017.</p>
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(1) Hung SKY (2016). Prepared for AFCD. Available at: [https://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_chi/con\\_mar\\_chi\\_chi/files/Final\\_Report\\_2015\\_16.pdf](https://www.afcd.gov.hk/english/conservation/con_mar/con_mar_chi/con_mar_chi_chi/files/Final_Report_2015_16.pdf)

<p><b>Actions Taken/ To Be Taken</b></p>	<p>With reference to the site inspection records in this quarter, the respective marine ecological mitigation measures have been implemented properly by the Contractor throughout the marine works period, including:</p> <ol style="list-style-type: none"> <li>1. 250m dolphin exclusion zone;</li> <li>2. Acoustic decoupling plan;</li> <li>3. Training to workers;</li> <li>4. Offsite vessel routing control in accordance with Regular Marine Travel Routes Plan, including routing control within existing and proposed marine park boundaries;</li> <li>5. Vessels speed limited at 5 knots and 10 knots within existing and proposed marine park boundaries and site boundary respectively;</li> <li>6. Idling and mooring of working vessels within site boundary;</li> </ol> <p>The existing mitigation measures are recommended to be continuously implemented. Furthermore, it is also recommended to reduce the vessels for marine works as much as possible. The ET will monitor for future trends in exceedance(s).</p> <p>A joint team meeting was held on 17 July 2017 for discussion on CWD trend, with attendance of ENPO, HyD, Representatives of Resident Site Staff (RSS), Representatives of Environmental Team (ET) for Contract No. HY/2010/02, HY2011/03, HY/2012/07 and HY/2012/08. The discussion/recommendation as recorded in the minutes of the meeting, which might be relevant to this Contract are summarized below. It was concluded that the HZMB works is one of the contributing factors affecting the dolphins. It was also concluded the contribution of impacts due to the HZMB works as a whole (or individual marine contracts) cannot be quantified or separate from the other stress factors. It was reminded that the ETs shall keep reviewing the implementation status of the dolphin related mitigation measures and remind the contractor to ensure the relevant measures are fully implemented. The ETs were also reminded to update the BMP boundary in the Regular Marine Travel Route Plan. The participants were requested by ENPO to collect and report the marine traffic statistics. It was recommended that the marine works of HZMB projects should be completed as soon as possible so as to reduce the overall duration of impacts and allow the dolphins population to recover as early as possible. It was also suggested that the protection measures (e.g., speed limit control) for the proposed Brothers Marine Park (BMP) shall be brought forward as soon as possible before its establishment so as to provide a better habitat for dolphin recovery. It is noted that even though marine vessels may moor within the mooring site of BMP, commercial activities including loading / unloading / transshipment are not allowed except a permit is obtained. The HZMB works vessels were recommended to avoid the BMP. It was also recommended that the marine works footprint (e.g. reduce the size of peripheral silt curtain) and vessels for the marine works should be reduced as much as possible, and vessels idling / mooring in other part of the North Lantau shall be avoided whenever possible.</p> <p>It was reminded that starting from January 2016, high-speed ferry (HSF) from the SkyPier would be re-routed north to the northern edge of the Sha Chau and Lung Kwu Chau Marine Park that had the highest density of CWD in the NWL. While the HSF would reduce speed to 15 knots, the associated disturbance might still affect CWD in the area. It implied that the CWDs in the area should be closely followed.</p>
<p><b>Remarks</b></p>	<p>The results of impact dolphin monitoring, the status of implemented marine ecological mitigation measures are documented in the approved <i>Forty-first to Forty-third Monthly EM&amp;A Reports</i>.</p>

**ENVIRONMENTAL COMPLAINT/ENQUIRY INVESTIGATION REPORT**

*Our Reference: 0212330\_Complaint LOG\_20170328\_13*

***Basic Information of Complaint/Enquiry***

Reference Number:	Not disclosed
Date of Complaint/Enquiry Received	27 March 2017
Location of Complaint/Enquiry	Site near HKBCF of HZMB
Nature of Complaint/Enquiry	Noise nuisance and water pollution
Complaint/Enquiry Received by	EPD
Via	Not disclosed
Complainant/Enquirer	Not disclosed

***Details of Complaint/Enquiry***

On 27 March 2017, a complaint case was received by EPD regarding intermittent noise nuisance from the site near HKBCF of HZMB from 10:00pm on 26 March 2017 to the mid-night on 27 March 2017 and water pollution at the sea observed in the morning on 27 March 2017. The SOR, the Environmental Team (ET) and the Contractor(DBJV) received the complaint notification from IEC on 28 March 2017. The ET was informed that the case is categorized as complaint in nature upon the investigation, discussion and agreement between relevant parties (i.e. the Contractor (DBJV), SOR and IEC).

***Investigation Report***

Upon receiving the case notification from IEC on 28 March 2017, the Contractor had promptly checked the construction programme of March 2017.

According to the construction programme provided by the Contractor, the major construction works during the incident period were cutter soil mixing(CSM) ground treatment. Interview with the night time staff has been conducted. Cutter soil mixing rig and grout pump were being used. The construction works and the use of the above powered mechanical equipment were complied with the condition of current construction noise permit GW-RS0165-17. The construction programme is provided in Annex B. As the incident area is about 2.5km from the site, it is expected that there would not be any significant noise impact caused by this Contract.

Moreover, the water pollution at the sea shown in the photo provided by IEC (*Provided in Annex A*) is not likely to be related to this Contract since the site shown in the photo is not the site of this Contract. The incident area is also far away from the site of this Contract. Moreover, no marine works were undertaken at Southern Landfall during the incident period. Site investigation was conducted with SOR and DBJV on 19 April 2017. No improper discharge was observed. Wetsep records are provided in Annex F. A location map showing the distance between this site and the incident area is shown in Annex C. The site drainage plan showing the discharge location is shown in Annex D. Moreover, no contract-related marine traffic in the concerned waters was recorded according to the marine travel route record. The marine travel route record is provided in Annex E.

Based on the above, there is no evidence to prove that the complaint case is related to this Contract.

*Mitigation Measures and Follow-Up Actions Recommended to/ Undertaken by Contractor*

There is no evidence to prove that the complaint case is related to this Contract.

Nevertheless, The Contractor has been reminded to adhere strictly to implement all relevant mitigation measures of noise impact recommended or specified in the EP (EP-354/2009/D), the approved EIA and the Updated EM&A Manual of this Project to avoid causing noise pollution. No other additional action is required. The Contractor shall also fully comply with the conditions in the approved CNP to carry out construction works under the Contract.

The Contractor has also been reminded to adhere strictly to implement all relevant mitigation measures of water quality impact recommended or specified in the EP (EP-354/2009/D), the approved EIA, Updated EM&A Manual and the Water Discharge License of this Project to avoid causing water pollution. The Contractor shall also fully comply with the conditions in the approved water discharge license to carry out construction works under the Contract.

Date of File Closed : 11 May 2017

Approved and Filed by:

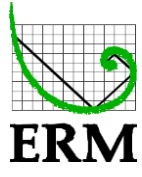


(Jovy Tam, ET Leader)

Date: 11 May 2017

Annex A

## Photo record



**Annex A**      **Photo provided by IEC**

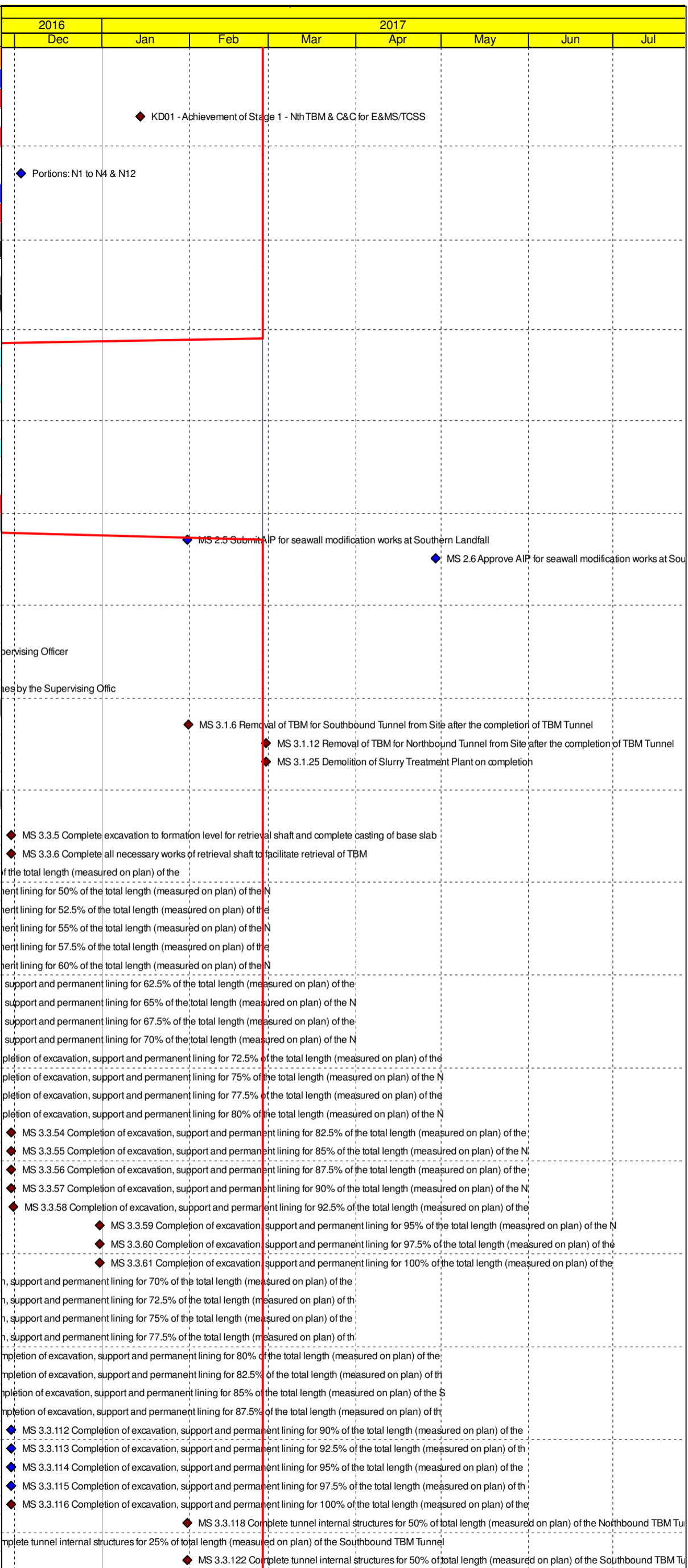


Annex B

## Construction Programme



Activity Name	
<b>TMCLK - Northern Connection Sub-Sea Tunnel Section</b>	
<b>Contract Dates</b>	
<b>Commencement and Completion Dates</b>	
KD01 - Achievement of Stage 1 - Nth TBM & C&C for E&MS/TCSS	
<b>Site Possession Date</b>	
Portions: X1,(N10,11,13 & 14) - Sth Landfall	
Portions: N1 to N4 & N12	
<b>General Submissions</b>	
<b>Environmental</b>	
<b>Environmental Permit Submissions</b>	
<b>Supplementary WMP of C&amp;C Tunnel at Sth.Landfall</b>	
Supplementary WMP of C&C Tunnel at Sth.Landfall	
<b>Sediment Quality Report/Dumping Permit</b>	
<b>Southern Landfall</b>	
Southern landfall - Commencement of Shaft & C&C Tunnel Dwall	
Southern Landfall - Commencement of Retrieval Shaft Excavation	
<b>Sediment Sampling &amp; Testing Plan (SSTP) - if required</b>	
Complete SSTP and Obtain EPD's approval	
<b>Sediment Quality Report (SQR) - if required</b>	
Advance Ground Investigation works for Sediment sampling	
Sediment Sample Testing & Report preparation	
<b>Dumping Permit for Load Dumping (Loading Permit) - if required</b>	
Finalize the application document and submit to EPD - for Dwall	
Notify the results and issue Loading Permit for Local & Cross Boundary Crossing - for Dwall	
<b>PAYMENT MILESTONE</b>	
<b>Design and Design Checking of the Works</b>	
MS 2.5 Submit AIP for seawall modification works at Southern Landfall	
MS 2.6 Approve AIP for seawall modification works at Southern Landfall by the Supervising Officer	
MS 2.44 Approve DDA for South Ventilation Building by the Supervising Officer	
MS 2.52 Approve DDA for Facilities Provision for TCSS by the Supervising Officer	
MS 2.60 Approve DDA for Drainage, Sewerage, Waterworks and Utilities at Northern Landfall by the Supervising Officer	
MS 2.69 Submit draft Operation and Maintenance Manual for all Tunnels and Cross Passgases	
MS 2.70 Accept Operation and Maintenance Manual for all Tunnels and Cross Passgases by the Supervising Officer	
MS 2.71 Submit draft Operation and Maintenance Manual for all works except Tunnels and Cross Passgases	
MS 2.72 Accept Operation and Maintenance Manual for all works except Tunnels and Cross Passgases by the Supervising Officer	
<b>Tunnel Boring Machine (TBM) and Back-up Equipment for TBM Tunnel</b>	
MS 3.1.6 Removal of TBM for Southbound Tunnel from Site after the completion of TBM Tunnel	
MS 3.1.12 Removal of TBM for Northbound Tunnel from Site after the completion of TBM Tunnel	
MS 3.1.25 Demolition of Slurry Treatment Plant on completion	
MS 3.1.26 Complete the whole of the activities under this Cost Centre Part to the satisfaction of the Supervising Officer	
<b>TBM Tunnel</b>	
MS 3.3.4 Complete walls of retrieval shaft	
MS 3.3.5 Complete excavation to formation level for retrieval shaft and complete casting of base slab	
MS 3.3.6 Complete all necessary works of retrieval shaft to facilitate retrieval of TBM	
MS 3.3.40 Completion of excavation, support and permanent lining for 47.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.41 Completion of excavation, support and permanent lining for 50% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.42 Completion of excavation, support and permanent lining for 52.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.43 Completion of excavation, support and permanent lining for 55% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.44 Completion of excavation, support and permanent lining for 57.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.45 Completion of excavation, support and permanent lining for 60% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.46 Completion of excavation, support and permanent lining for 62.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.47 Completion of excavation, support and permanent lining for 65% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.48 Completion of excavation, support and permanent lining for 67.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.49 Completion of excavation, support and permanent lining for 70% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.50 Completion of excavation, support and permanent lining for 72.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.51 Completion of excavation, support and permanent lining for 75% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.52 Completion of excavation, support and permanent lining for 77.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.53 Completion of excavation, support and permanent lining for 80% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.54 Completion of excavation, support and permanent lining for 82.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.55 Completion of excavation, support and permanent lining for 85% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.56 Completion of excavation, support and permanent lining for 87.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.57 Completion of excavation, support and permanent lining for 90% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.58 Completion of excavation, support and permanent lining for 92.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.59 Completion of excavation, support and permanent lining for 95% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.60 Completion of excavation, support and permanent lining for 97.5% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.61 Completion of excavation, support and permanent lining for 100% of the total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.104 Completion of excavation, support and permanent lining for 70% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.105 Completion of excavation, support and permanent lining for 72.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.106 Completion of excavation, support and permanent lining for 75% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.107 Completion of excavation, support and permanent lining for 77.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.108 Completion of excavation, support and permanent lining for 80% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.109 Completion of excavation, support and permanent lining for 82.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.110 Completion of excavation, support and permanent lining for 85% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.111 Completion of excavation, support and permanent lining for 87.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.112 Completion of excavation, support and permanent lining for 90% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.113 Completion of excavation, support and permanent lining for 92.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.114 Completion of excavation, support and permanent lining for 95% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.115 Completion of excavation, support and permanent lining for 97.5% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.116 Completion of excavation, support and permanent lining for 100% of the total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.118 Complete tunnel internal structures for 50% of total length (measured on plan) of the Northbound TBM Tunnel	
MS 3.3.121 Complete tunnel internal structures for 25% of total length (measured on plan) of the Southbound TBM Tunnel	
MS 3.3.122 Complete tunnel internal structures for 50% of total length (measured on plan) of the Southbound TBM Tunnel	



	Planned Bar
	Planned Bar - Critical
	Planned Milestone
	Progress bar
	Progress Milestone

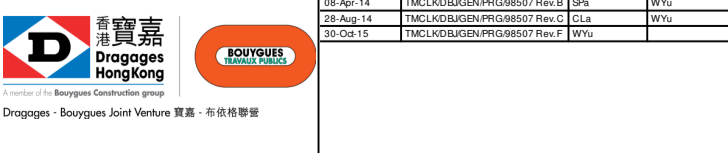
Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Date	Revision	Checked	Approved
12-Feb-14	TMCLKDUGEN-PRG-98507	WYu	SPe
08-Apr-14	TMCLKDUGEN-PRG-98507 Rev.B	SPe	WYu
28-Aug-14	TMCLKDUGEN-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDUGEN-PRG-98507 Rev.F	WYu	

Activity Name	2017							
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
<b>Cross Passages for TBM Tunnel</b>								
MS 3.3.1 Complete 50% of ground treatment for excavation of all Type 1 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.1 Complete 50% of ground treatment for excavation of all Type 1 Cross Passages(Percentage to be certified for 50%)							
MS 3.3.3 Complete 50% of ground treatment for excavation of all Type 2 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.3 Complete 50% of ground treatment for excavation of all Type 2 Cross Passages(Percentage to be certified for 50%)							
MS 3.3.5 Complete 50% of excavation and support for all Type 1 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.5 Complete 50% of excavation and support for all Type 1 Cross Passages(Percentage to be certified for 50%)							
MS 3.3.7 Complete 50% of excavation and support for all Type 2 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.7 Complete 50% of excavation and support for all Type 2 Cross Passages(Percentage to be certified for 50%)							
MS 3.3.9 Complete 50% of permanent lining and internal structures for all Type 1 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.9 Complete 50% of permanent lining and internal structures for all Type 1 Cross Passages(Percentage to be certified for 50%)							
MS 3.3.11 Complete 50% of permanent lining and internal structures for all Type 2 Cross Passages(Percentage to be certified for 50%)	◆ MS 3.3.11 Complete 50% of permanent lining and internal structures for all Type 2 Cross Passages(Percentage to be certified for 50%)							
<b>Cut-and-cover Tunnels at Southern Landfalls</b>								
MS 4.1.1 Complete 10% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.2 Complete 20% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.3 Complete 30% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.4 Complete 40% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.5 Complete 50% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.6 Complete 60% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.7 Complete 70% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.8 Complete 80% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.9 Complete 90% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.10 Complete 100% of total length (measured on plan) of temporary retaining walls for excavation of Cut-and-cover Tunnel								
MS 4.1.11 Complete 40% of excavation for Cut-and-cover tunnel								
MS 4.1.12 Complete 60% of excavation for Cut-and-cover tunnel								
MS 4.1.13 Complete 80% of excavation for Cut-and-cover tunnel								
MS 4.1.14 Complete 100% of excavation for Cut-and-cover tunnel	◆ MS 4.1.14 Complete 80% of excavation for Cut-and-cover tunnel							
MS 4.1.15 Complete permanent tunnel structure for 10% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.16 Complete permanent tunnel structure for 20% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.17 Complete permanent tunnel structure for 30% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.18 Complete permanent tunnel structure for 40% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.19 Complete permanent tunnel structure for 50% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.20 Complete permanent tunnel structure for 60% of the total length (measured on plan) of Cut-and-cover Tunnel								
MS 4.1.21 Complete permanent tunnel structure for 70% of the total length (measured on plan) of Cut-and-cover Tunnel	◆ MS 4.1.21 Complete permanent tunnel structure for 60% of the total length (measured on plan) of Cut-and-cover Tunnel							
MS 4.1.22 Complete permanent tunnel structure for 80% of the total length (measured on plan) of Cut-and-cover Tunnel	◆ MS 4.1.22 Complete permanent tunnel structure for 70% of the total length (measured on plan) of Cut-and-cover Tunnel							
MS 4.1.23 Complete permanent tunnel structure for 90% of the total length (measured on plan) of Cut-and-cover Tunnel	◆ MS 4.1.23 Complete permanent tunnel structure for 80% of the total length (measured on plan) of Cut-and-cover Tunnel							
MS 4.1.24 Complete permanent tunnel structure for 100% of the total length (measured on plan) of Cut-and-cover Tunnel	◆ MS 4.1.24 Complete permanent tunnel structure for 90% of the total length (measured on plan) of Cut-and-cover Tunnel							
MS 4.1.26 Complete excavation for 50% of total length (measured on plan) of all Cross Passages								
MS 4.1.27 Complete excavation for 100% of total length (measured on plan) of all Cross Passages								
MS 4.1.29 Complete pavement for 50% of the total length (measured on plan) of Cut-and-cover Tunnel	◆ MS 4.1.29 Complete pavement for 50% of the total length (measured on plan) of Cut-and-cover Tunnel							
<b>Cut-and-cover Tunnel at Northern Landfall</b>								
MS 4.2.22 Complete tunnel internal structure for 50% of NB Northern Landfall TBM Tunnel								
MS 4.2.23 Complete tunnel internal structure for 100% of NB Northern Landfall TBM Tunnel								
MS 4.2.24 Complete tunnel internal structure for 50% of SB Northern Landfall TBM Tunnel								
MS 4.2.25 Complete tunnel internal structure for 100% of SB Northern Landfall TBM Tunnel	◆ MS 4.2.25 Complete tunnel internal structure for 100% of SB Northern Landfall TBM Tunnel							
MS 4.2.29 Complete 100% of permanent lining and internal structures for all Northern Landfall Cross Passages								
MS 4.2.30 Complete Permanent tunnel structure for 25% of Cut and Cover Tunnel								
MS 4.2.31 Complete Permanent tunnel structure for 50% of Cut and Cover Tunnel								
MS 4.2.32 Complete Permanent tunnel structure for 75% of Cut and Cover Tunnel	◆ MS 4.2.32 Complete Permanent tunnel structure for 75% of Cut and Cover Tunnel							
MS 4.2.34 Complete Permanent junction structure at interface between Cut-and-cover and TBM Tunnel								
<b>Approach Ramp Structures to Cut-and-cover Tunnel at Southern Landfall</b>								
MS 5.1.2 Complete 40% of excavation for approach ramp structures								
MS 5.1.3 Complete 60% of excavation for approach ramp structures								
MS 5.1.4 Complete 80% of excavation for approach ramp structures								
MS 5.1.5 Complete 100% of excavation for approach ramp structures								
MS 5.1.6 Complete retaining wall foundation for 10% of the total length (measured on plan) of approach ramp structures								
MS 5.1.7 Complete retaining wall foundation for 20% of the total length (measured on plan) of approach ramp structures								
MS 5.1.8 Complete retaining wall foundation for 30% of the total length (measured on plan) of approach ramp structures								
MS 5.1.9 Complete retaining wall foundation for 40% of the total length (measured on plan) of approach ramp structures								
MS 5.1.10 Complete retaining wall foundation for 50% of the total length (measured on plan) of approach ramp structures								
MS 5.1.11 Complete retaining wall foundation for 60% of the total length (measured on plan) of approach ramp structures								
MS 5.1.12 Complete retaining wall foundation for 70% of the total length (measured on plan) of approach ramp structures								
MS 5.1.13 Complete retaining wall foundation for 80% of the total length (measured on plan) of approach ramp structures								
MS 5.1.14 Complete retaining wall foundation for 90% of the total length (measured on plan) of approach ramp structures								
MS 5.1.15 Complete retaining wall foundation for 100% of the total length (measured on plan) of approach ramp structures								
<b>At grade Roads at Northern Landfall</b>								
MS 6.2.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes								◆ MS 6.2.13 Complete drainage installation of 20% length of total length (measured on plan) of drainage pipes
MS 6.2.17 Complete sewerage installation of 20% length of total length (measured on plan) of sewerage pipes								◆ MS 6.2.17 Complete sewerage installation of 20% length of total length (measured on plan) of sewerage pipes
<b>South Ventilation Buildings</b>								
MS 7.1.1 Complete 100% of cofferdam for excavation								
MS 7.1.2 Complete 100% of excavation to the formation level								
MS 7.1.3 Complete 100% of foundation for the ventilation building								
MS 7.1.4 Complete concreting works of 25% area of the total construction floor area for the ventilation building								
MS 7.1.5 Complete concreting works of 50% area of the total construction floor area for the ventilation building	◆ MS 7.1.5 Complete concreting works of 50% area of the total construction floor area for the ventilation building							
MS 7.1.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building								◆ MS 7.1.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building
MS 7.1.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building								◆ MS 7.1.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building
<b>North Ventilation Buildings</b>								
MS 7.2.4 Complete concreting works of 25% area of the total construction floor area for the ventilation building								
MS 7.2.5 Complete concreting works of 50% area of the total construction floor area for the ventilation building								
MS 7.2.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building	◆ MS 7.2.6 Complete concreting works of 75% area of the total construction floor area for the ventilation building							
MS 7.2.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building								◆ MS 7.2.7 Complete concreting works of 100% area of the total construction floor area for the ventilation building
<b>Facilities Provision for E&amp;M Works for TBM Tunnel, Cut &amp; Cover Tunnels and Cross Passages</b>								
MS 9.1.1 Complete 25% of bonding terminal, opening and accessories, etc.								
MS 9.1.2 Complete 25% of plinth, hoisting facilities and accessories, etc.								
MS 9.1.3 Complete 50% of bonding terminal, opening and accessories, etc.								◆ MS 9.1.3 Complete 50% of bonding terminal, opening and accessories, etc.
MS 9.1.4 Complete 50% of plinth, hoisting facilities and accessories, etc.								◆ MS 9.1.4 Complete 50% of plinth, hoisting facilities and accessories, etc.
MS 9.1.5 Complete 75% of bonding terminal, opening and accessories, etc.								◆ MS 9.1.5 Complete 75% of bonding terminal, opening and accessories, etc.
MS 9.1.6 Complete 75% of plinth, hoisting facilities and accessories, etc.								◆ MS 9.1.6 Complete 75% of plinth, hoisting facilities and accessories, etc.

■ Planned Bar  
■ Planned Bar - Critical  
◆ Planned Milestone  
■ Progress bar  
◆ Progress Milestone

Date	Revision	Checked	Approved
12-Feb-14	TMCLKDWPF-PRG-98507	WYu	SPe
08-Apr-14	TMCLKDWPF-PRG-98507 Rev.B	SPe	WYu
28-Aug-14	TMCLKDWPF-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDWPF-PRG-98507 Rev.F	WYu	



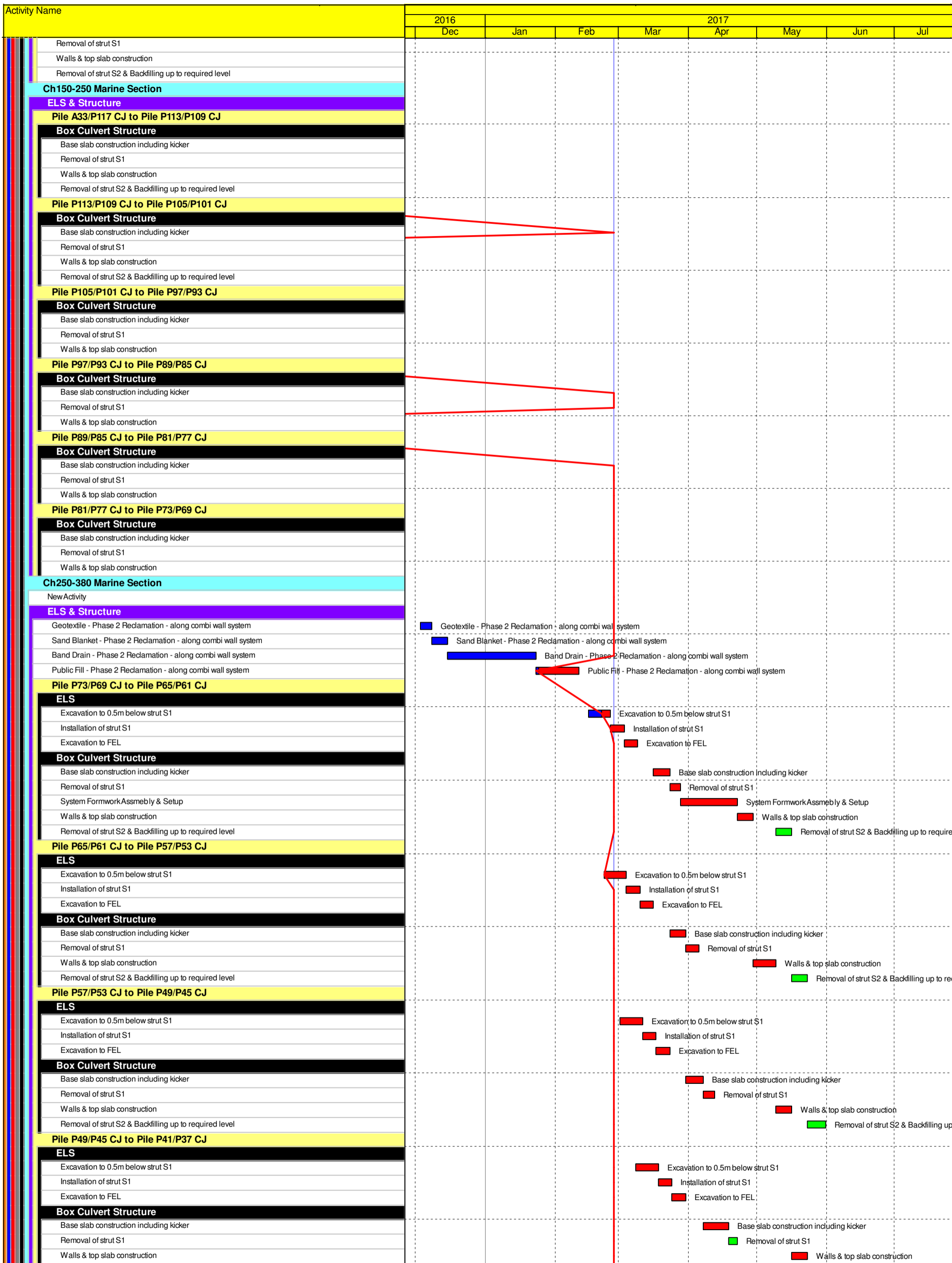
Activity Name	2016		2017					
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
<b>Facilities Provision for E&amp;M Works for North Ventilation Building</b>								
MS 9.5.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal								◆ MS 9.5.1 Complete 25% of bonding terminal, main earth mat, clean earth mat, earth pit, lightning pit, conceal
MS 9.5.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.								◆ MS 9.5.2 Complete 25% of plinth, hoisting facilities, louver, wire mesh and accessories, etc.
MS 9.5.3 Complete 25% of floor drain, water tank and accessories, etc.								◆ MS 9.5.3 Complete 25% of floor drain, water tank and accessories, etc.
<b>Construction</b>								
<b>Northern Landfall</b>								
<b>North Reclamation (Phase 1)</b>								
<b>Construction</b>								
<b>Zone C1</b>								
<b>Reclamation</b>								
Surcharge Removal - Zone C1 - (CH493 to 543)								■ Surcharge Removal - Zone C1
Surcharge Removal - Zone C1 - (CH493 to 543)								■ Surcharge Removal - Zone C1
<b>Zone C2</b>								
<b>Reclamation</b>								
Surcharge Removal - Zone C2 - (CH543 to 598)								■ Surcharge Removal - Zone C2
<b>Zone B</b>								
<b>Reclamation</b>								
Surcharge Removal - Zone B - (CH598 to 648)								
Surcharge Removal - Zone B - (CH598 to 698) stage 1								
Surcharge Period - Zone B - (CH648 to 698) stage 2								
Surcharge Removal - Zone B - (CH598 to 698) stage 2								
<b>Zone F</b>								
<b>CH184 to CH231</b>								
F - Anchor wall Installation - CH184 to CH231								
F - Backfilling up to 0.0mPD & G2 Installation to Anchor Wall- CH184 to CH231								
F - Backfilling up to +3.0mPD & G1 Installation to Anchor Wall- CH184 to CH231								
F - Backfilling up to +6.0mPD to Anchor Wall - CH184 to CH231								
F - Backfilling to +6.0mPD to Existing Seawall - CH184 to CH231								
<b>CH231 to CH278</b>								
F - Backfilling up to +6.0mPD - CH231 to CH278								
F - Anchor wall Installation - CH231 to CH278								
F - Backfilling up to 0.0mPD & G2 Installation to Anchor Wall- CH231 to CH278								
F - Backfilling up to +3.0mPD & G1 Installation to Anchor Wall - CH231 to CH278								
F - Backfilling up to +6.0mPD to Anchor Wall - CH231 to CH278								
F - Backfilling to +6.0mPD to Existing Seawall - CH231 to CH278								
<b>CH278 to CH327</b>								
F - Backfilling up to +6.0mPD - CH278 to CH327								
F - Anchor wall Installation - CH278 to CH327								
F - Backfilling up to 0.0mPD & G2 Installation to Anchor Wall - CH278 to CH327								
F - Backfilling up to +3.0mPD & G1 Installation to Anchor Wall - CH278 to CH327								
F - Backfilling up to +6.0mPD to Anchor Wall - CH278 to CH327								
F - Backfilling to +6.0mPD to Existing Seawall - CH278 to CH327								
<b>CH327 to CH381</b>								
F - Backfilling up to +6.0mPD - CH327 to CH381								
F - Anchor wall Installation - CH327 to CH381								
F - Backfilling up to 0.0mPD & G2 Installation to Anchor Wall - CH327 to CH381								
F - Backfilling up to +3.0mPD & G1 Installation to Anchor Wall - CH327 to CH381								
F - Backfilling up to +6.0mPD to Anchor Wall - CH327 to CH381								
F - Backfilling to +6.0mPD to Existing Seawall - CH327 to CH381								
<b>Box Culvert Extension</b>								
<b>Construction</b>								
<b>Ch000-010 Culvert Outfall</b>								
Removal of temporary bulk head								
<b>CH100-150 Land Section</b>								
<b>Pile A41/A39 CJ to Pile A39/A37 CJ</b>								
<b>Box Culvert Structure</b>								
Pile cap construction								
Base slab construction including kicker								
Removal of strut S1								
Sliding formworks 1st assembly								
Walls & top slab construction								
Removal of strut S2 & Backfilling up to required level								
<b>Pile A39/A37 CJ to Pile A37/A35 CJ</b>								
<b>Box Culvert Structure</b>								
Pile cap construction								
Base slab construction including kicker								
Removal of strut S1								
Walls & top slab construction								
Removal of strut S2 & Backfilling up to required level								
<b>Pile A37/A35 CJ to Pile A35/A33 CJ</b>								
<b>ELS</b>								
Excavation to FEL								
<b>Box Culvert Structure</b>								
Pile cap construction								
Base slab construction including kicker								
Removal of strut S1								
Walls & top slab construction								
Removal of strut S2 & Backfilling up to required level								
<b>Pile A35/A33 CJ to Pile A33/P117 CJ</b>								
<b>ELS</b>								
Excavation to FEL								
<b>Box Culvert Structure</b>								
Pile cap construction								
Base slab construction including kicker								

■ Planned Bar  
■ Planned Bar - Critical  
◆ Planned Milestone  
■ Progress bar  
◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDJGEN-PRG-98507	WYu	SPe
08-Apr-14	TMCLKDJGEN-PRG-98507 Rev.B	SPe	WYu
28-Aug-14	TMCLKDJGEN-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDJGEN-PRG-98507 Rev.F	WYu	

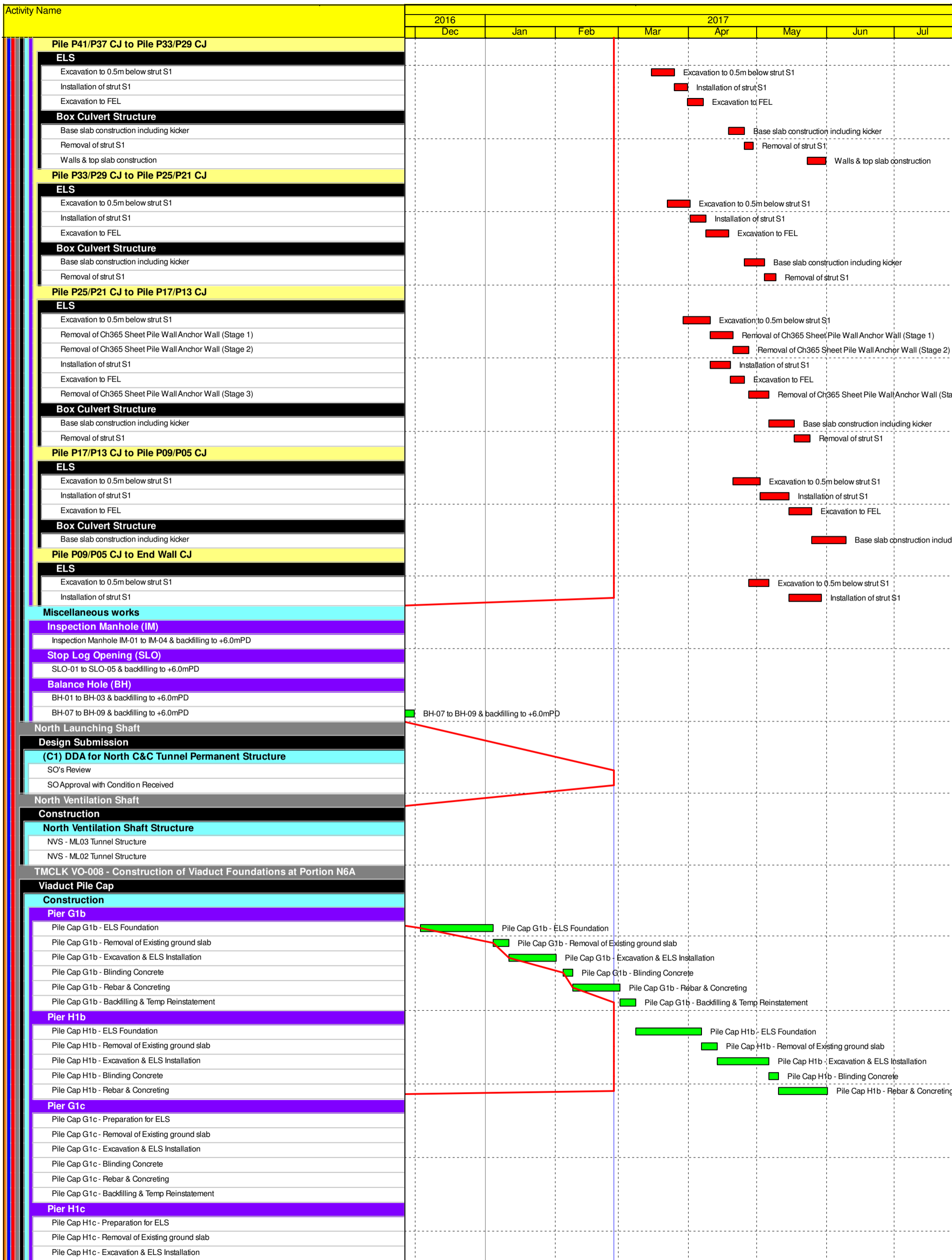




- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDUGEN-PRG-98507	WYu	SPe
08-Apr-14	TMCLKDUGEN-PRG-98507 Rev. B	SPe	WYu
28-Aug-14	TMCLKDUGEN-PRG-98507 Rev. C	CLa	WYu
30-Oct-15	TMCLKDUGEN-PRG-98507 Rev. F	WYu	

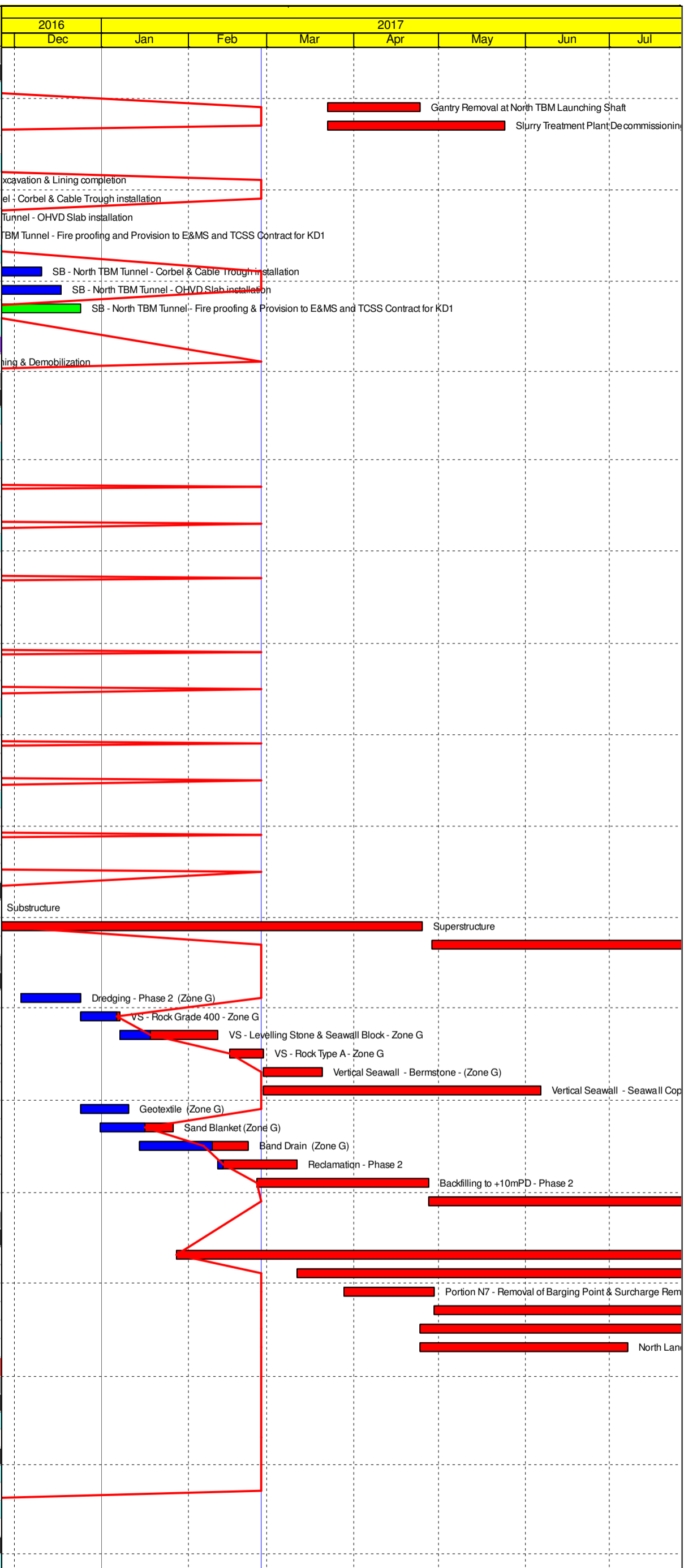


- █ Planned Bar
- █ Planned Bar - Critical
- ◆ Planned Milestone
- █ Progress bar
- ◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDJGEN-PRG-98507	WYu	SPe
08-Apr-14	TMCLKDJGEN-PRG-98507 Rev.B	SPe	WYu
28-Aug-14	TMCLKDJGEN-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDJGEN-PRG-98507 Rev.F	WYu	

Activity Name	
<b>North Approach TBM Tunnelling &amp; Cross Passage</b>	
<b>Construction</b>	
<b>Northern Landfall Surface Setup for TBM operation</b>	
Gantry Removal at North TBM Launching Shaft	
Slurry Treatment Plant De-commissioning & Removal	
Gantry Removal at North Ventilation Shaft	
<b>North Approach Tunnel Internal Structure - NB</b>	
CP51 - Excavation & Lining completion	
NB - North TBM Tunnel - Corbel & Cable Trough installation	
NB - North TBM Tunnel - OHVD Slab installation	
NB - North TBM Tunnel - Fire proofing and Provision to E&MS and TCSS Contract for KD1	
<b>North Approach Tunnel Internal Structure - SB</b>	
SB - North TBM Tunnel - Corbel & Cable Trough installation	
SB - North TBM Tunnel - OHVD Slab installation	
SB - North TBM Tunnel - Fire proofing & Provision to E&MS and TCSS Contract for KD1	
<b>North Approach Cross Passage</b>	
<b>CP51 - Traditional Method</b>	
CP Finishing & Demobilization	
<b>North Ventilation Building</b>	
<b>Design Submission</b>	
<b>(A11) Submissions to Design Advisory Panel of ArchSD</b>	
ArchSD's comment	
<b>(I1) DDA for North Vent.Bldgs. GBP &amp; Arch.Submission</b>	
IPs Review	
IP's No Objection Received	
SO's Review	
SO Approval with Condition Received	
<b>(I1) DDA for North &amp; South Vent.Bldg. ABWF works</b>	
Designer to Reply RTC + Update Submission	
Submit Updated DDA to SO/ICE/IPs	
ICE Approval & Issue Check Cert	
Submit ICE Check Cert to SO	
IPs Review	
IP's No Objection Received	
SO's Review	
SO Approval with Condition Received	
<b>(I2) DDA for North Vent.Bldgs.Structural Design incl.Vent.Connections</b>	
IPs Review	
IP's No Objection Received	
SO's Review	
SO Approval with Condition Received	
<b>(I3) DDA for North &amp; South Vent.Bldgs. Service and E&amp;M Provision</b>	
IPs Review	
IP's No Objection Received	
SO's Review	
SO Approval with Condition Received	
<b>Construction</b>	
Substructure	
Superstructure	
Finishing Works	
<b>North Reclamation (Phase 2)</b>	
<b>Construction</b>	
Dredging - Phase 2 (Zone G)	
VS - Rock Grade 400 - Zone G	
VS - Levelling Stone & Seawall Block - Zone G	
VS - Rock Type A - Zone G	
Vertical Seawall - Bermstone - (Zone G)	
Vertical Seawall - Seawall Coping - (Zone G)	
Geotextile (Zone G)	
Sand Blanket (Zone G)	
Band Drain (Zone G)	
Reclamation - Phase 2	
Backfilling to +10mPD - Phase 2	
Surcharge - Phase 2	
<b>North Surface Roadworks, Utility &amp; Drainage works</b>	
<b>Construction</b>	
North Landfall - Underground Sewerage & Drainage - Summary	
North Landfall - Underground Sewerage & Drainage - Portion N5	
Portion N7 - Removal of Barging Point & Surcharge Removal to +6mPD	
North Landfall - Underground Sewerage & Drainage - Portion N7	
North Landfall - Watermain & Undergourd Utilities - Summary	
North Landfall - Watermain & Undergourd Utilities - Zone E	
<b>Sub-sea Tunnel</b>	
<b>Sub-sea TBM Tunnelling</b>	
<b>Major Procurement</b>	
<b>Precast Semgnet ID12.40 - Production for Sub-sea TBM Tunnel</b>	
ID12.40 TBM Segment Ring Fabrication - 12 rings per day	
<b>Design Submission</b>	
<b>(G1) DDA for TBM Tunnel Lining Structural Design - Sub-sea tunnel</b>	
Sub-sea TBM Tunnel Segment - Fabrication	
<b>(G3) DDA for TBM Tunnel Internal Structures (Sub-sea)</b>	
Sub-sea Tunnel - Precast Gallery Fabrication	
<b>Construction</b>	
<b>Sub-sea TBM Tunnel - NB ID12.2m - S881</b>	

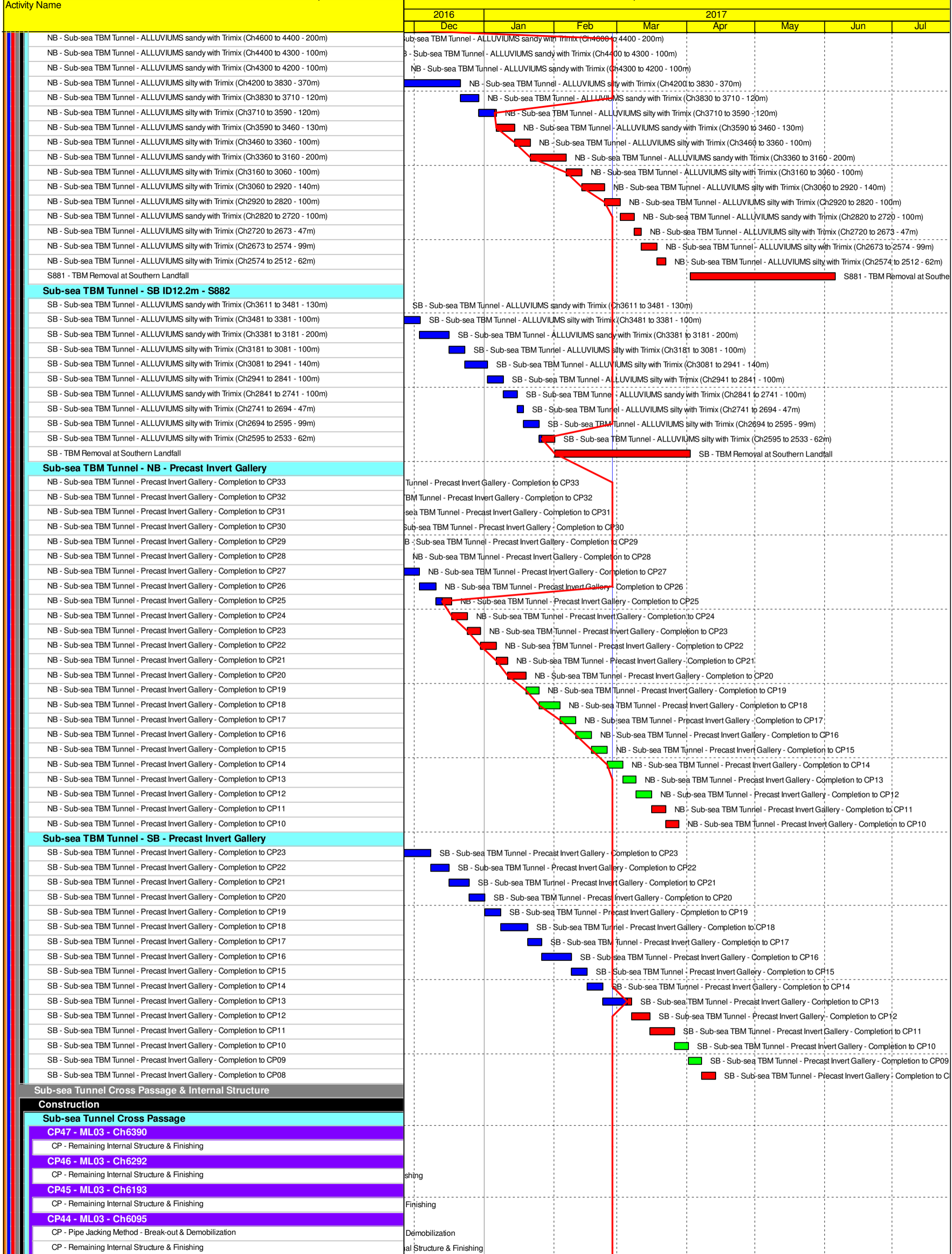


<span style="color: green;">■</span>	Planned Bar
<span style="color: red;">■</span>	Planned Bar - Critical
<span style="color: blue;">■</span>	Progress bar
<span style="color: green;">◆</span>	Planned Milestone
<span style="color: blue;">◆</span>	Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDBJGEN-PRG-98507	WYu	SPe
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30-Oct-15	TMCLKDBJGEN-PRG-98507 Rev.F	WYu	

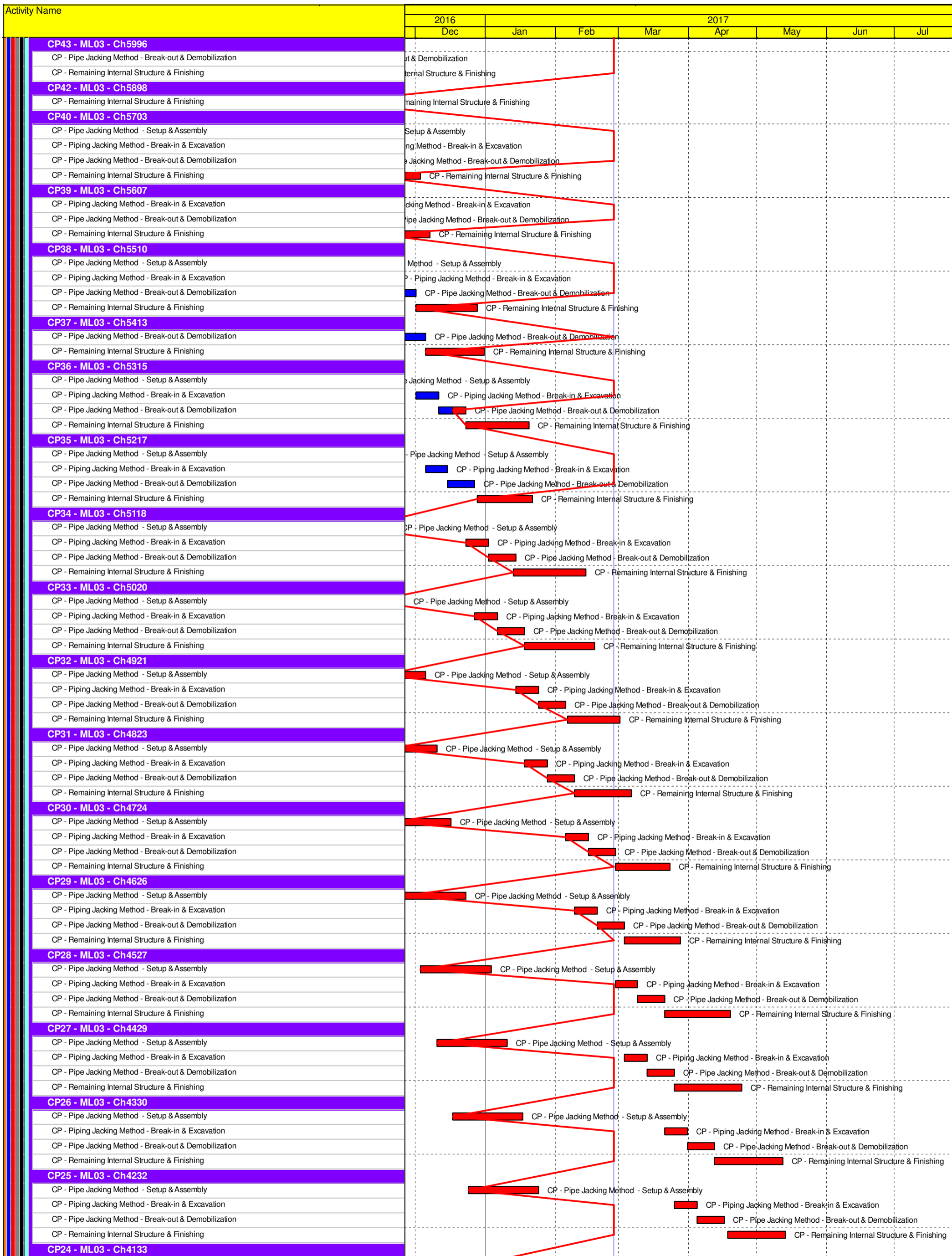




<span style="color: green;">■</span>	Planned Bar
<span style="color: red;">■</span>	Planned Bar - Critical
<span style="color: blue;">◆</span>	Planned Milestone
<span style="color: blue;">■</span>	Progress bar
<span style="color: blue;">◆</span>	Progress Milestone

Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Date	Revision	Checked	Approved
12-Feb-14	TMCLKDUGEN-PRG-98507	WYu	SP
08-Apr-14	TMCLKDUGEN-PRG-98507 Rev.B	SP	WYu
28-Aug-14	TMCLKDUGEN-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDUGEN-PRG-98507 Rev.F	WYu	



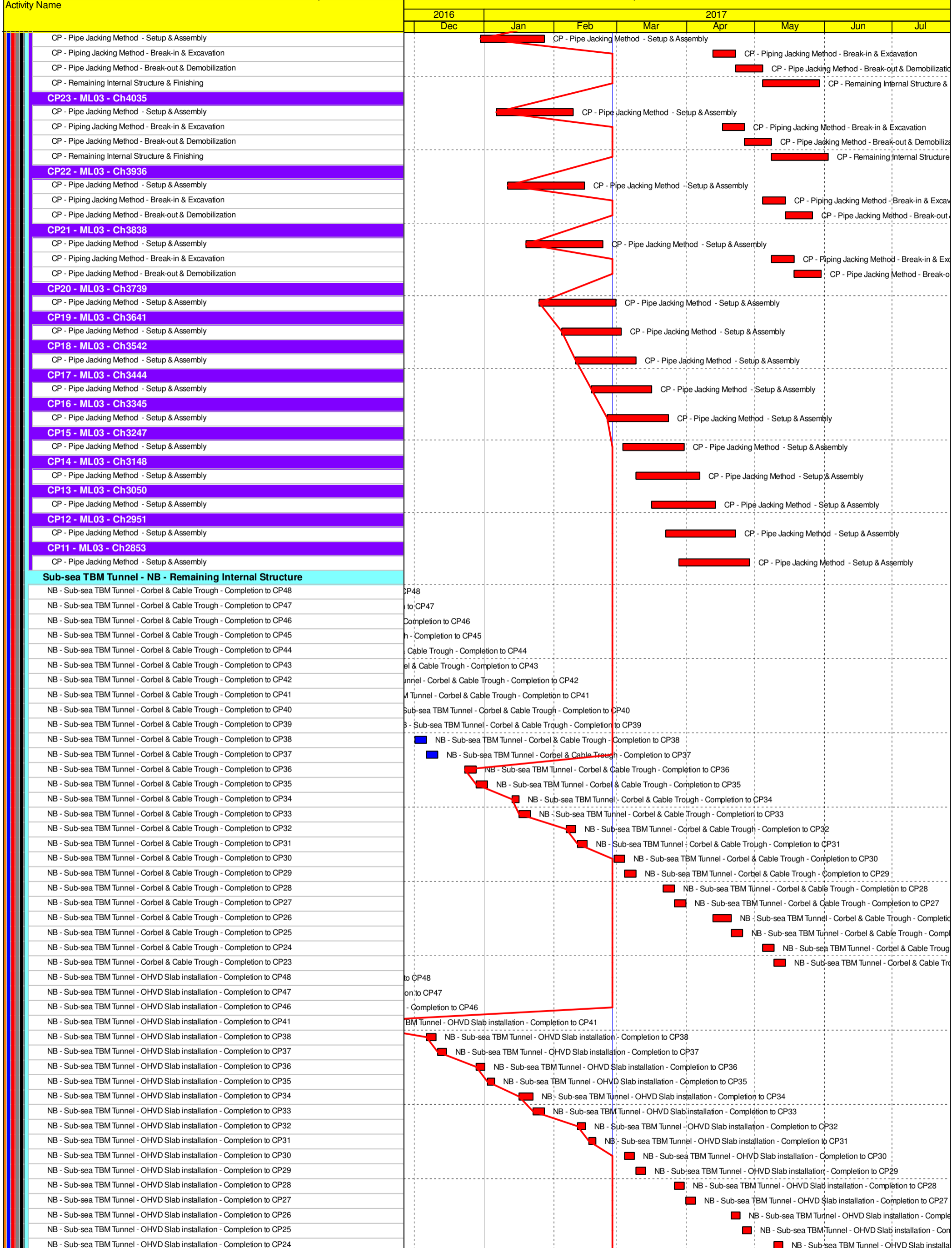
- Planned Bar
- Planned Bar - Critical
- Planned Milestone
- Progress bar
- Progress Milestone

TMCLK - Northern Connection Sub-Sea Tunnel Section  
 Detailed Works Programme (Rev. F)  
 Three Months Rolling Programme  
 Progress as of 26-Feb-17



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDUGEN-PRG-98507	WYu	SP
08-Apr-14	TMCLKDUGEN-PRG-98507 Rev.B	SP	WYu
28-Aug-14	TMCLKDUGEN-PRG-98507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDUGEN-PRG-98507 Rev.F	WYu	

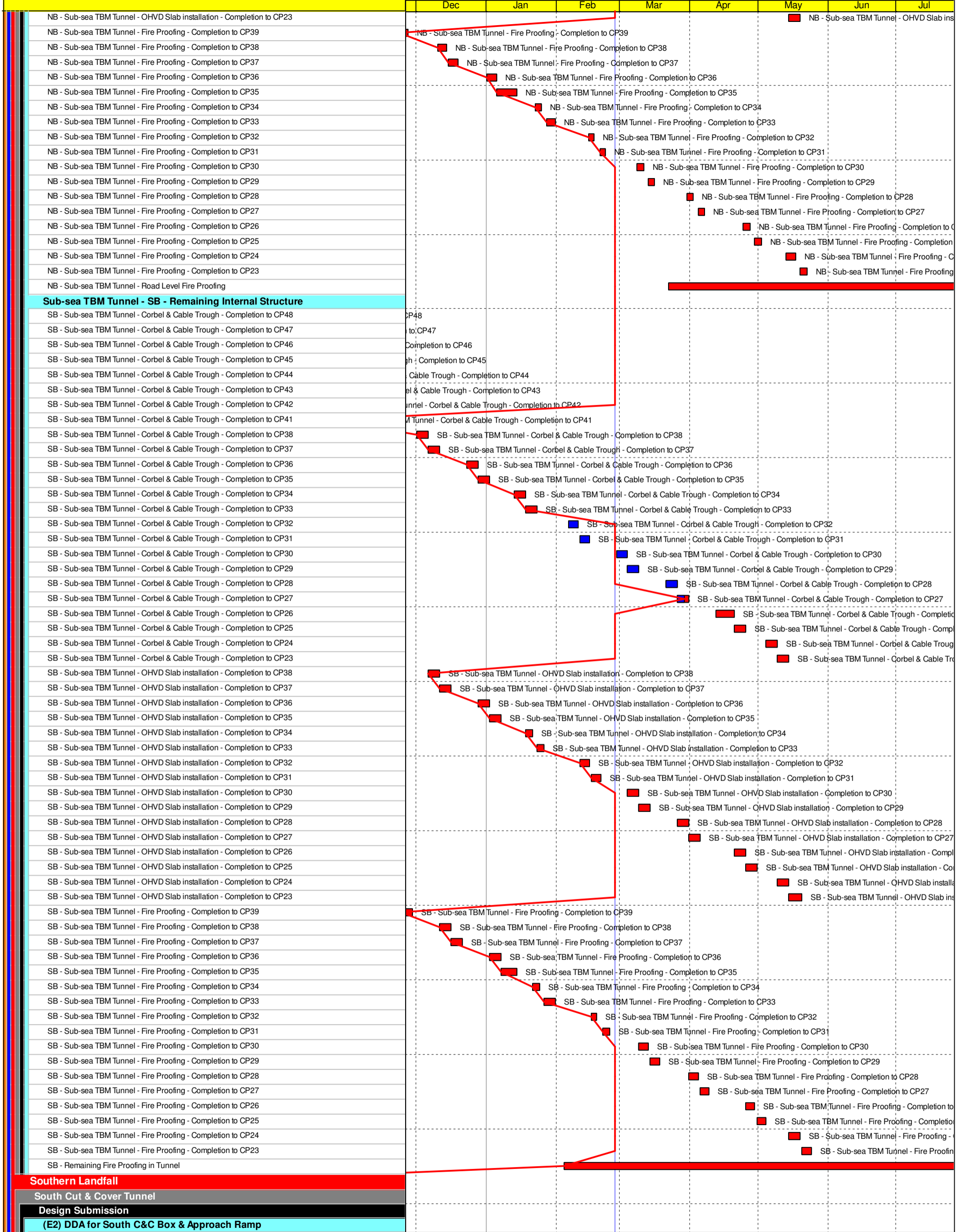




■ Planned Bar  
■ Planned Bar - Critical  
◆ Planned Milestone  
■ Progress bar  
◆ Progress Milestone



Date	Revision	Checked	Approved
12-Feb-14	TMCLKDWPF-PRG-08507	WYu	SPe
08-Apr-14	TMCLKDWPF-PRG-08507 Rev.B	SPe	WYu
28-Aug-14	TMCLKDWPF-PRG-08507 Rev.C	CLa	WYu
30-Oct-15	TMCLKDWPF-PRG-08507 Rev.F	WYu	



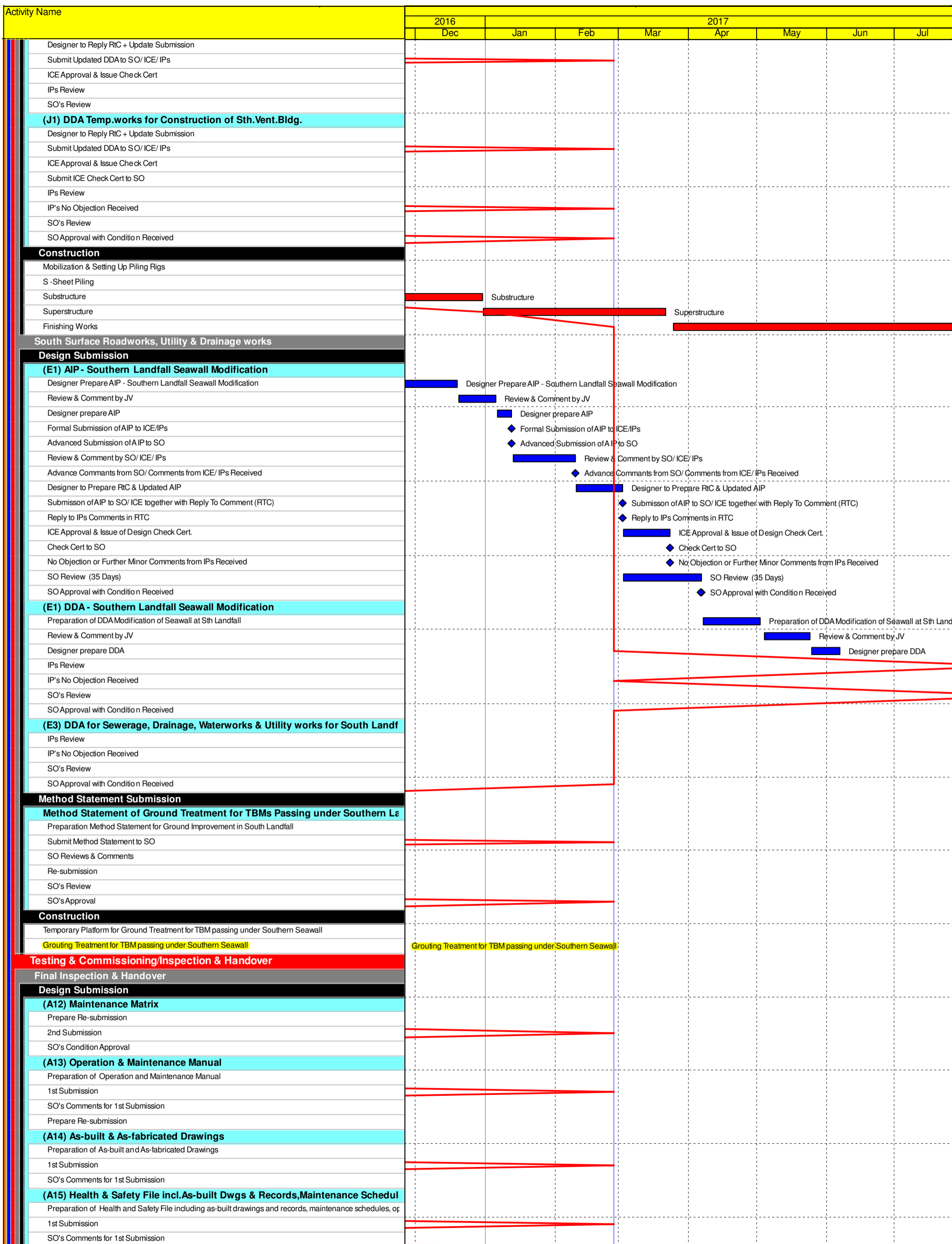
Activity Name	2016							2017	
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Review & Comment by JV									
Designer prepare DDA									
Formal Submission of DDA to ICE/ IPs									
Advanced Submission to SO									
IPs/ SO's Advance Comments/ ICE Comments									
Comments Received									
Designer to Reply RtC + Update Submission									
Submit Updated DDA to SO/ ICE/ IPs									
ICE Approval & Issue Check Cert									
IPs Review									
SO's Review									
<b>Method Statement Submission</b>									
<b>Method Statement of Construction Methodology of C&amp;C Tunnels</b>									
Preparation Method Statement for C&C Tunnels									
Submit Method Statement to SO									
SO Reviews & Comments									
Re-submission									
SO's Review									
<b>Construction</b>									
C&C Tunnel - 4th 85m - Tunnel Structure									
C&C Tunnel - 4th 85m - Backfilling									
C&C Tunnel - 5th 85m - Tunnel Structure									
C&C Tunnel - 5th 85m - Backfilling									
C&C Tunnel - 6th 85m - Tunnel Structure									
C&C Tunnel - 6th 85m - Backfilling									
C&C Tunnel - 7th 67m - Excavation by vertical mean									
C&C Tunnel - 7th 67m - Tunnel Structure									
C&C Tunnel - 7th 67m - Backfilling									
C&C Tunnel - 8th 85m - Excavation by vertical mean									
C&C Tunnel - 8th 85m - Tunnel Structure									
Intermediate Slab									
<b>South Retrieval Shaft</b>									
<b>Design Submission</b>									
<b>(F4) Gantry Crane Support/Foundations in Southern Landfall</b>									
Designer to Reply RtC + Update Submission									
Submit Updated IFA to SO/ ICE/ IPs									
ICE Approval & Issue Check Cert									
IPs Review									
IP's No Objection Received									
SO's Review									
SO Approval with Condition Received									
<b>Method Statement Submission</b>									
<b>Method Statement of Construction Methodology of Retrieval Shaft</b>									
Preparation Method Statement for Retrieval Shaft									
Submit Method Statement to SO									
SO Reviews & Comments									
Re-submission									
SO's Review									
<b>Construction</b>									
South Retrieval Shaft - Diaphragm Wall									
Retrieval Shaft - Temp. Slab/Prepare for TBM Breakthrough									
<b>South Approach Ramp</b>									
<b>Construction</b>									
Approach Ramp (CH1580-1850) - Pipe Pile/Sheet Piles Wall									
Approach Ramp (CH1580-1850) - Tension Piles									
Approach Ramp (CH1580-1800) - Excavation,									
Remaining Approach Tunnel Structure									
<b>South Ventilation Building</b>									
<b>Design Submission</b>									
<b>(1) DDA for South Vent.Bldg. GBP &amp; Arch.Submission</b>									
IPs Review									
IP's No Objection Received									
SO's Review									
SO Approval with Condition Received									
<b>(12) DDA for South Vent.Bldg. Foundation Design</b>									
Review & Comment by JV									
Designer prepare DDA									
Formal Submission of DDA to ICE/ IPs									
Advanced Submission to SO									
IPs/ SO's Advance Comments/ ICE Comments									
Comments Received									
Designer to Reply RtC + Update Submission									
Submit Updated DDA to SO/ ICE/ IPs									
ICE Approval & Issue Check Cert									
IPs Review									
SO's Review									
<b>(12) DDA for South Vent.Bldg.Structural Design incl.Vent.Connections</b>									
Review & Comment by JV									
Designer prepare DDA									
Formal Submission of DDA to ICE/ IPs									
Advanced Submission to SO									
IPs/ SO's Advance Comments/ ICE Comments									
Comments Received									

- Planned Bar
- Planned Bar - Critical
- ◆ Planned Milestone
- Progress bar
- ◆ Progress Milestone



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30-Oct-15	TMCLKDBJGEN-PRG-98507 Rev.F	WYu	





Legend:

- Planned Bar
- Planned Bar - Critical
- Planned Milestone
- Progress bar
- Progress Milestone



Date	Revision	Checked	Approved
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30-Oct-15	TMCLKDJGEN-PRG-98507 Rev.F	WYu	

Annex C

## Location Map



Site location

1.00 公里

Incident area

2.46 公里

測量距離

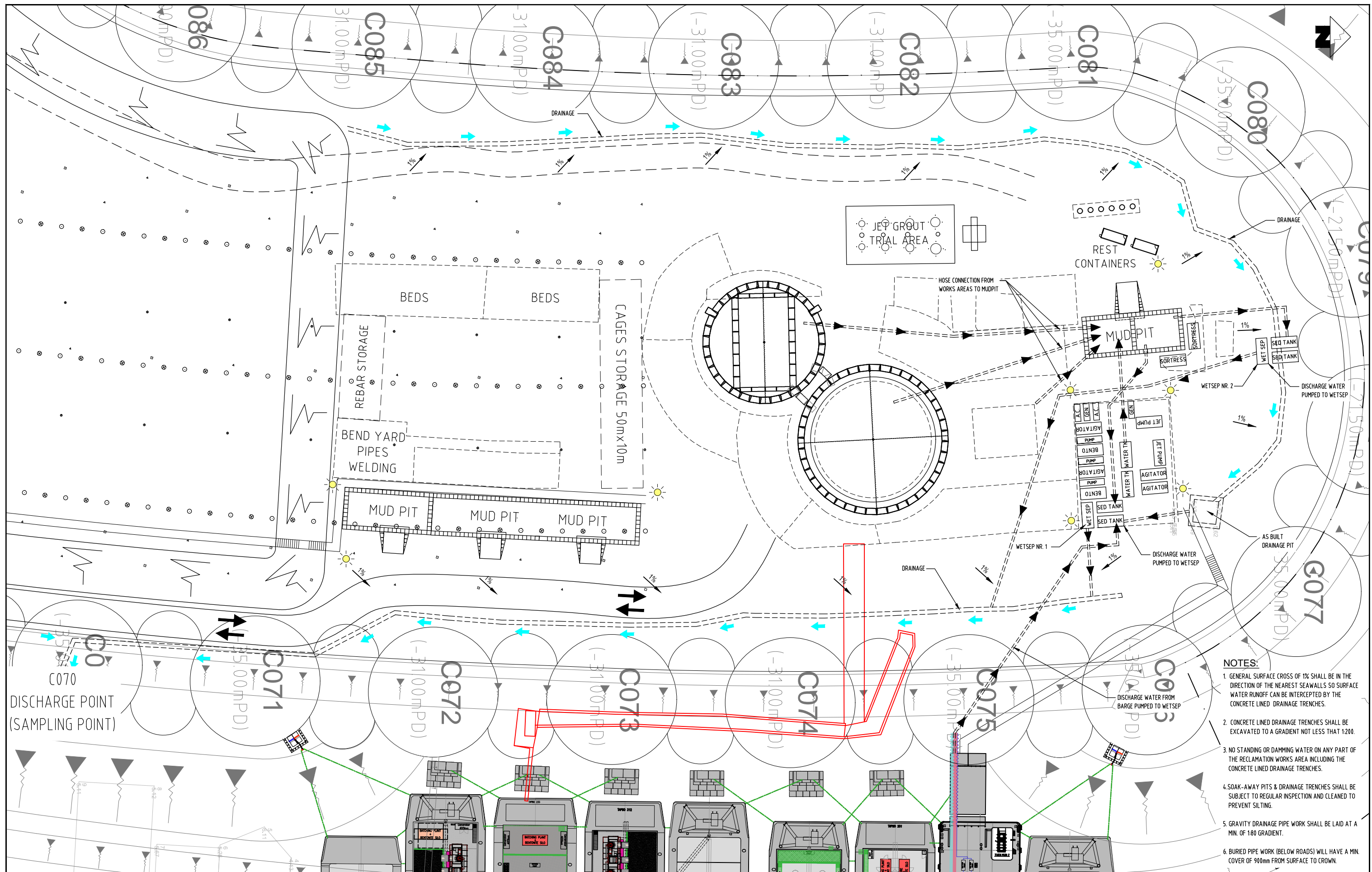
在地圖上按一下即可新增路徑

總距離：2.46 公里 (1.53 英里)

Annex D

## Site Drainage Plan





- NOTES:**
1. GENERAL SURFACE CROSS OF 1% SHALL BE IN THE DIRECTION OF THE NEAREST SEAWALLS SO SURFACE WATER RUNOFF CAN BE INTERCEPTED BY THE CONCRETE LINED DRAINAGE TRENCHES.
  2. CONCRETE LINED DRAINAGE TRENCHES SHALL BE EXCAVATED TO A GRADIENT NOT LESS THAN 1:200.
  3. NO STANDING OR DAMMING WATER ON ANY PART OF THE RECLAMATION WORKS AREA INCLUDING THE CONCRETE LINED DRAINAGE TRENCHES.
  4. SOAK-AWAY PITS & DRAINAGE TRENCHES SHALL BE SUBJECT TO REGULAR INSPECTION AND CLEANED TO PREVENT SILTING.
  5. GRAVITY DRAINAGE PIPE WORK SHALL BE LAID AT A MIN. OF 1:80 GRADIENT.
  6. BURIED PIPE WORK (BELOW ROADS) WILL HAVE A MIN. COVER OF 900mm FROM SURFACE TO CROWN.

Rev.	Date	Drawn	Designed	Verified	Description	Approved
D	27JUL16	AGM	pkv	Ble	UPDATE	SPo
C	15JUN16	pkv	pkv	ACh	WESTSEP NR. 3 REMOVED	SPo
B	14JUN16	pkv	pkv	ACh	DISCHARGE FROM BARGE ADDED	SPo
A	07JUN16	pkv	pkv	BLe	FIRST ISSUE	SPo

Main Contractor

Dragages - Bouygues Joint Venture 宜嘉 - 中鐵建聯營

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

SOUTHERN LANDFALL  
PORTION E1 SURFACE WATER DRAINAGE & DISCHARGE  
ARRANGEMENT - GENERAL LAYOUT

Drawing no.

TMCLKL8-DBJ-SAA-MSI-10026

Scale

NTS

CADD Ref.

SAA-MSI-10026

Issue Status

DFT (DRAFT)

Revision

D



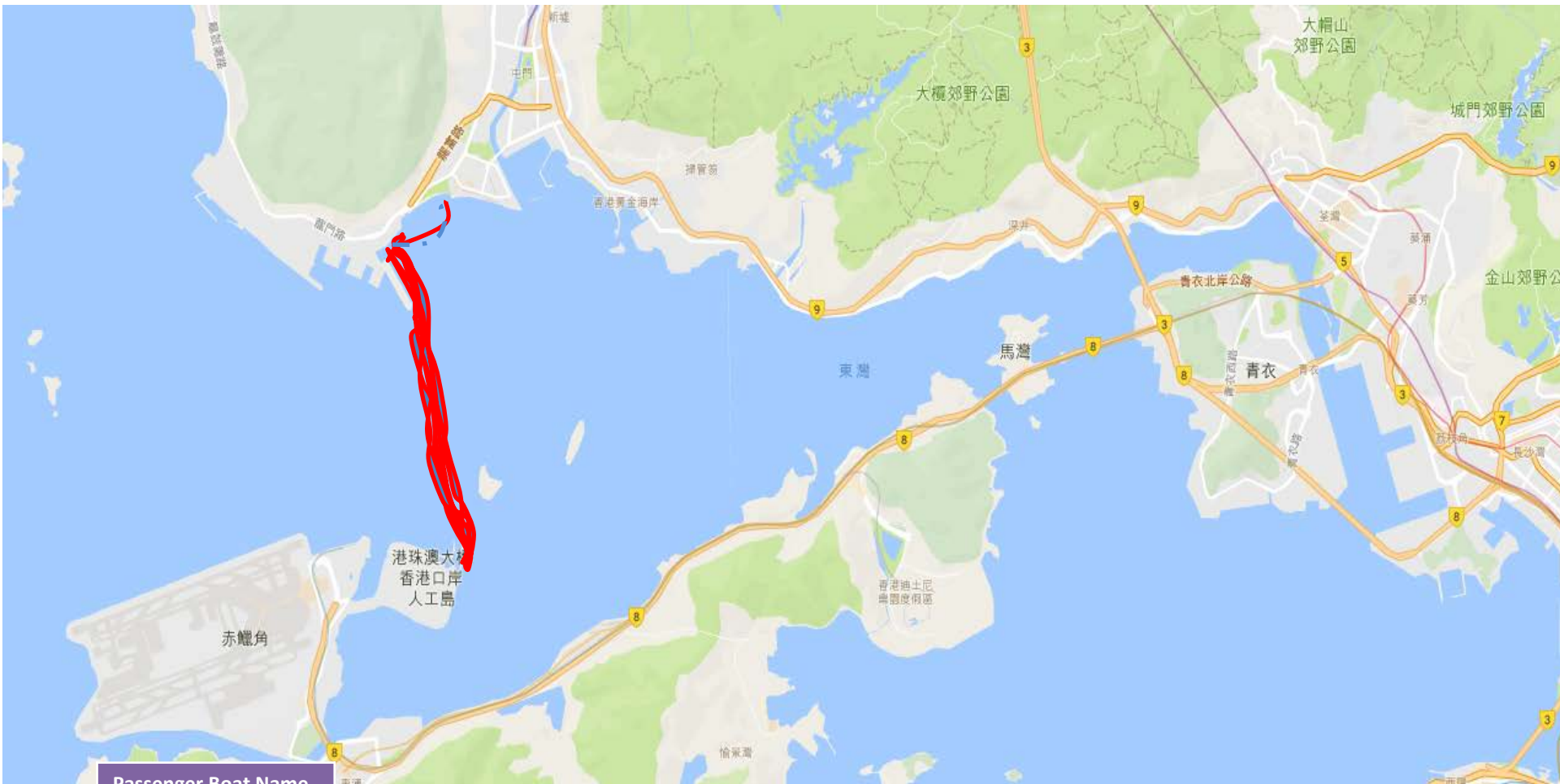
Annex E

## Marine Travel Route Record

Contract No. HY/2012/08

# Tuen Mun-Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section

## Records of Off-site Marine Vessel Routing – March 2017



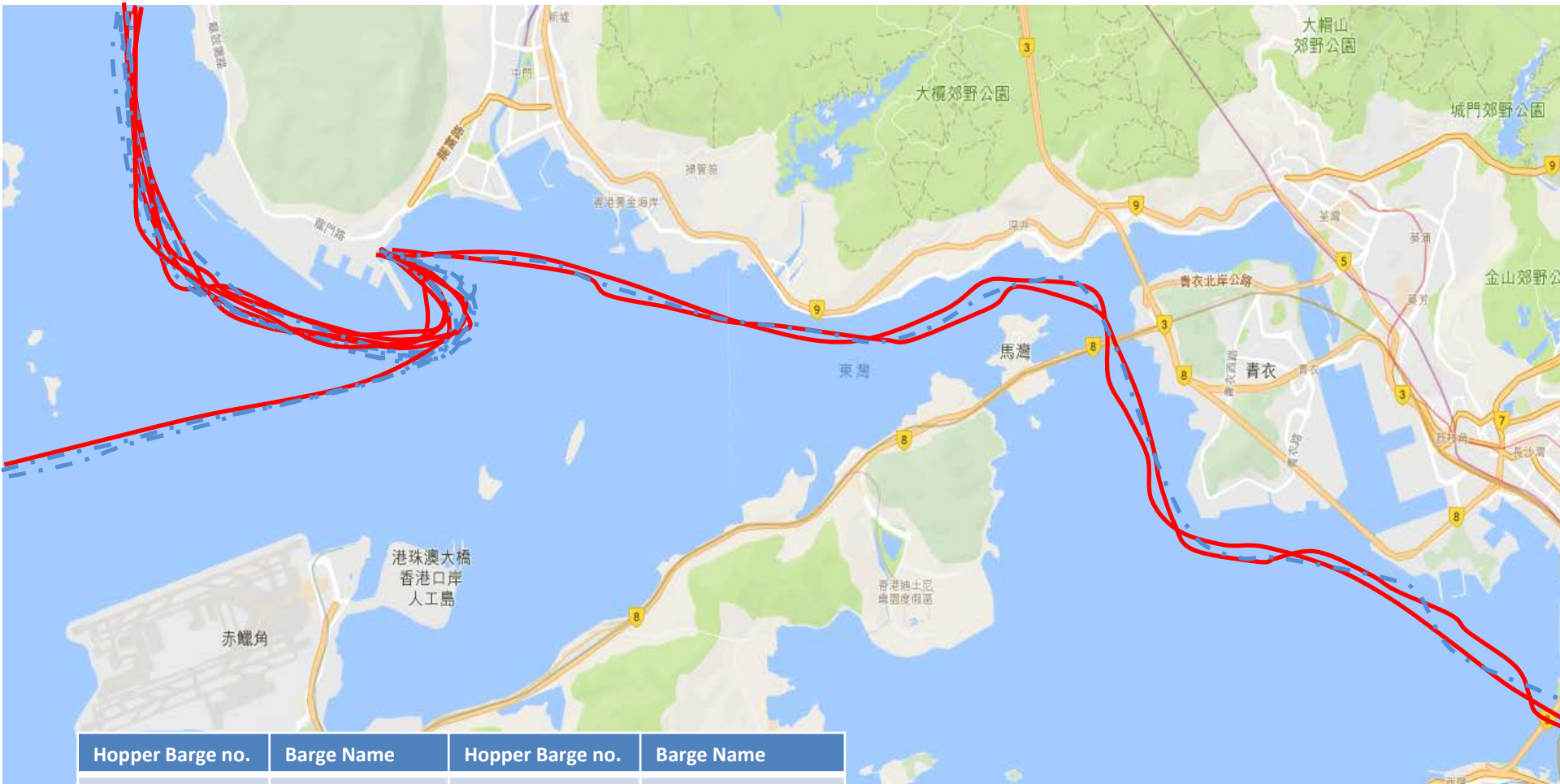
Passenger Boat Name.
Hung Tai 6
Ming Lee 27
Frantonios

--- To Works Area  
— From Works Area

Contract No. HY/2012/08

# Tuen Mun-Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section

## Records of Off-site Marine Vessel Routing – March 2017



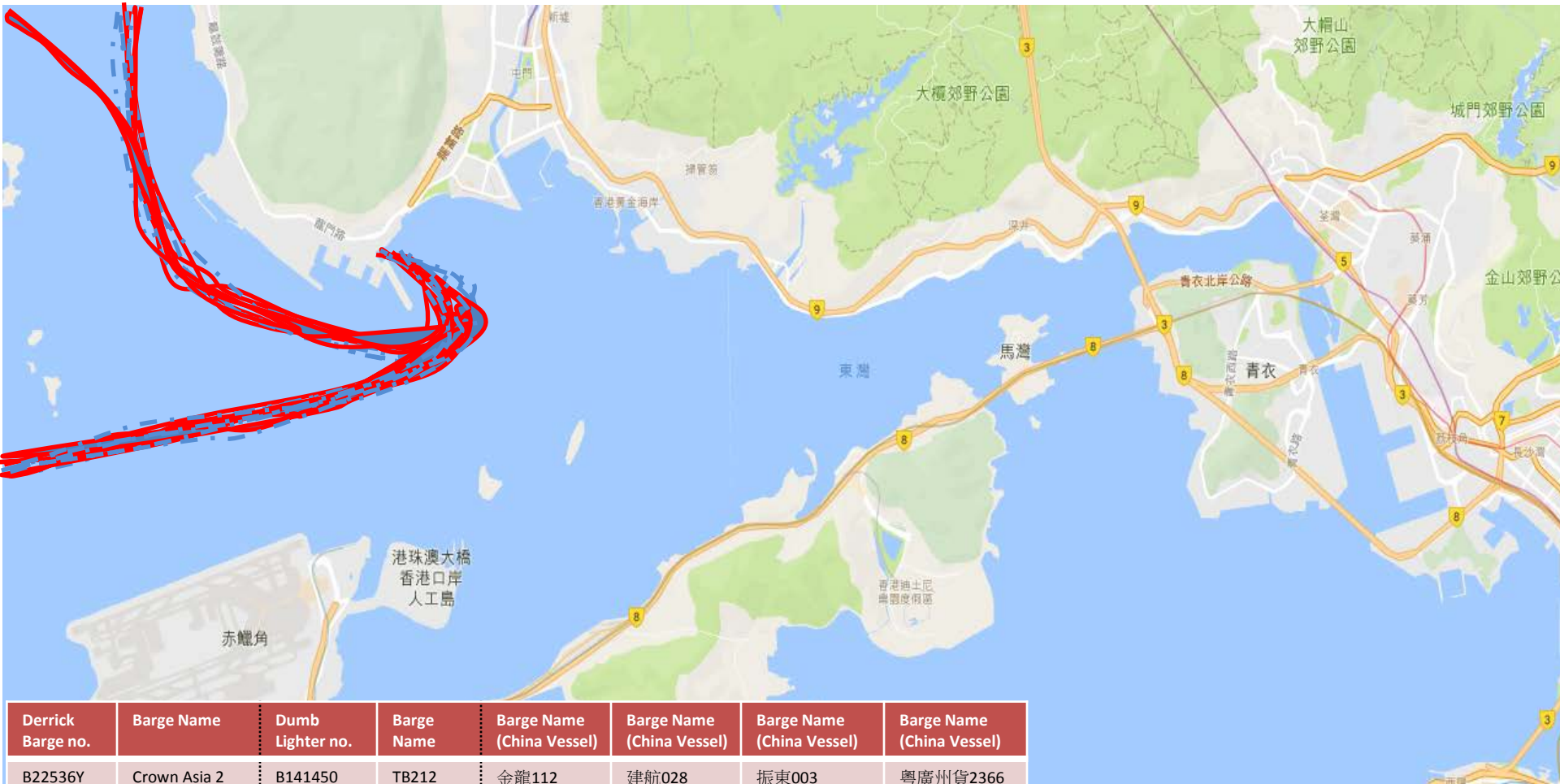
Hopper Barge no.	Barge Name	Hopper Barge no.	Barge Name
B21342V	HB1007S	B21843V	Crown Asia 21
B21396V	SH102		
B21521V	Hang Yang 861		
B21630V	Geoworks SB-1		

--- To Works Area  
— From Works Area

Contract No. HY/2012/08

Tuen Mun-Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section

Records of Off-site Marine Vessel Routing – March 2017



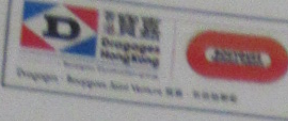
Derrick Barge no.	Barge Name	Dumb Lighter no.	Barge Name	Barge Name (China Vessel)	Barge Name (China Vessel)	Barge Name (China Vessel)	Barge Name (China Vessel)
B22536Y	Crown Asia 2	B141450	TB212	金龍112	建航028	振東003	粵廣州貨2366
B22570Y	Crown Asia 11			金龍113	建航036	振東988	粵廣州貨3662
B22600Y	Crown Asia 12			金龍119	建航066	嘉信878	粵廣州貨4866
B21702Y	Crown Asia 13			金龍663	建航118	聯福88	BM40614Y - Leung Ngau Chai
B21507V	Crown Asia 15			金龍883	建航287	粵廣州貨1062	

- - - - - To Works Area  
————— From Works Area

Annex F

## Wetsep Record





WETSEP Location 污水處理機位置: 28  
Date 日期: 20-3-2017 to 26-3-2017

	Monday 星期一	Tuesday 星期二	Wednesday 星期三	Thursday 星期四	Friday 星期五	Saturday 星期六	Sunday 星期日
1. WETSEP In Normal Operation? 處理機是否正常運作?	✓	✓	✓	✓	✓	✓	✓
2. pH Value 酸鹼度 (6.0-9.0)	8.6	8.6	8.7	8.6	7.8	7.6	7.9
3. Electrical Supply OK? 電力供應正常?	✓	✓	✓	✓	✓	✓	✓
4. Outlet Abnormal? (Any Sludge? Any Colour Change? Flowrate?) 出水口有否異常? (污泥有否積聚? 顏色有否改變? 流量有否異常?)	有異常	有異常	有異常	有異常	無	無	無
5. Potion Enough? 藥水是否足夠?	✓	✓	✓	✓	✓	✓	✓
6. Clean the Sedimentation Tank? 有否清理隔沙缸?	有 09:00	有 09:00	有 09:00	有 09:00	有	有	有
7. Clean the De-silt Basin? 有否清理蓄泥池?	有 09:30	有 09:30	有 09:30	有 09:30	有	有	有
8. Are the Cleansing Records of Sedimentation Tank/ De-silt Basin Stored Properly? 清理蓄泥池記錄是否妥善儲存?	✓	✓	✓	✓	✓	✓	✓
9. Others 其他情況	一切正常	一切正常	一切正常	一切正常	/	/	/
Verified by Site Foreman/Supervisor 地盤管工/監督簽署確認							

\*Please - tick (✓) in the box if the condition is normal. \*若情況正常, 請於方格內加上剔號(✓).  
cross (X) in the box if the condition is abnormal, and write down the non-conformance.  
\*若情況不尋常, 請於方格內加上交叉(X), 並寫下不尋常狀況。

Remarks:

(1) Please keep the record and send to environmental department in monthly basis.

備註:

(1) 請將記錄妥善保存, 並每月將記錄交回環保部。

**24/04/2017**



WETSEP Location 污水處理機位置: 28

Date 日期: 27-3-2017 to 29-3-2017

24/04/2017

	Monday 星期二	Tuesday 星期三	Wednesday 星期四	Thursday 星期五	Friday 星期六	Saturday 星期日
1. WETSEP in Normal Operation? 處理機是否正常運作?	✓	✓	✓	✓	✓	✓
2. pH Value 酸鹼度 (6.0 - 9.0)	6.9	7.4	6.7	8.2	8.9	8.6
3. Electrical Supply OK? 電力供應正常?	✓	✓	✓	✓	✓	✓
4. Outlet Abnormal? (Any Sludge? Any Colour Change? Flowrate?) 出水口有否異常? (污泥有否積聚? 顏色有否改變? 流量有否異常?)	無	無	無	無	無	無
5. Potion Enough? 藥水是否足夠?	✓	✓	✓	✓	✓	✓
6. Clean the Sedimentation Tank? 有否清理隔沙缸?	有	有	有	有	有	有
7. Clean the De-silt Basin? 有否清理蓄泥池?	有	有	有	有	有	有
8. Are the Cleansing Records of Sedimentation Tank/ De-silt Basin Stored Properly? 清理蓄泥池記錄是否妥善儲存?	✓	✓	✓	✓	✓	✓
9. Others 其他情況	/	/	/	/	/	異常
Verified by Site Foreman/Supervisor 地盤管工/監督簽署確認	✓	✓	✓	✓	✓	✓

\*Please - tick (✓) in the box if the condition is normal. \*若情況正常, 請於方格內加上剔號(✓).  
cross (X) in the box if the condition is abnormal, and write down the non-conformance.  
\*若情況不尋常, 請於方格內加上交叉(X), 並寫下不尋常狀況。

Remarks:

(1) Please keep the record and send to environmental department in monthly basis.

備註:

(1) 請將記錄妥善保存, 並每月將記錄交回環保部。



Appendix K

## Waste Flow Table

**Monthly Summary Waste Flow Table**

Name of Department: HyD

Contract No. / Works Order No.: HY/2012/08

Monthly Summary Waste Flow Table for May 2017 [to be submitted not later than the 15<sup>th</sup> day of each month following reporting month] (All quantities shall be rounded off to 3 decimal places.)

Month	Monthly Break-down of <u>Inert</u> 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	1097.465	0.000	0.000	0.000	1097.465
Jan-2017	60.781	0.000	0.000	0.000	60.781
Feb-2017	17.367	0.000	0.000	0.000	17.367
Mar-2017	7.508	0.000	0.000	0.000	7.508
Apr-2017	15.603	0.000	0.000	0.000	15.603
May-2017	12.343	0.000	0.000	0.000	12.343
Jun-2017					
Half Year Sub-total					
Jul-2017					
Aug-2017					
Sep-2017					
Oct-2017					
Nov-2017					
Dec-2017					
Project Total Quantities	1211.067	0.000	0.000	0.000	1211.067

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	1.850	1.850	3.150	3.150	6.870	6.870	9.450	9.450	4.935
Jan-2017	0.000	0.000	0.000	0.000	0.000	0.000	3.400	3.400	0.257
Feb-2017	0.000	0.000	0.200	0.200	0.000	0.000	0.000	0.000	0.340
Mar-2017	0.000	0.000	0.000	0.000	0.000	0.000	6.100	6.100	0.286
Apr-2017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.237
May-2017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.300
Jun-2017									
Half Year Sub-total									
Jul-2017									
Aug-2017									
Sep-2017									
Oct-2017									
Nov-2017									
Dec-2017									
Project Total Quantities	1.850	1.850	3.350	3.350	6.870	6.870	18.950	18.950	6.355

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)
20.000	0.000	0.000	0.000	20.000

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 '000 ton)
0.000	0.000	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<sup>3</sup>. (**ER Part 8 Clause 8.8.5 (d) (ii)** refers).