




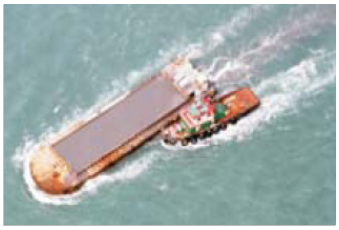
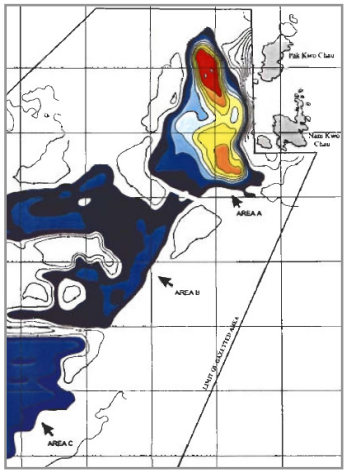

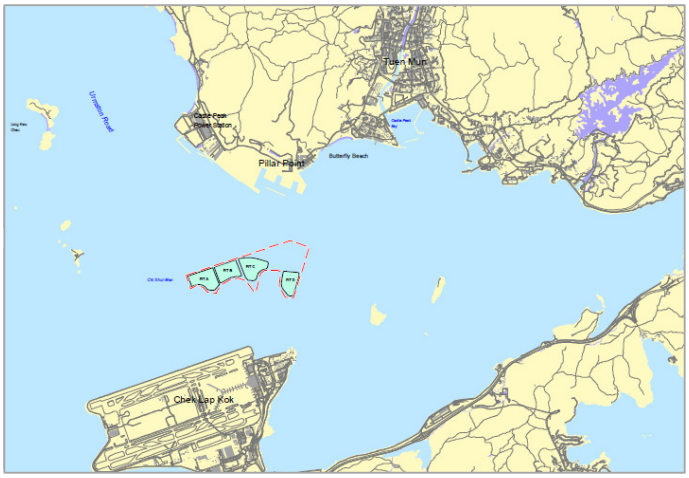

CEDD 土木工程拓展署
Civil Engineering and Development Department

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

Agreement No. CE 4/2009(EP)

37th Monthly Progress Report for Contaminated Mud Pits at Sha Chau – July 2012

Revision 0

28 November 2012

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Client:	Project No:
Civil Engineering and Development Department (CEDD)	0103262
Summary: This document presents progress of monitoring works on contaminated mud pits at Sha Chau in July 2012 under Agreement No. CE 4/2009 (EP).	Date: 28 November 2012 Approved by:  *Dr Robin Kennish* *Director*

Revision	Description	By	Checked	Approved	Date
0	37th Monthly Progress Report for CMP	RC	JT	RK	28/11/12

Distribution

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CONTENTS

ANNEXES

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

37th MONTHLY PROGRESS REPORT FOR CONTAMINATED MUD PITS AT SHA CHAU July 2012

1.1 BACKGROUND

1.1.1 Since 1992, the East of Sha Chau 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 July 2012, 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
- The dredging of CMP Vd was in progress.

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

1.2 REPORTING PERIOD

1.2.1 This Monthly Progress Report covers the reporting month of July 2012.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1 The following monitoring activities have been undertaken for CMP V in July 2012 and findings from these activities were presented in the current monthly report:

- *Sediment Chemistry after a Major Storm Event* was conducted for CMP Va on 6 July 2012;
- *Impact Water Quality Monitoring during Dredging Operations* was conducted for CMP Vd on 7 July 2012;
- *Pit Specific Sediment Chemistry* was conducted for CMP Va on 9 July 2012;
- *Routine Water Quality Monitoring* was conducted for CMP Va on 13 July 2012;
- *Water Column Profiling* was conducted for CMP Va on 14 July 2012, and;

- *Demersal Trawling* was conducted for CMP Va on 18 and 19 July 2012.

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

1.4 DETAILS OF OUTSTANDING SAMPLING AND / OR ANALYSIS

1.4.1 No outstanding sampling and laboratory analysis remained from July 2012.

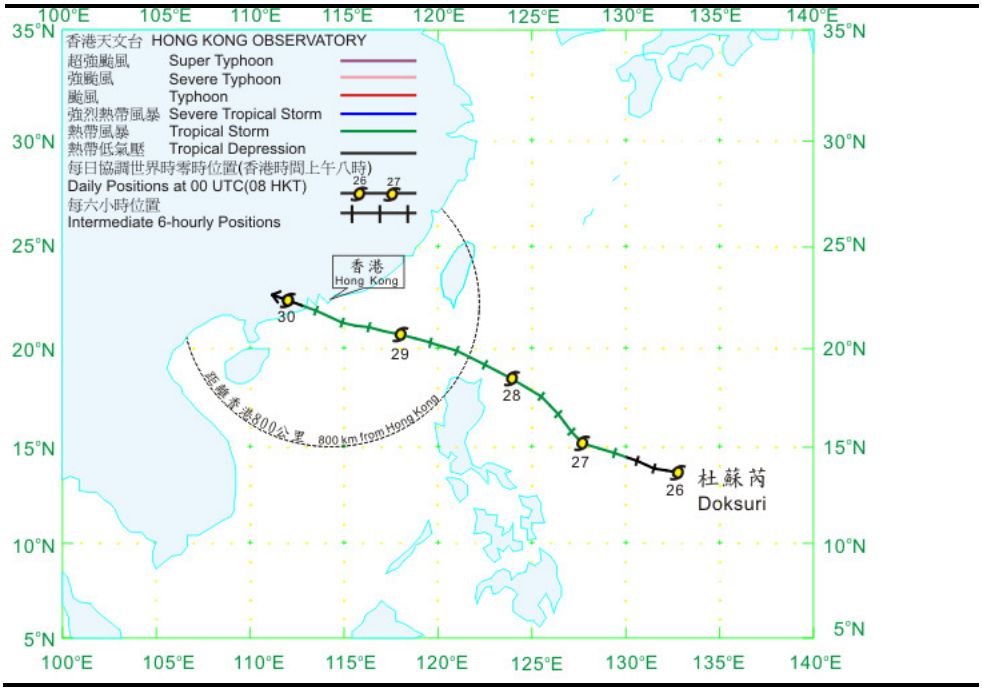
1.5 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR CMP V

1.5.1 Brief discussion of the monitoring results is presented in this section. Detailed discussion will be presented in the corresponding Quarterly Report.

1.5.2 *Sediment Chemistry after a Major Storm Event of CMP Va – July 2012*

1.5.3 Sampling for Sediment Chemistry after a Major Storm Event was conducted on 6 July 2012 after the visit of Tropical Storm Doksuri, which led to the issue of Typhoon Signal No.8 on 29 & 30 June 2012. A total of nine monitoring stations were being sampled. The track of Doksuri is shown in *Figure 1.1*.

Figure 1.1 Track of Severe Typhoon Doksuri from 26 to 30 June 2012 (Source: Hong Kong Observatory)



1.5.4 Concentrations of all metals, except Arsenic, were below the Lower Chemical Exceedance Limit (*LCEL*) (*Figures 1 and 2* of *Annex B*). Concentrations of Arsenic in sediments from all stations exceeded *LCEL* (12 mg/kg), but remained below *UCEL* (42 mg/kg). It is important to note that relatively high natural levels of Arsenic are present in Hong Kong's marine sediments. 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.

1.5.5 Overall, there appeared to be no evidence showing the failure of CMPs in retaining disposed mud or causing contamination of sediments after the major storm event in July 2012.

1.5.6 Impact Water Quality Monitoring during Dredging Operations of CMP Vd – July 2012

1.5.7 *Impact Water Quality Monitoring during Dredging Operations of CMP Vd* was conducted on 7 July 2012. 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 1.2*). Monitoring was also conducted at the 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).

1.5.8 Monitoring results are presented in *Table C1* of *Annex C*. Levels of DO, Turbidity and TSS generally complied with the Action and Limit Levels set in the Baseline Monitoring Report (1), except for bottom DO level at station DS 3 during the mid-flood tide. The single case of exceedance recorded at station DS3 is not likely to be caused by the dredging operations at CMP Vd since the bottom DO levels well complied with the Action level at stations closer to dredging operations at CMP Vd (ie DS1 and DS2).

1.5.9 Overall, the results indicated that the dredging operations at CMP Vd did not appear to cause any unacceptable deterioration in water quality during this reporting period. Therefore, no further mitigation measures, except for those recommended in the Environmental Permit (*EP-312/2008*), are considered required for the dredging operations of CMP Vd.

(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.

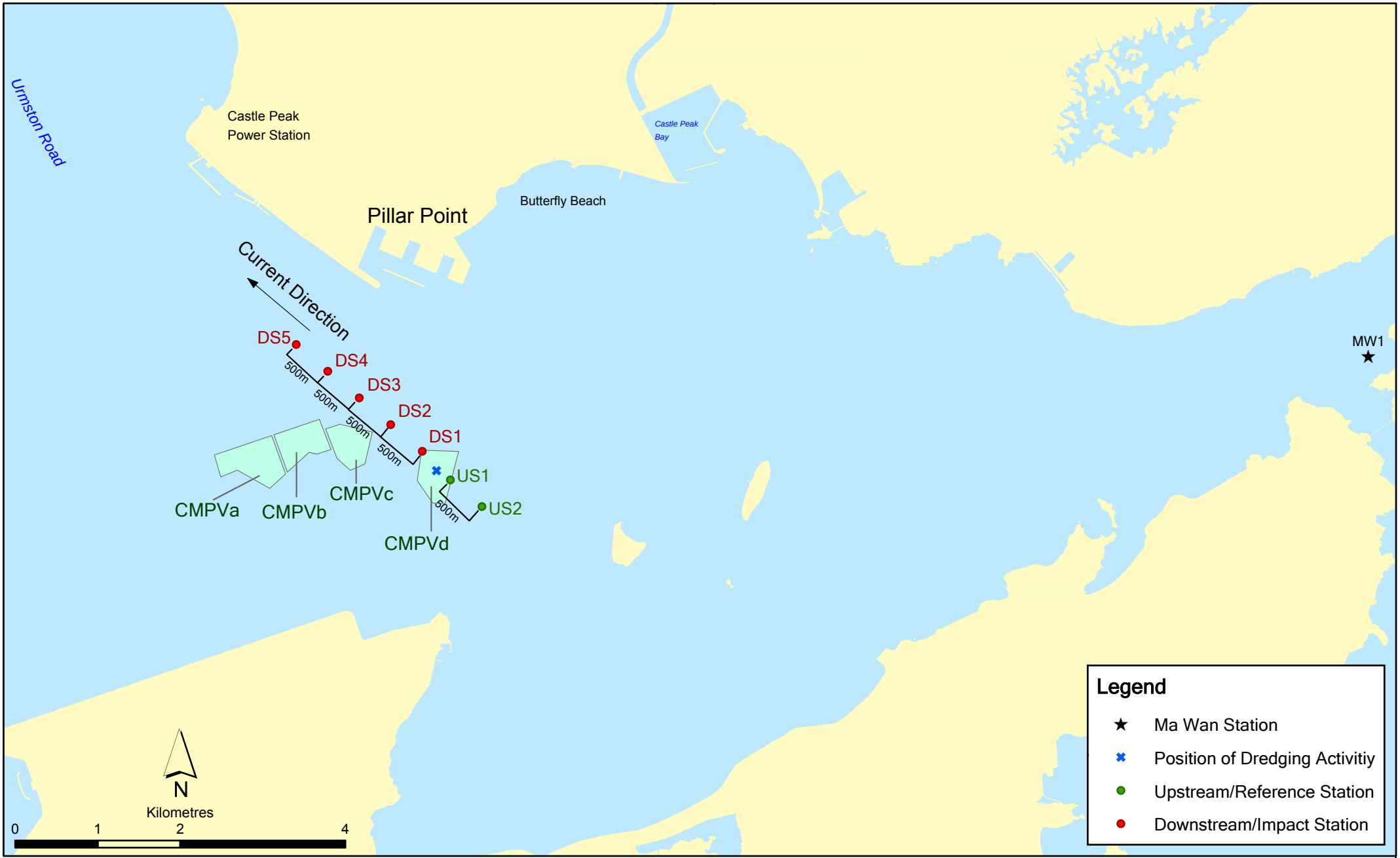


Figure 1.2

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.

File: T:\GIS\CONTRACT\0103262\Mxd\CMPV\0103262_modelling stations2.mxd
Date: 28/11/2012

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1.5.10 Pit Specific Sediment Chemistry of CMP Va – July 2012

1.5.11 Monitoring locations for Pit Specific Sediment Chemistry for CMP Va are shown in *Figure 1.3*. A total of six monitoring stations were being sampled. Concentrations of metals at all stations in July 2012 were below the LCEL, with the exception of Arsenic (*Figures 4 and 5* of *Annex B*). Concentrations of Arsenic exceeded the LCEL at all stations in July 2012. As discussed in *Section 1.5.4* above, 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.

1.5.12 For organic contaminants, Total Polychlorinated Biphenyls (PCBs), Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (Low and High M.W. PAHs) were below the limit of reporting at all stations in July 2012, except at the Active Pit station NPDB. Total Organic Carbon (TOC) concentration was similar amongst all stations (*Figure 6* of *Annex B*). TBT concentration was the highest at Active Pit station NPDB in July 2012 when compared to other stations (*Figure 7* of *Annex B*). Concentrations of 4,4''-DDE were higher than the limit of reporting at the Active Pit station NPDB for July 2012, whereas concentrations of DDT were lower than the limit of reporting at all stations.

1.5.13 It should be noted that the Action Pit stations are located within CMP Va which were receiving contaminated mud during the reporting month. Therefore, the higher concentrations of contaminants recorded at the Action Pit stations alone are not considered as indicating any dispersal of contaminated mud from CMP Va and thus not considered as indicating any unacceptable environmental impacts from the mud disposal operations. Nevertheless, detailed analysis will be presented in the Quarterly Report to reveal any trend of increasing sediment contaminant concentrations towards CMP Va.

1.5.14 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.

1.5.15 Routine Water Quality Monitoring for CMP Va – July 2012

1.5.16 The results for the Routine Water Monitoring conducted during July 2012 in the wet season have been assessed for compliance with the Water Quality Objectives (WQOs) (please see *Figure 1.4* for the monitoring locations). This consists of a review of the Environmental Protection Department (EPD) routine water quality monitoring data for the wet season period (April to October) of 1999-2010 from stations in the Northwestern Water Control Zone, where CMPs are located. For Salinity, the average value obtained from the upstream station was used for the basis as the WQO. *In-situ* monitoring and laboratory results are shown in *Tables 1.1 and 1.2* respectively, with graphical presentation provided in *Annex B*. Monitoring was undertaken at a total of ten stations in the reporting month.

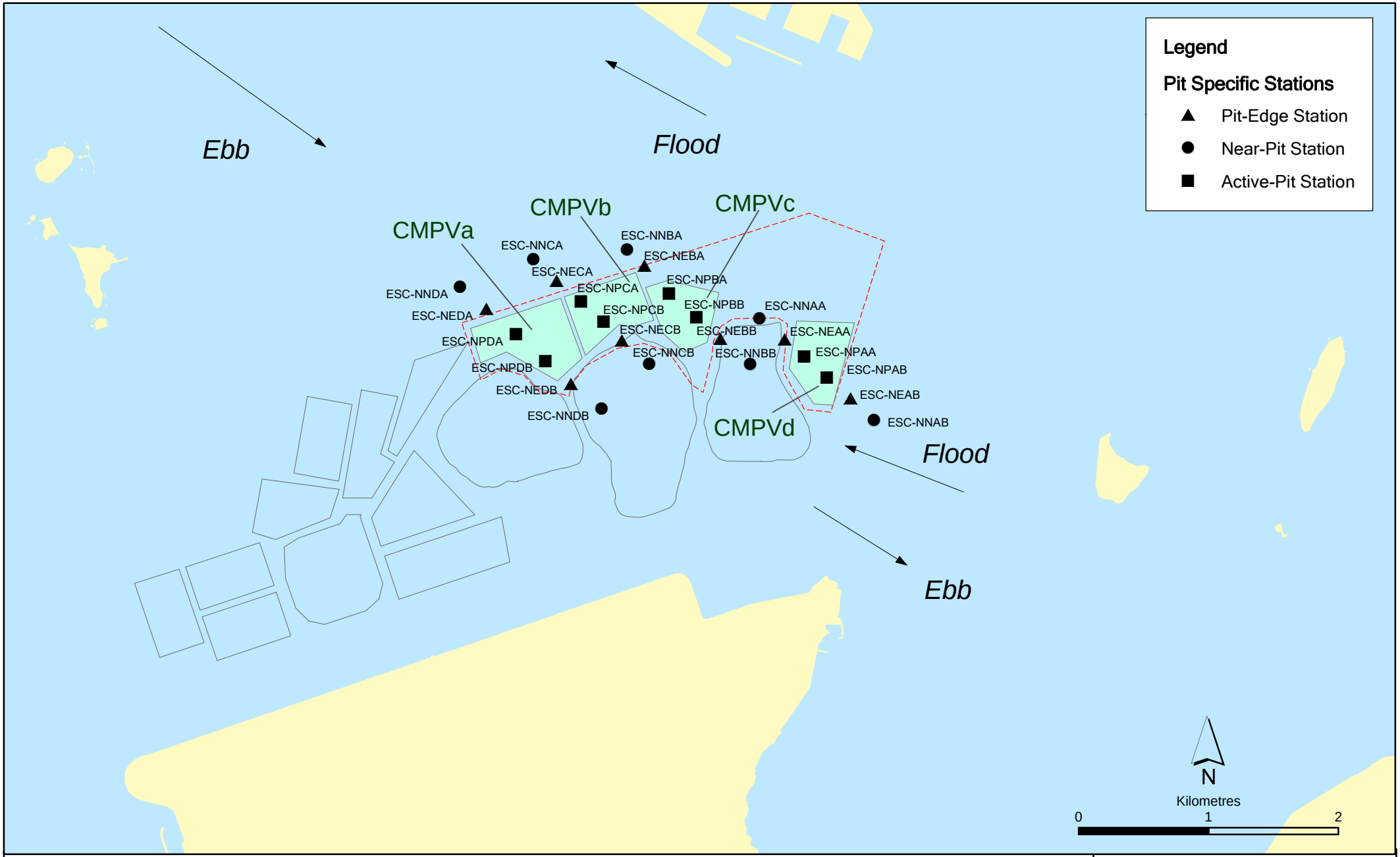

Figure 1.3

Pit Specific Sediment Quality Monitoring Stations for CMPV

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Date: 29/10/2009

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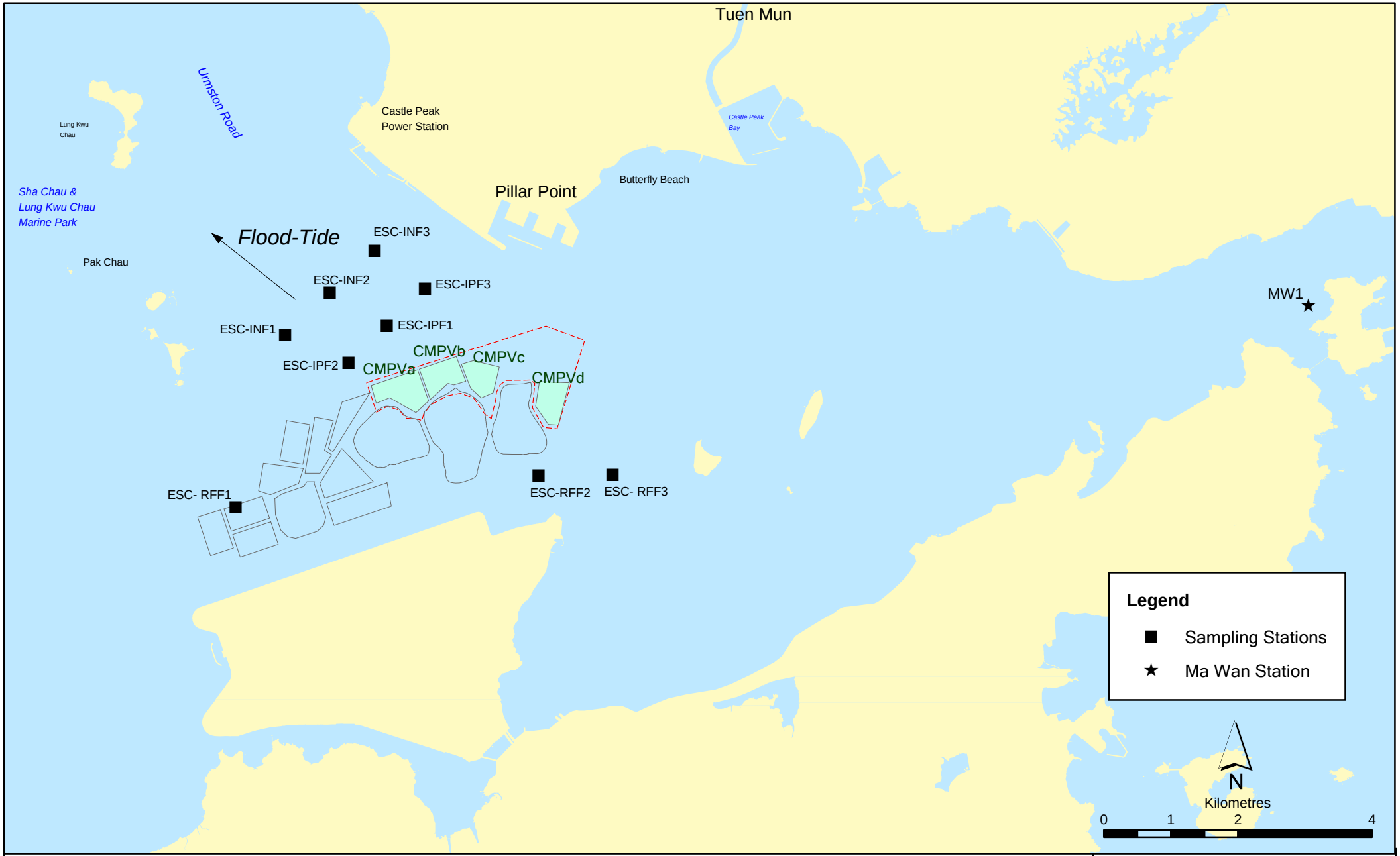

Figure 1.4

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

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

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In-situ Measurements

1.5.17 Analyses of results for July 2012 indicated that for all stations (Impact, Intermediate and Reference), levels of pH and DO complied with the WQOs (*Figures 8-10 of Annex B*). Levels of Salinity exceeded the WQO at all stations, except at Reference station (*Figure 11* 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 9, 10, 12 of Annex B*). All *in-situ* water quality measurements showed relatively minor variations between Impact, Intermediate and Reference stations (*Figures 8 to 12 of Annex B*).

Laboratory Measurements

1.5.18 Analyses of July 2012 results indicate that majority of metal concentrations (ie Arsenic, Cadmium, Chromium, Mercury and Silver) were below their limit of reporting at all stations. Copper, Nickel and Zinc were detected in samples from all stations while Lead and Chromium levels were below the limits of reporting at all stations except Ma Wan Station (*Figures 13 and 14* of *Annex B*). Concentration of Nickel appeared to be similar amongst all stations. Concentrations of Copper, Lead and Zinc were higher at Ma Wan station. Levels of 5-day Biochemical Oxygen Demand (BOD_5), Total Inorganic Nitrogen (TIN) and NH_3-N also appeared to be similar amongst all stations (*Figures 15 and 16 of Annex B*). Concentrations of TSS exceed WQO (12.74 mg/L for wet season) at all stations, except at the Reference station while they complied with the Action and Limit Levels at all stations within the reporting month (*Figure 17 of Annex B*).

Table 1.1 In-situ Monitoring Results for Routine Water Quality Monitoring during July 2012

Stations	Temp (°C)	Salinity	Turbidity (NTU)	pH	Dissolved Oxygen (%)	Dissolved Oxygen (mg L^{-1})
RFE (Reference)	29.26	12.51	5.66	7.55	94.18	6.74
IPE (Impact)	28.47	17.95	4.35	7.46	74.45	5.24
INE (Intermediate)	28.46	17.75	4.23	7.46	73.63	5.19
Ma Wan Station	27.05	23.63	2.95	7.01	57.66	4.02
WQO	*N/A*	11.26-13.76	*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 1.2 Laboratory Results for Routine Water Quality Monitoring during July 2012

Stations	As	Ag	Cd	Cr	Cu	Hg	Pb	Ni	Zn	NH_3-N	TIN	BOD_5	TSS
RFF	<LOR	<LOR	<LOR	<LOR	1.58	<LOR	<LOR	2.13	12.79	0.02	1.23	1.00	12.33
IPF	<LOR	<LOR	<LOR	<LOR	1.38	<LOR	<LOR	1.92	8.79	0.03	1.03	1.12	16.92
INF	<LOR	<LOR	<LOR	<LOR	1.19	<LOR	<LOR	2.08	10.04	0.03	1.08	0.93	22.29
Ma Wan Station	<LOR	<LOR	<LOR	<LOR	4.25	<LOR	1.56	2.75	51.00	0.03	0.78	1.16	25.13
											WQO of TSS		12.74

(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).

1.5.19 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.

1.5.20 Water Column Profiling for CMP Va – July 2012

In-situ Measurements

1.5.21 Water Column Profiling was undertaken at a total of two sampling stations in July 2012. The water quality monitoring results have been assessed for compliance with the WQOs set by EPD as presented in *Section 1.5.16* above. Graphical presentation of the monitoring results is provided in *Annex B*.

1.5.22 Analyses of results for July 2012 indicated that levels of Salinity, pH and DO complied with the WQOs at both Upstream and Downstream stations (*Figures 18-20 in Annex B*). DO and Turbidity complied with the Action and Limit Levels set in the EM&A Manual (1).

Laboratory Measurements for Total Suspended Solids (TSS)

1.5.23 Analyses of data obtained in July 2012 indicated that the TSS levels at Upstream stations complied with the WQO (*Figure 21 in Annex B*), but not at Downstream stations. TSS levels measured in July 2012 complied with the Action and Limit Levels set in the EM&A Manual.

1.5.24 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.

1.5.25 Demersal Trawling for CMP Va – July 2012

Abundance and Biomass

1.5.26 Demersal Trawling was undertaken at a total of six sampling stations in July 2012. The average number of species collected is presented in *Table 1.3*. In July 2012, species richness was relatively similar between Impact and Reference stations, except that the lowest mean number of species was recorded in Reference station TNA.

Table 1.3 Summary of the Mean Number of Faunal Species Caught during July 2012 Monitoring

Date of Sampling	Impact Stations		Reference Stations			
	INA	INB	TNA	TNB	TSA	TSB
July 2012	48.8	43.8	39.2	50.4	50.8	45.0

(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).

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.6.1 The following monitoring programmes will be conducted in the next monthly period of August 2012:

CMP IV

- *Impact Monitoring during Capping* for CMP IVc;

CMP V

- *Pit Specific Sediment Chemistry* for CMP Va;
- *Cumulative Impact Sediment Chemistry* for CMP Va;
- *Sediment Toxicity Test* 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 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 2012)

		2012											
Tissue/ Whole Body Sampling		**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**
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**
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**
Plume Stations	WCP1	*											
	WCP2	*											

"*" = 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

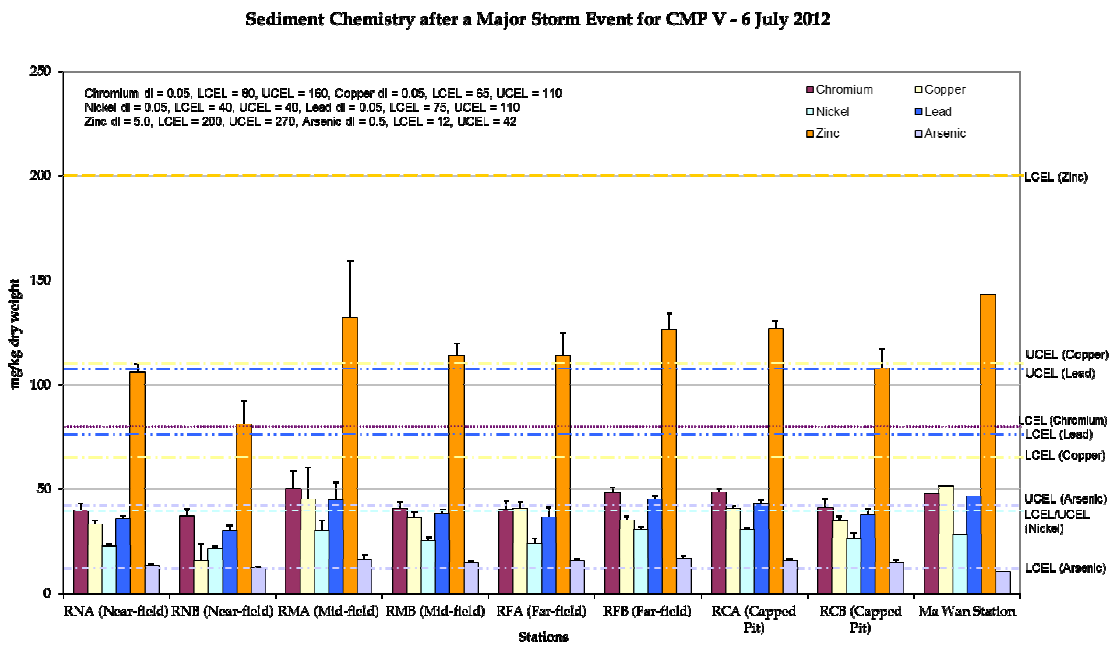

Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean + SD) in sediment samples collected from Sediment Chemistry after a Major Storm Event for CMP Va in July 2012.

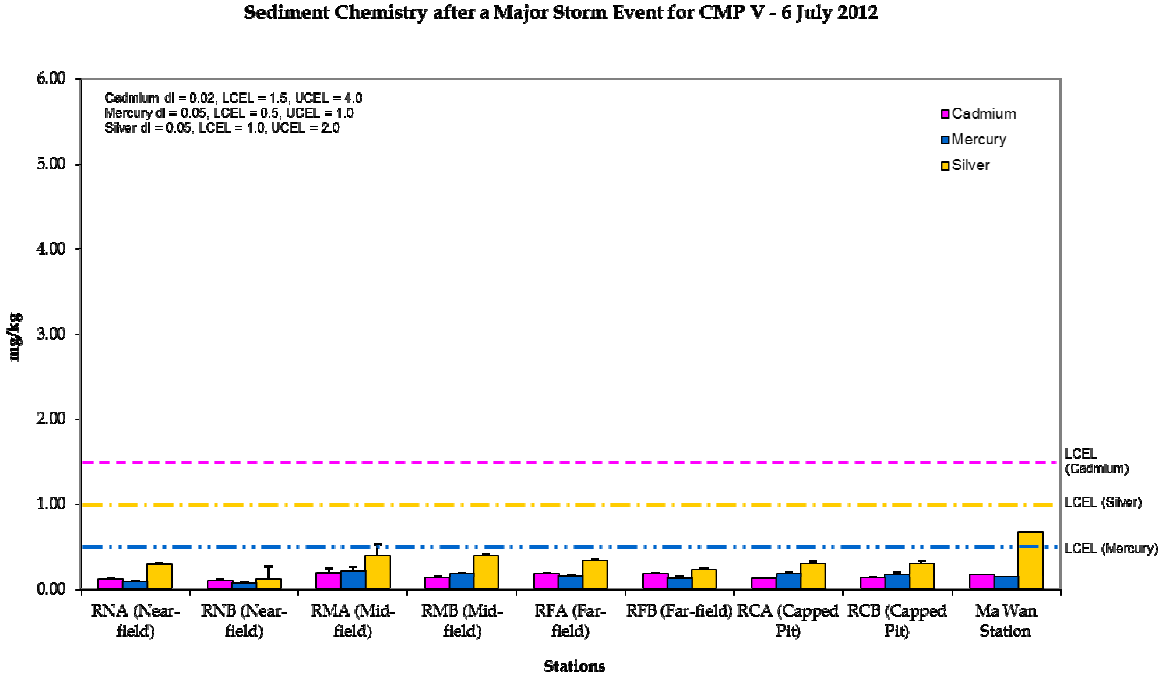

Figure 2: Concentration of Metals (Cd, Hg, Ag; mean + SD) in sediment samples collected from Sediment Chemistry after a Major Storm Event for CMP Va in July 2012.

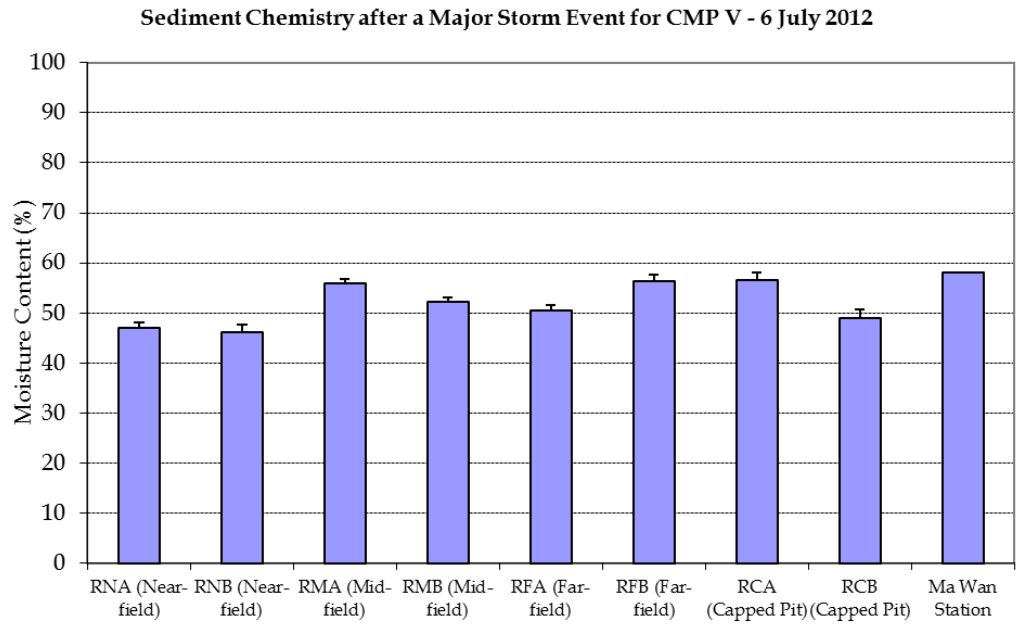

Figure 3: Moisture Content (%; mean + SD) in sediment samples collected from Sediment Chemistry after a Major Storm Event for CMP Va in July 2012.

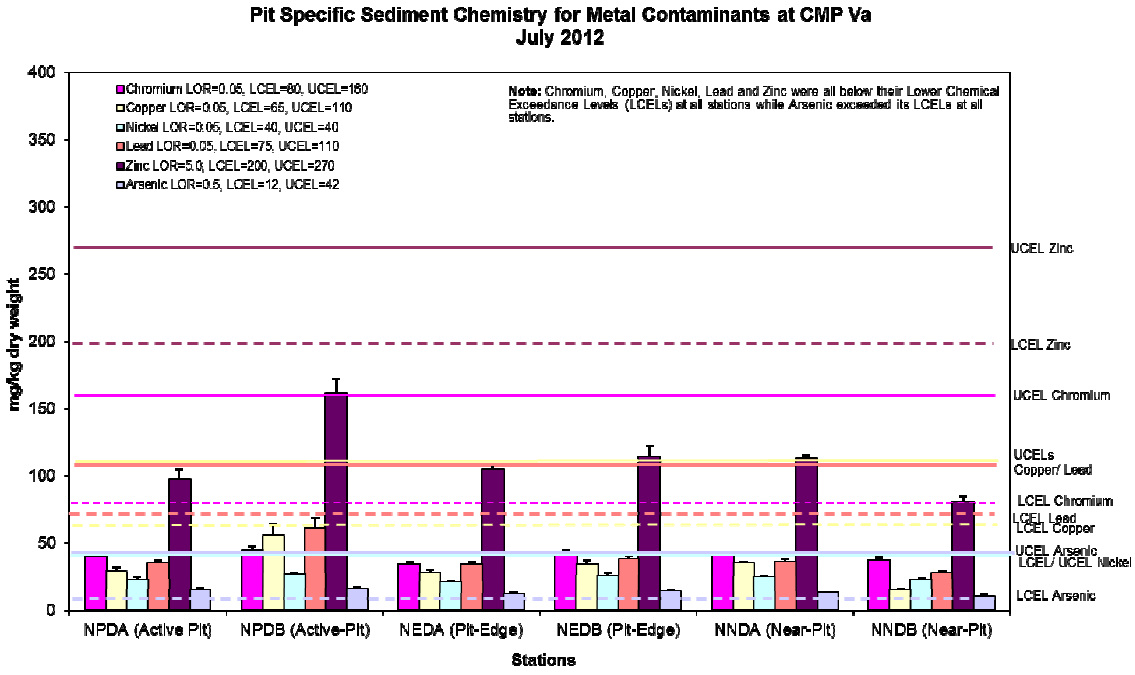

Figure 4: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry of CMP Va in July 2012.

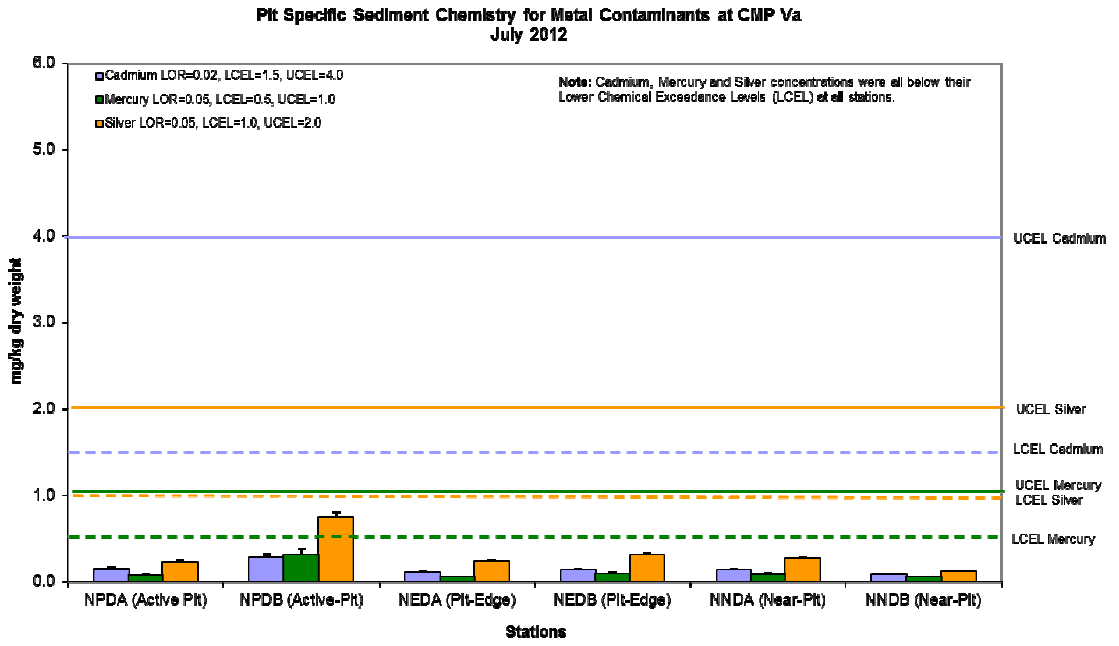

Figure 5: Concentration of Metals (Cd, Hg, Ag; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry of CMP Va in July 2012.

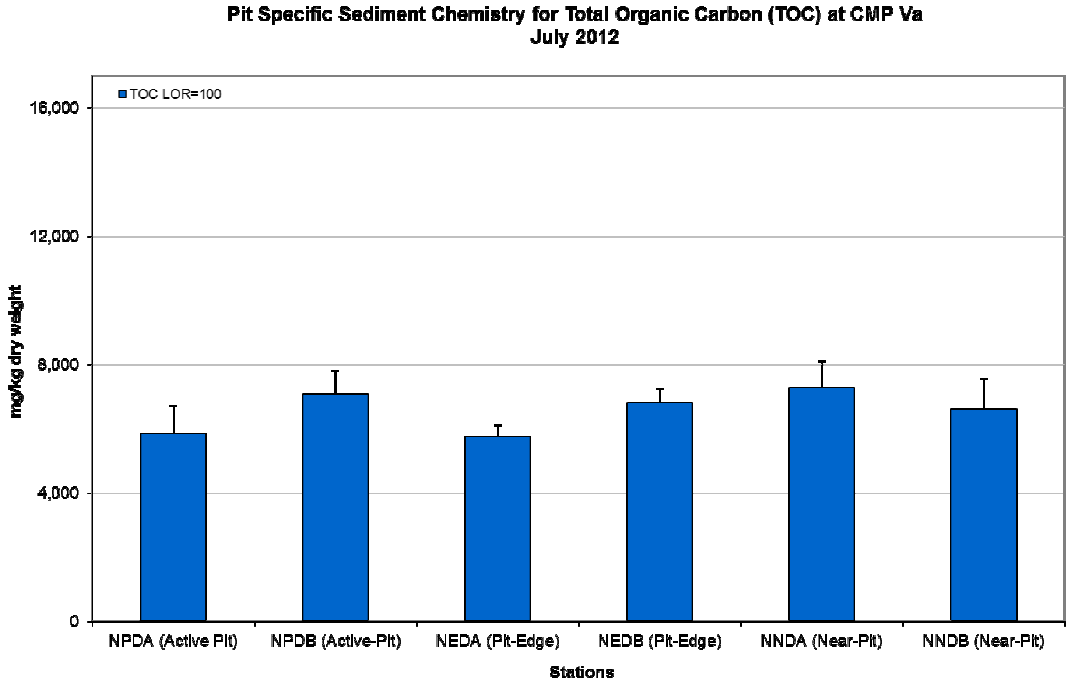

Figure 6: Concentration of Total Organic Carbon (mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry of CMP Va in July 2012.

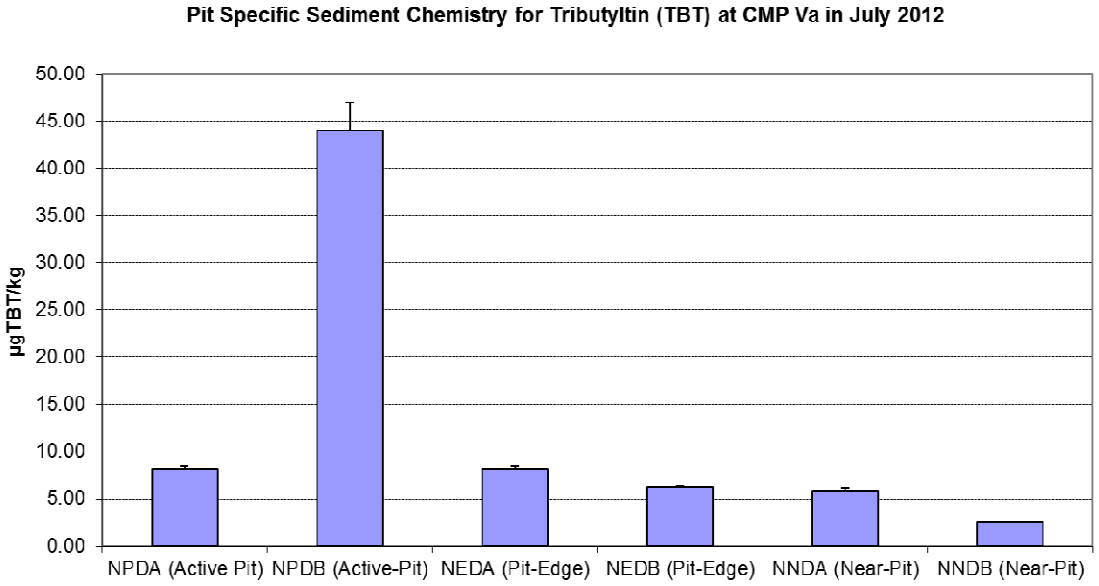

Figure 7: Concentration of Tributyltin (µg TBT/kg; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry of CMP Va in July 2012.

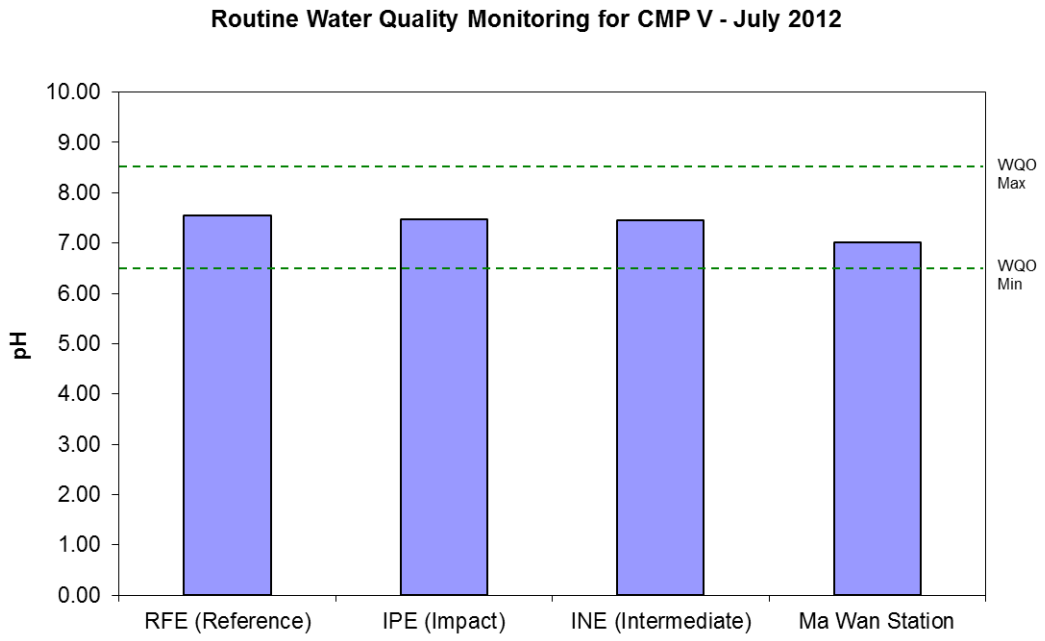

Figure 8: Level of pH (mean + SD) recorded during Routine Water Quality Monitoring of CMP Va in July 2012.

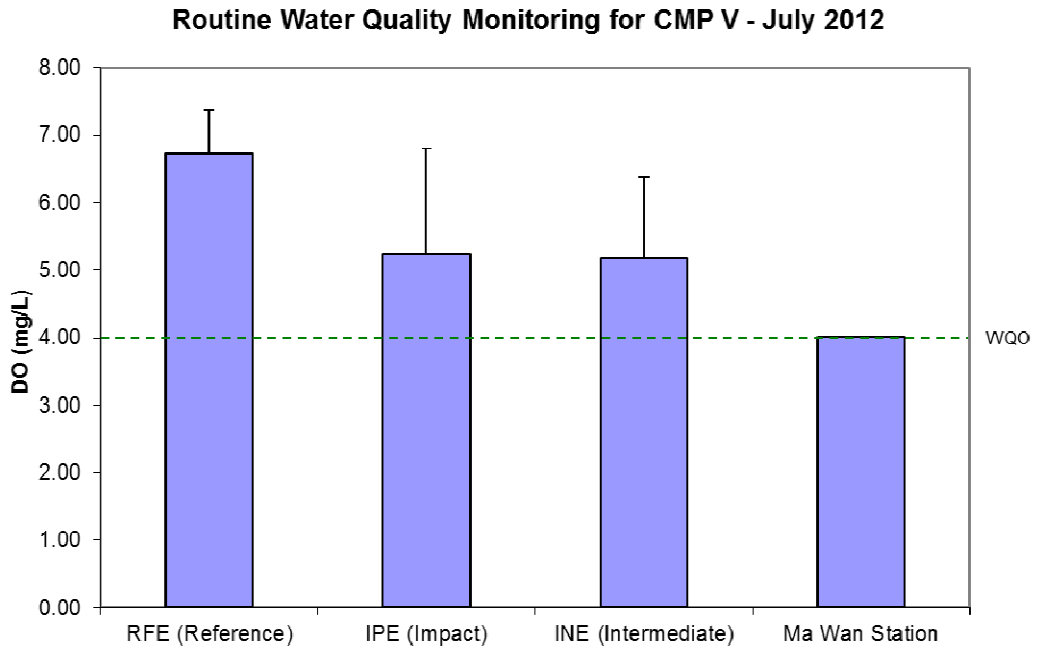

Figure 9: Concentration of Dissolved Oxygen (mg/L; mean + SD) recorded during Routine Water Quality Monitoring of CMP Va in July 2012.

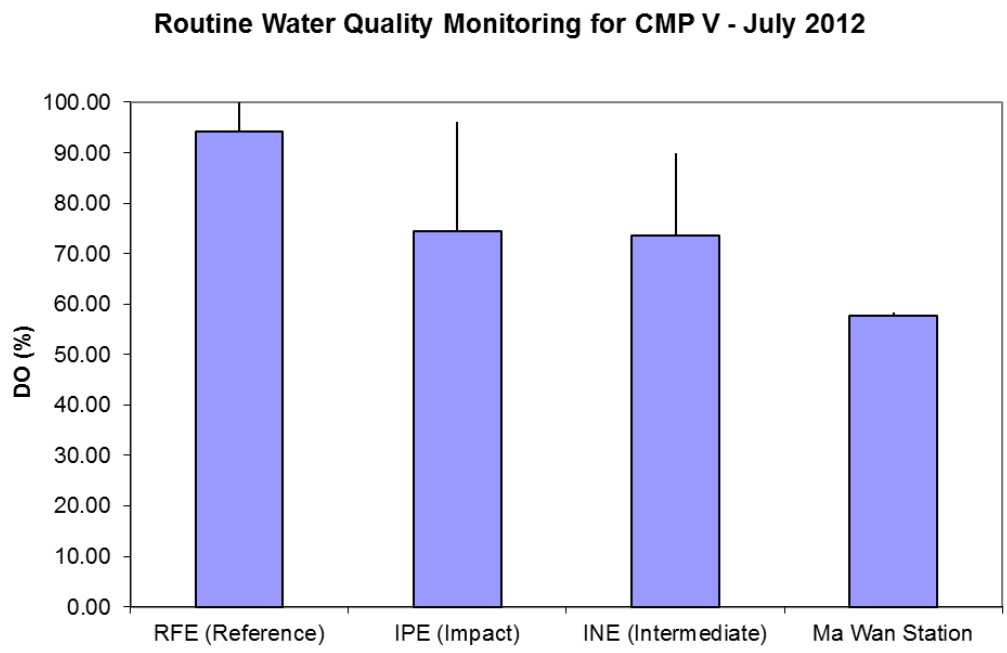

Figure 10: Level of Dissolved Oxygen (% saturation; mean + SD) recorded during Routine Water Quality Monitoring of CMP Va in July 2012.

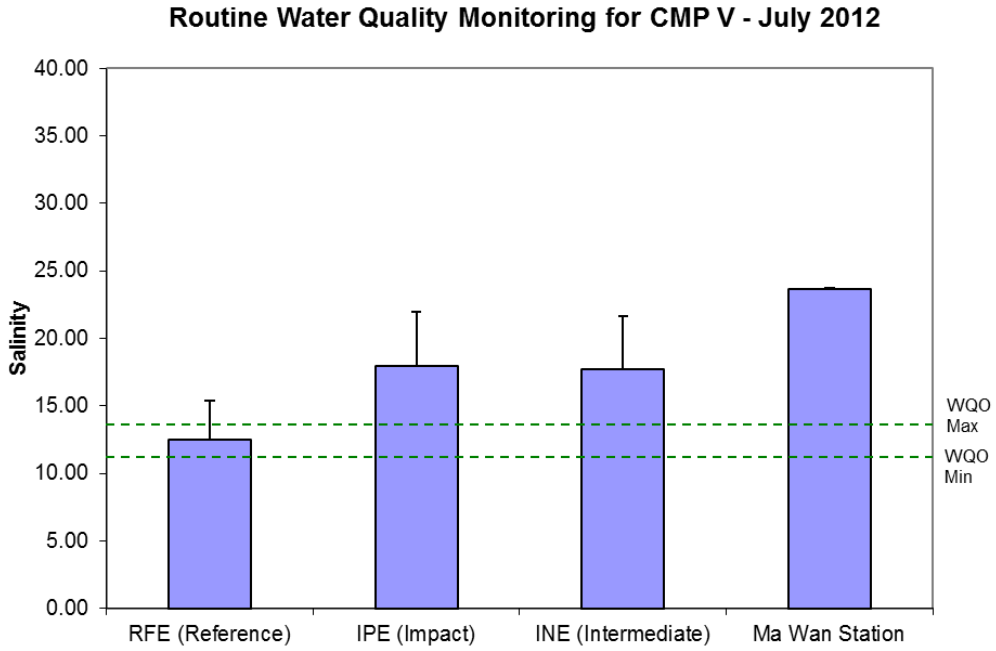

Figure 11: Level of Salinity (mean + SD) recorded during Routine Water Quality Monitoring of CMP Va in July 2012.

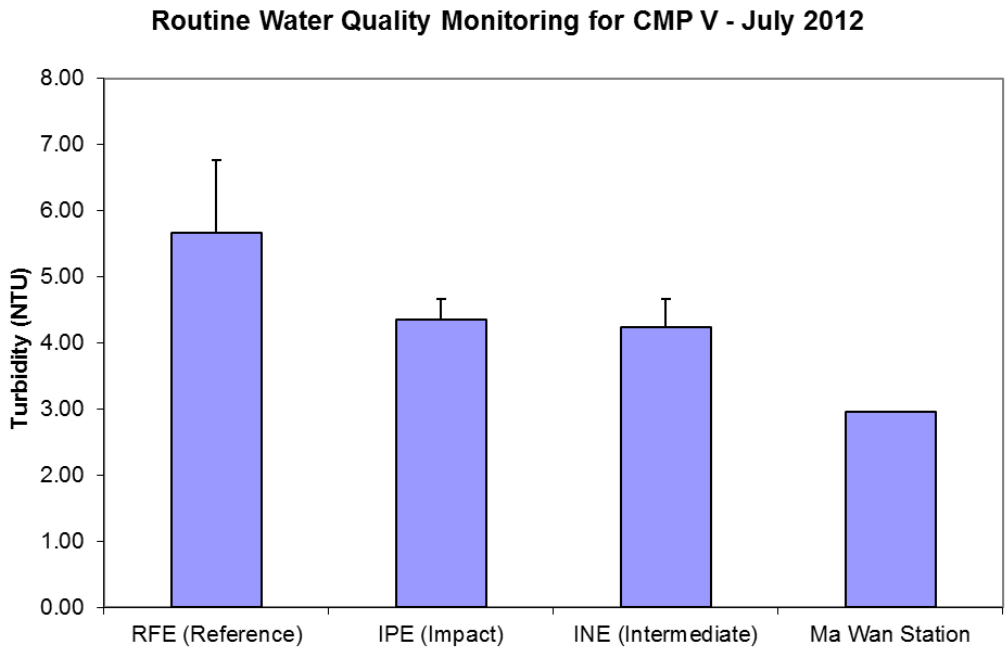

Figure 12: Level of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Monitoring of CMP Va in July 2012.

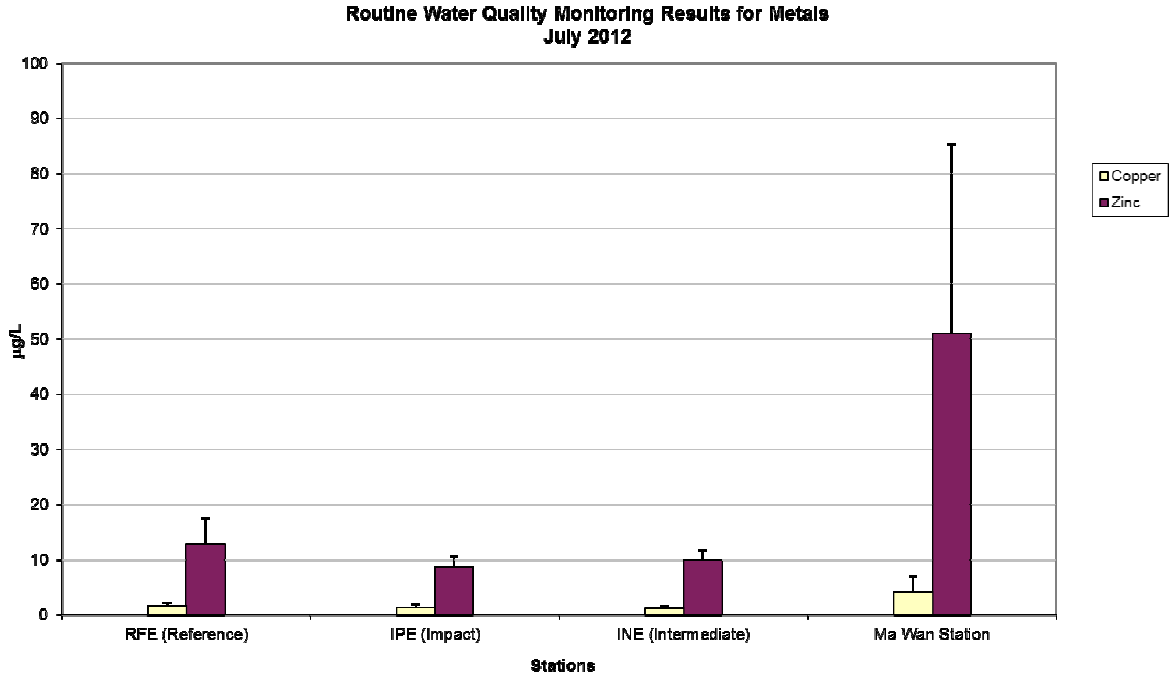

Figure 13: Concentration of Copper and Zinc (mean + SD) in water samples collected from Routine Water Quality Monitoring of CMP Va in July 2012.

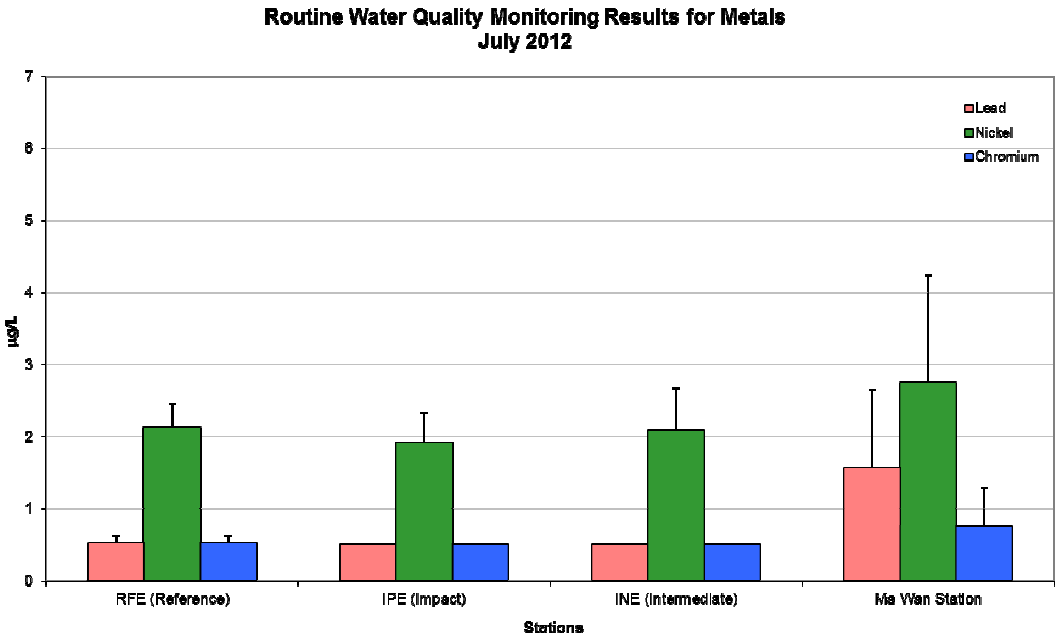

Figure 14: Concentration of Lead, Nickel and Chromium (mean + SD) in water samples collected from Routine Water Quality Monitoring of CMP Va in July 2012.

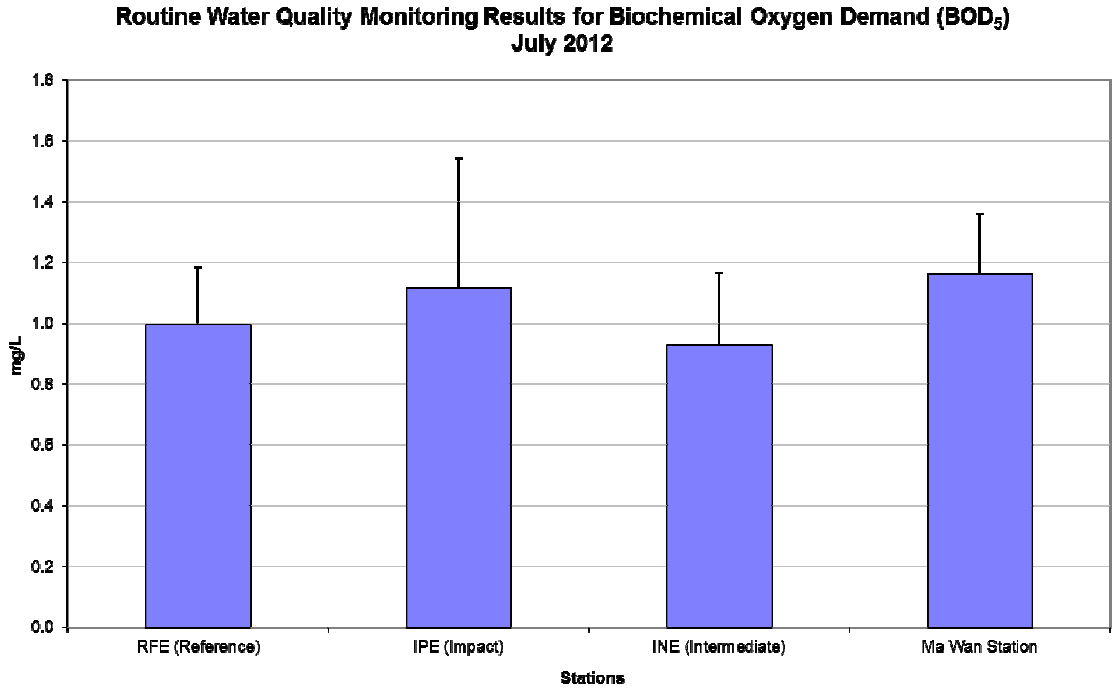

Figure 15: Biochemical Oxygen Demand (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring of CMP Va in July 2012.

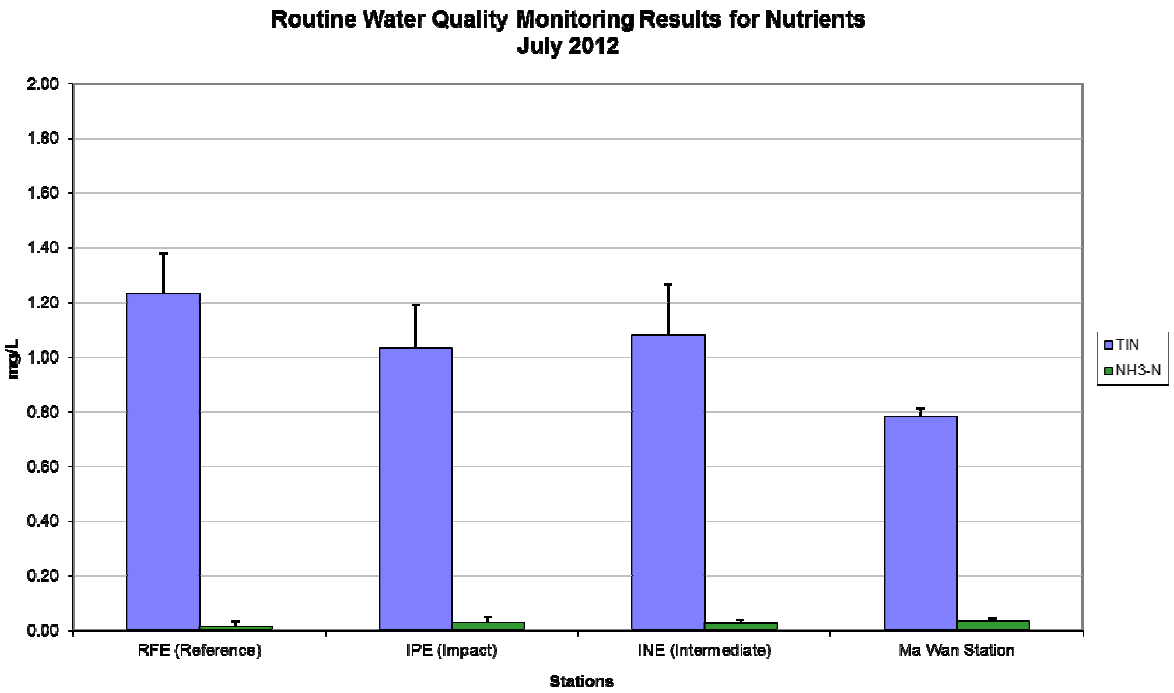

Figure 16: Total Inorganic Nitrogen and NH_3-N (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring of CMP Va in July 2012.

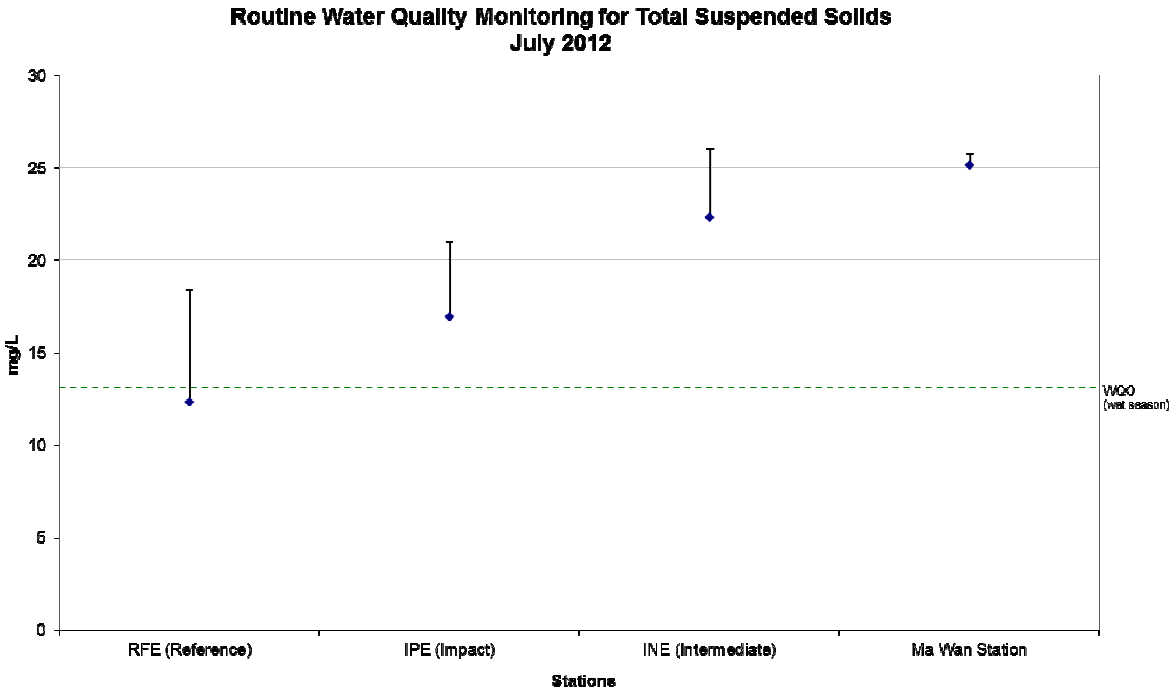

Figure 17: Total Suspended Solids (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring of CMP Va in July 2012.

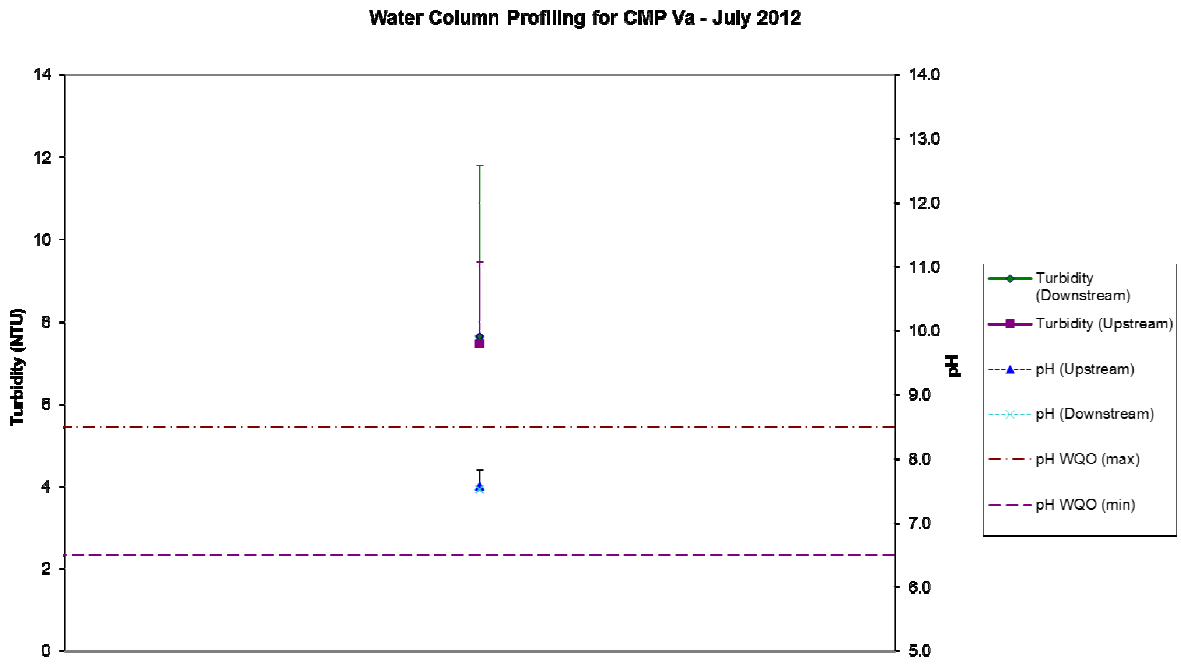

Figure 18: Turbidity and pH (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in July 2012.

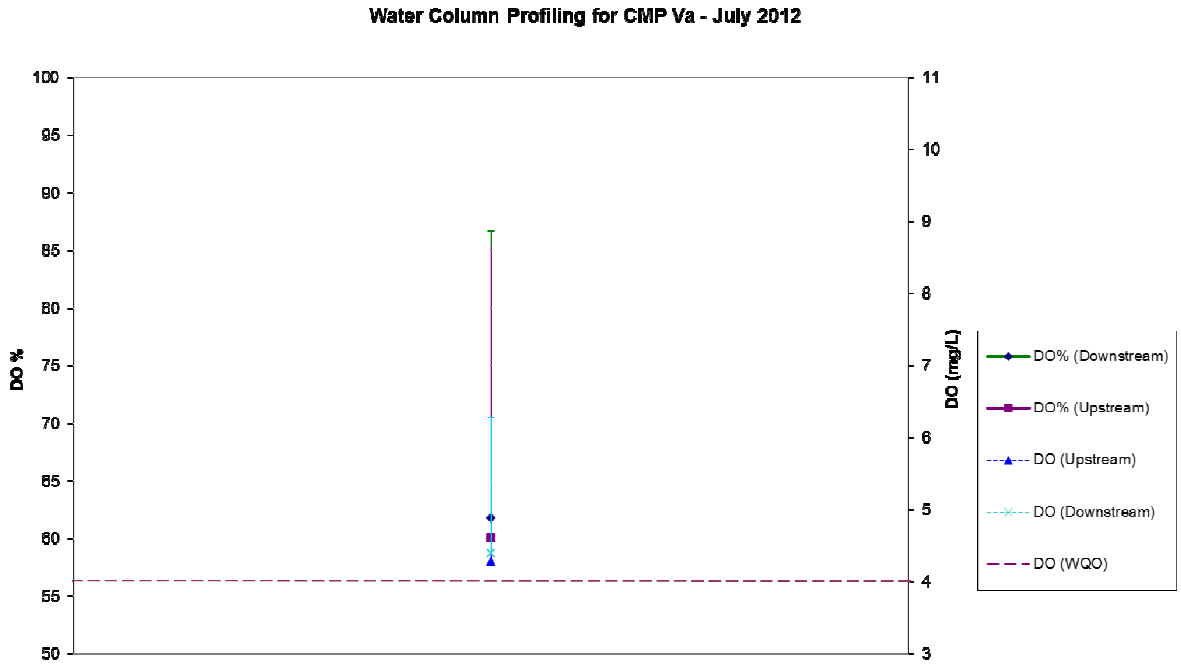

Figure 19: Dissolved Oxygen (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in July 2012.

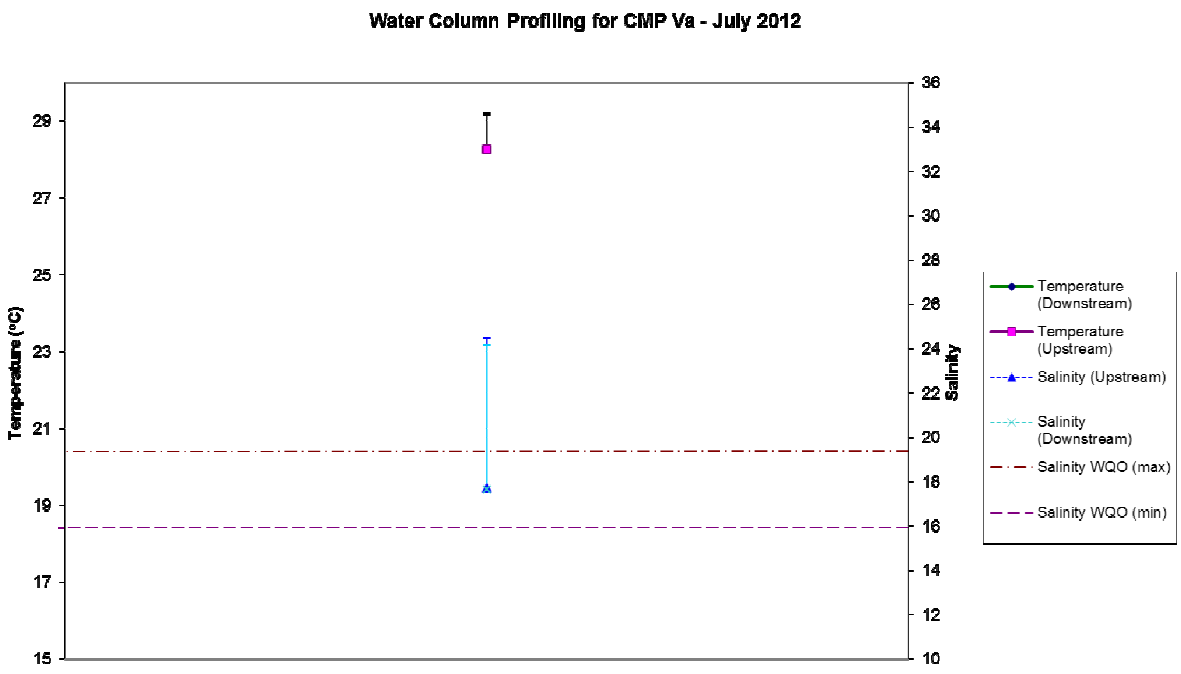

Figure 20: Salinity and Temperature (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in July 2012.

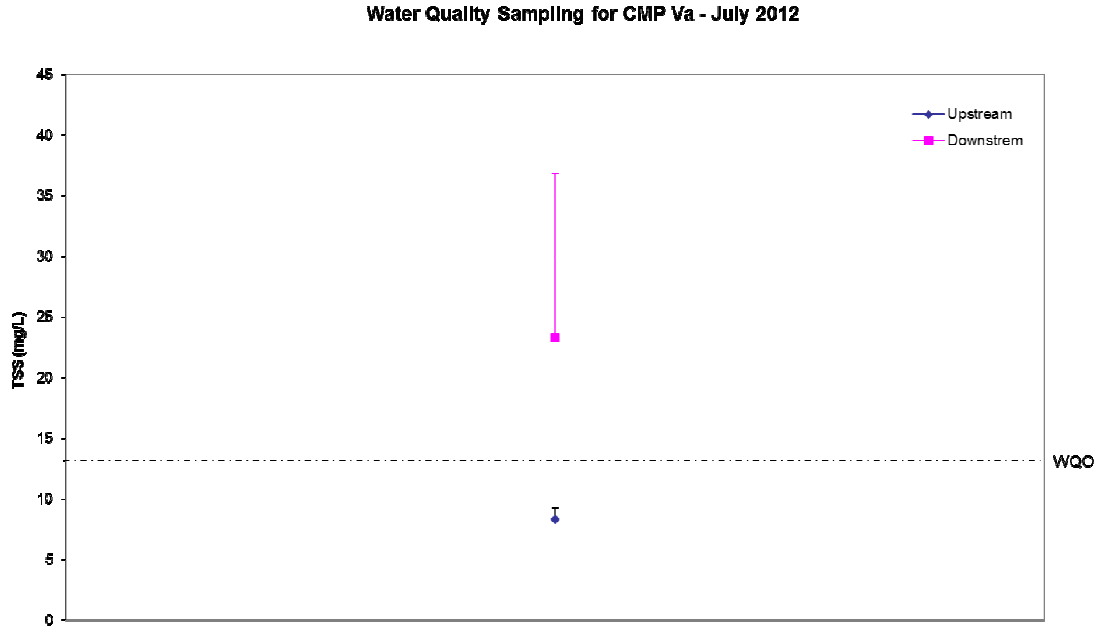

Figure 21: Total Suspended Solids (mean + SD) recorded during Water Column Profiling for disposal operations at CMP Va in July 2012.

Annex C

Results of Impact Monitoring during CMP V Dredging Operations for July 2012

Table C1 Summary Table of DO, Turbidity and TSS Levels Recorded in July 2012

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average TSS Level (mg/L)
			Bottom	Surface and Mid Depth		
2012/07/07	ME	DS1	5.0	5.7	26.6	25.7
		DS2	5.0	5.7	19.6	21.2
		DS3	4.8	5.5	22.0	24.2
		DS4	4.8	5.6	19.0	29.0
		DS5	4.8	5.5	20.1	30.0
		MW1	5.2	5.6	5.4	10.5
		US1	4.9	5.5	22.8	29.7
		US2	4.6	5.5	15.6	16.0
	MF	DS1	4.8	5.5	11.6	16.7
		DS2	4.7	5.1	22.0	23.0
		DS3	2.2	4.9	11.3	21.3
		DS4	4.9	5.1	9.6	16.2
		DS5	4.7	5.2	10.0	14.0
		MW1	4.2	5.1	5.3	9.1
		US1	4.7	5.4	11.0	11.2
		US2	4.7	5.3	17.8	19.3

Notes:

1. Cell shaded yellow indicated value exceeding the Action Level criteria.
2. Cell shaded red indicated value exceeding the Limit Level criteria.
3. DO for Surface and Mid-depth: less than 3.76 mg L^{-1} (Action Level); less than 3.11 mg L^{-1} (Limit Level)
   DO for Bottom: less than 2.96 mg L^{-1} (Action Level); less than 2 mg L^{-1} (Limit Level)
   Depth-average Turbidity: greater than 28.14 NTU(Action Level); greater than 38.32 NTU(Limit Level)
   Depth-average SS: greater than 37.88 mg L^{-1} (Action Level); greater than 61.92 mg L^{-1} (Limit Level)

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

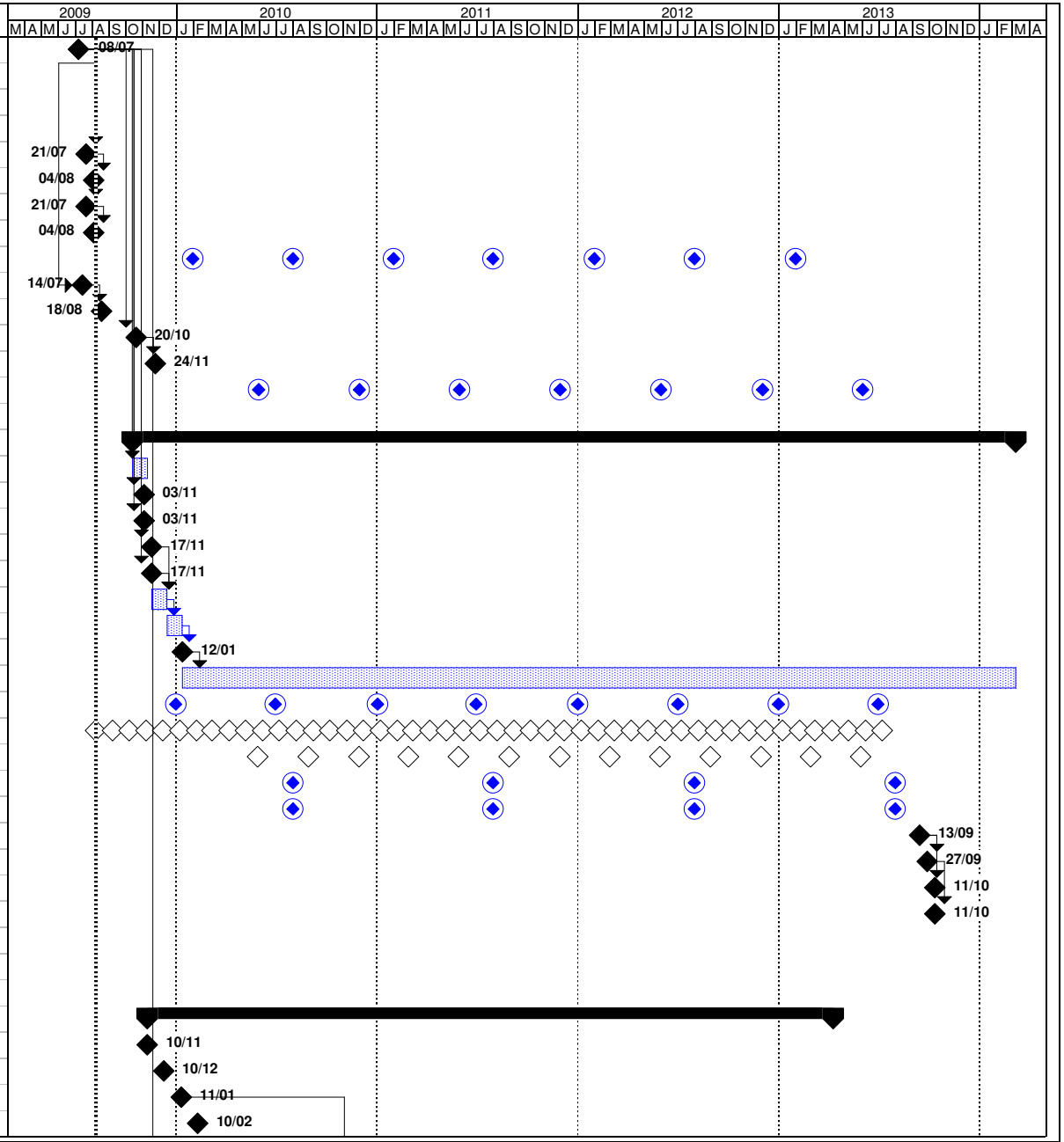

Figure 4.1 - Study Programme

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

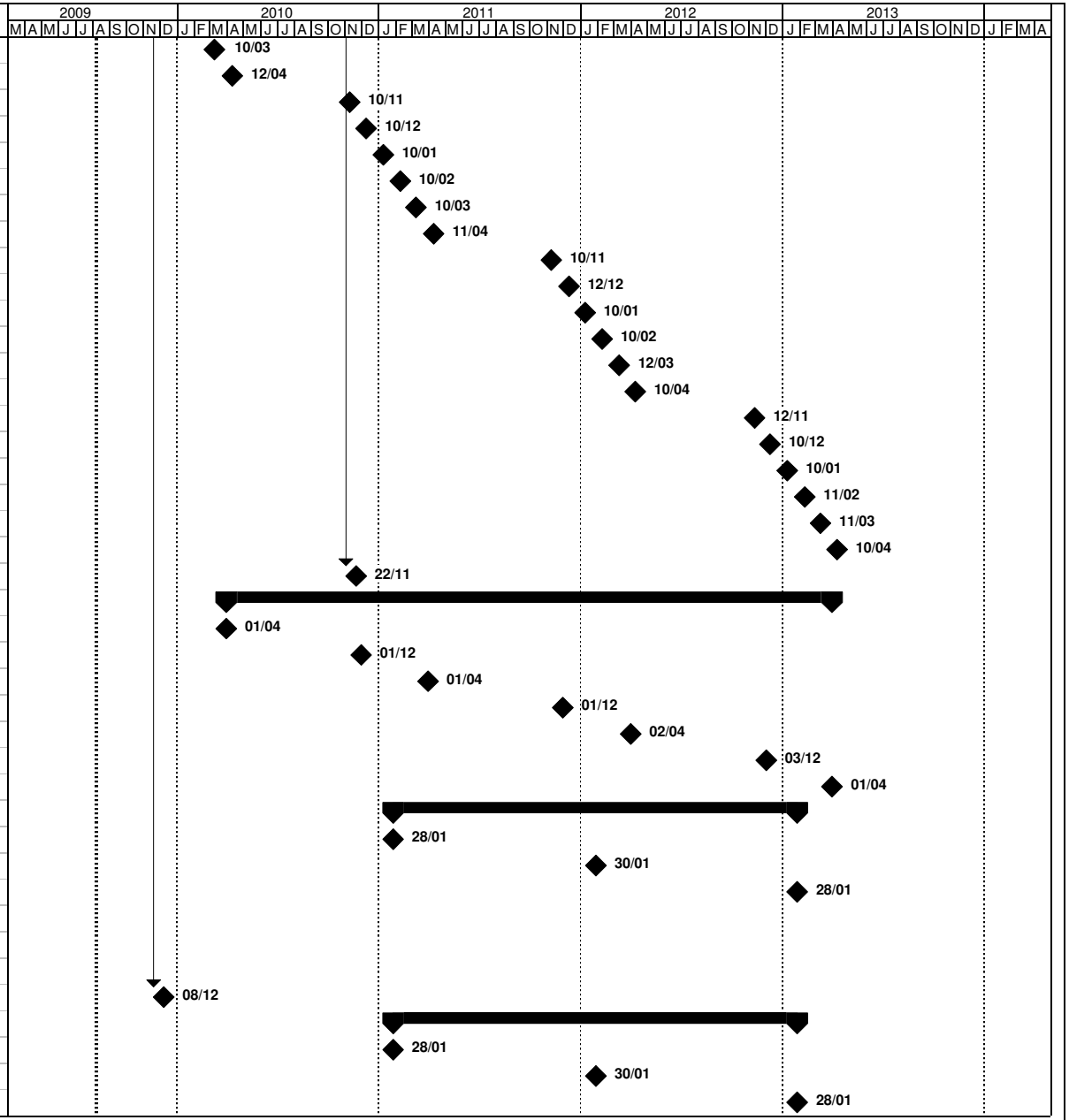

Figure 4.1 - Study Programme

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