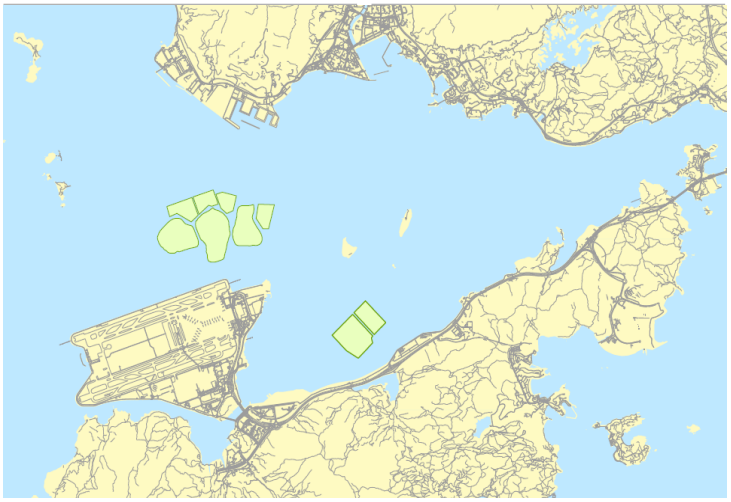

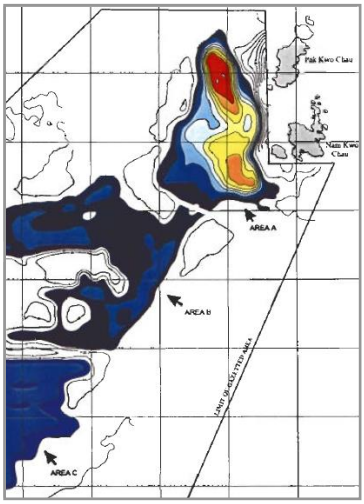

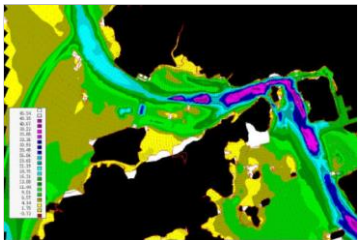

土木工程拓展署
Civil Engineering and Development Department

Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) – Investigation

Agreement No. CE 23/2012(EP)

46th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau – June 2016

Draft (Revision 0)

14 July 2016

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Client:	Project No:
Civil Engineering and Development Department (CEDD)	0175086
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Revision	Description	By	Checked	Approved	Date
v0	46th Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	14/7/16

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Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers

Environmental Certification Sheet
EP-427/2011/A

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	46th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau – June 2016
Date of Report:	14 July 2016
Date prepared by ET:	14 July 2016
Date received by IA:	14 July 2016

Reference EP Condition

Environmental Permit Condition: Condition No.: 4.4

4 hard copies and 1 electronic copy of monthly EM&A Report shall be submitted to the Director within 2 weeks after the end of the reporting month. The EM&A Reports shall include a summary of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels). The submissions shall be certified by the ET Leader and verified by the Independent Auditor. Additional copies of the submission shall be provided to the Director upon request by the Director.

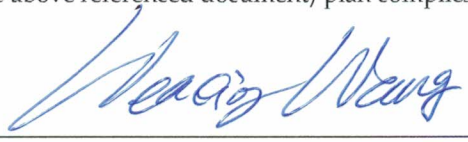
ET Certification

I hereby certify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Craig A. Reid,
Environmental Team Leader:  Date: 14/7/2016

IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Dr Wang Wen Xiong,
Independent Auditor:  Date: 14/7/2016

CONTENTS

ANNEXES

Agreement No. CE 23/2012 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) - Investigation

46TH MONTHLY PROGRESS REPORT FOR JUNE 2016

1.1 BACKGROUND

1.1.1 Since early 1990s, contaminated sediment (1) arising from various construction works (e.g. dredging and reclamation projects) in Hong Kong has been disposed of at a series of seabed pits at East of Sha Chau (ESC). In late 2008, a review indicated that the existing and planned facilities at ESC would not be able to meet the disposal demand after 2012. In order to meet this demand, the Hong Kong Special Administrative Region Government (HKSARG) decided to implement a new contained aquatic disposal (CAD) (2) facility at the South of The Brothers (SB CMPs) which had been under consideration for a number of years.

1.1.2 The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) study completed in 2005 under *Agreement No. CE 12/2002(EP)* (3). The Director of Environmental Protection (DEP) approved this EIA report under the *Environmental Impact Assessment Ordinance* (*Cap. 499*) (*EIAO*) in September 2005 (*EIA Register No.: AEIAR-089/2005*).

1.1.3 In accordance with the EIA recommendation, prior to commencement of construction works for the SB CMPs, the Civil Engineering and Development Department (CEDD) undertook a detailed review and update of the EIA findings for the SB site (4). Findings of the EIA review undertaken in 2009/ 2010 confirmed that the construction and operation of the SB site had been predicted to be environmentally acceptable.

(1) According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 – Confined Marine Disposal as determined according to this TC(W).

(2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.7

(3) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/ East of Sha Chau Area (Agreement No. CE 12/2002(EP))

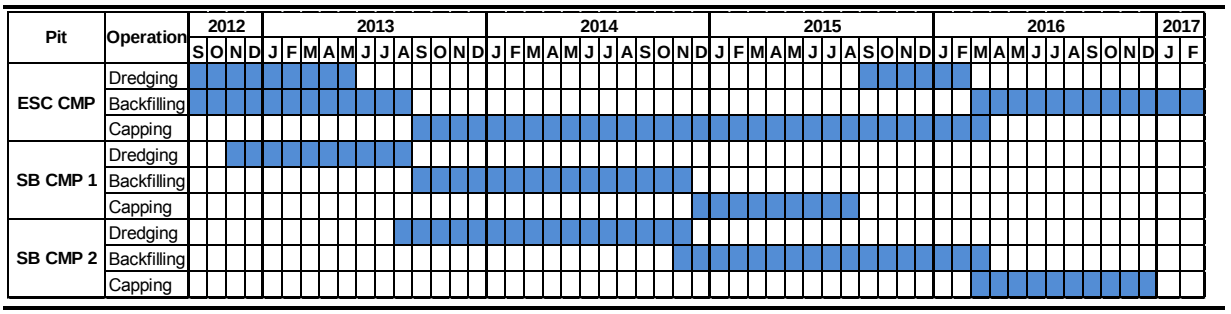
(4) Under the CEDD study *Contaminated Sediment Disposal Facility to the South of The Brothers (Agreement No. FM 2/2009)*

1.1.4 *Environmental Permits (EPs)* (*EP-312/2008/A* and *EP-427/2011A*) were issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 for ESC CMP V and on 23 December 2011 for SB CMPs, respectively. Under the requirements of the *EPs*, an Environmental Monitoring and Audit (EM&A) programme as set out in the EM&A Manuals (1) (2) is required to be implemented for the CMPs.

1.1.5 The present EM&A programme under *Agreement No. CE 23/2012 (EP)* covers the dredging, disposal and capping operations of the SB CMPs as well as ESC CMPs. Detailed works schedule for both CMPs is shown in *Figure 1.1*. In June 2016, the following works were being undertaken at the CMPs:

- Disposal of contaminated mud at ESC CMP Vd; and
- Capping operation at SB CMP 2.

Figure 1.1 Works Schedule for ESC CMPs and SB CMPs



1.2 REPORTING PERIOD

1.2.1 This *46th Monthly Progress Report* covers the EM&A activities for the reporting month of June 2016.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1 The following monitoring activities have been undertaken for ESC CMPs in June 2016:

- *Water Column Profiling of ESC CMP Vd* was undertaken on 6 June 2016;
- *Pit Specific Sediment Chemistry of ESC CMP Vd* was undertaken on 7 June 2016; and

(1) ERM (2012) Environmental Monitoring and Audit (EM&A) Manual. Final First Review. Environmental Monitoring and Audit for Contaminated Mud Pits to the South of the Brothers and at East Sha Chau (2012-2017) – Investigation. Agreement No. CE 23/2012(EP). Submitted to EPD in November 2012.

(2) ERM (2010) Environmental Monitoring and Audit (EM&A) Manual. Final Second Review. Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation. Agreement No. CE 4/2009(EP). Submitted to EPD in November 2010.

- *Cumulative Impact Sediment Chemistry* of *ESC CMP Vd* was undertaken on 8 June 2016;

1.3.2 The following monitoring activities have been undertaken for SB CMPs in June 2016:

- *Water Quality Monitoring during Capping Operations of SB CMP 2* was undertaken on 2 June 2016;

1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS

1.4.1 No outstanding sampling and analysis remained for June 2016.

1.5 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR ESC CMPS

1.5.1 Brief discussion of the monitoring results of the following activities for ESC CMPs is presented in this *46th Monthly Progress Report*:

- *Pit Specific Sediment Chemistry of ESC CMP Vd* in June 2016; and
- *Cumulative Impact Sediment Chemistry of ESC CMP Vd* in June 2016; and
- *Water Column Profiling of ESC CMP Vd* in June 2016.

1.5.2 ***Pit Specific Sediment Chemistry of ESC CMP Vd – June 2016***

1.5.3 Monitoring locations for *Pit Specific Sediment Chemistry for ESC CMP Vd* are shown in *Figure 1.2*. A total of six (6) monitoring stations were sampled in June 2016.

1.5.4 The concentrations of all inorganic contaminants were lower than the Lower Chemical Exceedance Level (LCEL) at all stations, except Copper (*Figures 1* and *2* of *Annex B*). In June 2016, Copper exceeded the LCEL at Active Pit station ESC-NPAA (*Figure 1* of *Annex B*).

1.5.5 For organic contaminants, the concentrations of Total Organic Carbon (TOC) were similar amongst most stations in June 2016 (*Figure 3* of *Annex B*). In June 2016, Tributyltin (TBT) concentrations were higher at Active Pit station ESC-NPAA (*Figure 4* of *Annex B*). Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), Total Polychlorinated Biphenyls (PCBs), Total dichlorodiphenyltrichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) concentrations were below the limit of reporting at all stations in June 2016.

1.5.6 Higher Copper concentrations were recorded within the Active Pit station only which were receiving contaminated mud during the reporting month. Therefore, there is no evidence indicating any dispersal of contaminants from the Active Pit due to the disposal activities.

1.5.7 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vd in June 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

1.5.8 ***Cumulative Impact Sediment Chemistry of ESC CMP Vd – June 2016***

1.5.9 Monitoring locations for *Cumulative Impact Sediment Chemistry for ESC CMP Vd* are shown in *Figure 1.3*. A total of nine (9) monitoring stations were sampled in June 2016.

1.5.10 Analyses of results for the *Cumulative Impact Sediment Chemistry Monitoring* indicated that the concentrations of all inorganic contaminants were below the LCEL in June 2016 (*Figures 5* and *6* of *Annex B*).

1.5.11 For organic contaminants, concentrations of TOC were observed to be similar among all stations (*Figure 7* of *Annex B*). Concentrations of TBTs were recorded to be higher at Ma Wan station (*Figure 8* of *Annex B*). Total DDT, 4,4'-DDE, Total PCBs as well as Low and High Molecular Weight PAHs were recorded below the limit of reporting at all stations.

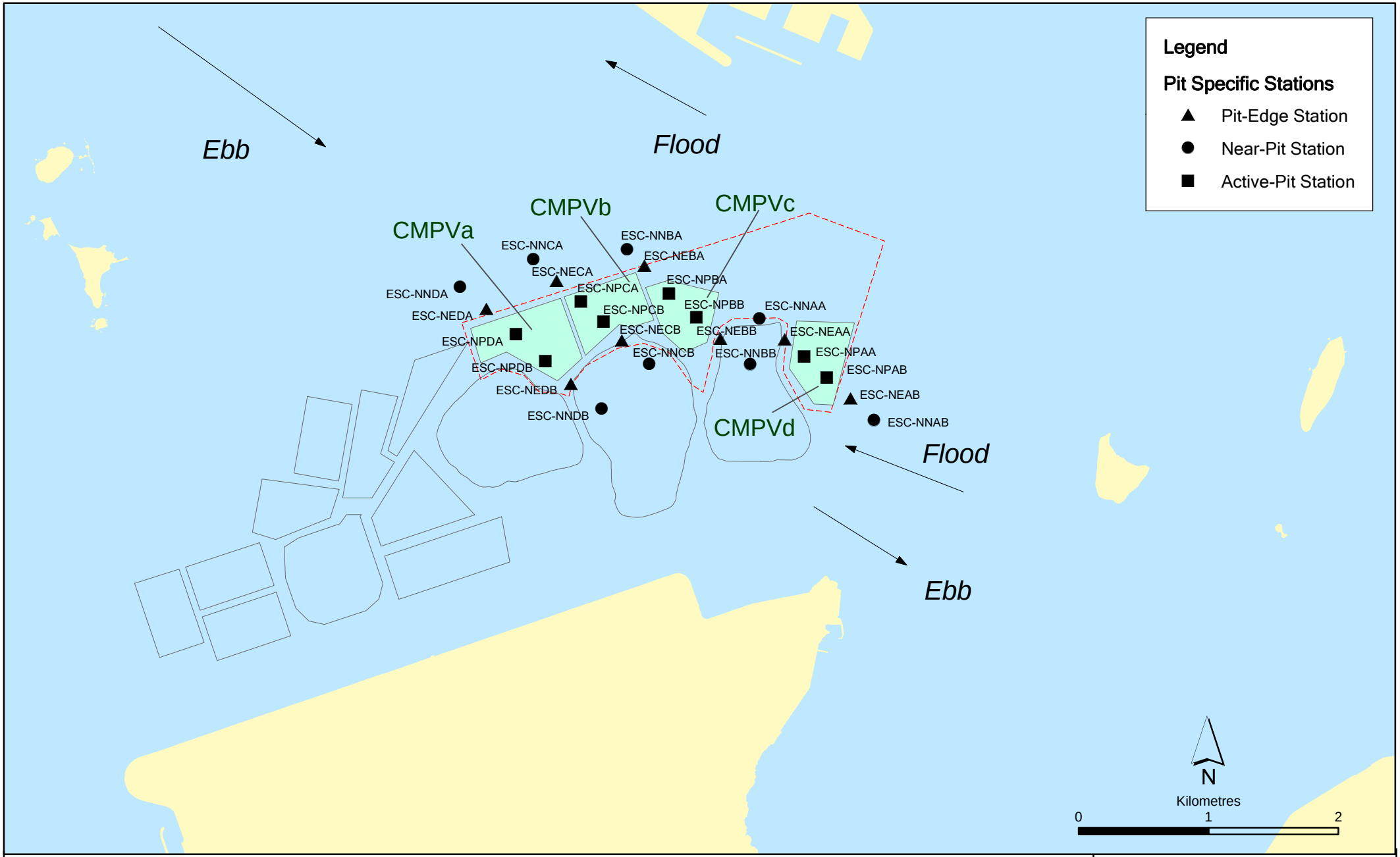


Figure 1.2

Pit Specific Sediment Quality Monitoring Stations for CMPV

File: CMPV\0103262_SQMS_pit specific.mxd
Date: 29/10/2009

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Figure 1.3

Cumulative Impacts Sediment Quality Monitoring Stations for CMPV

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Date: 29/10/2009

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1.5.12 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vd in June 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

1.5.13 ***Water Column Profiling of ESC CMP Vd – June 2016***

1.5.14 *Water Column Profiling* was undertaken on 6 June 2016. The monitoring results have been assessed for compliance with the Water Quality Objectives (WQOs) set by Environmental Protection Department (EPD). This consists of a review of the EPD routine water quality monitoring data for the wet season period (April to October) of 2005 - 2014 from stations in the Northwestern Water Control Zone (WCZ), where the ESC CMPs are located [1]. For Salinity, the averaged value obtained from the Reference stations was used for the basis as the WQO. Levels of Dissolved Oxygen (DO) and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table C1* of *Annex C* for details).

In-situ Measurements

1.5.15 Analyses of results for June 2016 indicated that levels of Salinity, DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table C2* of *Annex C*). In addition, DO and Turbidity at all stations complied with the Action and Limit Levels (*Table C2* of *Annex C*).

Laboratory Measurements for Suspended Solids (SS)

1.5.16 Analyses of results for June 2016 indicated that the SS levels were higher than the WQO at Downstream station. Both Upstream and Downstream stations complied with the Action and Limit Levels (*Table C2* of *Annex C*).

Overall, the monitoring results indicated that the mud disposal operation at ESC CMP Vd did not appear to cause any deterioration in water quality during this reporting period.

[1] http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en

1.6 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR SB CMPS

1.6.1 Brief discussion of the monitoring results of the following activities for SB CMPs is presented in this *46th Monthly Progress Report*:

- *Water Quality Monitoring during Capping Operations of SB CMP 2* in June 2016.

1.6.2 *Water Quality Monitoring during Capping of SB CMP 2 – June 2016*

1.6.3 The monitoring results obtained during June 2016 sampling in the wet season have been assessed for compliance with the WQOs (see *Section 1.5.13* for details). Levels of DO and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table C3* of *Annex C* for details). A total of fourteen (14) monitoring stations were sampled in June 2016 as shown in *Figure 1.4*. Graphical presentation of the monitoring results is provided in *Annex B*.

In-situ Measurements

1.6.4 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in *Figures 9-14* of *Annex B*. Levels of pH at all stations in June 2016 complied with the WQO (*Table C3* of *Annex C*; *Figure 9* of *Annex B*). The levels of Turbidity at all stations complied with the Action and Limit levels in June 2016 (*Table C3* of *Annex C; Figure 10* of *Annex B*). DO at all stations also complied with the WQO and the Action and Limit levels in June 2016 (*Table C3* of *Annex C; Figure 12* of *Annex B*).

Levels of Salinity at most stations exceeded with the WQO except at Impact stations. The lower Salinities recorded at Tai Ho Bay 1 and Tai Ho Bay 2 are likely due to the close proximity of the nearby streams, which release large amount of freshwater runoff in the area during flooding. The Salinities at other stations were higher or above the WQO as they were located further away from the Tai Ho Bay and Reference stations which experienced less freshwater runoff from the nearby streams and Pearl River mouth.

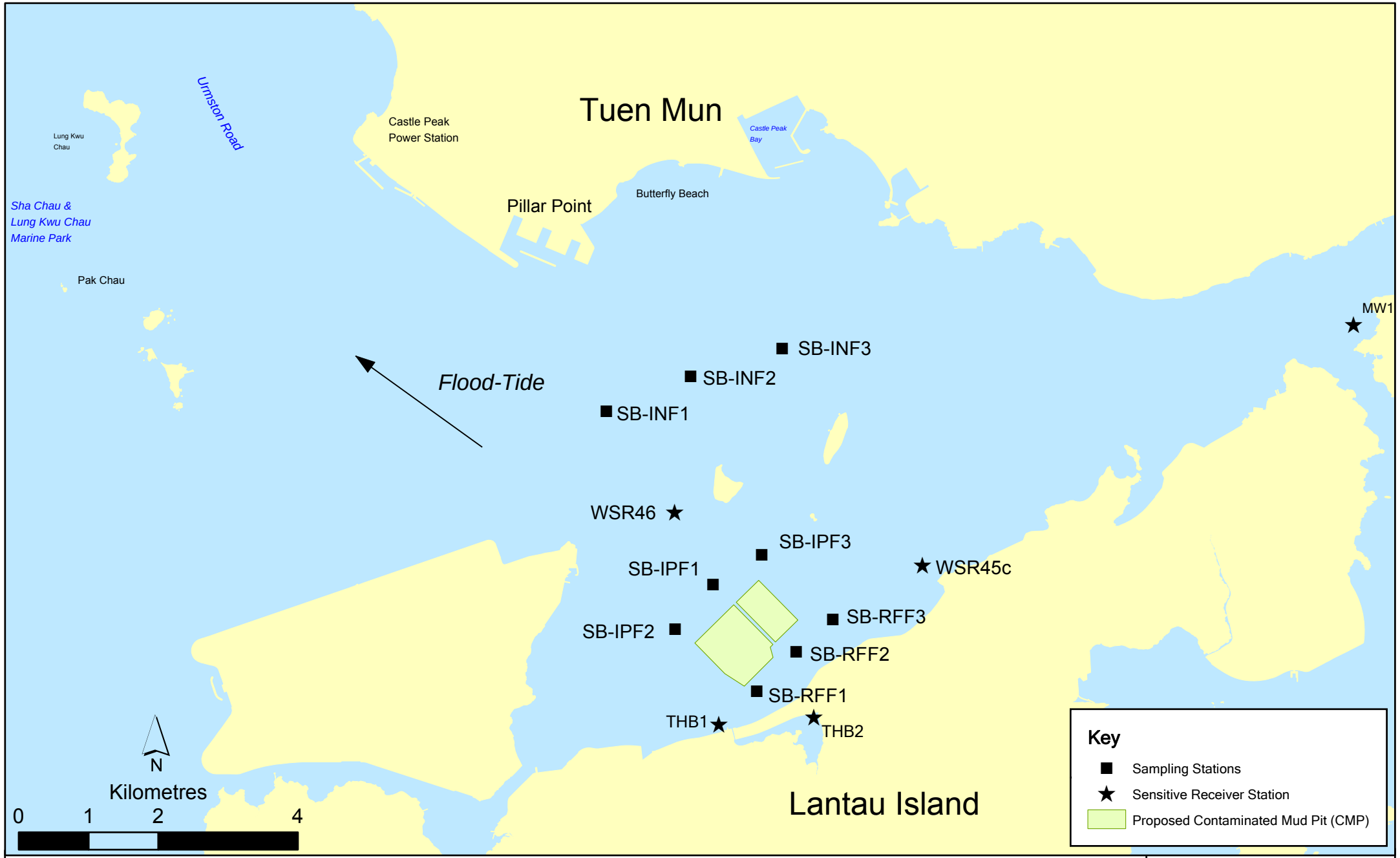

Figure 1.4

Routine & Capping Water Quality Sampling Stations (Flood-Tide) for South Brothers Facility

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Date: 11/12/2012

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Laboratory Measurement

1.6.5 Concentrations of SS were recorded higher than the WQO (11.1 mg/L for wet season) at Tai Mo To, Tai Ho Bay 1 and Tai Ho Bay 2 stations in June 2016 (*Table C4* of *Annex C*; *Figure 15* of *Annex B*). Levels of SS at all stations generally complied with the Action and Limit Levels in June 2016, except the exceedance in Tai Mo To station. Since Tai Mo To station is located further away from the works area of CMP 2 when compared to all other monitoring stations at which the levels of SS did not exceed the Action and Limits Levels during the same tidal period, the exceedance were not considered as indicating any unacceptable impacts from the capping operations to cause any deterioration in water quality during this reporting period. (*Table C3* of *Annex C*).

1.6.6 For nutrients, concentrations of NH_3 were relatively similar amongst all stations (*Table C4* of *Annex* **C; Figure 16 of Annex B**). ***TIN at most stations exceeded the WQO of 0.5 mg/L, except Ma Wan station in June 2016 (*****Table C4** ***of* Annex C; Figure 17** ***of* Annex B**). ***It should be noted that due to effect of Pearl River, the North Western WCZ has historically experienced higher levels of TIN*** [1]. ***Since TIN concentrations were recorded to be similar*** amongst all stations, the exceedances of TIN WQO at all stations are unlikely to be caused by the disposal operation at CMP 2. Levels of BOD_5 appeared to be higher at Tai Ho Bay 2 station in June 2016. (*Table C4* of *Annex C*; *Figure 18* of *Annex B*).

1.6.7 Overall, the monitoring results indicated that the capping operation at CMP 2 did not appear to cause any unacceptable deterioration in water quality in June 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether the capping operations at CMP 2 is causing any unacceptable impacts in water quality of the area.

1.7 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.7.1 The following monitoring activities will be conducted in the next monthly period of July 2016 for ESC CMPs:

- *Water Column Profiling of ESC CMP Vd*;
- *Routine Water Quality Monitoring of ESC CMP Vd*;
- *Pit Specific Sediment Chemistry of ESC CMP Vd; and*
- *Demersal Trawling of ESC CMP Vd.*

(1) http://www.epd.gov.hk/epd/misc/marine_quality/1986-2005/textonly/eng/index.htm

1.7.2 No monitoring activities will be scheduled in the next monthly period of July 2016 for SB CMPs.

1.7.3 The sampling schedule is presented in *Annex A*.

1.8 STUDY PROGRAMME

1.8.1 A summary of the Study programme is presented in *Annex D*.

Annex A

Sampling Schedule

Annex A1 - Environmental Monitoring and Audit Sampling Schedule for East of Sha Chau (September 2012 - February 2017)

		2012				2013												2014												2015												2016												2017	
Pit Specific Sediment Chemistry	**Code**	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Active-Pit																																																						
	ESC-NPDA	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*
	ESC-NPDB	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*
Pit-Edge																																																						
	ESC-NEDA	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*
	ESC-NEDB	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*
Near-Pit																																																						
	ESC-NNDA	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*
	ESC-NNDB	*	*	*	*	*	*	*	*	*	*	*	*																													*	*	*	*	*	*	*	*	*	*	*	*

Cumulative Impact Sediment Chemistry	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Near-field Stations																																																						
ESC-RNA				*		*				*		*																																										
ESC-RNB				*		*				*		*																																										
Mid-field Stations																																																						
ESC-RMA				*		*				*		*																																										
ESC-RMB				*		*				*		*																																										
Capped Pit Stations																																																						
ESC-RCA				*		*				*		*																																										
ESC-RCB				*		*				*		*																																										
Far-Field Stations																																																						
ESC-RFA				*		*				*		*																																										
ESC-RFB				*		*				*		*																																										
Ma Wan Station																																																						
MW1				*		*				*		*																																										

Sediment Toxicity Tests	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Near-Field Stations																																																						
ESC-TDA						*						*																																										
ESC-TDB						*						*																																										
Reference Stations																																																						
ESC-TRA						*						*																																										
ESC-TRB						*						*																																										
Ma Wan Station																																																						
MW1						*						*																																										

Tissue/ Whole Body Sampling	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Impact Stations																																																						
ESC-INA						*						*																																										
ESC-INB						*						*																																										
Reference																																																							
ESC-TNA						*						*																																										
ESC-TNB						*						*																																										
ESC-TSA						*						*																																										
ESC-TSB						*						*																																										

Demersal Trawling	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Impact Stations																																																					
ESC-INA					*	*					*	*																																								
ESC-INB					*	*					*	*																																								
Reference Stations																																																						
ESC-TNA					*	*					*	*																																								
ESC-TNB					*	*					*	*																																								
ESC-TSA					*	*					*	*																																								
ESC-TSB					*	*					*	*																																								

Water Column Profiling		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Plume Stations	WCP1	*	*	*	*	*	*	*	*	*	*	*	*																																									
	WCP2	*	*	*	*	*	*	*	*	*	*	*	*																																									

Annex A1 - Environmental Monitoring and Audit Sampling Schedule for East of Sha Chau (September 2012 - February 2017)

	2012				2013												2014												2015												2016												2017	
Benthic Recolonisation Studies	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Capped Contaminated Mud Pits IVa-c																																																			
ESC-CPA				*								*				*								*				*								*				*								*				*		
ESC-CPB				*								*				*								*				*								*				*								*				*		
ESC-CPC				*								*				*								*				*								*				*								*				*		
Reference Stations																																																					
ESC-RBA				*								*				*								*				*								*				*								*				*		
ESC-RBB				*								*				*								*				*								*				*								*				*		
ESC-RBC				*								*				*								*				*								*				*								*				*		

	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Impact Monitoring for Dredging																																																					
Upstream/Reference Stations																																																					
US1	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
US2	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
Downstream/Impact Stations																																																					
DS1	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
DS2	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
DS3	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
DS4	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
DS5	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													
Ma Wan Station																																																					
MW1	*	*	*	*	*	*	*	*	*																												*	*	*	*	*	*													

	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Capping																																																					
Ebb Tide																																																					
Impact Station																																																						
ESC-IPE1																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPE2																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPE3																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPE4																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPE5																*		*				*		*				*		*				*		*				*								*				*		
Intermediate Station																																																					
ESC-INE1																*		*				*		*				*		*				*		*				*								*				*		
ESC-INE2																*		*				*		*				*		*				*		*				*								*				*		
ESC-INE3																*		*				*		*				*		*				*		*				*								*				*		
ESC-INE4																*		*				*		*				*		*				*		*				*								*				*		
ESC-INE5																*		*				*		*				*		*				*		*				*								*				*		
Reference Station																																																					
ESC-RFE1																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFE2																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFE3																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFE4																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFE5																*		*				*		*				*		*				*		*				*								*				*		
Ma Wan Station																																																					
MW1																*		*				*		*				*		*				*		*				*								*				*		
Flood Tide																																																					
Impact Station																																																					
ESC-IPF1																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPF2																*		*				*		*				*		*				*		*				*								*				*		
ESC-IPF3																*		*				*		*				*		*				*		*				*								*				*		
Intermediate Station																																																					
ESC-INF1																*		*				*		*				*		*				*		*				*								*				*		
ESC-INF2																*		*				*		*				*		*				*		*				*								*				*		
ESC-INF3																*		*				*		*				*		*				*		*				*								*				*		
Reference Station																																																					
ESC-RFF1																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFF2																*		*				*		*				*		*				*		*				*								*				*		
ESC-RFF3																*		*				*		*				*		*				*		*				*								*				*		
Ma Wan Station																																																					
MW1																*		*				*		*				*		*				*		*				*								*				*		

Annex A1 - Environmental Monitoring and Audit Sampling Schedule for East of Sha Chau (September 2012 - February 2017)

Routine Water Quality Monitoring	2012				2013												2014												2015												2016												2017	
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Ebb Tide																																																					
Impact Station																																																					
ESC-IPE1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPE2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPE3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPE4		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPE5		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Intermediate Station																																																					
ESC-INE1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INE2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INE3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INE4		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INE5		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Reference Station																																																					
ESC-RFE1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFE2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFE3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFE4		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFE5		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Ma Wan Station																																																					
MW1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Flood Tide																																																					
Impact Station																																																					
ESC-IPF1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPF2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-IPF3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Intermediate Station																																																					
ESC-INF1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INF2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-INF3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Reference Station																																																					
ESC-RFF1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFF2		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
ESC-RFF3		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*
Ma Wan Station																																																					
MW1		*	*		*	*		*	*		*	*																																*	*		*	*		*	*		*	*

Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

Baseline Monitoring Prior to Dredging	Code	Frequency	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
			2012						2013												2014												2015												2016												2017	
Far Field Stations																																																													
	SB-WFA	3 days per week for 4 weeks	*	*																																																								
	SB-WFB	3 days per week for 4 weeks	*	*																																																								
Mid Field Stations																																																														
	SB-WMA	3 days per week for 4 weeks	*	*																																																								
	SB-WMB	3 days per week for 4 weeks	*	*																																																								
Near Field Stations																																																													
	SB-WNAA	3 days per week for 4 weeks	*	*																																																								
	SB-WNAB	3 days per week for 4 weeks	*	*																																																								
	SB-WNBA	3 days per week for 4 weeks	*	*																																																								
	SB-WNBB	3 days per week for 4 weeks	*	*																																																								
Reference Stations																																																													
	NM1	3 days per week for 4 weeks	*	*																																																								
	NM2	3 days per week for 4 weeks	*	*																																																								
	NM3	3 days per week for 4 weeks	*	*																																																								
	NM5	3 days per week for 4 weeks	*	*																																																								
	NM6	3 days per week for 4 weeks	*	*																																																								
Sensitive Receiver Stations																																																												
	MW1	3 days per week for 4 weeks	*	*																																																								
	THB1	3 days per week for 4 weeks	*	*																																																								
	THB2	3 days per week for 4 weeks	*	*																																																								
	WSR45C	3 days per week for 4 weeks	*	*																																																								
	WSR46	3 days per week for 4 weeks	*	*																																																								

Impact Monitoring for Dredging			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Upstream Stations																																																												
	US1	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	US2	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
Downstream Stations																																																											
	DS1	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	DS2	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	DS3	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	DS4	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	DS5	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
Sensitive Receiver Stations																																																												
	MW1	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	THB1	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	THB2	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	WSR45C	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												
	WSR46	3 days per week					*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																												

Pit Specific Sediment Chemistry			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
SB CMP 1 Active																																																											
Near-Pit																																																											
	SB-NNAA	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
	SB-NNAB	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
Pit-Edge																																																											
	SB-NEAA	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
	SB-NEAB	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
Active-Pit																																																											
	SB-NPAA	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
	SB-NPAB	Monthly													12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																												
SB CMP 2 Active																																																										
Near-Pit																																																											
	SB-NNBA	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														
	SB-NNBB	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														
Pit-Edge																																																											
	SB-NEBA	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														
	SB-NEBB	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														
Active-Pit																																																											
	SB-NPBA	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														
	SB-NPBB	Monthly																															12	12	12	12	12	12	12	12	12	12	12	12	12														

Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

Cumulative Impact Sediment Chemistry			2012						2013											2014											2015											2016											2017	
			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Near-field Stations																																																					
	SB-RNA	4 times per year														12				12		12				12		12				12						12		12				12		12											
	SB-RNB	4 times per year														12				12		12				12		12				12						12		12				12		12											
Mid-field Stations																																																					
	SB-RMA	4 times per year														12				12		12				12		12				12						12		12				12		12											
	SB-RMB	4 times per year														12				12		12				12		12				12						12		12				12		12											
Far-Field Stations																																																					
	SB-RFA	4 times per year														12				12		12				12		12				12						12		12				12		12											
	SB-RFB	4 times per year														12				12		12				12		12				12						12		12				12		12											
Capped Pit Stations																																																					
	SB-RCA	4 times per year														12				12		12				12		12				12						12		12				12		12											
	SB-RCB	4 times per year														12				12		12				12		12				12						12		12				12		12											
Sensitive Receiver Stations																																																				
	MW1	4 times per year														12				12		12				12		12				12						12		12				12		12											
	THB1	4 times per year														12				12		12				12		12				12						12		12				12		12											
	THB2	4 times per year														12				12		12				12		12				12						12		12				12		12											

Sediment Toxicity Tests			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
SB CMP 1 Active																																																					
Reference																																																						
	SB-TRA	2 times per year														5						5				5																														
	SB-TRB	2 times per year														5						5				5																														
Near-Field																																																					
	SB-TAA	2 times per year														5						5				5																														
	SB-TAB	2 times per year														5						5				5																														
Sensitive Receiver Stations																																																					
	MW1	2 times per year														5						5				5																														
	THB1	2 times per year														5						5				5																														
	THB2	2 times per year														5						5				5																														
SB CMP 2 Active																																																						
Reference																																																						
	SB-TRA	2 times per year																																5						5						5											
	SB-TRB	2 times per year																																5						5						5											
Near-Field																																																						
	SB-TBA	2 times per year																																5						5						5											
	SB-TBB	2 times per year																																5						5						5											
Sensitive Receiver Stations																																																					
	MW1	2 times per year																																5						5						5											
	THB1	2 times per year																																5						5						5											
	THB2	2 times per year																																5						5						5											

Tissue/ Whole Body Sampling			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Near-Pit Stations																																																					
	SB-INA	2 times per year																			*						*							*						*						*											
	SB-INB	2 times per year																			*						*							*						*						*											
Reference North																																																					
	TNA	2 times per year																			*						*							*						*						*											
	TNB	2 times per year																			*						*							*						*						*											
Reference South																																																					
	TSA	2 times per year																			*						*							*						*						*											
	TSB	2 times per year																			*						*							*						*						*											

Demersal Trawling			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Impact																																																					
	SB-INA 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				
	SB-INB 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				
Reference North																																																					
	TNA 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				
	TNB 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				
Reference South																																																					
	TSA 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				
	TSB 1-5	4 times per year														5					5	5				5	5					5	5					5	5					5	5					5	5				

Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

			2012						2013												2014												2015												2016												2017	
Routine Water Quality Monitoring			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Ebb Tide																																																										
Impact Stations Downcurrent																																																										
	SB-IPE1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPE2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPE3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPE4	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPE5	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Intermediate Stations Downcurrent																																																										
	SB-INE1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INE2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INE3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INE4	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INE5	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Reference Stations Upcurrent																																																										
	SB-RFE1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFE2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFE3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFE4	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFE5	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Sensitive Receiver Stations																																																										
	MW1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	THB1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	THB2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	WSR45C	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	WSR46	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Flood Tide																																																										
Impact Stations Downcurrent																																																										
	SB-IPF1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPF2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-IPF3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Intermediate Stations Downcurrent																																																										
	SB-INF1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INF2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-INF3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Reference Stations Upcurrent																																																										
	SB-RFF1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFF2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	SB-RFF3	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
Sensitive Receiver Stations																																																										
	MW1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	THB1	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	THB2	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	WSR45C	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												
	WSR46	8 times per year														8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8												

Water Column Profiling			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Plume Stations	WCP1	Monthly														4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4											
	WCP2	Monthly														4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4											

Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

			2012						2013												2014												2015												2016												2017	
Capping Water Quality Monitoring			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Ebb Tide																																																							
Impact Stations Downcurrent																																																									
	SB-IPE1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPE2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPE3	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPE4	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPE5	4 times per year																													3		3				3		3				3		3				3		3				3		
Intermediate Stations Downcurrent																																																							
	SB-INE1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INE2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INE3	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INE4	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INE5	4 times per year																													3		3				3		3				3		3				3		3				3		
Reference Stations Upcurrent																																																							
	SB-RFE1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFE2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFE3	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFE4	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFE5	4 times per year																													3		3				3		3				3		3				3		3				3		
Sensitive Receiver Stations																																																						
	MW1	4 times per year																													3		3				3		3				3		3				3		3				3		
	THB1	4 times per year																													3		3				3		3				3		3				3		3				3		
	THB2	4 times per year																													3		3				3		3				3		3				3		3				3		
	WSR45C	4 times per year																													3		3				3		3				3		3				3		3				3		
	WSR46	4 times per year																													3		3				3		3				3		3				3		3				3		
Flood Tide																																																							
Impact Stations Downcurrent																																																							
	SB-IPF1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPF2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-IPF3	4 times per year																													3		3				3		3				3		3				3		3				3		
Intermediate Stations Downcurrent																																																						
	SB-INF1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INF2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-INF3	4 times per year																													3		3				3		3				3		3				3		3				3		
Reference Stations Upcurrent																																																						
	SB-RFF1	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFF2	4 times per year																													3		3				3		3				3		3				3		3				3		
	SB-RFF3	4 times per year																													3		3				3		3				3		3				3		3				3		
Sensitive Receiver Stations																																																						
	MW1	4 times per year																													3		3				3		3				3		3				3		3				3		
	THB1	4 times per year																													3		3				3		3				3		3				3		3				3		
	THB2	4 times per year																													3		3				3		3				3		3				3		3				3		
	WSR45C	4 times per year																													3		3				3		3				3		3				3		3				3		
	WSR46	4 times per year																													3		3				3		3				3		3				3		3				3		

Benthic Recolonisation Studies			J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Capped Contaminated Mud Pits																																																								
	SB-CPA	2 times per year																																																								
	SB-CPB	2 times per year																																																							
Reference Stations																																																								
	RBA	2 times per year																																																								
	RBB	2 times per year																																																								
	RBC	2 times per year																																																								

Notes:
"*" = Number of replicates depends on parameters
Naming of stations are tentative only and will be subjected to changes

Annex B

Graphical Presentations

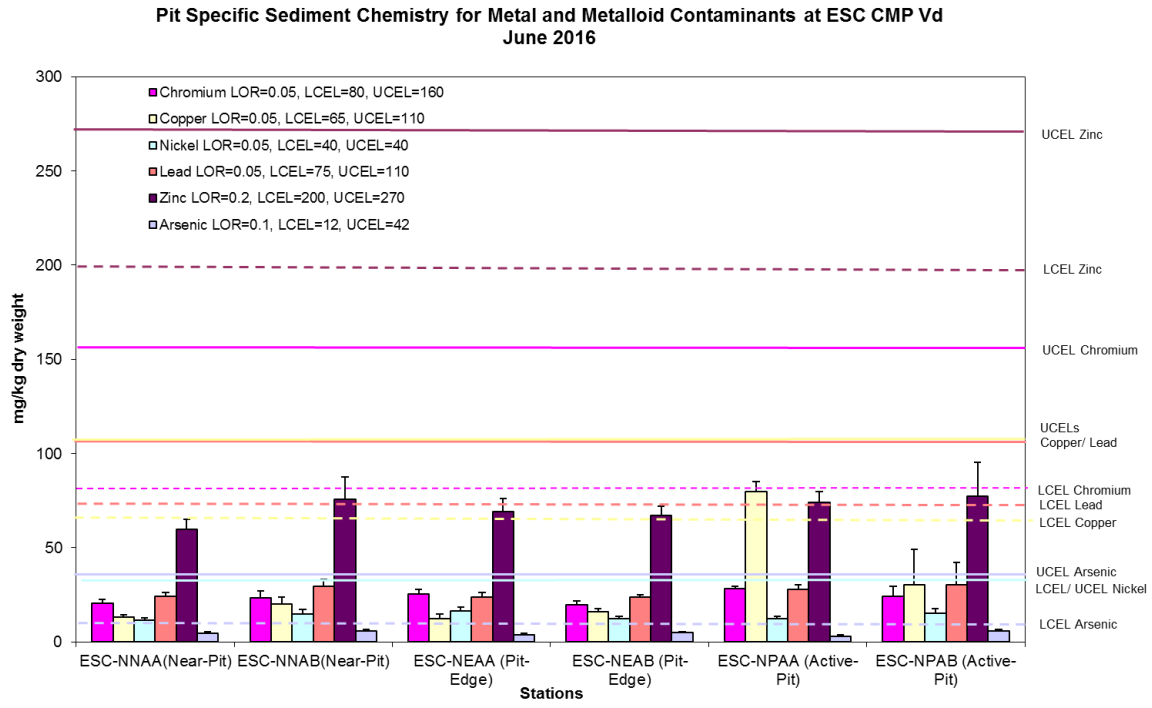

Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

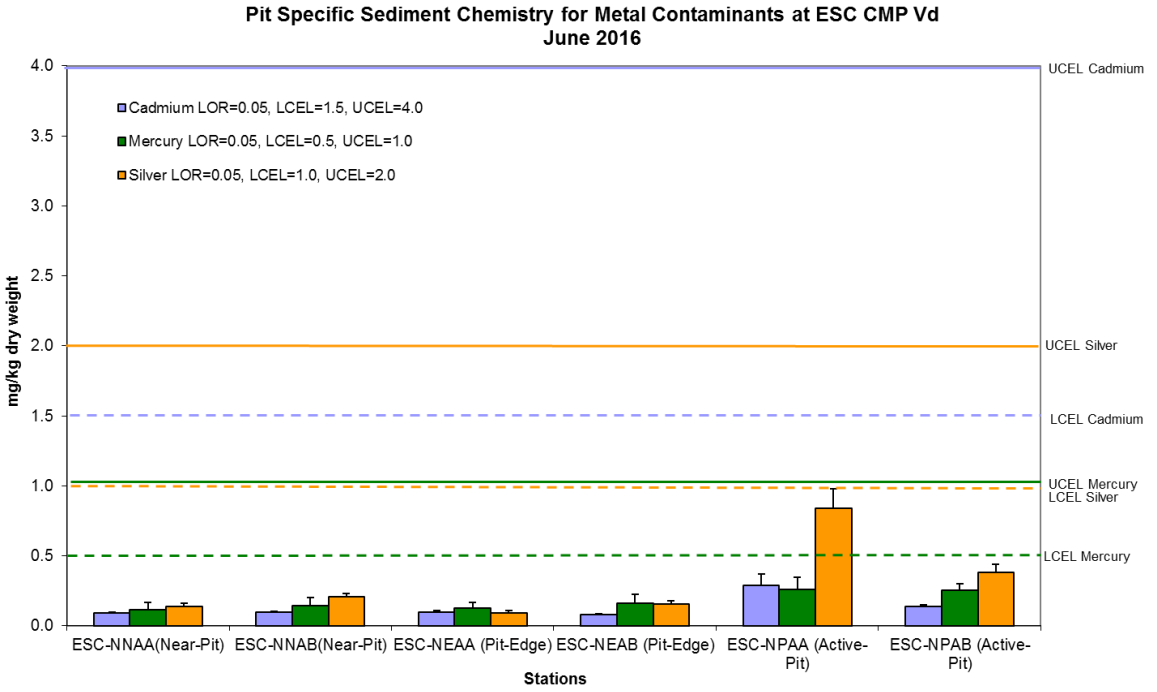

Figure 2: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

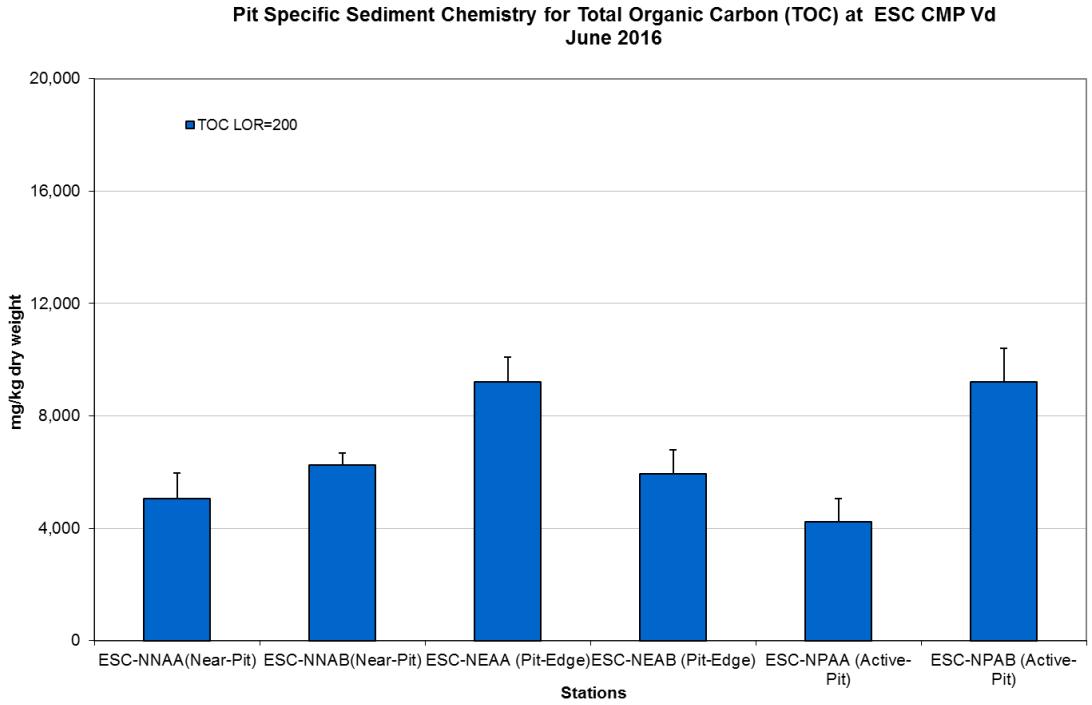

Figure 3: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

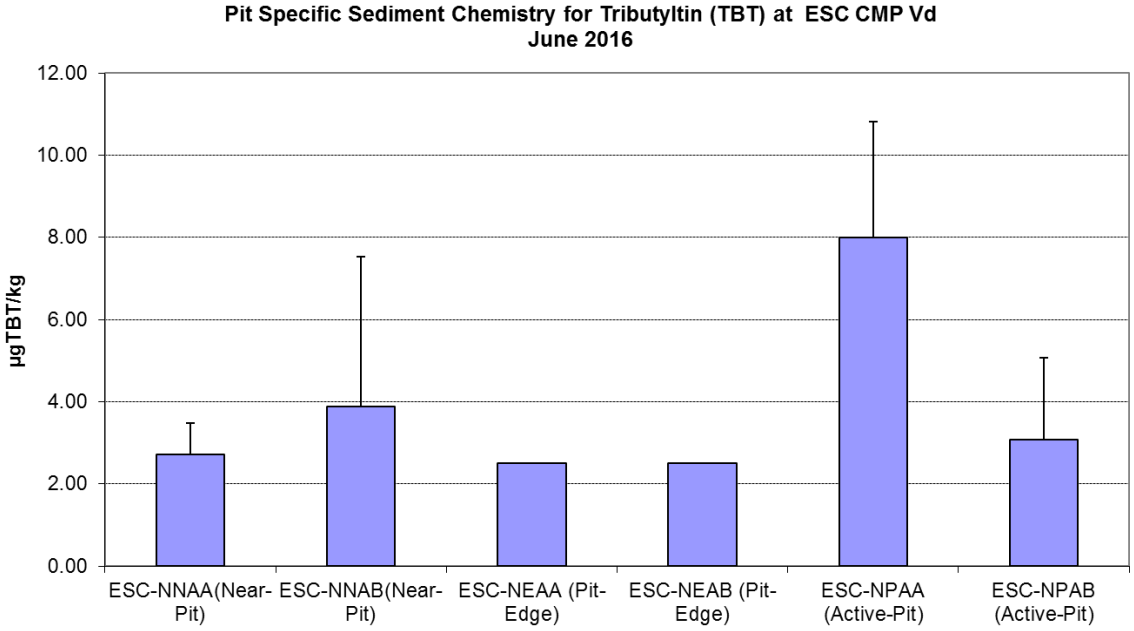

Figure 4: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

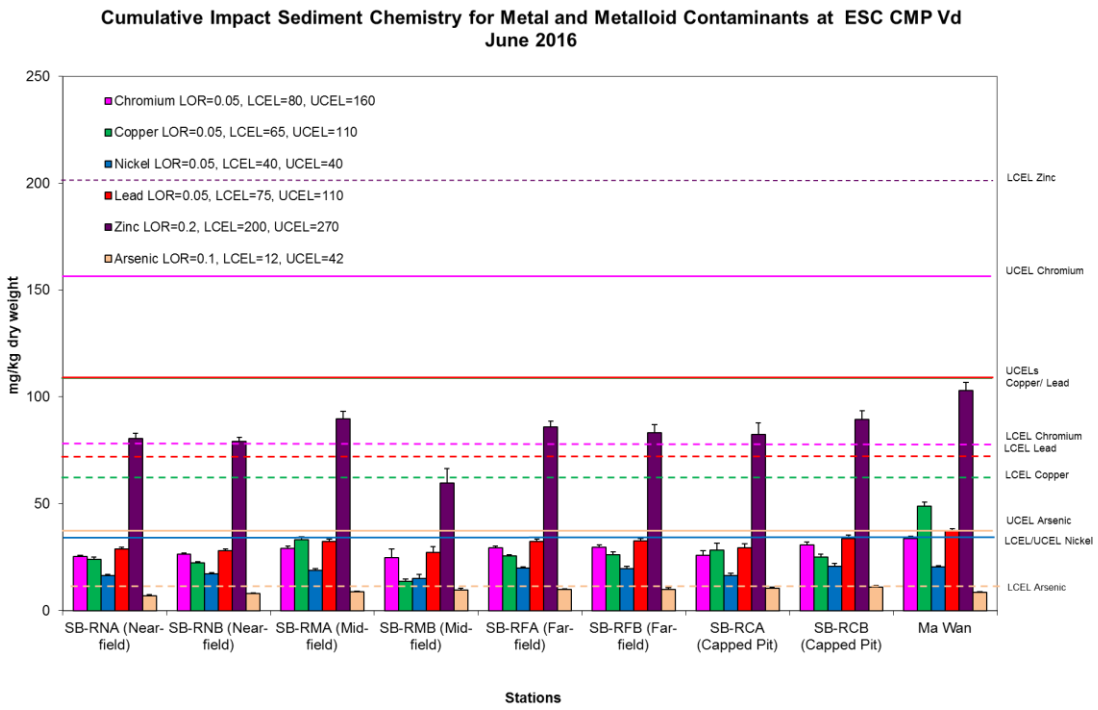

Figure 5: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

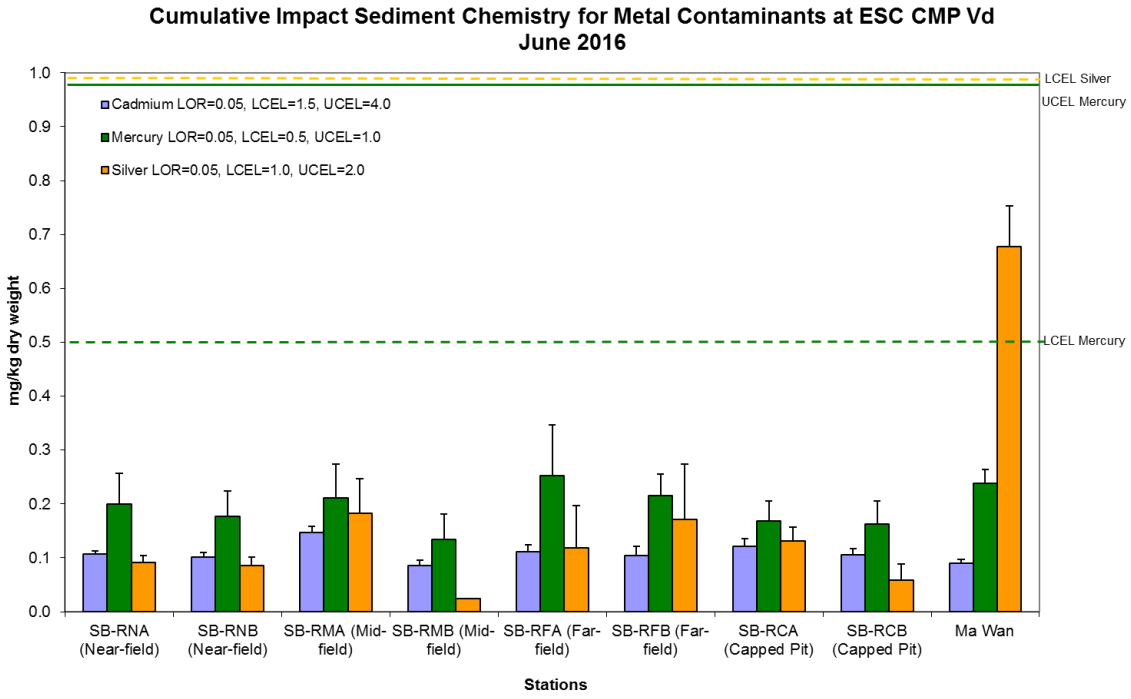

Figure 6: Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

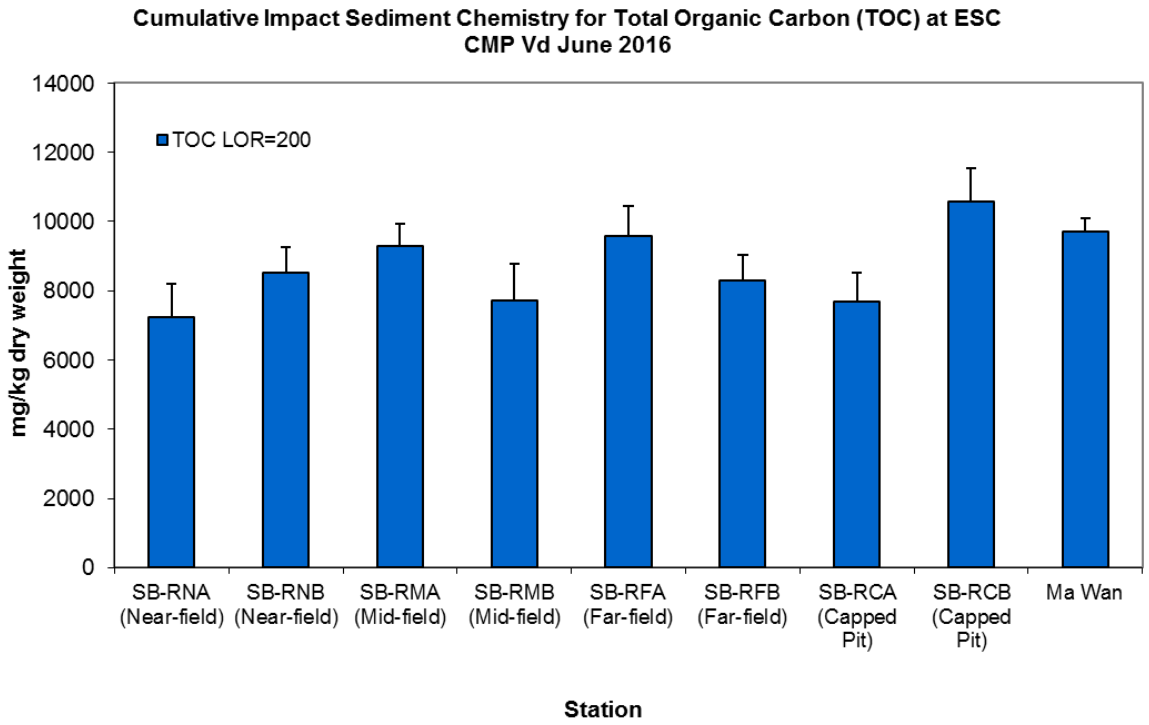

Figure 7: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

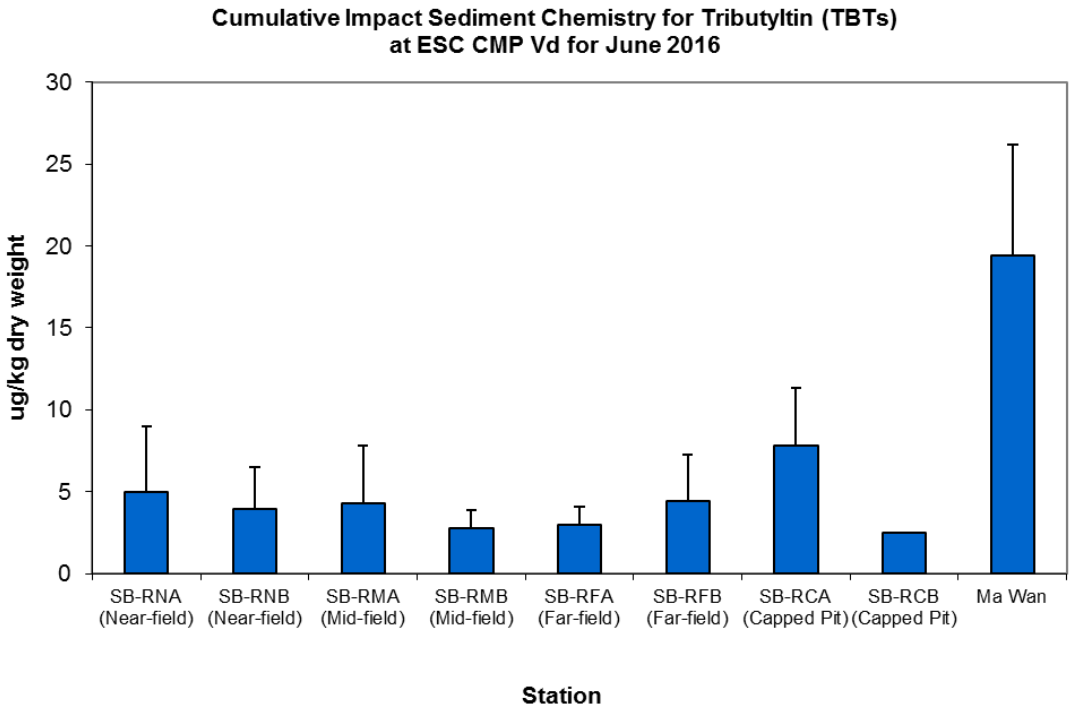

Figure 8: Concentration of Tributyltin (µg TBT/kg; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMP Vd in June 2016.

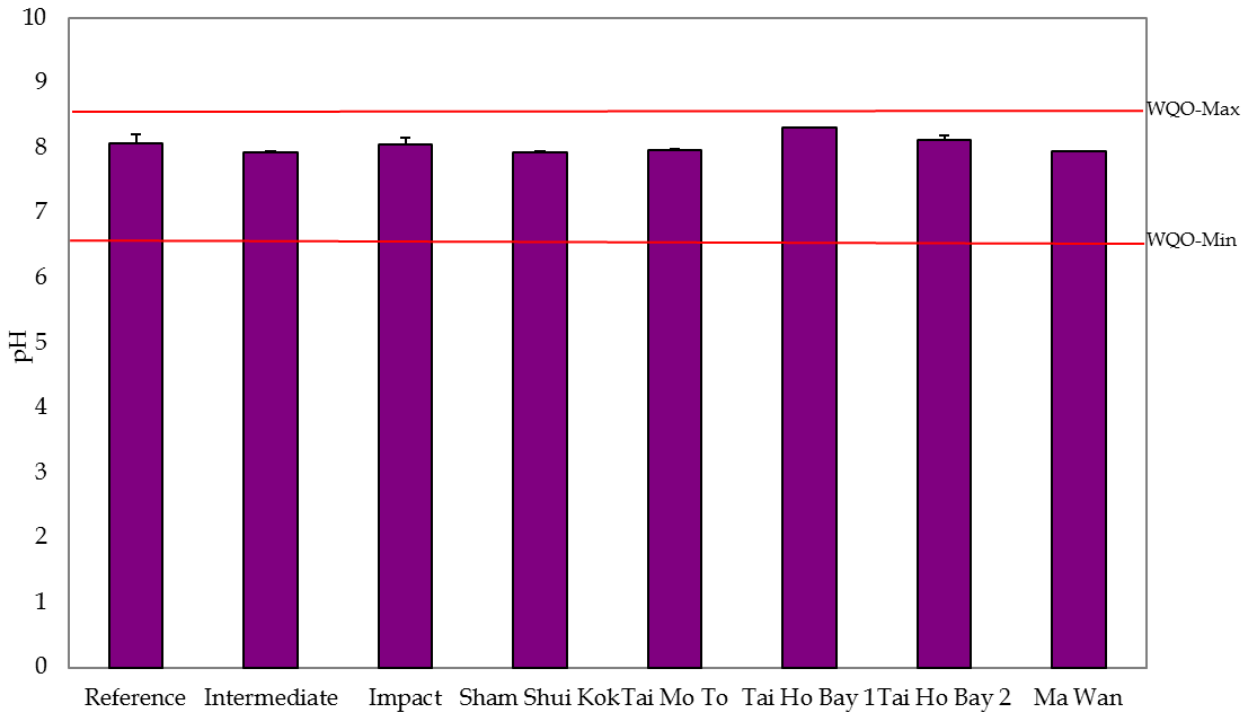

Figure 9: Levels of pH (mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016.

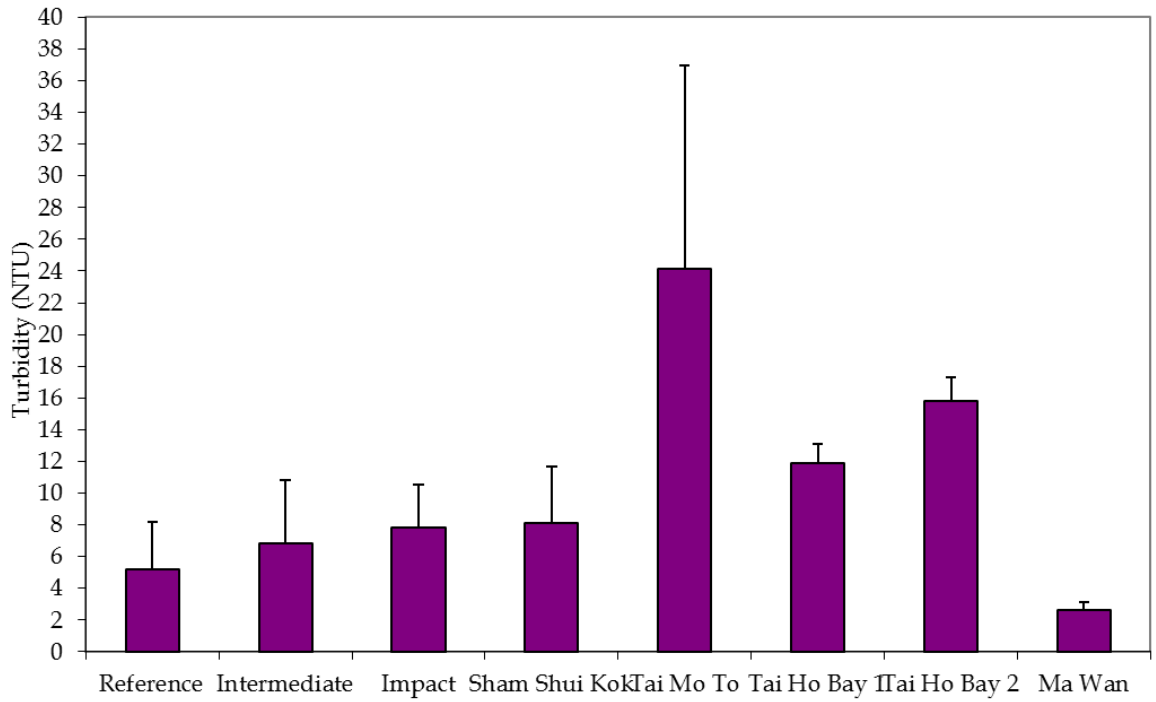

Figure 10: Levels of Turbidity (NTU; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016

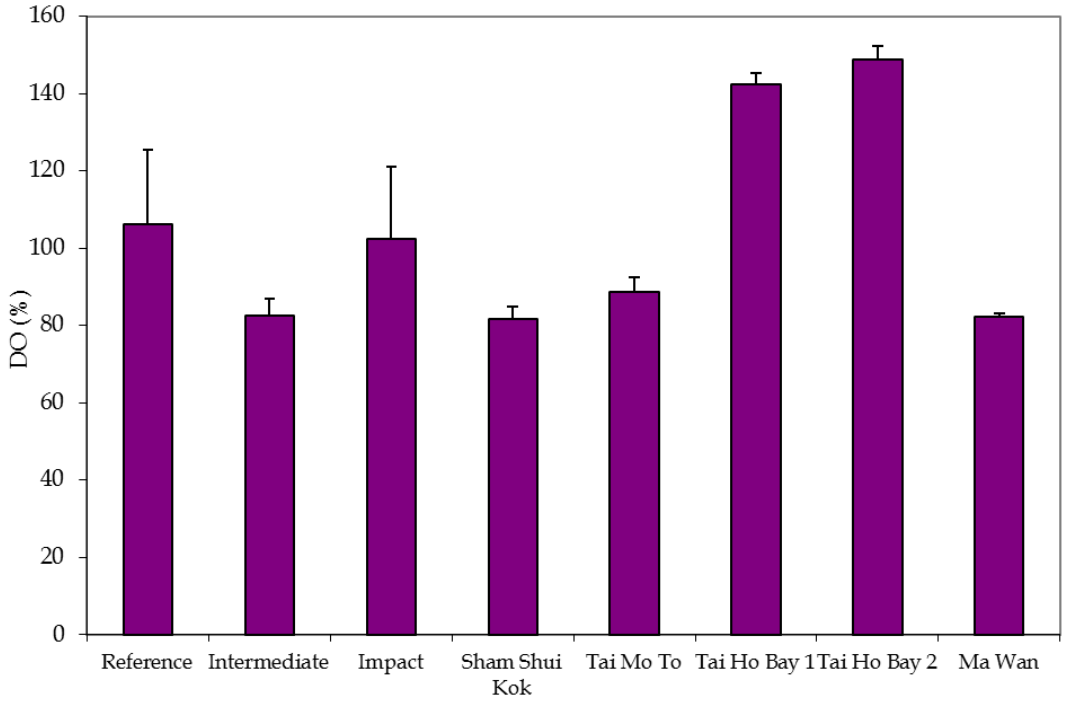

Figure 11: Levels of Dissolved Oxygen (% saturation; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016

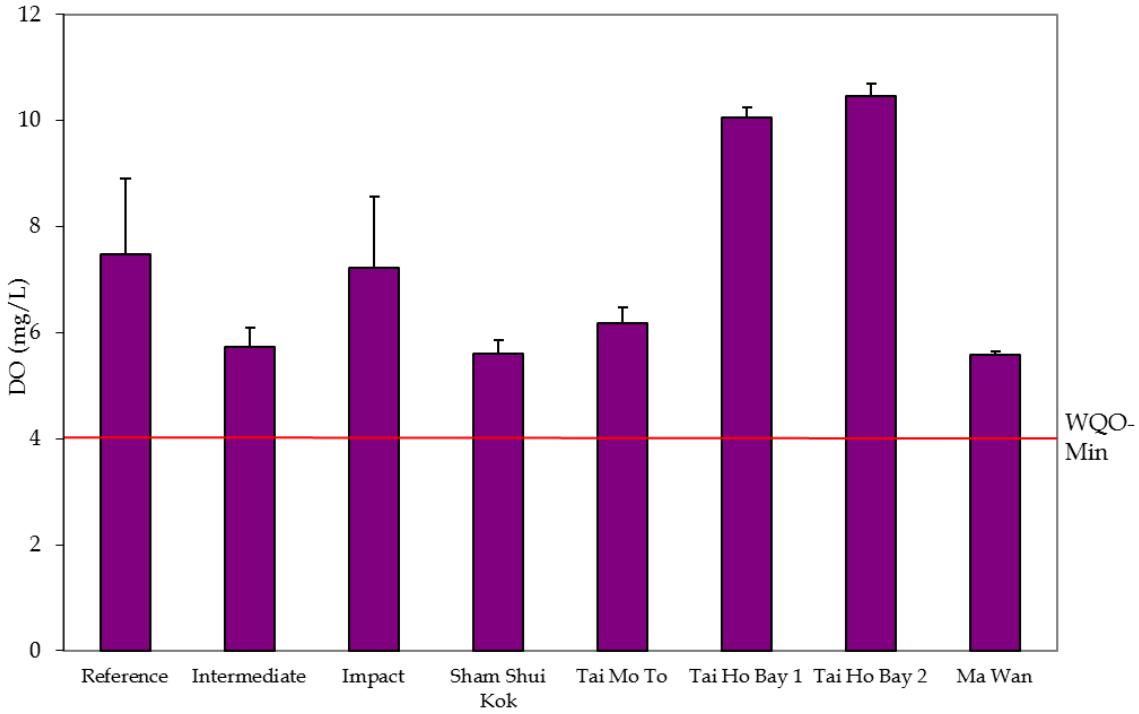

Figure 12: Levels of Dissolved Oxygen (mg/L; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016

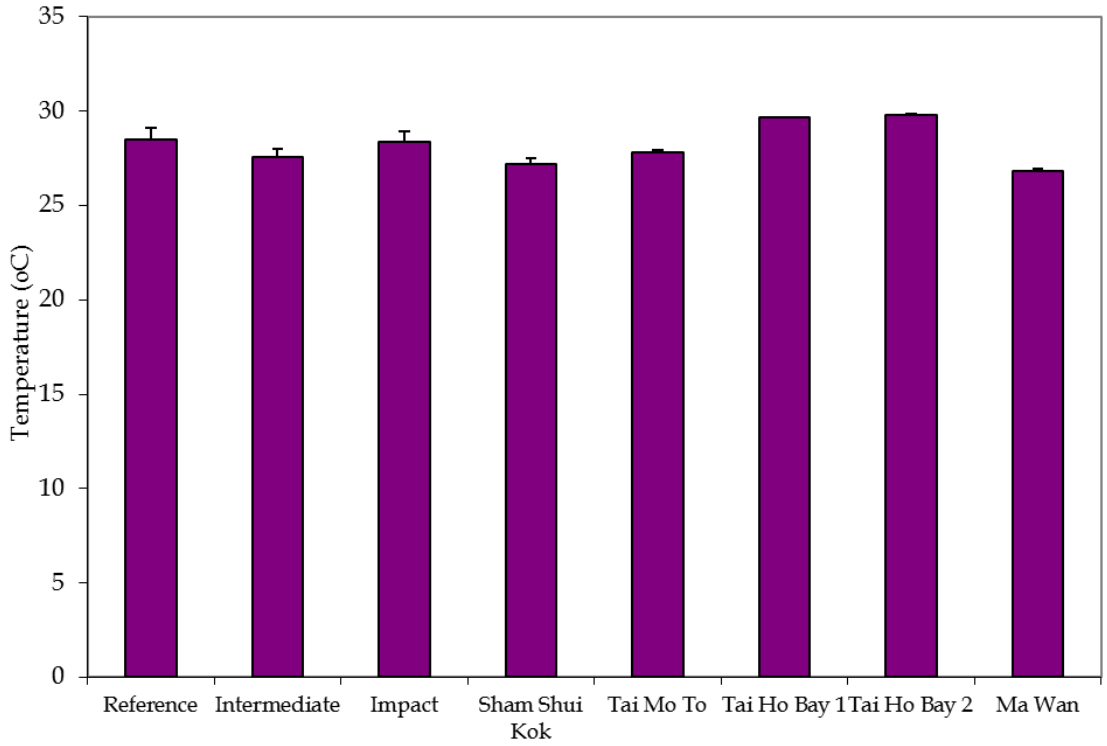

Figure 13: Levels of Temperature (˚C; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016.

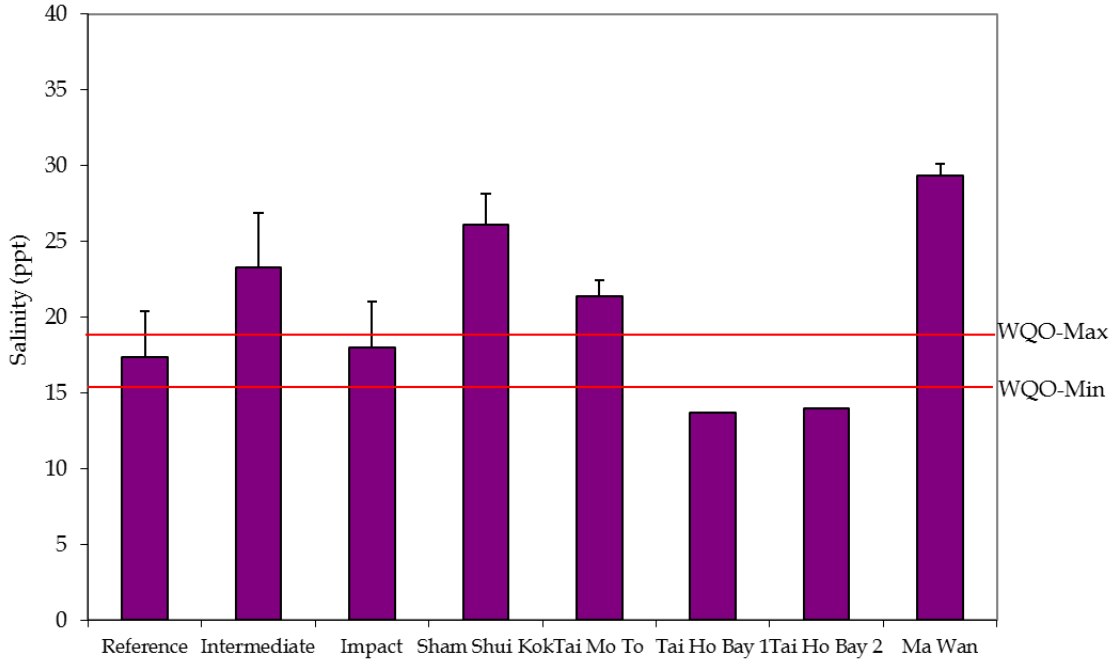

Figure 14: Levels of Salinity (ppt; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016.

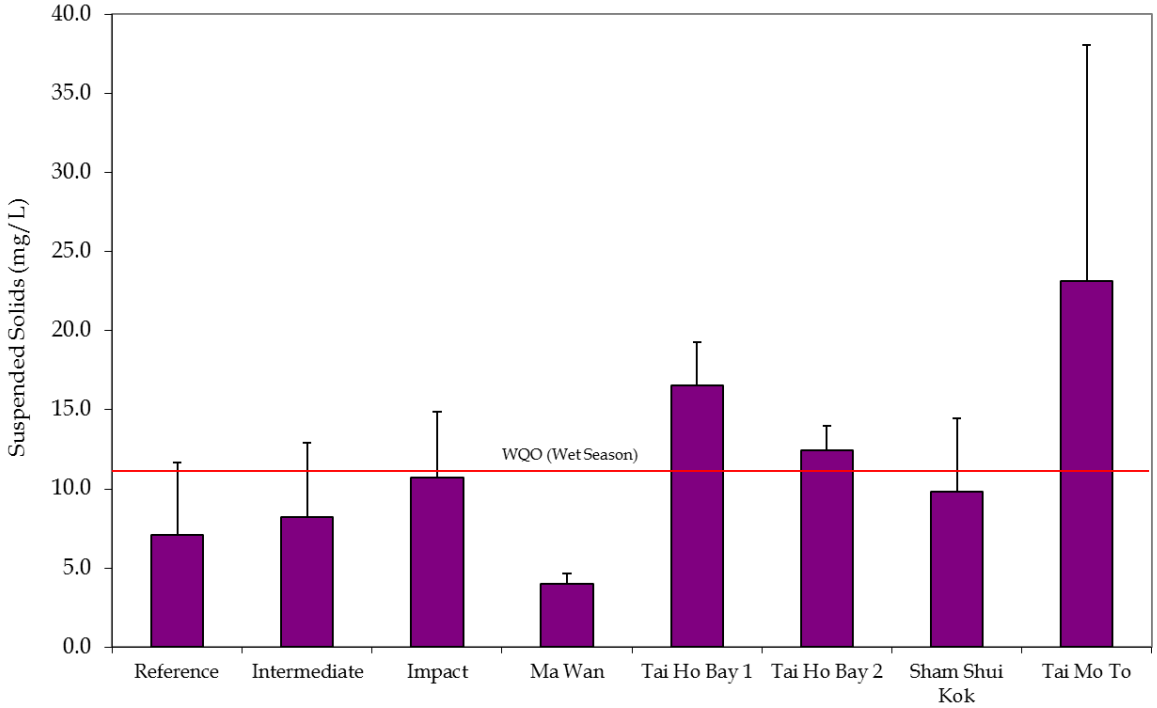

Figure 15: Levels of Suspended Solids (mg/L; mean +SD) recorded from Water Quality Monitoring during Capping of SB CMP 2 in June 2016

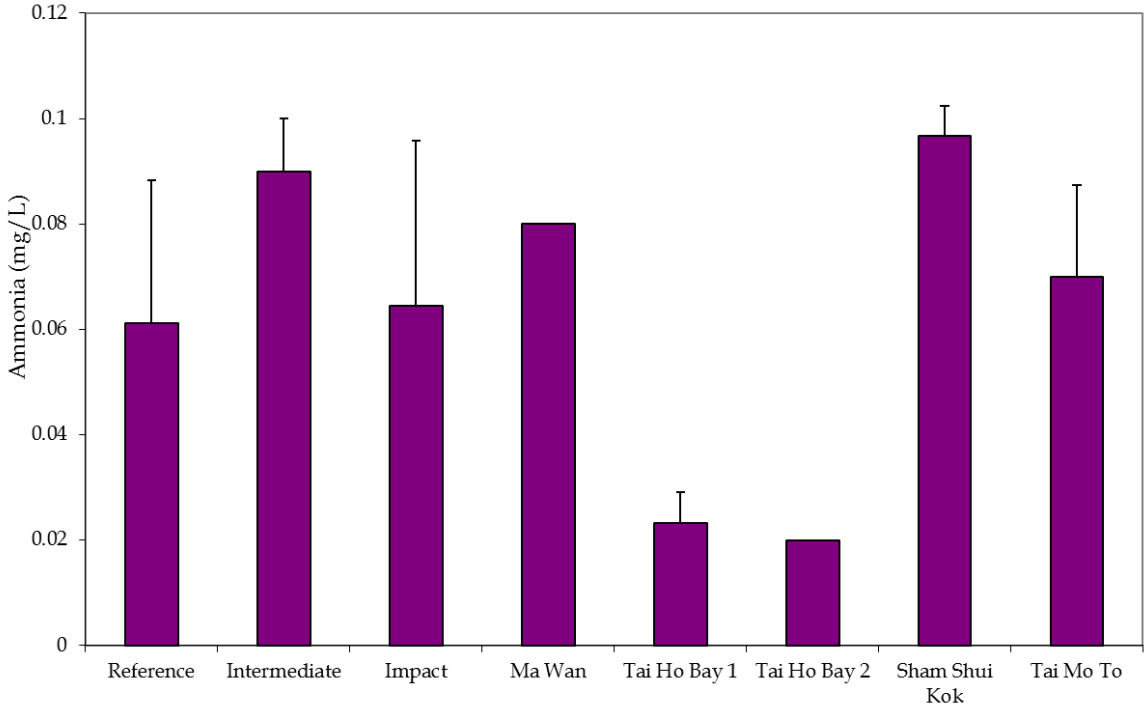

Figure 16: Level of Ammonia (mg/L; mean + SD) recorded from Water Quality Monitoring during Capping for SB CMP 2 in June 2016.

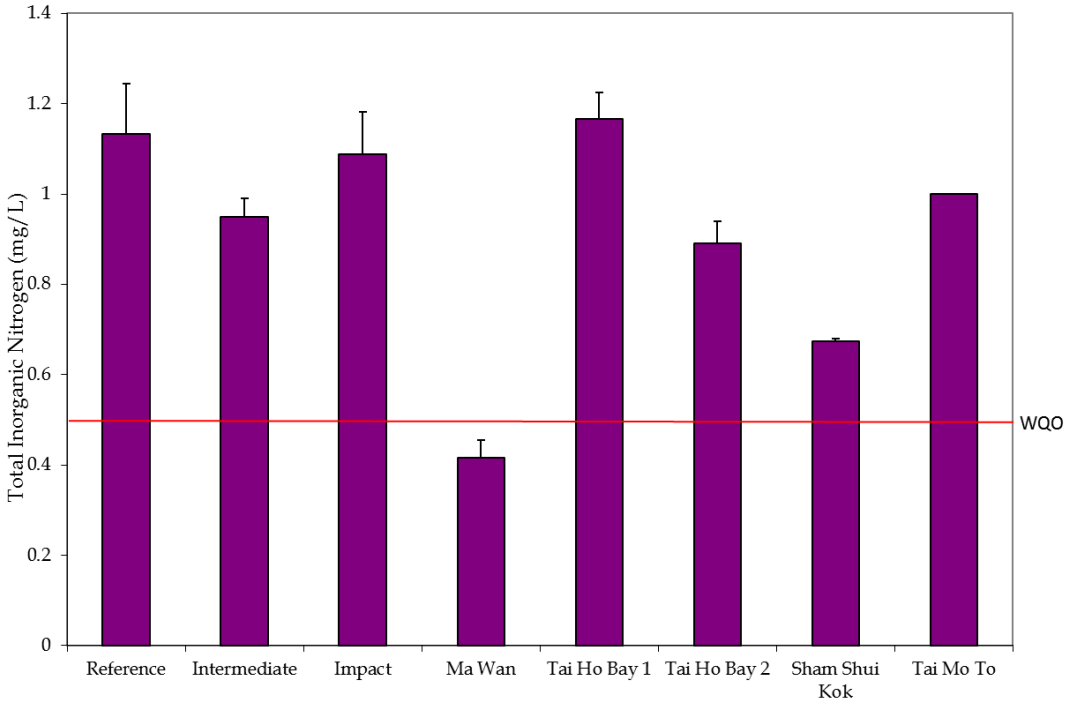

Figure 17: Level of TIN (mg/L; mean + SD) recorded from Water Quality Monitoring during Capping for SB CMP 2 in June 2016

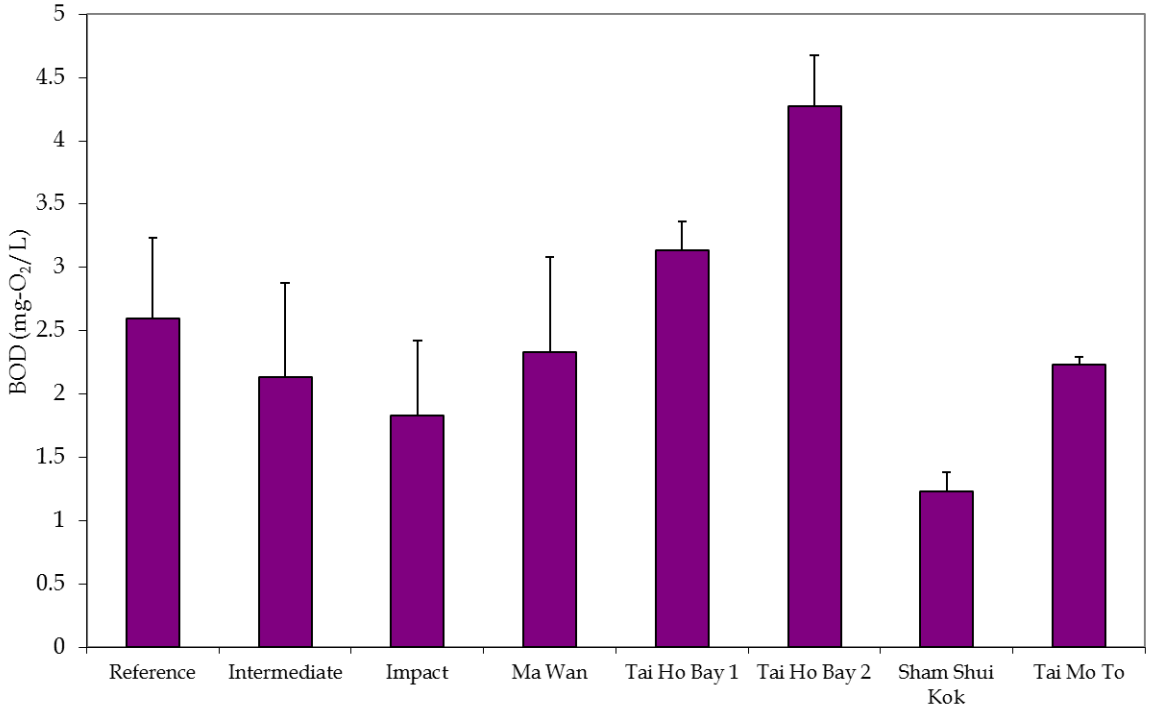

Figure 18: Level of BOD_5 (mg-O_2/L; mean + SD) recorded from Water Quality Monitoring during Capping for SB CMP 2 in June 2016.

Annex C

Water Quality Monitoring Results

Table C1 Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities at ESC CMPs

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) (1)	Surface and Mid-depth (2) 5%-ile of baseline data for surface and middle layer = **3.76 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)	Surface and Mid-depth (2) 1%-ile of baseline data for surface and middle layer = **3.11 mg L^{-1}** (3) and Significantly less than the reference stations mean DO (at the same tide of the same day)
	Bottom 5%-ile of baseline data for bottom layers = **2.96 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)	Bottom The average of the impact station readings are **<2 mg/L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)
Depth-averaged Suspended Solids (SS) (4) (5)	95%-ile of baseline data for depth average = **37.88 mg L^{-1}** and 120% of control station's SS at the same tide of the same day	99%-ile of baseline data for depth average = **61.92 mg L^{-1}** and 130% of control station's SS at the same tide of the same day
Depth-averaged Turbidity (Tby) (4) (5)	95%-ile of baseline data = **28.14 NTU** and 120% of control station's Tby at the same tide of the same day	99%-ile of baseline data = **38.32 NTU** and 130% of control station's Tby at the same tide of the same day

Notes:

(1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

(2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.

(3) Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L^{-1}, it is proposed to set the Limit Level at 3.11 mg L^{-1} which is the first percentile of the baseline data.

(4) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

(5) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table C2 Water Column Profiling Results for ESC CMP Vd in June 2016

Stations	Temp	Salinity	Turbidity	Dissolved Oxygen		pH	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L^{-1})	(mg L^{-1})	(mg L^{-1})
WCP 1 (Downstream)	27.45	21.82	24.08	69.06	4.83	7.75	13.25
WCP 2 (Upstream)	27.87	20.25	11.86	74.70	5.24	7.74	9.38
WQO (Wet season)	N/A	18.93 – 22.27#	N/A	N/A	>4	6.5-8.5	11.1

Note:
#Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
Cell shaded yellow / red indicate value exceeding the Action/Limit levels.
Cell shaded grey indicate value exceeding the WQO.

Table C3 Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities for SB CMPs

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) (1)	Surface and Mid-depth (2) The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for surface and middle layer = **4.32 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)	Surface and Mid-depth (2) The average of the impact, WSR 45C and WSR 46 station readings are **< 4 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)
	Bottom The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for bottom layers = **3.12 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)	Bottom The average of the impact station, WSR 45C and WSR 46 readings are **< 2 mg L^{-1}** and Significantly less than the reference stations mean DO (at the same tide of the same day)
Depth-averaged Suspended Solids (SS) (3) (4)	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data for depth average = **21.60 mg L^{-1}** and 120% of control station's SS at the same tide of the same day	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data for depth average = **40.10 mg L^{-1}** and 130% of control station's SS at the same tide of the same day
Depth-averaged Turbidity (Tby) (3) (4)	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data = **25.04 NTU** and 120% of control station's Tby at the same tide of the same day	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data = **32.68 NTU** and 130% of control station's Tby at the same tide of the same day

Notes:

(1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

(2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.

(3) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

(4) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table C4 Monitoring Results for Water Quality Monitoring during Capping of SB CMP in June 2016

Sampling Period	Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L-1)	pH (mg L-1)	SS (mg L-1)	NH3 (mg L-1)	TIN (mg L-1)	BOD_5 (mg L-1)
June 2016	RFF (Reference)	28.49	17.33	5.18	7.48	106.08	8.07	7.10	0.06	1.13	2.6
	IPF (Impact)	28.37	17.98	7.85	7.22	102.50	8.05	10.69	0.06	1.09	2.13
	INF (Intermediate)	27.53	23.31	6.81	5.73	82.57	7.94	8.20	0.09	0.95	1.83
	Ma Wan	26.84	29.31	2.61	5.57	82.16	7.96	4.02	0.08	0.42	2.33
	Sham Shui Kok	27.21	26.09	8.08	5.60	81.60	7.94	9.80	0.10	0.67	1.23
	Tai Mo To	27.78	21.39	24.13	6.19	88.67	7.97	23.12	0.07	1.00	2.23
	Tai Ho Bay 1	29.64	13.67	11.87	10.06	142.53	8.32	16.53	0.02	1.17	3.13
	Tai Ho Bay 2	29.81	13.94	15.83	10.45	148.80	8.13	12.43	0.02	0.89	4.28
	WQO	N/A	15.60-19.06*	N/A	N/A	>4	6.5-8.5	11.1	N/A	0.50	N/A

Notes:

Not exceeding 2°C of change of the results from the Reference Station.

#Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.

Cell shaded yellow / red indicate value exceeding the Action/Limit levels.

Cell shaded grey indicate value exceeding the WQO.

Annex D

Study Programme

Task Name	2012	2013	2014	2015	2016	2017
	M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J
Project Commencement	9/5					
For South Brothers CMPs and East of Sha Chau CMPs						
Submission of Draft Inception Report & Draft Programme	9/18					
Submission of Final Inception Report & Final Programme	10/2					
Submission of Draft EM&A Manual (First Review)	9/18					
Submission of Final EM&A Manual (First Review)	10/2					
Submission of Draft EM&A Manual (Second Review)	10/30					
Submission of Final EM&A Manual (Second Review)	11/27					
Submission of Subsequent EM&A Manual Updates						
Submission of Draft Operations Manual		12/31				
Submission of Final Operations Manual		1/14				
Submission of Operations Manual Updates						
Monitoring Contracts						
Regular Site Inspections of CMP Contractors						
Participate in Liaison Group Meetings/ Consultations as required by CEDD						
Submission of Report on Dredging & Capping Operations						
Submission of Monthly Progress Report						
Submission of Quarterly EM&A Report						
Submission of Annual Review Report						
Submission of Annual Risk Assessment Report						
Submission of Draft Final Report						3/20
Submission of the Final Report						4/14
Submission of Draft Executive Summary Report						4/14
Submission of Final Executive Summary Report						4/28
For East Tung Lung Chau Disposal Facility						
Submission of Monitoring Results & Monthly EM&A Progress Report						
Submission of Initial Review Report (assume disposal commences in November 2012)		2/15				
Submission of Quarterly EM&A Report						
Submission of Annual Report						
Alternative / Modified Capping Design						
Submission of Investigation Report		2/5				
Submission of Quarterly Report						
Submission of Annual Report						
Submission of Draft Final Report						3/20
Submission of the Final Report						4/14
Baseline Pelagic and Demersal Fisheries Survey						
Baseline Shrimp Trawl & Hang Trawl Surveys, twice before SB CMPs dredging						
Submission of Baseline Pelagic and Demersal Fisheries Survey Report	11/20					

Study Programme	Task	Milestone	Summary	Rolled Up Task	Rolled Up Milestone

Agreement No. CE 23/2012 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) - Investigation