




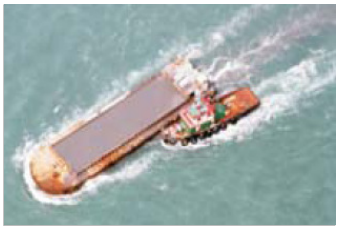
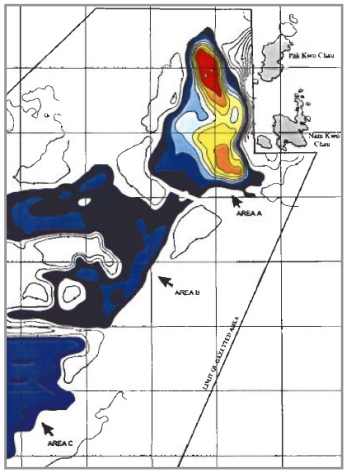

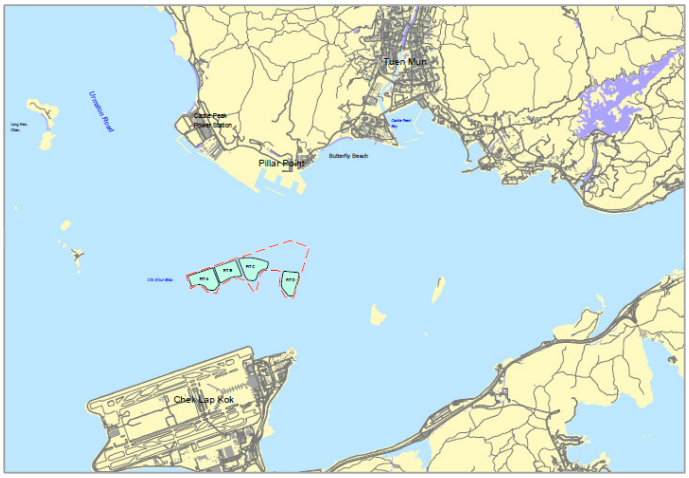

CEDD 土木工程拓展署
Civil Engineering and Development Department

Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation

Agreement No. CE 4/2009(EP)

43rd Monthly Progress Report for Contaminated Mud Pits at Sha Chau – January 2013

Revision 0

27 February 2013

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Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation

43rd Monthly Progress Report for Contaminated Mud Pits at Sha Chau – January 2013

Revision 0

Document Code: 0103262 Monthly Progress Jan 13_v0.doc

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Client: Civil Engineering and Development Department (CEDD)	Project No: 0103262
Summary: This document presents progress of monitoring works on contaminated mud pits at Sha Chau in January 2013 under Agreement No. CE 4/2009 (EP).	Date: 27 February 2013 Approved by: *Dr Robin Kennish* *Director*

Revision	Description	By	Checked	Approved	Date
0	43rd Monthly Progress Report for CMP	CL	JT	RK	27/2/13

Distribution

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土木工程拓展署
CEDD Civil Engineering and Development Department

New Contaminated Mud Marine Disposal Facility at Airport East/East Sha Chau Area

Environmental Certification Sheet
EP-312/2008/A

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	43rd Monthly Progress Report for Contaminated Mud Pits at Sha Chau – January 2013
Date of Report: 21/02/2013	
Date received by ET: 21/02/2013	
Date received by IA: 21/02/2013	

Reference EP Condition

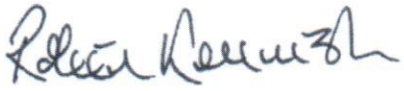
Environmental Permit Condition:	Condition No.: 3.4

Content:

Four hard copies and one electronic copy of monthly EM&A Report shall be submitted to the Director within 10 working days 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 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-312/2008/A

Dr Robin Kennish,
Environmental Team Leader:  Date: 21/02/2013

IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-312/2008/A

Dr Wang Wen Xiong,
Independent Auditor:  Date: 22/2/2013

Notes:

CONTENTS

ANNEXES

Agreement No. CE 4/2009 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation

43RD MONTHLY PROGRESS REPORT FOR CONTAMINATED MUD PITS AT SHA CHAU January 2013

1.1 BACKGROUND

1.1.1 Since 1992, the East of Sha Chau (ESC) area has been the site of a series of dredged contaminated mud pits (CMPs) designed to provide confined marine disposal capacity for contaminated mud arising from the HKSAR's dredging and reclamation projects. In January 2013, the following works were being undertaken at the CMPs:

- Capping was being undertaken at CMP IVc;
- Disposal of contaminated mud was taking place at CMP Va; and
- Dredging of CMP Vd was in progress.

1.1.2 The Environmental Monitoring and Audit (EM&A) programme for the CMPs at the ESC area presently covers the above operations.

1.2 REPORTING PERIOD

1.2.1 This Monthly Progress Report covers the monitoring period of January 2013.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1 The following monitoring activities have been undertaken for CMP V in January 2013:

- *Water Column Profiling* was conducted for CMP Va on 4 January 2013;
- *Pit Specific Sediment Chemistry* was conducted for CMP Va on 11 January 2013;
- *Demersal Trawling* was conducted for CMP Va on 17 and 18 January 2013;
- *Routine Water Quality Monitoring* was conducted for CMP Va on 18 January 2013; and
- *Impact Water Quality Monitoring during Dredging Operations* was conducted for CMP Vd on 23 January 2013.

1.3.2 A summary of field activities are presented in *Annex A*.

1.4 DETAILS OF OUTSTANDING SAMPLING AND / OR ANALYSIS

1.4.1 No outstanding sampling remained and laboratory analysis of *Pit Specific Sediment Chemistry* conducted in January 2013 was yet to be completed during preparation of this monthly report.

1.5 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR CMP V

1.5.1 *Table 1.1* summarises the monitoring results that are presented in the current monthly report. Brief discussion of the monitoring results is presented in this section. Detailed discussion will be presented in the corresponding *Quarterly Report*.

Table 1.1 Monitoring activities in December 2012/January 2013

Monitoring activities	Date of Monitoring	Monitoring results presented in this report?
Cumulative Impact Sediment Chemistry Monitoring for CMP Va	3 Dec 2012	Yes
Pit Specific Sediment Chemistry Monitoring for CMP Va	7 Dec 2012	Yes
	11 Jan 2013	No. Laboratory analysis yet to be completed during preparation of this monthly report.
Water Column Profiling for CMP Va	4 Jan 2013	Yes
Demersal Trawling for CMP Va	17&18 Jan 2013	No. Laboratory analysis yet to be completed during preparation of this monthly report.
Routine Water Quality Monitoring for CMP Va	18 Jan 2013	Yes
Impact Water Quality Monitoring during Dredging Operations of CMP Vd	23 Jan 2013	Yes

1.5.2 Pit Specific Sediment Chemistry of CMP Va – December 2012

1.5.3 Monitoring locations for Pit Specific Sediment Chemistry for CMP Va are shown in *Figure 1.1*. A total of six monitoring stations were sampled in December 2012. Concentrations of Arsenic exceeded the Lower Chemical Exceedance Level (LCEL) at all stations except at Active Pit station NPDA while concentrations of Silver exceeded the LCEL at Active Pit station NPDA (*Figures 1-2* of *Annex B*). Whilst the average concentration of Arsenic in the Earth's crust is generally ~2mg/kg, significantly higher Arsenic concentrations (median = 14 mg/kg) have been recorded in Hong Kong's onshore sediments [(1)]. It is presumed that the natural concentrations of Arsenic are similar in onshore and offshore sediments [(2)], and relatively high Arsenic levels may thus occur throughout Hong Kong. Therefore, the slight exceedances of the LCEL for Arsenic are unlikely to be caused by the disposal operations at CMP Va but rather as a result of naturally occurring deposits. In addition, the Active Pit stations are located within CMP Va which was receiving contaminated mud during the reporting period. As such, the exceedances of LCEL for Silver which were recorded at one Active Pit station only is not considered as indicating any dispersal of contaminated mud from CMP Va.

1.5.4 For organic contaminants, Total Organic Carbon (TOC) concentration was similar amongst all stations (*Figure 3* of *Annex B*). Tributyltin (TBT) concentration was higher at Active Pit Station NPDA and Pit Edge Station NEDB when compared to other stations (*Figure 4 of Annex B*). High MW PAHs concentrations were below the limit of reporting at all stations except at Active Pit stations NPDA and NPDB and Pit-Edge station NEDB (*Figure 5 of Annex B*). Low Molecular Weigh Polycyclic Aromatics Hydrocarbons (Low MW PAHs), Total Polychlorinated Biphenyls (PCBs), Total Dichloro-diphenyl-trichloroethane (DDT) and 4,4'-Dichloro-diphenyl-dichloroethylene (4,4'-DDE) were below the limit of reporting at all stations.

1.5.5 As described in *Section 1.5.3*, the higher concentrations of contaminants (including metals and organic contaminants) recorded at the Active Pit stations only are not considered as indicating any dispersal of contaminated mud from CMP Va. Nevertheless, detailed analysis will be presented in the *Quarterly Report* to reveal any trend of increasing sediment contaminant concentrations towards CMP Va.

1.5.6 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP Va during this monthly period.

(1) Sewell RJ (1999) Geochemical Atlas of Hong Kong. Geotechnical Engineering Office, Government of the Hong Kong Special Administrative Region

(2) Whiteside PGD (2000) Natural geochemistry and contamination of marine sediments in Hong Kong. In: The Urban Geology of Hong Kong (ed Page A & Reels SJ). Geological Society of Hong Kong Bulletin No. 6, p109-121

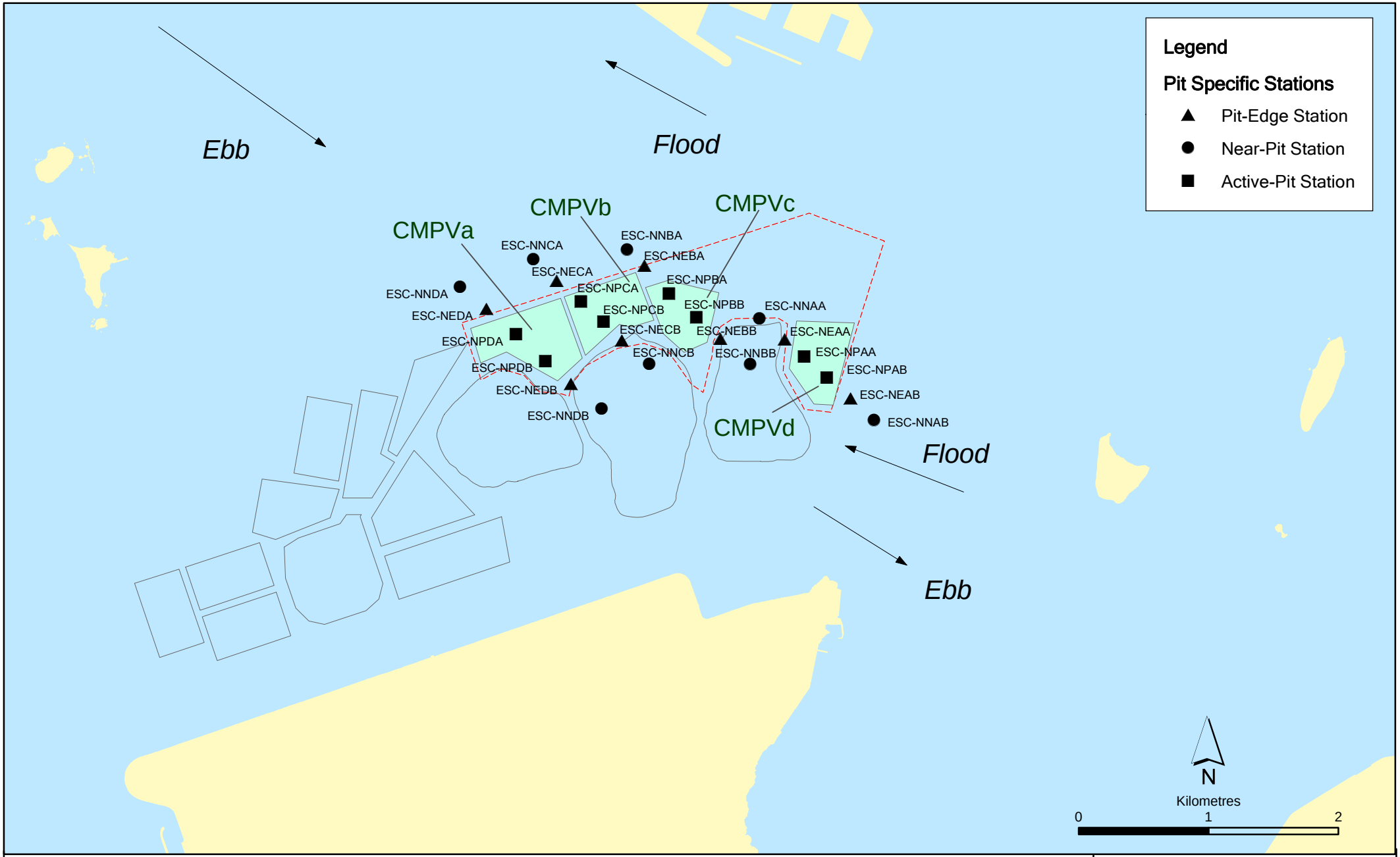


Figure 1.1

Pit Specific Sediment Quality Monitoring Stations for CMPV

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Date: 29/10/2009

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1.5.7 Cumulative Impact Sediment Chemistry for CMP Va – December 2012

1.5.8 Monitoring locations for Cumulative Impact Sediment Chemistry for CMP Va are shown in *Figure 1.2*. A total of nine monitoring stations were being sampled.

1.5.9 Analyses of results for the Cumulative Impact Sediment Chemistry Monitoring indicate that the concentrations of all metals, except Arsenic, were below the LCEL in December 2012 (*Figures 6 and 7* of *Annex B*). Concentrations of Arsenic in sediments from all stations, except for Ma Wan station, Near Field stations RNA and RNB, exceeded the LCEL. As discussed in *Section 1.5.3* above, relatively high natural levels of Arsenic are present in Hong Kong's marine sediments and hence the slight exceedances of the LCEL for the Arsenic do not necessarily indicate any adverse impacts to sediment quality caused by disposal operation at CMP Va.

1.5.10 The concentration of TOC was similar amongst stations (*Figure 8* of *Annex B*). TBTs were recorded in sediment samples from Near Field (RNA and RNB), Mid Field (RMA and RMB), Far-field (RFA), Capped Pit (RCA) and Ma Wan stations (*Figure 9* of *Annex B*). Concentrations of Total DDT, 4,4''-DDE, Total PCBs, Low and High M.W. PAHs were below the limit of detection at all stations.

1.5.11 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP Va during this monthly period.

1.5.12 Impact Water Quality Monitoring during Dredging Operations of CMP Vd – January 2013

1.5.13 *Impact Water Quality Monitoring during Dredging Operations of CMP Vd* was conducted on 23 January 2013. On the survey day, sampling was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations upstream and five Impact (Downstream) stations downstream of the dredging operations at CMP Vd (*Figure 1.3*). Monitoring was also conducted at Ma Wan station. At each station, *in-situ* measurements of water quality parameters as well as water samples were taken from three depths in the water column (ie surface: 1 m below sea surface, mid-depth and bottom: 1 m above the seabed). Where water depth is less than 6 m, the mid-depth station was omitted. If water depth is less than 3 m, only the mid-depth station was monitored.

1.5.14 Monitoring results are presented in *Table C1* of *Annex C*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solids (SS) complied with the Action and Limit Levels set in the Baseline Monitoring Report [(1)].

(1) ERM (2009) Baseline Monitoring Report. Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation. Agreement No. CE 4/2009(EP). Submitted to EPD in September 2009.

Figure 1.2

Cumulative Impacts Sediment Quality Monitoring Stations for CMPV

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Date: 3/12/2012

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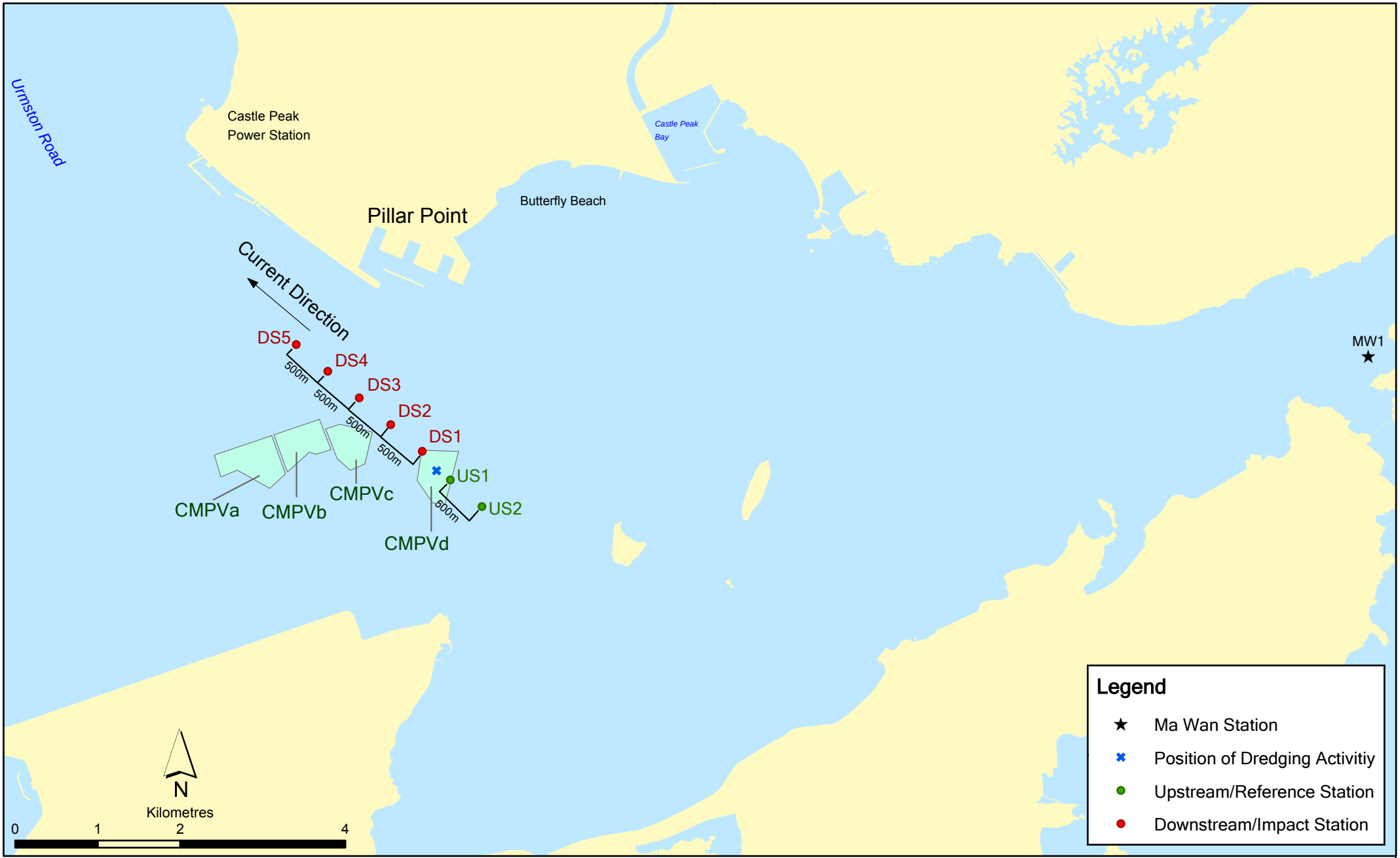

Figure 1.3

Indicative Dredging Impact Sampling Stations for CMPVd

Note: The locations of sampling stations will be determined on site based on current direction and position of dredging activities.

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Date: 28/11/2012

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1.5.15 Overall, there appears to be no unacceptable water quality impacts causing by the dredging operations at CMP Vd and no additional measures are thus considered required except for those stated in the Environmental Permit (*EP-312/2008*).

1.5.16 ***Water Column Profiling for CMP Va – January 2013***

In-situ Measurements

1.5.17 Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) in January 2013. The water quality monitoring results for January 2013 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 dry season period (November to March) of 1999-2010 from stations in the Northwestern Water Control Zone, where the CMPs are located. For Salinity, the average value obtained from the Upstream station was used for the basis as the WQO. Graphical presentation of the monitoring results is provided in *Annex B*.

1.5.18 Analyses of results for January 2013 indicated that levels of Salinity, pH and DO complied with the WQOs at both Upstream and Downstream stations (*Figures 10 - 12 of Annex B*). DO and Turbidity complied with the Action and Limit Levels set in the *EM&A Manual* (1).

Laboratory Measurements for Suspended Solids (SS)

1.5.19 Analyses of data obtained in January 2013 indicated that the SS levels at both Upstream and Downstream stations complied with the WQO (*Figure 13 of Annex B*). In addition, SS levels at all stations complied with the Action and Limit Levels set in the *EM&A Manual*.

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

(1) ERM (2009). Draft Second Review of the EM&A Manual. Prepared for CEDD for EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation Agreement No. CE 4/2009 (EP).

1.5.21 Routine Water Quality Monitoring for CMP Va – January 2013

1.5.22 The results for the Routine Water Quality Monitoring conducted during January 2013 in the dry season have been assessed for compliance with the WQOs set by EPD as presented in *Section 1.5.18* above (please see *Figure 1.4* for the monitoring locations). *In-situ* monitoring and laboratory results are shown in *Tables 1.2* and *1.3*, respectively, with graphical presentation provided in *Annex B*. Monitoring was undertaken at a total of ten stations in the reporting month.

In-situ Measurements

1.5.23 Analysis of results for January 2013 indicated that for all stations (Impact, Intermediate and Reference), levels of pH, DO and salinity complied with the WQOs (*Figures 14-17* of *Annex B*). Levels of DO and Turbidity within the reporting month complied with the Action and Limit Levels set in the *EM&A Manual* (1) (*Figures 15 and 18 of Annex B*). All *in-situ* water quality measurements showed relatively minor variations amongst Impact, Intermediate and Reference stations (*Figures 14-18* of *Annex B*).

Laboratory Measurements

1.5.24 Analyses of January 2013 results indicate that concentrations of Cadmium, Mercury and Silver were below their limit of reporting at all stations. Arsenic, Copper, Lead, Nickel and Zinc were detected in samples from all stations (*Figures 19 and 20 of Annex B*). Concentrations of Arsenic, Chromium, Lead and Nickel appeared to be similar amongst all stations while concentration of Zinc was the highest at Reference stations. Levels of 5-day Biochemical Oxygen Demand (BOD_5), Total Inorganic Nitrogen (TIN) and NH_3-N were similar amongst all stations (*Figures 21 and 22 of Annex C*). Concentrations of SS complied with the WQO (15.34 mg/L for dry season) and Action and Limit Levels at all stations within the reporting month (*Figure 23 of Annex C*).

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

(1) ERM (2009). Draft Second Review of the EM&A Manual. Prepared for CEDD for EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation Agreement No. CE 4/2009 (EP).

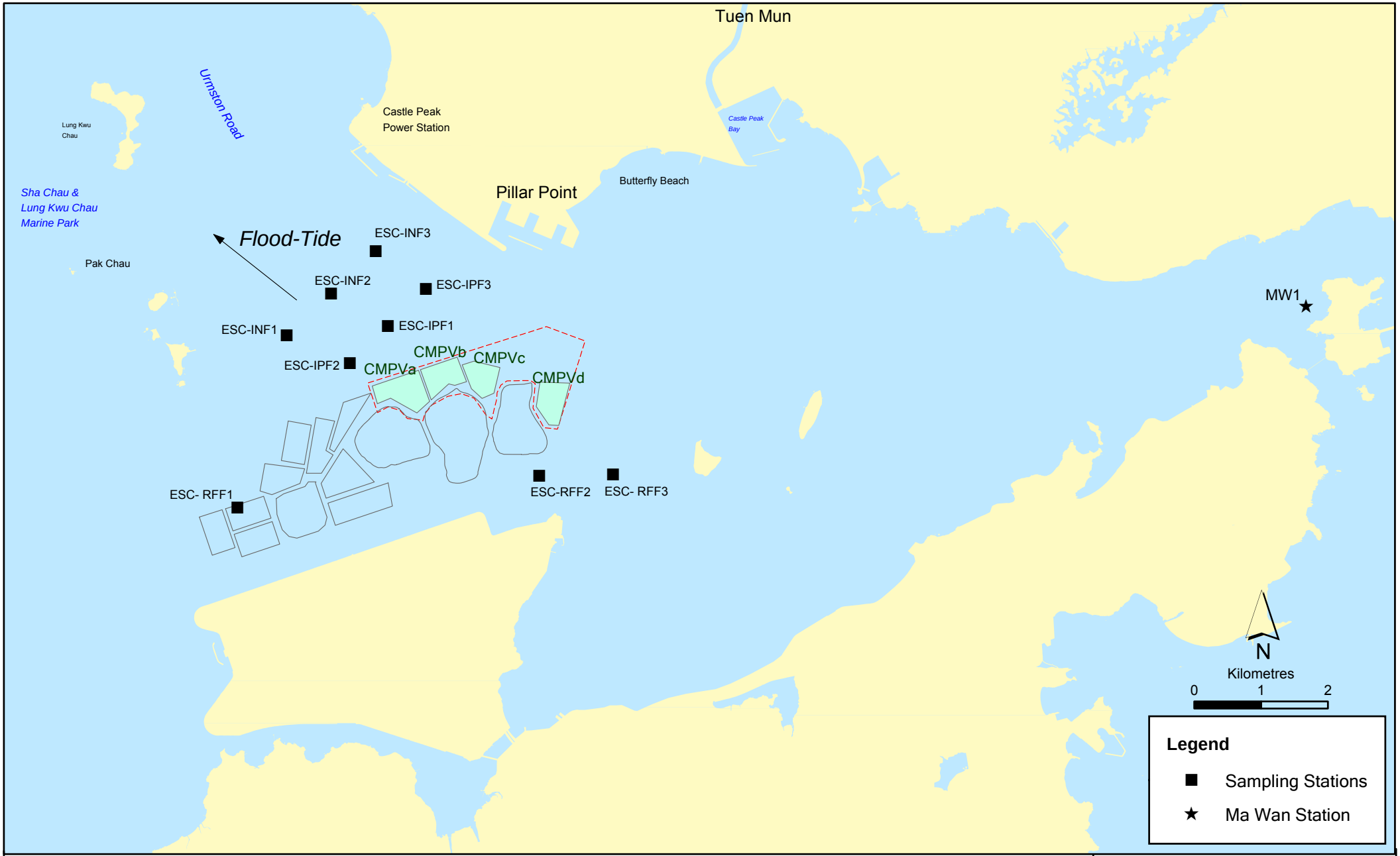

Figure 1.4

Routine & Capping Water Quality Sampling Stations (Flood-Tide) for CMPV

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Date: 3/12/2012

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Table 1.2 ***In-situ Monitoring Results for Routine Water Quality Monitoring during January 2013***

Stations	Temp (°C)	Salinity	Turbidity (NTU)	pH	Dissolved Oxygen (%)	Dissolved Oxygen (mg L^{-1})
RFF (Reference)	17.36	32.12	3.12	7.79	100.47	7.94
IPF (Impact)	17.46	32.19	4.89	7.76	97.85	7.72
INF (Intermediate)	17.46	32.16	3.09	7.73	98.62	7.78
Ma Wan Station	17.60	32.87	2.54	7.73	93.10	7.29
WQO	*N/A*	28.91-35.33#	*N/A*	*6.5-8.5*	*N/A*	>4

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

Table 1.3 ***Laboratory Results for Routine Water Quality Monitoring during January 2013***

Stations	As (µg/L)	Ag (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Hg (µg/L)	Pb (µg/L)	Ni (µg/L)	Zn (µg/L)	NH_3-N (mg/L)	TIN (mg/L)	BOD_5 (mg/L)	SS (mg/L)
RFF	1.04	<LOR	<LOR	1.60	7.83	<LOR	4.42	3.83	10.79	0.17	0.38	2.41	4.88
IPF	1.13	<LOR	<LOR	1.00	11.08	<LOR	2.29	2.75	8.54	0.14	0.34	1.72	8.46
INF	<LOR	<LOR	<LOR	2.19	7.29	<LOR	2.63	4.58	8.88	0.12	0.34	2.15	5.08
Ma Wan Station	<LOR	<LOR	<LOR	1.44	7.56	<LOR	3.88	2.00	10.50	0.11	0.25	0.65	4.13
												WQO of SS	15.34

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.6.1 The following monitoring activities will be conducted in the next monthly period of February 2013 for CMP V:

- *Pit Specific Sediment Chemistry* for CMP Va;
- *Cumulative Impact Sediment Chemistry* for CMP Va;
- *Sediment Toxicity* for CMP Va;
- *Tissue/ Whole Body Sampling* for CMP Va;
- *Demersal Trawling* for CMP Va;
- *Routine Water Quality Monitoring* for CMP Va;
- *Water Column Profiling* for CMP Va; and
- *Impact Water Quality Monitoring during Dredging Operations* for CMP Vd.

1.6.2 *Water Quality Monitoring during Capping* will be conducted for CMP IVc in the next monthly period of February 2013.

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

1.7 STUDY PROGRAMME

1.7.1 A summary of the Study Programme is presented in *Annex D*.

Annex A

Sampling Schedule

Annex A1 - East of Sha Chau Environmental Monitoring and Audit Sampling Schedule for CMP IV (January 2012 - December 2013)

		2012												2013											
Tissue/ Whole Body Sampling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Near-Pit Stations																									
	INA		*																						
	INB		*																						
Reference North																									
	TNA		*																						
	TNB		*																						
Reference South																									
	TSA		*																						
	TSB		*																						
Demersal Trawling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Near Pit Stations																									
	INA 1-5	*	*																						
	INB 1-5	*	*																						
Reference North																									
	TNA 1-5	*	*																						
	TNB 1-5	*	*																						
Reference South																									
	TSA 1-5	*	*																						
	TSB 1-5	*	*																						
Capping		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Ebb Tide																									
Impact Station Downcurrent																									
	IPE1		*				*		*				*		*				*		*				*
	IPE2		*				*		*				*		*				*		*				*
	IPE3		*				*		*				*		*				*		*				*
	IPE4		*				*		*				*		*				*		*				*
	PFC1		*				*		*				*		*				*		*				*
Intermediate Station Downcurrent																									
	INE1		*				*		*				*		*				*		*				*
	INE2		*				*		*				*		*				*		*				*
	INE3		*				*		*				*		*				*		*				*
	INE4		*				*		*				*		*				*		*				*
	INE5		*				*		*				*		*				*		*				*
Reference Station Upcurrent																									
	RFE1		*				*		*				*		*				*		*				*
	RFE2		*				*		*				*		*				*		*				*
	RFE3		*				*		*				*		*				*		*				*
	RFE4		*				*		*				*		*				*		*				*
	RFE5		*				*		*				*		*				*		*				*
Flood Tide																									
Impact Station Downcurrent																									
	INF1		*				*		*				*		*				*		*				*
	PFC2		*				*		*				*		*				*		*				*
	INF3		*				*		*				*		*				*		*				*
Intermediate Station Downcurrent																									
	IPF1		*				*		*				*		*				*		*				*
	IPF2		*				*		*				*		*				*		*				*
	IPF3		*				*		*				*		*				*		*				*
Reference Station Upcurrent																									
	RFF1		*				*		*				*		*				*		*				*
	RFF2		*				*		*				*		*				*		*				*
	RFF3		*				*		*				*		*				*		*				*
Water Column Profiling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Plume Stations	WCP1	*																							
	WCP2	*																							
Benthic Recolonisation Studies		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Capped Contaminated Mud Pits III																									
CPA	1 grab per station								*				*								*				*
CPB	1 grab per station								*				*								*				*
CPC	1 grab per station								*				*								*				*
Reference Stations																									
RBA	1 grab per station								*				*								*				*
RBB	1 grab per station								*				*								*				*
RBC	1 grab per station								*				*								*				*

"*" = Number of replicates depends on field catch or parameters

Sampling completed

Sampling to be completed

Annex A2 - East of Sha Chau Environmental Monitoring and Audit Sampling Schedule for CMP V (January 2012 - February 2014)

		2012												2013												2014	
Pit Specific Sediment Chemistry	**Code**	**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		**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		**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		**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		**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							*	*					*	*												

Capping		**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																				*				*		*

		2012												2013												2014	
Routine Water Quality Monitoring		**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		*		*	*		*	*		*	*		*	*		*	*									

Water Column Profiling		**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		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*									

Benthic Recolonisation Studies		**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								*				*								*				*		

Impact Monitoring for Dredging		**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/Reference Stations																											
	US1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	US2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
Downstream/Impact Stations																											
	DS1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
Ma Wan Station																											
	MW1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								

Sampling completed

Sampling to be completed

Annex B

Monitoring Results

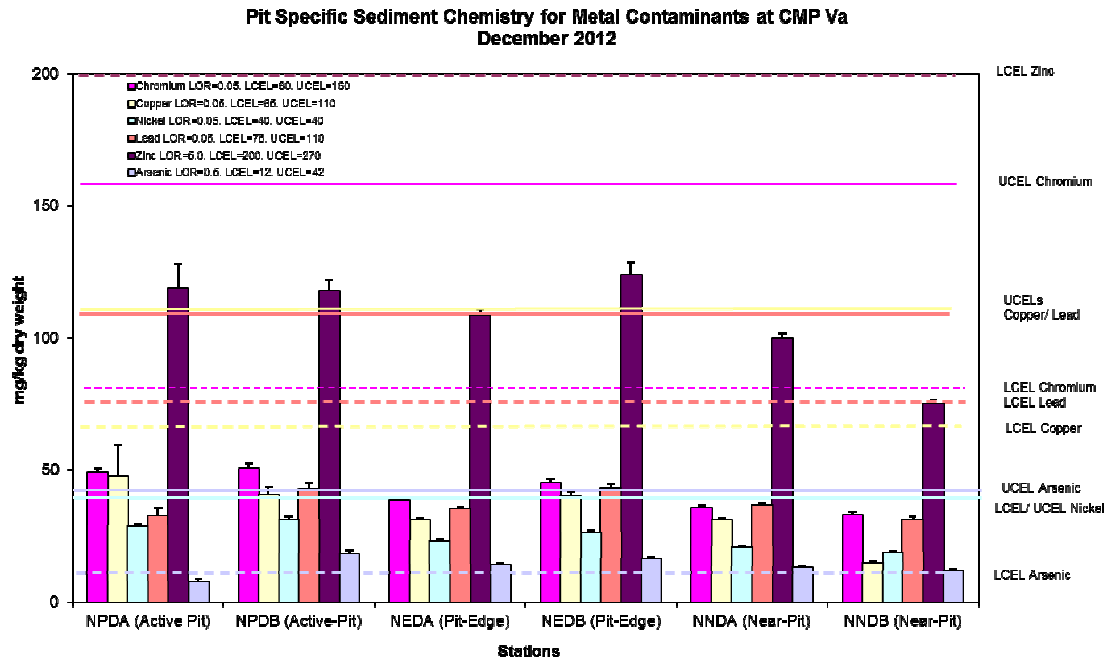

Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in December 2012.

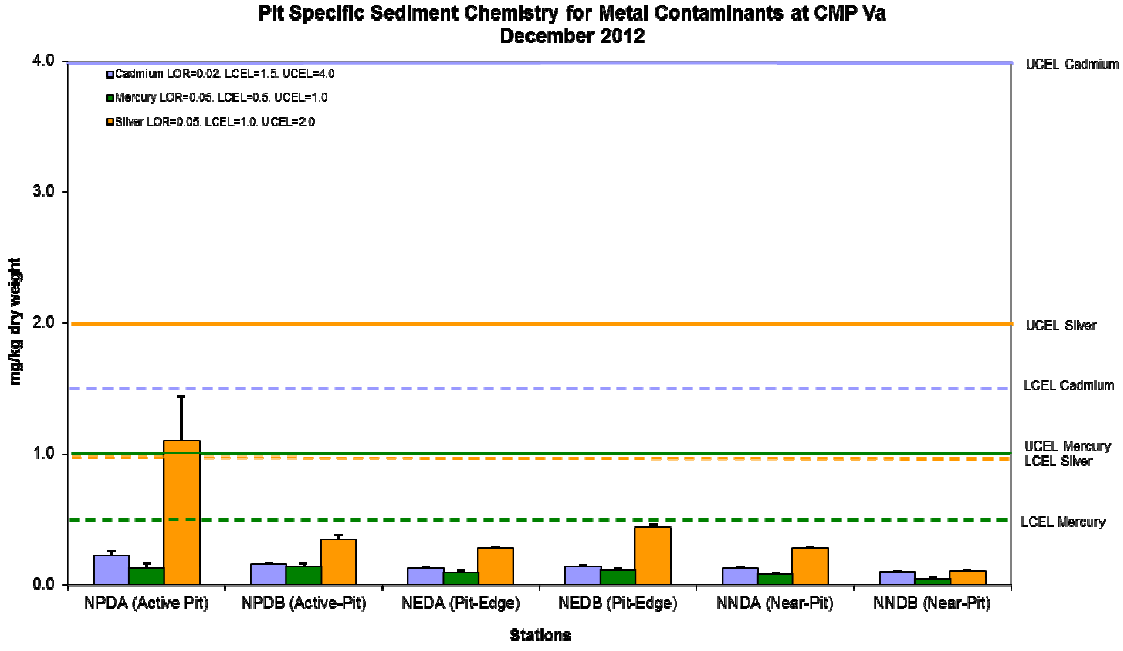

Figure 2: Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in December 2012.

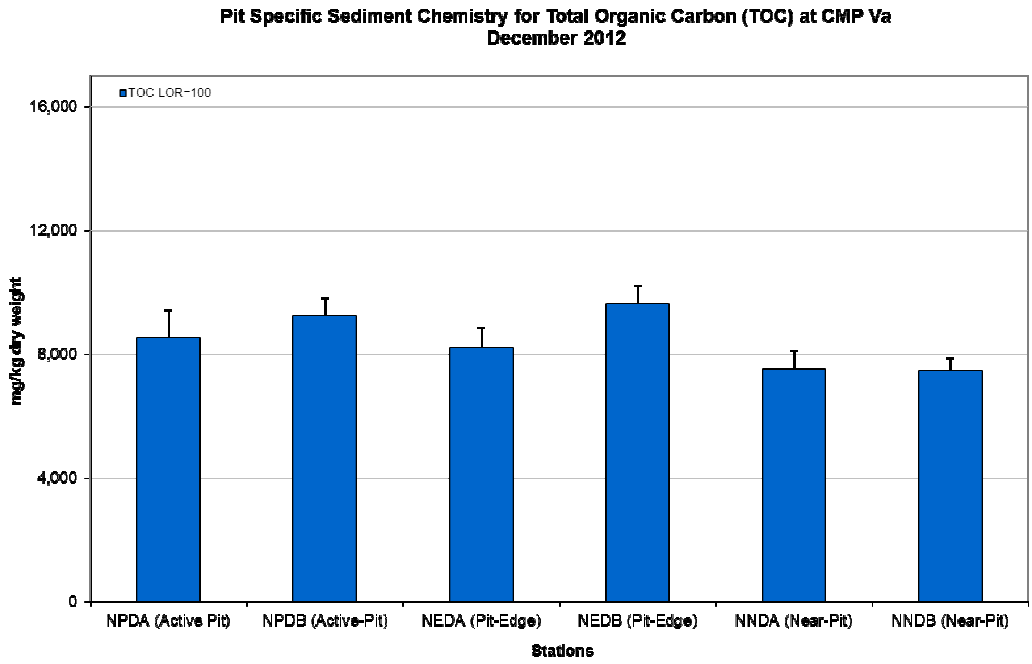

Figure 3: Concentration of Total Organic Carbon (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in December 2012.

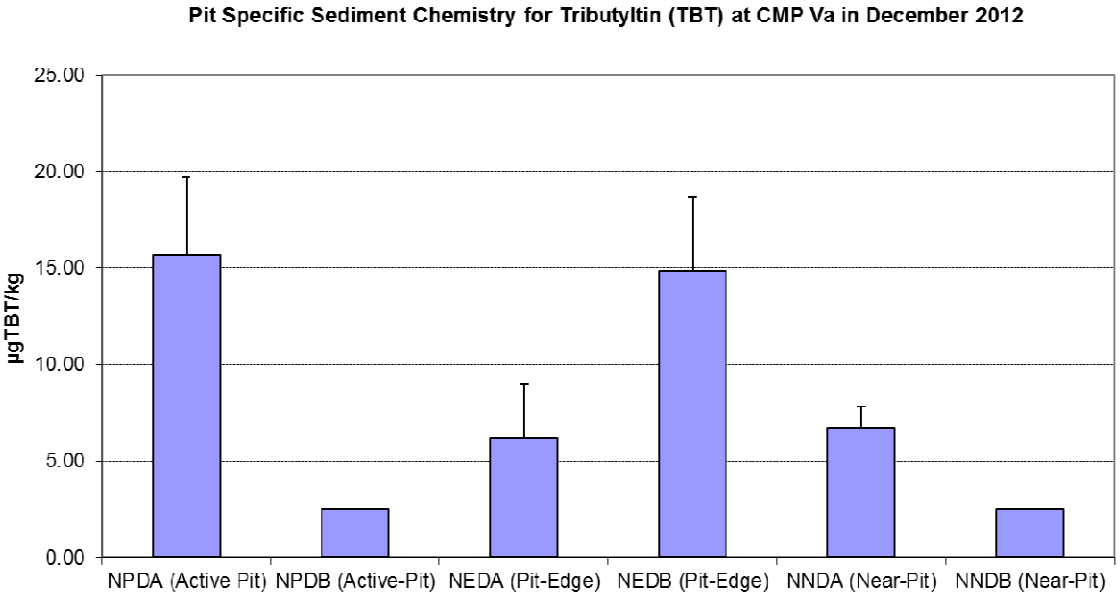

Figure 4: Concentration of Tributyltin (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring of CMP Va in December 2012.

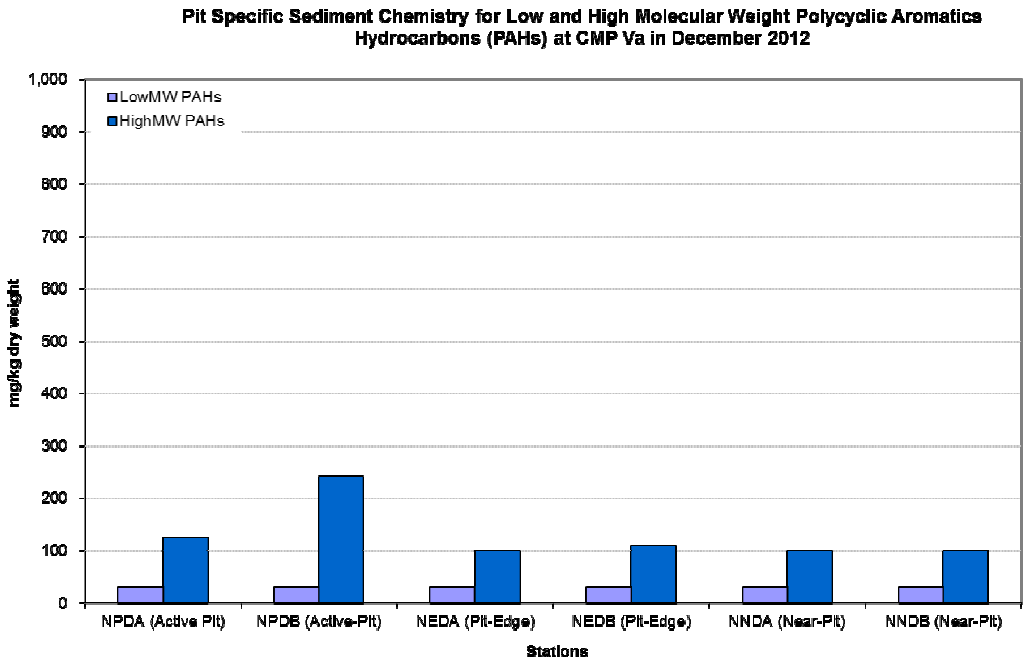

Figure 5: Concentration of Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) (µg/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in December 2012.

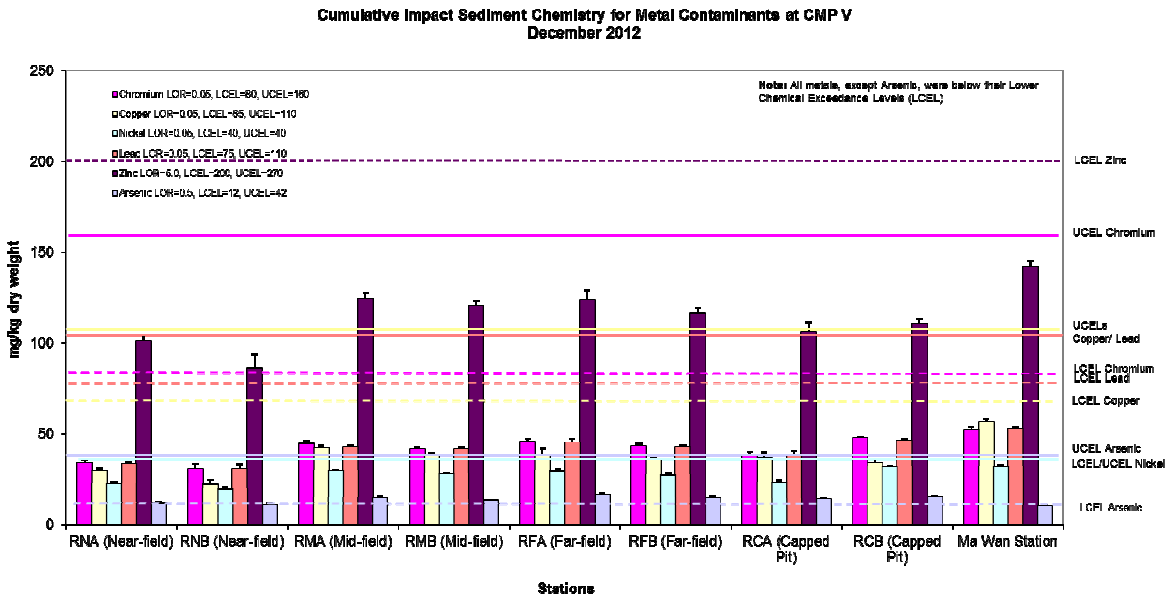

Figure 6: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean + SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for CMP Va in December 2012.

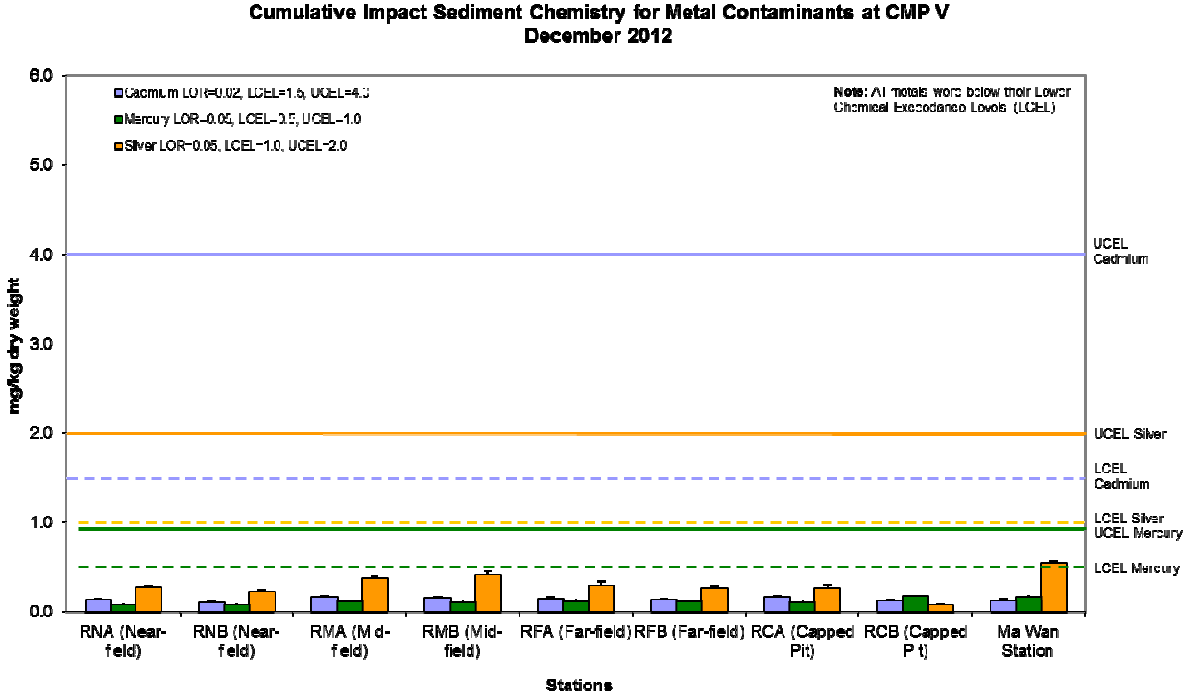

Figure 7: Concentration of Metals (Cd, Hg, Ag; mean + SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring of CMP Va in December 2012.

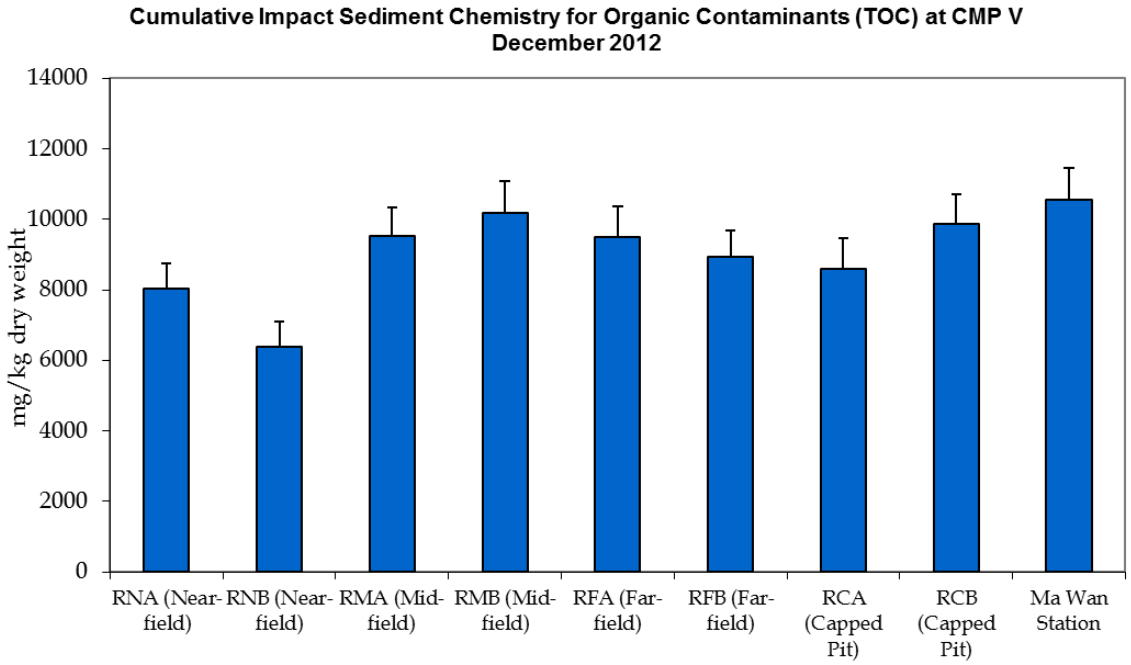

Figure 8: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean + SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring of CMP Va in December 2012.

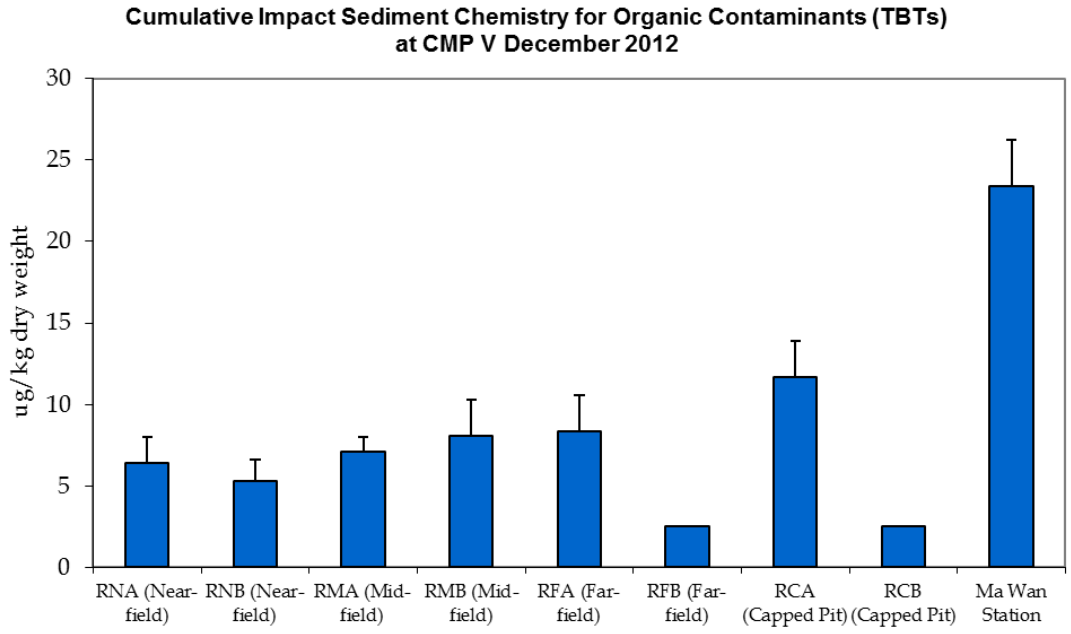

Figure 9: Concentration of Tributyltin (µg TBT/kg; mean + SD) in sediment samples collected from Cumulative Impact Chemistry Monitoring of CMP Va in December 2012.

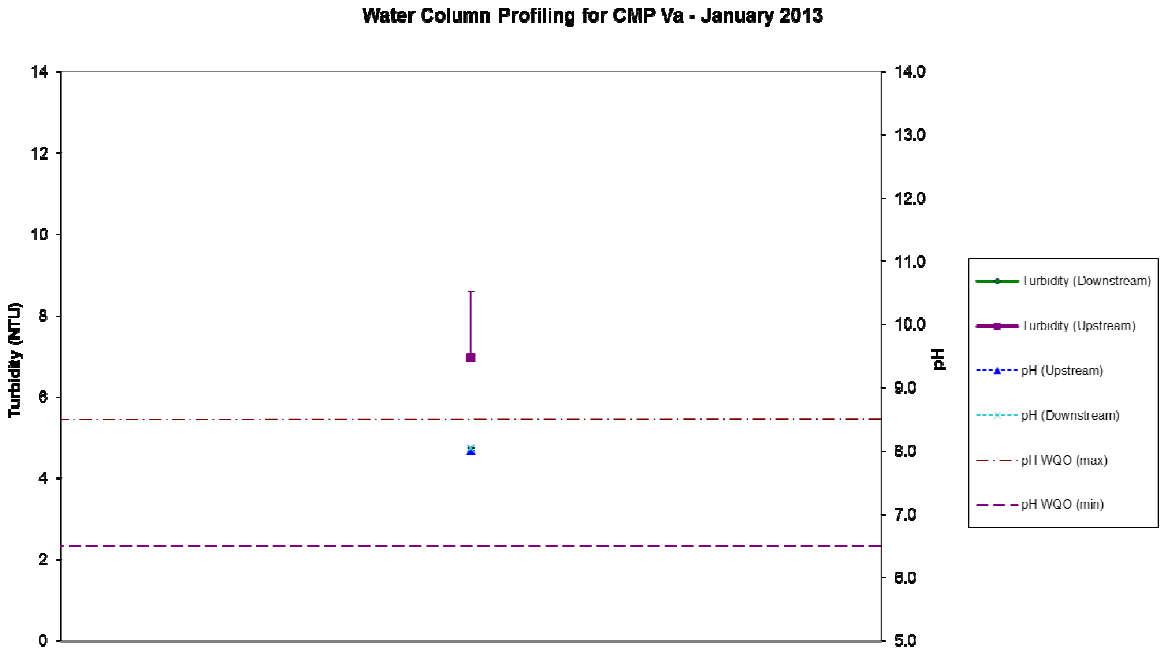

Figure 10: Turbidity and pH (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in January 2013.

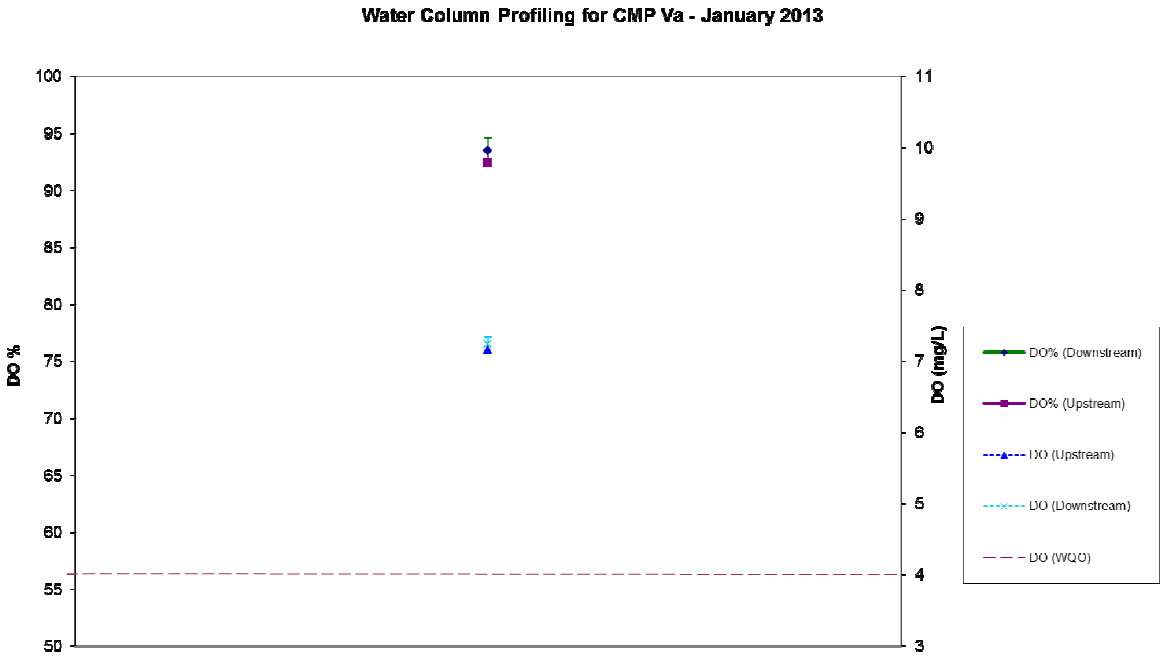

Figure 11: Dissolved Oxygen (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in January 2013.

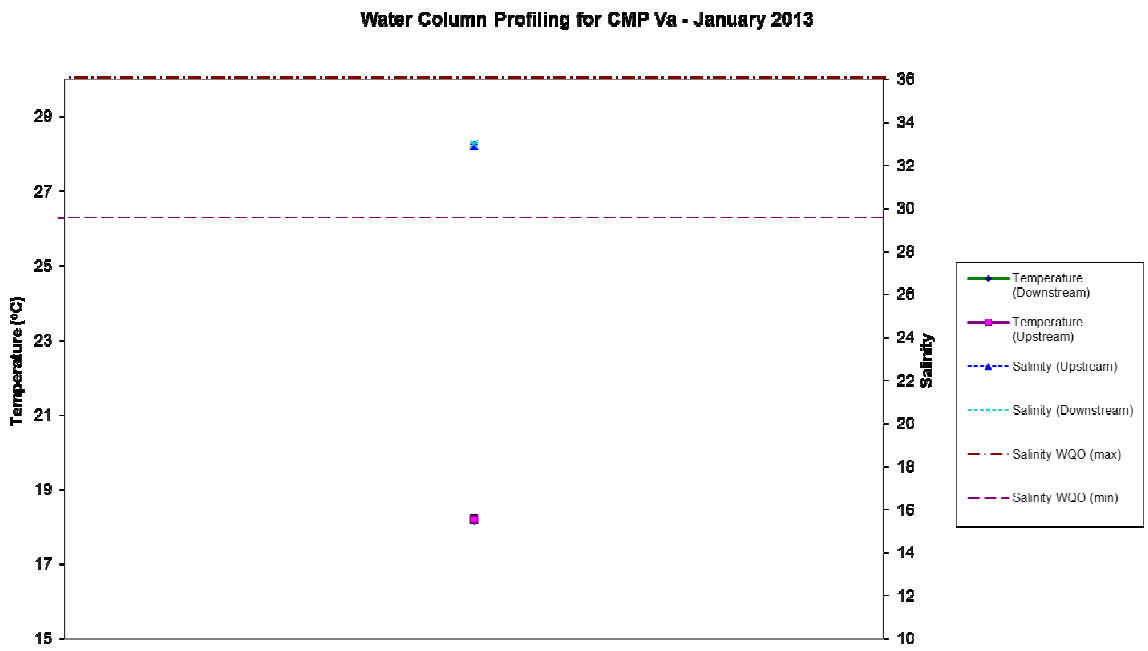

Figure 12: Salinity and Temperature (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in January 2013.

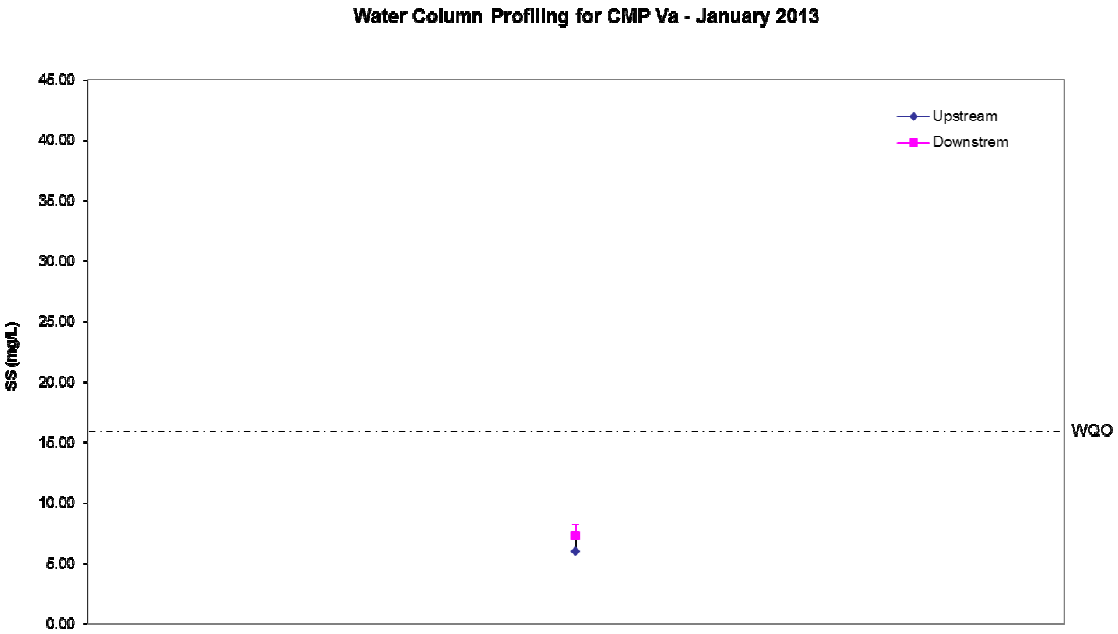

Figure 13: Suspended Solids (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in January 2013.

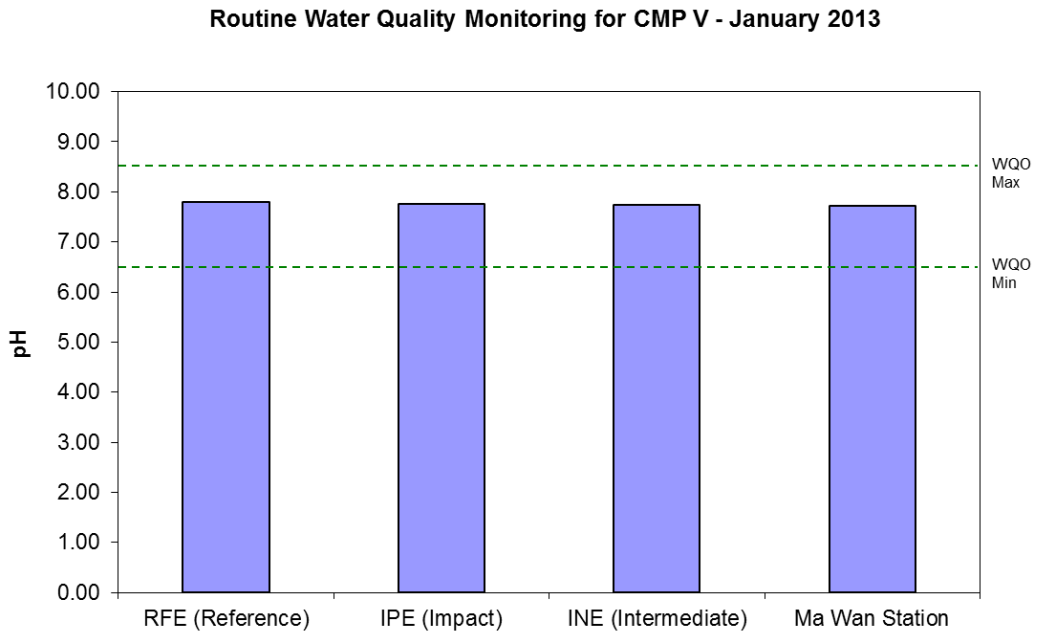

Figure 14: Level of pH (mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

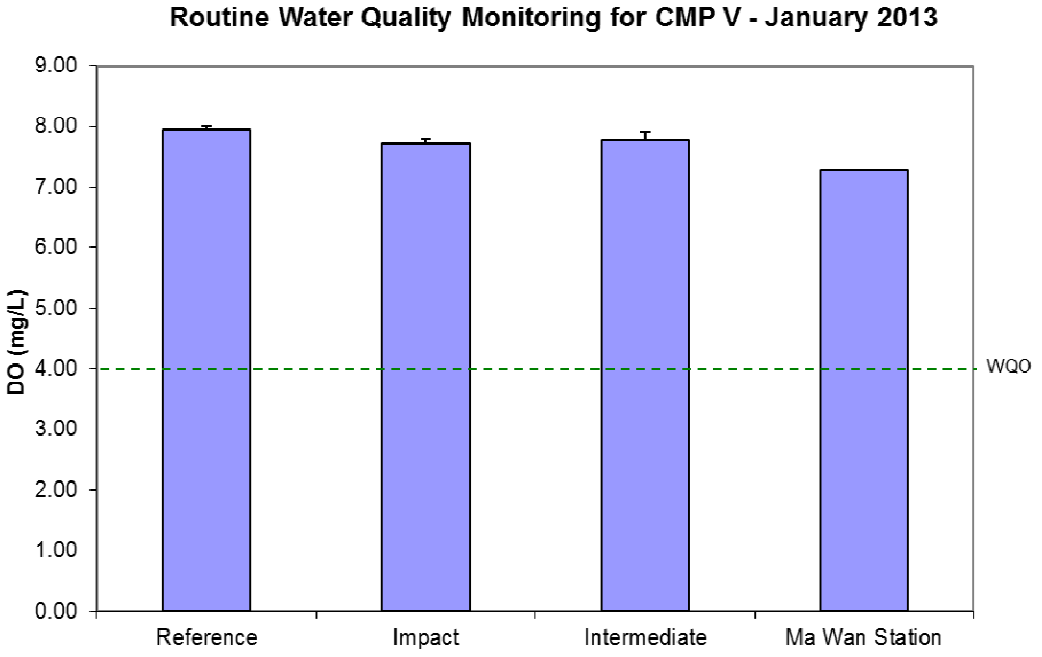

Figure 15: Concentration of Dissolved Oxygen (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

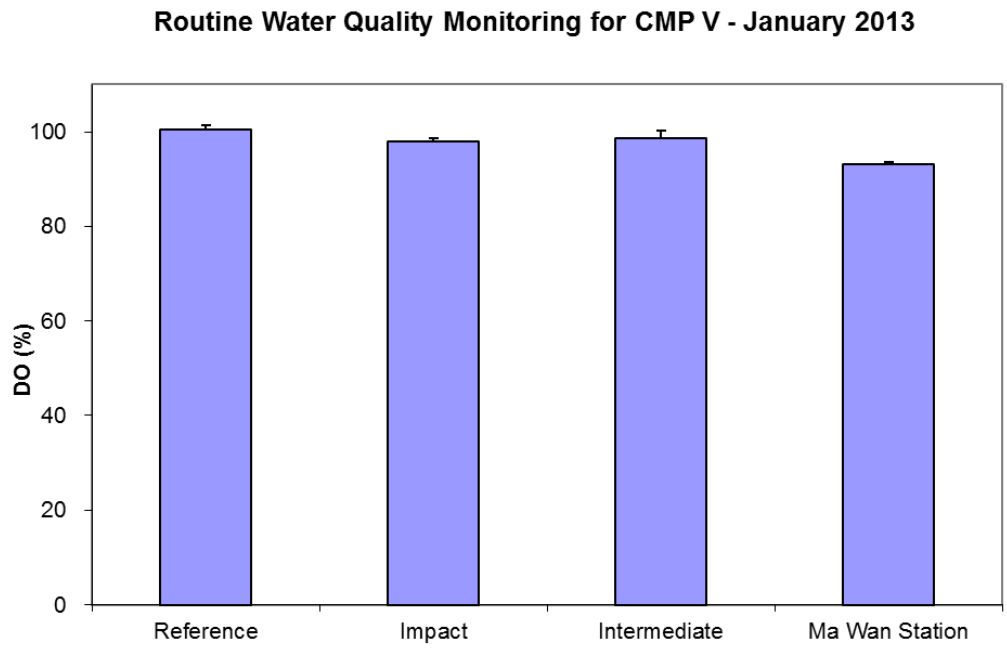

Figure 16: Level of Dissolved Oxygen (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

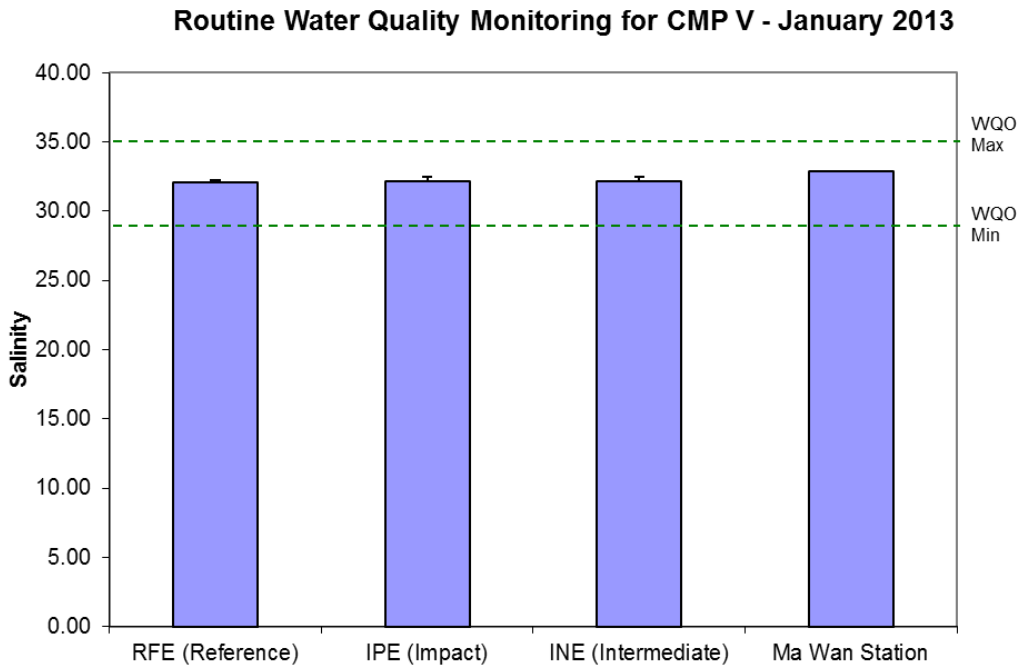

Figure 17: Level of Salinity (mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

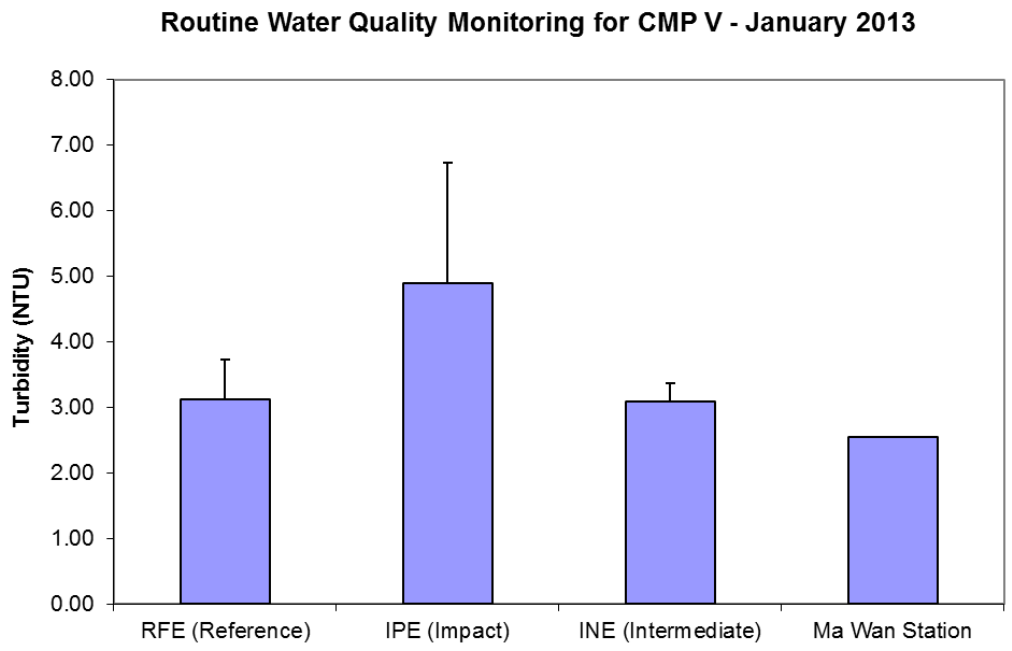

Figure 18: Level of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

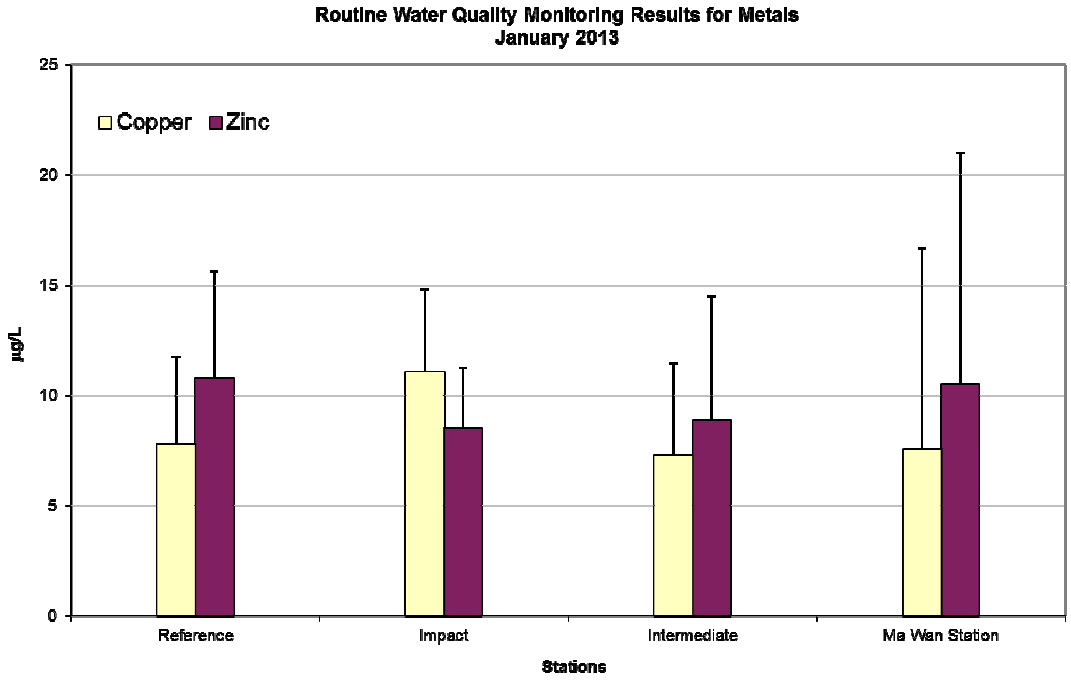

Figure 19: Concentration of Copper and Zinc (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

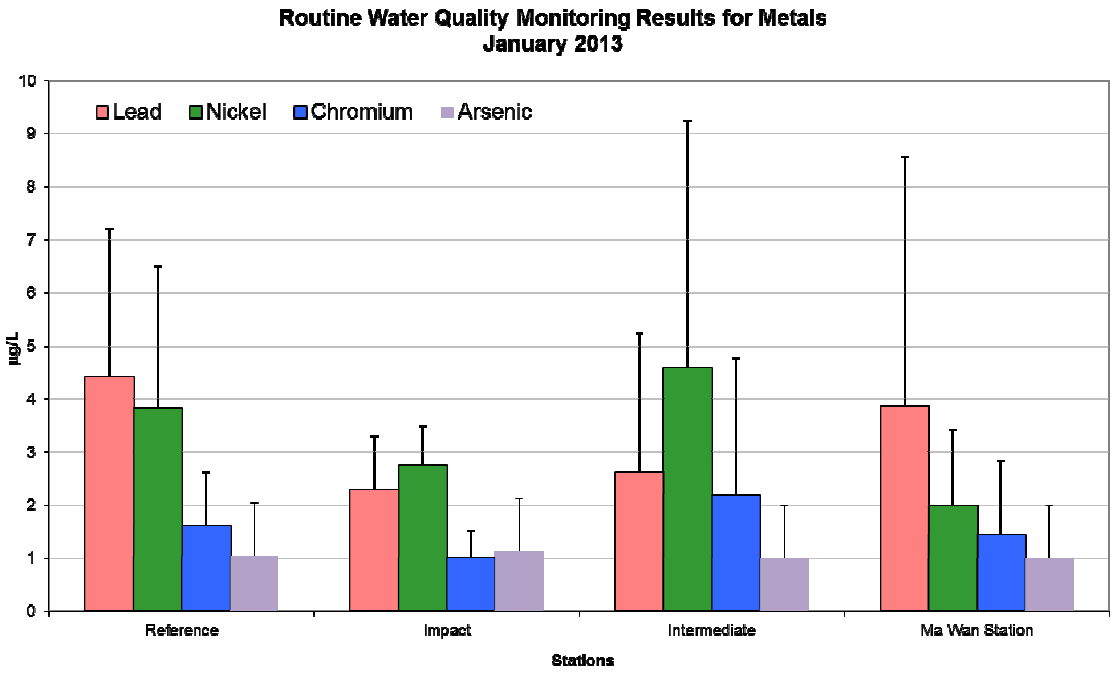

Figure 20: Concentration of Lead, Nickel, Chromium and Arsenic (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

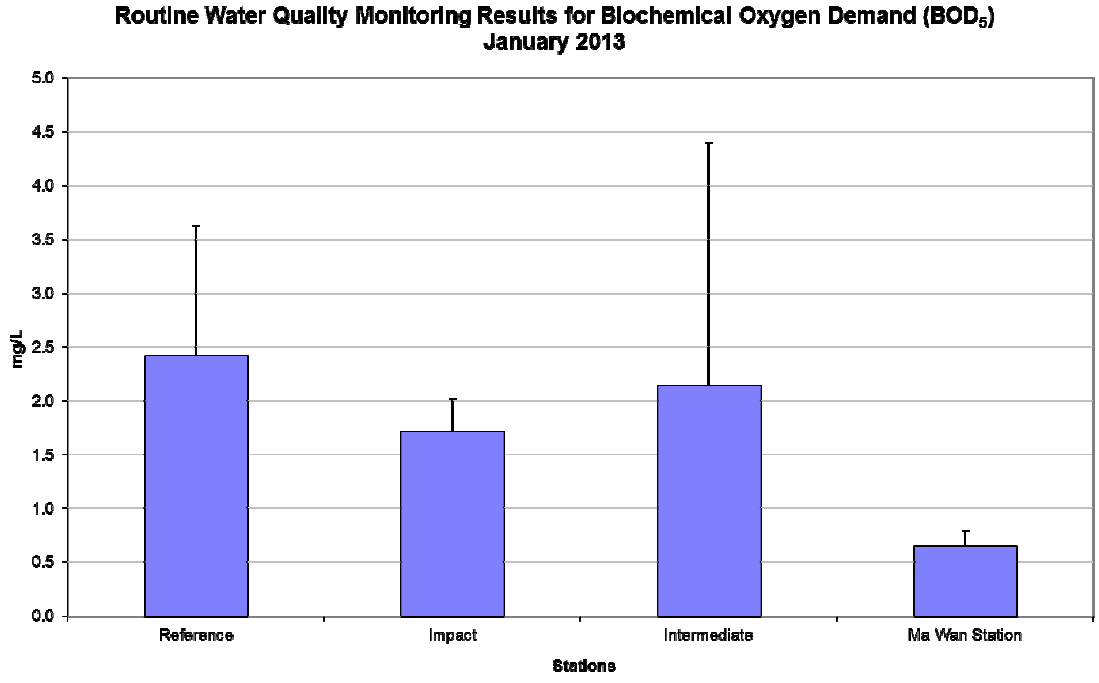

Figure 21: Level of Biochemical Oxygen Demand (BOD_5; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

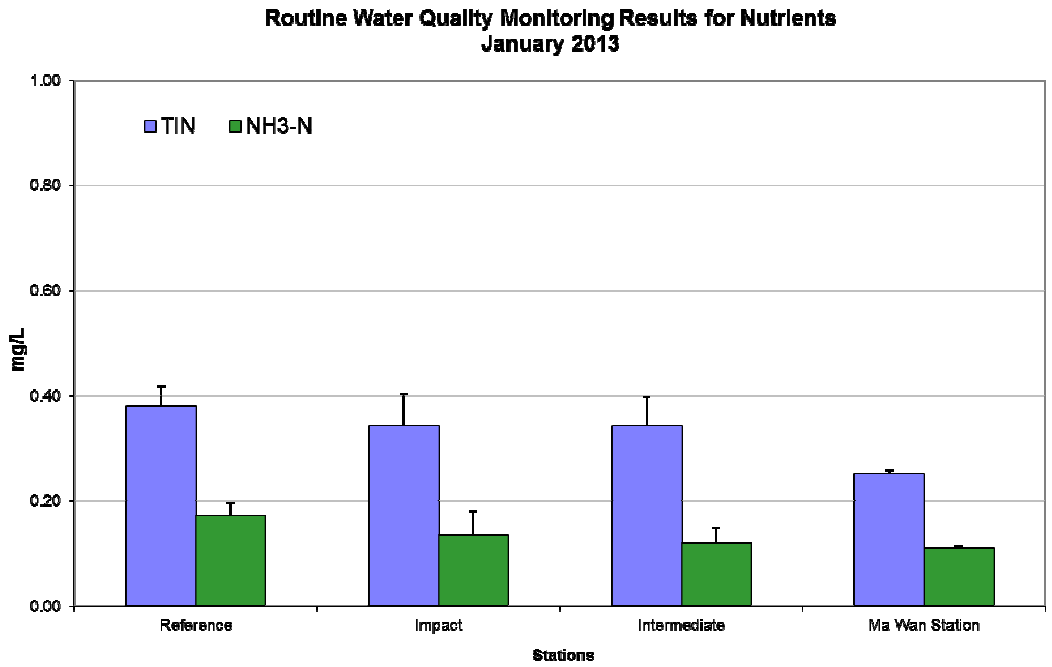

Figure 22: Concentration of Total Inorganic Nitrogen and NH_3-N (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

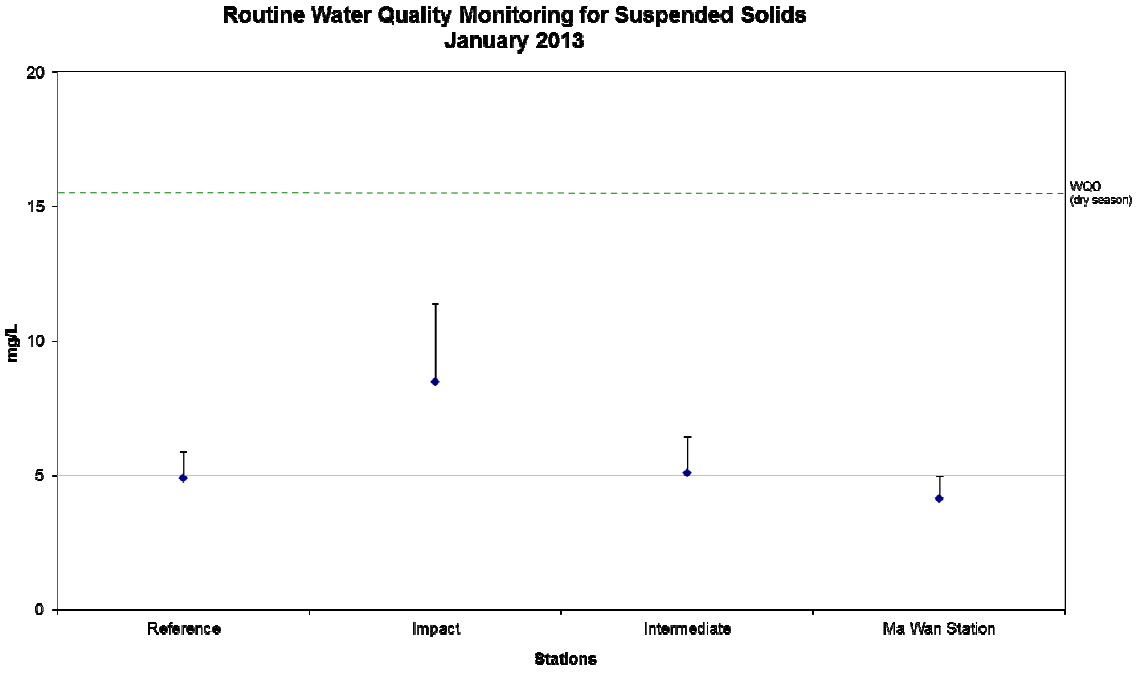

Figure 23: Concentration of Suspended Solids (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in January 2013.

Annex C

Results of Impact Monitoring during CMP Vd Dredging Operations for January 2013

Table C1 Summary Table of DO, Turbidity and SS Levels Recorded in January 2013

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/23	ME	DS1	8.09	8.59	2.92	4.17
		DS2	8.32	8.69	2.34	3.33
		DS3	8.16	8.36	2.16	4.00
		DS4	8.19	8.47	1.77	3.17
		DS5	8.24	8.53	2.72	5.00
		MW1	7.32	7.30	2.16	4.00
		US1	8.41	8.60	4.09	6.17
		US2	7.99	8.63	2.97	5.00
	MF	DS1	7.93	8.68	10.09	14.33
		DS2	8.35	9.14	6.06	16.50
		DS3	7.84	8.30	2.26	3.00
		DS4	7.95	8.39	2.24	3.33
		DS5	8.13	8.76	3.21	4.50
		MW1	7.10	7.16	1.61	2.83
		US1	7.96	8.72	2.32	3.67
		US2	8.58	9.28	2.21	2.00

Notes:

1. Please refer to Table C2 below for the Action and Limit Levels for dredging activities.
2. Cell shaded yellow indicated value exceeding the Action Level criteria.
3. Cell shaded red indicated value exceeding the Limit Level criteria.

Table C2 ***Action and Limit Levels of Water Quality for Dredging Activities***

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 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.

Annex D

Study Programme

ID	Task Name
1	**Project Commencement**
2	
3	**For CMP IV and New Facility at East Sha Chau**
4	
5	Submission of Draft Inception Report & Draft Programme
6	Submission of Final Inception Report & Final Programme
7	Submission of Draft Operations Manual
8	Submission of Final Operations Manual
9	**Submission of Operations Manual Updates**
17	Submission of Draft Monitoring And Audit Manual (Rev 1)
18	Submission of Final Monitoring And Audit Manual (Rev 1)
19	Submission of Draft Monitoring And Audit Manual (Rev 2)
20	Submission of Final Monitoring And Audit Manual (Rev 2)
21	**Submission of EM&A Manual Updates**
29	
30	**Monitoring Contract Works**
31	Prepare Draft Letters of Invitation, Gazette Documents & Tender Documents
32	Submission of Draft Tender Documents
33	Submission of Draft Gazette Documents
34	Submission of Final Tender Documents
35	Submission of Final Gazette Documents
36	Tendering and Tender Assessment
37	Prepare Contact Documents
38	Submission of Contract Documents
39	Administrate and Supervise Contracted Field and Laboratory Works
40	**Submission of Report on Dredging & Capping Operations**
49	**Monthly Progress Report**
101	**Quarterly EM&A Reports**
115	**Submission of Annual Review Report**
120	**Submission of Annual Risk Assessment Report**
125	**Submission of Draft Final Report**
126	**Submission of the Final Report**
127	**Submission of Draft Executive Summary Report**
128	**Submission of Final Executive Summary Reports**
129	
130	**For East Tung Lung Chau Disposal Facility**
131	
132	**Submission of Monitoring Results & Monthly EM&A Progress Report**
133	October 2009
134	November 2009
135	December 2009
136	January 2010

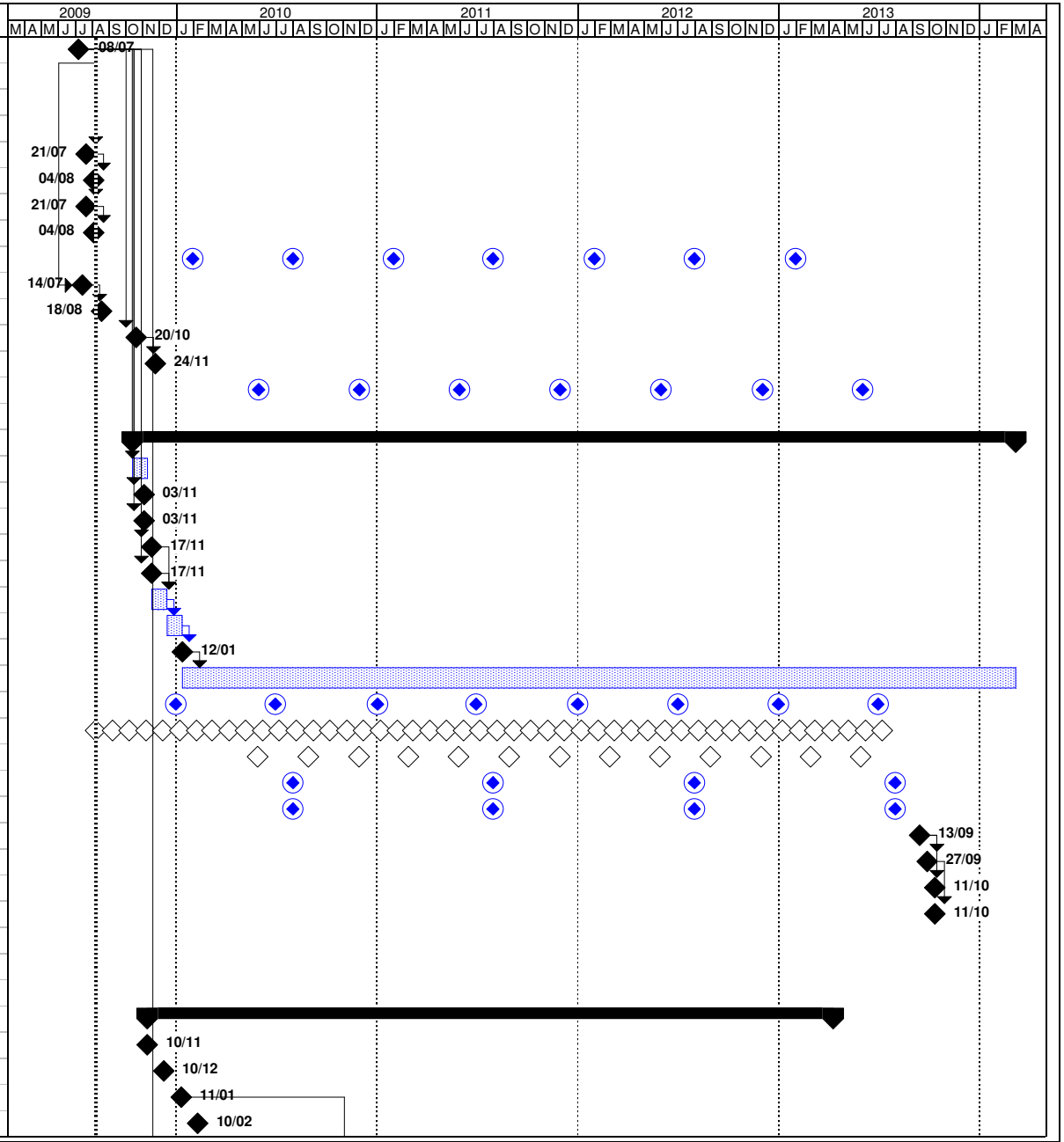

Figure 4.1 - Study Programme

Task | Milestone | Rolled Up Task
Progress | Summary | Rolled Up Milestone

Project: Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits at Sha Chau (2009-2013) - Investigation

ID	Task Name
137	February 2010
138	March 2010
139	October 2010
140	November 2010
141	December 2010
142	January 2011
143	February 2011
144	March 2011
145	October 2011
146	November 2011
147	December 2011
148	January 2012
149	February 2012
150	March 2012
151	October 2012
152	November 2012
153	December 2012
154	January 2013
155	February 2013
156	March 2013
157	**Submission of Initial Review Report**
158	**Submission of Quarterly EM&A Report**
159	Quarter 1 2010
160	Quarter 2 2010
161	Quarter 3 2011
162	Quarter 4 2011
163	Quarter 5 2012
164	Quarter 2 2012
165	Quarter 1 2013
166	**Submission of Annual Report**
167	Annual Report 1 2010
168	Annual Report 2 2011
169	Annual Report 3 2012
170	
171	**Alternative / Modified Capping Design**
172	
173	**Submission of Investigation Report**
174	**Submission of Annual Report**
175	Capping Design Annual Report 2010
176	Capping Design Annual Report 2011
177	Capping Design Annual Report 2012

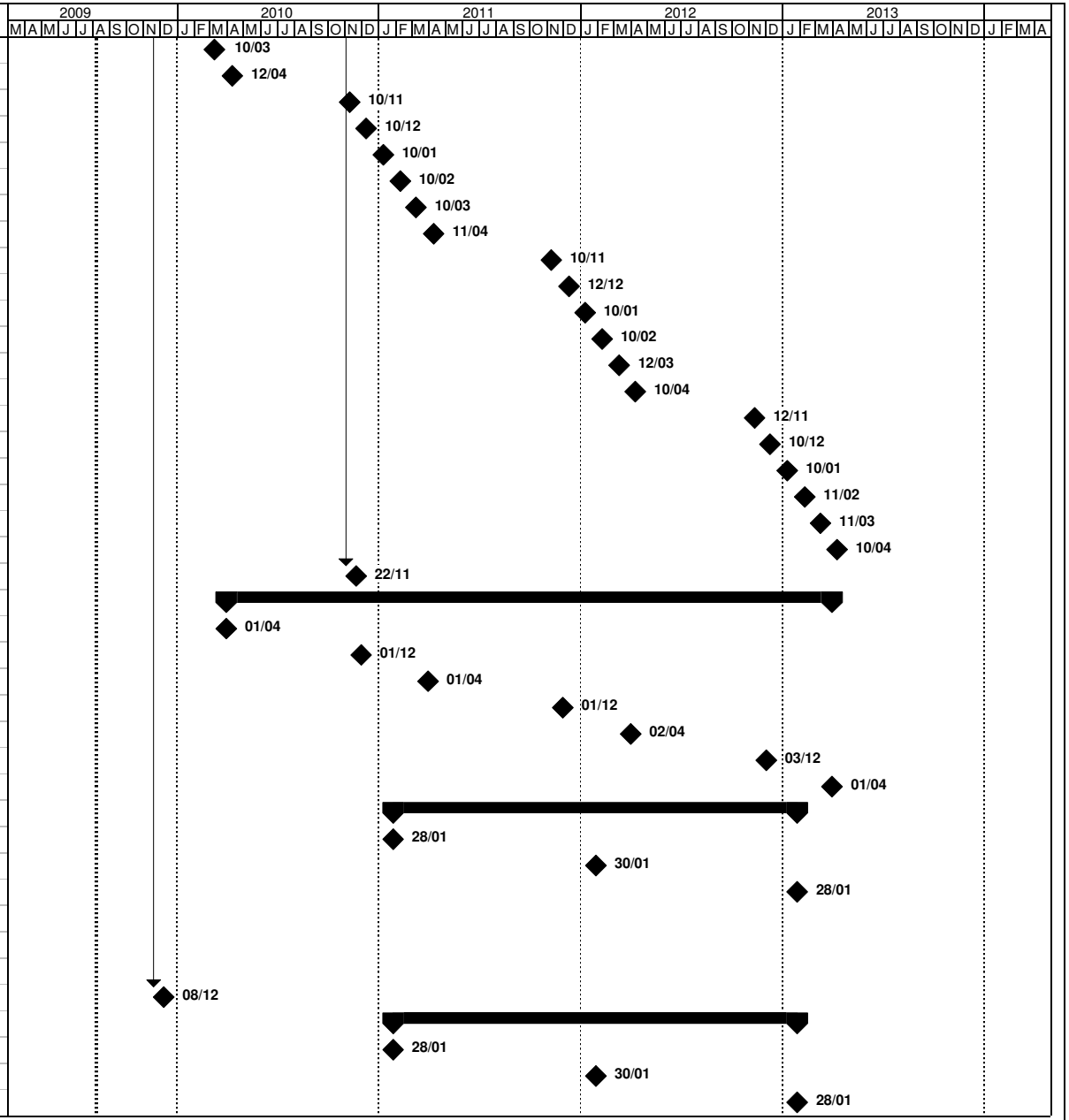

Figure 4.1 - Study Programme

Task | Milestone | Rolled Up Task
Progress | Summary | Rolled Up Milestone

Project: Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits at Sha Chau (2009-2013) - Investigation