

 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)**

**5th Monthly Progress Report for
Contaminated Mud Pits at Sha Chau –
November 2009**

Final (Revision 0)

26 January 2010

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Client: Civil Engineering and Development Department (CEDD)		Proposal No: 0103262			
Summary: This document presents progress of monitoring works on contaminated mud pits at Sha Chau in November 2009 under Agreement No. CE 4/2009 (EP).		Date: 26 January 2010			
		Approved by:  <i>Dr Robin Kennish</i> Director			
0	5 th Monthly Progress Report for CMP – Final (Revision 0)	EW	JT	RK	26/01/10
Revision	Description	By	Checked	Approved	Date
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Agreement No. CE 4/2009 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation

5th MONTHLY PROGRESS REPORT FOR CONTAMINATED MUD PITS
AT SHA CHAU - November 2009

1.1 BACKGROUND

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. CMP IVc is presently in operation for backfilling by contaminated mud and is anticipated to reach its capacity in 2010. A series of four newly constructed seabed pits at the East of Sha Chau area, CMP Va-d, will be provided for the disposal of contaminated mud after CMP IVc is full. Dredging operations are now taking place to construct CMP Va. The environmental monitoring and audit (EM&A) programme for the CMPs at the East of Sha Chau area presently covers disposal operations at CMP IVc and dredging operations at CMP V.

1.2 REPORTING PERIOD

This *Monthly Progress Report* covers the monitoring period of November 2009.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

No sampling was scheduled for CMP IV during November 2009. For CMP V, samplings for *Water Column Profiling* and *Impact Monitoring during Dredging Operations* were conducted on 25th and 26th November 2009, respectively. A summary of field activities are presented in *Annex A*.

A summary of laboratory analysis results submitted by the Contractor in this reporting month is presented on *Table 1.1*.

Table 1.1 *Summary of laboratory analysis results submitted by the Contractor during the reporting month*

Key Task	Monitoring Component	Results Received from the Contractor
CMP IV		
Water Sampling and Chemical Analysis	a) Water column profiling	August's sampling: 18 November 2009
	b) Routine water quality monitoring	August's sampling: 18 November 2009
Demersal Trawling and Tissue Analysis	a) Demersal trawling	July's sampling: 18 November 2009
		August's sampling: 18 November 2009
Sediment Sampling and Chemical Analysis	a) Pit Specific Sediment Chemistry	August's sampling: 18 and 26 November 2009
	b) Cumulative Impact Sediment Chemistry	August's sampling: 18 and 26 November 2009
	c) Sediment Chemistry after a Major Storm Event	July's sampling: 30 November 2009 (PSD data)
Benthic Recolonisation Study		August's sampling: 18 and 26 November 2009
		August's sampling: 16 November 2009
CMP V		
Water Sampling and Chemical Analysis	a) Baseline Water Quality Monitoring	August's sampling: 30 November 2009 (Chromium data)

1.4 *DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS*

No outstanding sampling remained from November 2009. Laboratory analysis of chemical contents in tissue and whole body samples of biota collected in July and August 2009 are still in progress.

1.5 *BRIEF DISCUSSION OF THE MONITORING RESULTS*

For CMP IV, monitoring results for *Sediment Chemistry after a Major Storm Event* for September 2009 are presented below. Further for CMP V, monitoring results are presented for *Water Column Profiling* for September and November 2009 and *Impact Monitoring during Dredging Operations* for November 2009. Detailed results will be discussed in the relevant *Quarterly Reports*.

1.5.1 *Sediment Chemistry after a Major Storm Event for CMP IV (Koppu)*

Sampling for *Sediment Chemistry after a Major Storm Event* was conducted on 19th September 2009 after the visit of Tropical Cyclone *Koppu*, which led to the issue of *No. 8 Gale or Storm Signal* on 15th September 2009. The track of *Koppu* is shown in *Figure 1.1*.

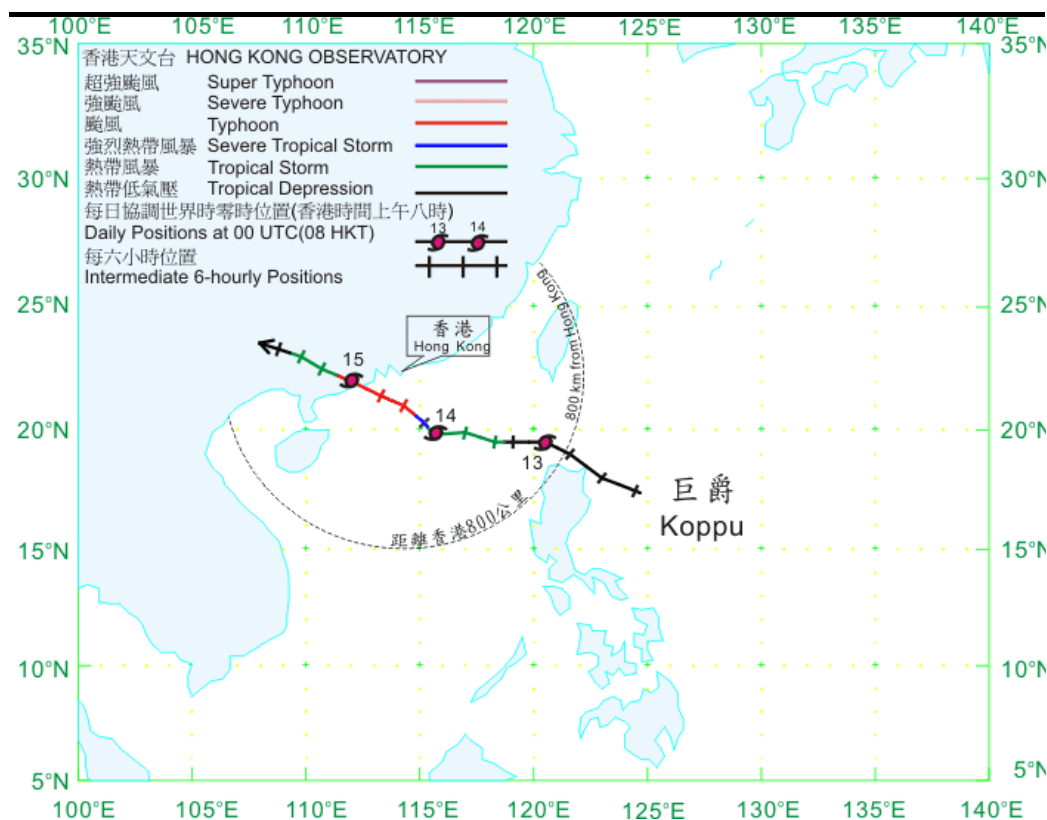


Figure 1.1 Track of Tropical Cyclone Koppu from 12-16 September 2009 (Source: Hong Kong Observatory)

Concentrations of all metals, except Arsenic, were below the *Lower Chemical Exceedance Limit (LCEL)* and *Upper Chemical Exceedance Limit (UCEL)* (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).

Moisture content in the sediments from all stations ranged between 39.97 – 57.98 % (Figure 3 of Annex B). Sediments were mostly composed of silt and clay materials (73 - 97 %; Figure 4 of Annex B).

1.5.2 Water Column Profiling for CMP V during September 2009

Results of *Water Column Profiling* for September 2009 show that salinity, pH and Dissolved Oxygen (DO) all complied with the Water Quality Objectives (WQOs) at both Upstream and Downstream stations (Figures 6 to 8 of Annex B). However, levels of Total Suspended Solids (TSS) exceeded the WQO at both Upstream and Downstream stations (Figure 5 of Annex B).

1.5.3 Water Column Profiling for CMP V during November 2009

Results of *Water Column Profiling* for November 2009 show that salinity, pH and DO all complied with the WQOs at both Upstream and Downstream stations (Figures 10 to 12 of Annex B). However, levels of TSS exceeded the WQO at both Upstream and Downstream stations (Figure 9 of Annex B).

1.5.4 *Impact Monitoring during Dredging Operations of CMP V – November 2009*

Impact Monitoring during Dredging Operations of CMP V was conducted on 26th November 2009. 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 V. Monitoring was also conducted at the Ma Wan station. At each station, *in-situ* measurements of water quality parameters and water samples were taken from three water depth levels of the water column which were surface (1m below sea surface), mid-depth and bottom (1m above the seabed).

Monitoring results are presented in *Figures 13 to 16 of Annex B*. Levels of DO, depth-average Turbidity and TSS complied with the Action and Limit Levels set in the *Baseline Monitoring Report* ⁽¹⁾ (*Tables B1 and B2 of Annex B*).

1.6 *ACTIVITIES SCHEDULED FOR THE NEXT MONTH*

Pit Specific Sediment Chemistry, Sediment Toxicity Monitoring, Benthic Macro In-fauna Sampling, Cumulative Impact Sediment Chemistry Monitoring and Water Column Profiling will be conducted for CMP IV in the next monthly period. *Water Column Profiling and Impact Monitoring during Dredging Operations* will be conducted for CMP V during the next monthly period. The sampling schedule is presented in *Annex A*.

1.7 *STUDY PROGRAMME*

A summary of Study programme is presented in *Annex C*.

(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 CEDD.

Annex A

Sampling Schedule

			2009					2010		
Pit Specific Sediment Chemistry	Code	Frequency	J	A	S	O	N	D	J	F
Active-Pit	NCA 1-8	3 times per year	*					*		
	NCB 1-8	3 times per year	*					*		
Pit-Edge	CPA 1-8	3 times per year	*					*		
	CPB 1-8	3 times per year	*					*		
Near-Pit	CNA 1-8	3 times per year	*					*		
	CNB 1-8	3 times per year	*					*		

			J	A	S	O	N	D	J	F
Cumulative Impact Sediment Chemistry										
Near-field Stations	RNA 1-9	2 times per year	*					*		
	RNB 1-9	2 times per year	*					*		
Mid-field Stations	RMA 1-9	2 times per year	*					*		
	RMB 1-9	2 times per year	*					*		
Capped Pit Stations	RCA 1-9	2 times per year	*					*		
	RCB 1-9	2 times per year	*					*		
Far-Field Stations	RFA 1-9	2 times per year	*					*		
	RFB 1-9	2 times per year	*					*		

			J	A	S	O	N	D	J	F
Sediment Toxicity Tests										
Near-Field Stations	TCA	2 times per year	3					3		
	TCB	2 times per year	3					3		
Reference Stations	TRA	2 times per year	3					3		
	TRB	2 times per year	3					3		

			J	A	S	O	N	D	J	F
Tissue/Whole Body Sampling										
Near-Pit Stations	INA	2 times per year	*							*
	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	*							*

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

			J	A	S	O	N	D	J	F
Capping										
<i>Ebb Tide</i>										
Impact Station Downcurrent	IPE1	4 times per year	3	3				3		3
	IPE2	4 times per year	3	3				3		3
	IPE3	4 times per year	3	3				3		3
	IPE4	4 times per year	3	3				3		3
	IFC1	4 times per year	3	3				3		3
Intermediate Station Downcurrent	INE1	4 times per year	3	3				3		3
	INE2	4 times per year	3	3				3		3
	INE3	4 times per year	3	3				3		3
	INE4	4 times per year	3	3				3		3
	INE5	4 times per year	3	3				3		3
Reference Station Upcurrent	RFE1	4 times per year	3	3				3		3
	RFE2	4 times per year	3	3				3		3
	RFE3	4 times per year	3	3				3		3
	RFE4	4 times per year	3	3				3		3
	RFE5	4 times per year	3	3				3		3
<i>Flood Tide</i>										
Impact Station Downcurrent	INF1	4 times per year	3	3				3		3
	IFC2	4 times per year	3	3				3		3
	INF3	4 times per year	3	3				3		3
Intermediate Station Downcurrent	IPF1	4 times per year	3	3				3		3
	IPF2	4 times per year	3	3				3		3
	IPF3	4 times per year	3	3				3		3
Reference Station Upcurrent	RFF1	4 times per year	3	3				3		3
	RFF2	4 times per year	3	3				3		3
	RFF3	4 times per year	3	3				3		3

			J	A	S	O	N	D	J	F
Routine Water Quality Monitoring										
<i>Ebb Tide</i>										
Impact Station Downcurrent	IPE1	2 times per year	*							*
	IPE2	2 times per year	*							*
	IPE3	2 times per year	*							*
	IPE4	2 times per year	*							*
	IPE5	2 times per year	*							*
Intermediate Station Downcurrent	INE1	2 times per year	*							*
	INE2	2 times per year	*							*
	INE3	2 times per year	*							*
	INE4	2 times per year	*							*
	INE5	2 times per year	*							*
Reference Station Upcurrent	RFE1	2 times per year	*							*
	RFE2	2 times per year	*							*
	RFE3	2 times per year	*							*
	RFE4	2 times per year	*							*
	RFE5	2 times per year	*							*
<i>Flood Tide</i>										
Impact Station Downcurrent	INF1	2 times per year	*							*
	INF2	2 times per year	*							*
	INF3	2 times per year	*							*
Intermediate Station Downcurrent	IPF1	2 times per year	*							*
	IPF2	2 times per year	*							*
	IPF3	2 times per year	*							*
Reference Station Upcurrent	RFF1	2 times per year	*							*
	RFF2	2 times per year	*							*
	RFF3	2 times per year	*							*

			J	A	S	O	N	D	J	F
Water Column Profiling										
Plume Stations	WCP1	6 times per year	2	2				2	2	2
	WCP2	6 times per year	2	2				2	2	2

			J	A	S	O	N	D	J	F
Benthic Recolonisation Studies										
Capped Contaminated Mud Pits	CPA 1-3	2 times per year	3					3		
	CPB 1-3	2 times per year	3					3		
	CPC 1-3	2 times per year	3					3		
Reference Stations	RBA 1-3	2 times per year	3					3		
	RBB 1-3	2 times per year	3					3		
	RBC 1-3	2 times per year	3					3		

n = Number of replicates depends on field catch or parameters

Annex B

Monitoring Results

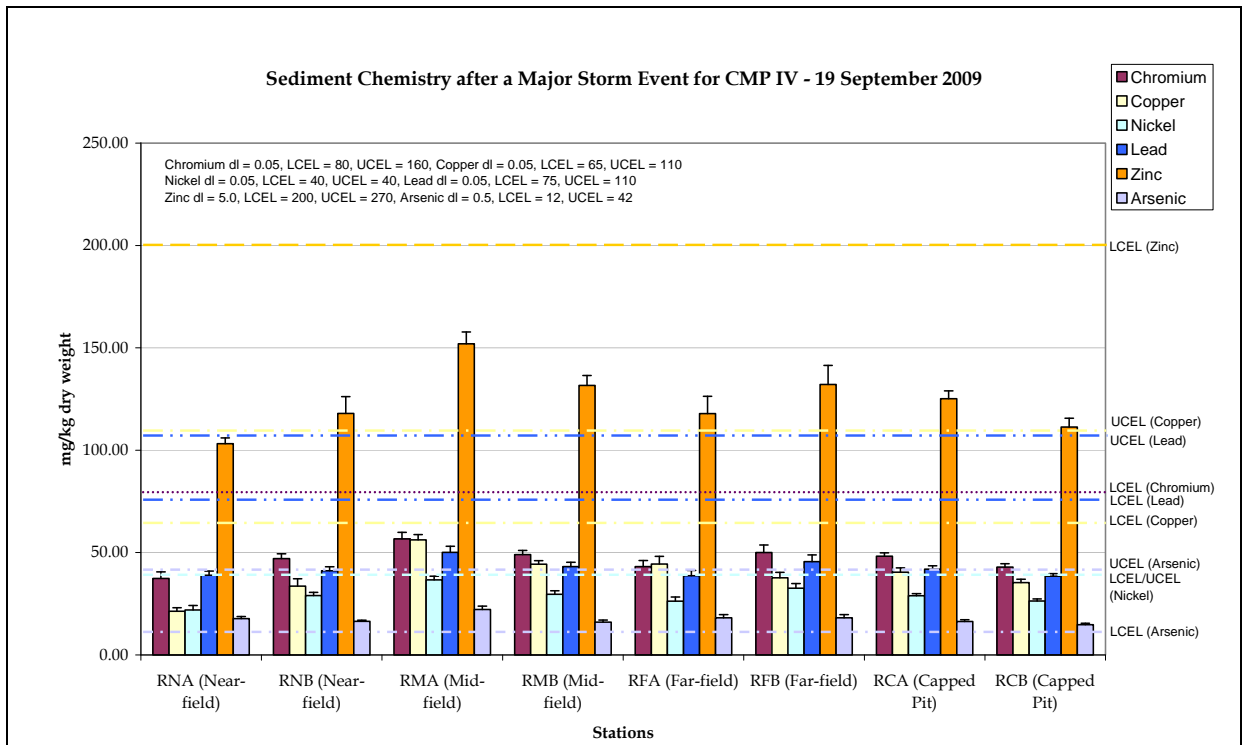


Figure 1: Concentrations of Metals (mean ± SD) during Sediment Chemistry after a Major Storm Event for CMP IV on 19 September 2009.

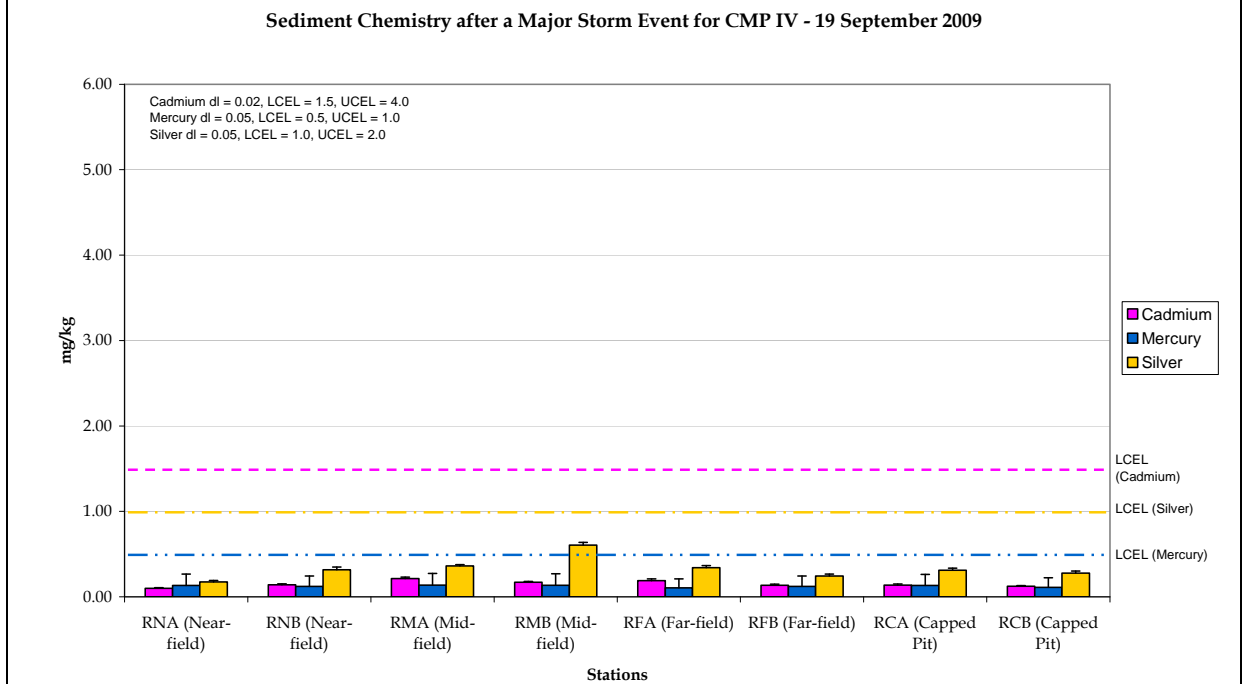


Figure 2: Concentrations of Metals (mean ± SD) during Sediment Chemistry after a Major Storm Event for CMP IV on 19 September 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06.11 Storm Sediment Chemistry\Sept 2009
 Date: 16/12/2009

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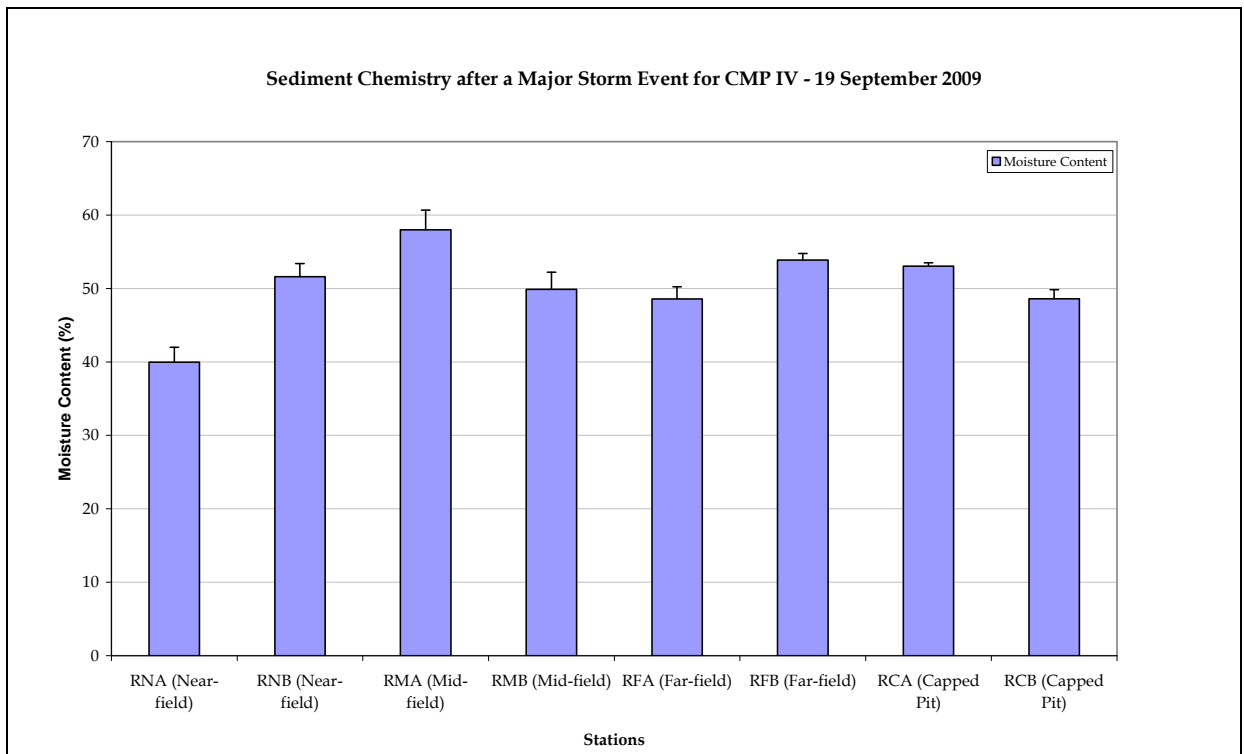


Figure 3: Moisture Content of Sediment (mean ± SD) during Sediment Chemistry after a Major Storm Event for CMP IV on 19 September 2009.

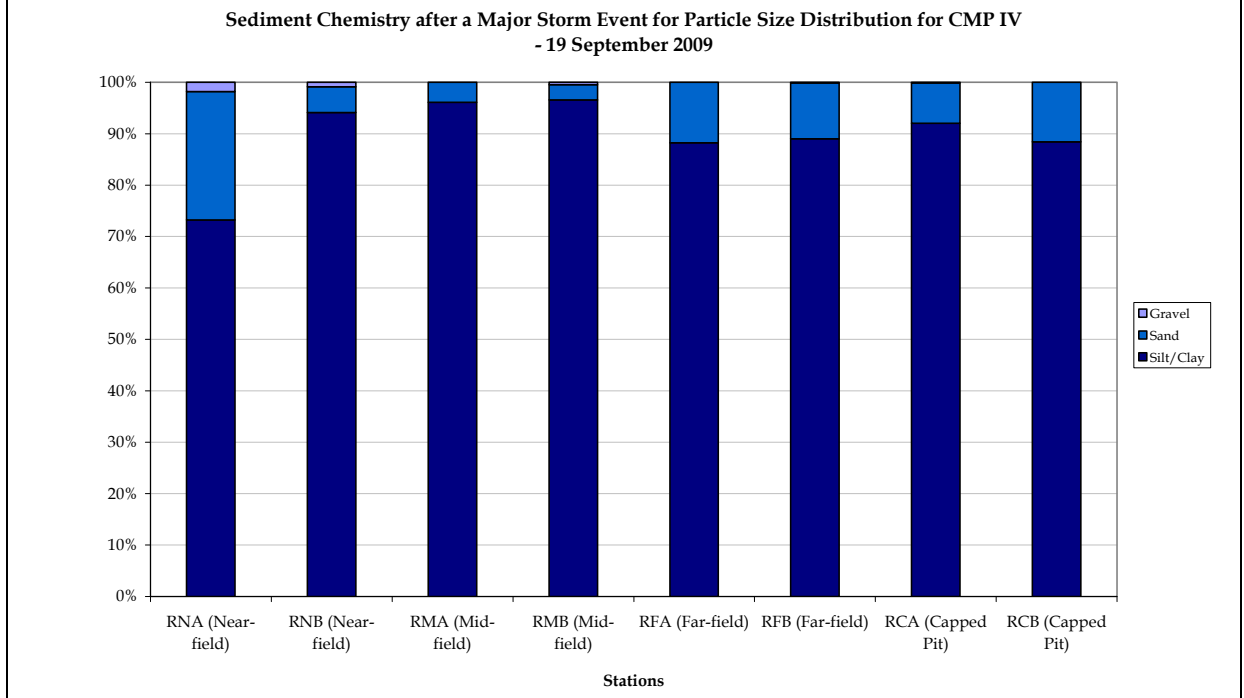


Figure 4: Particle Size Distribution (% mean) during Sediment Chemistry after a Major Storm Event for CMP IV on 19 September 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06. 12 Water Column Profiling CMP V\Sept 2009

Date: 21/12/2009

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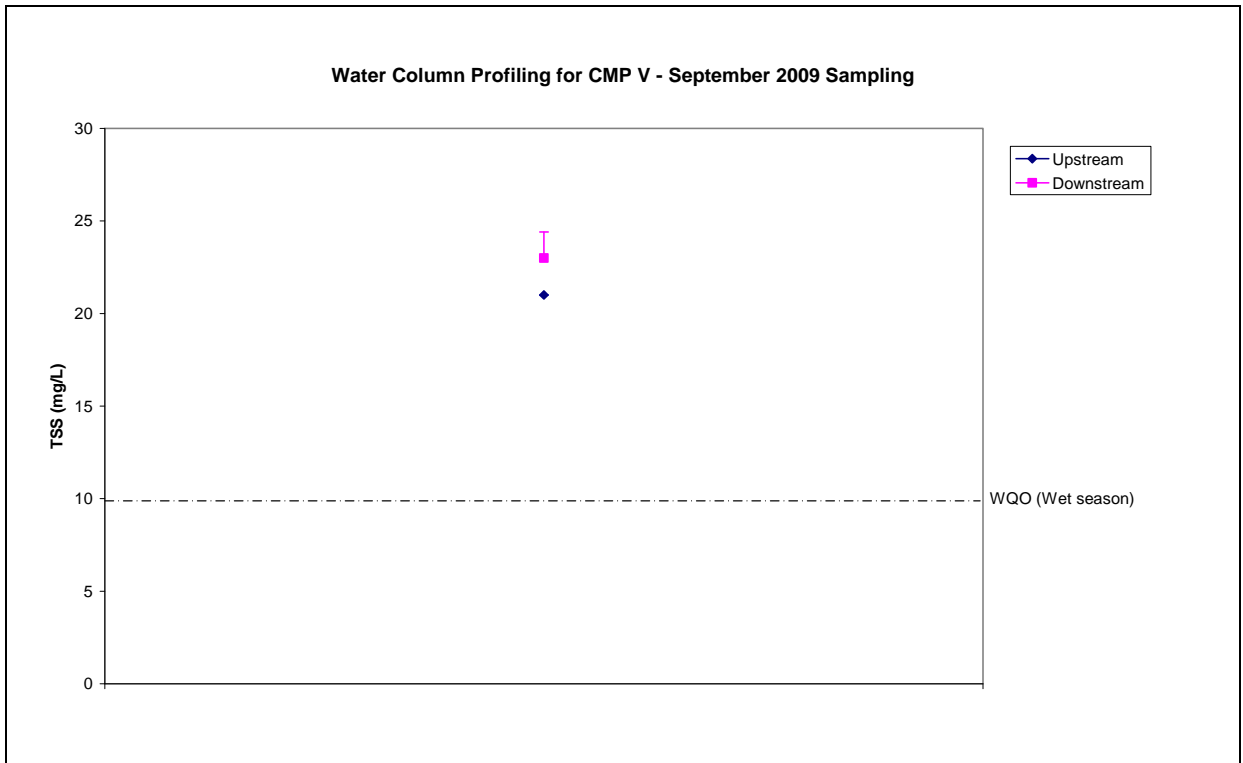


Figure 5: Total Suspended Solids (mean \pm SD) during Water Column Profiling for CMP V in September 2009.

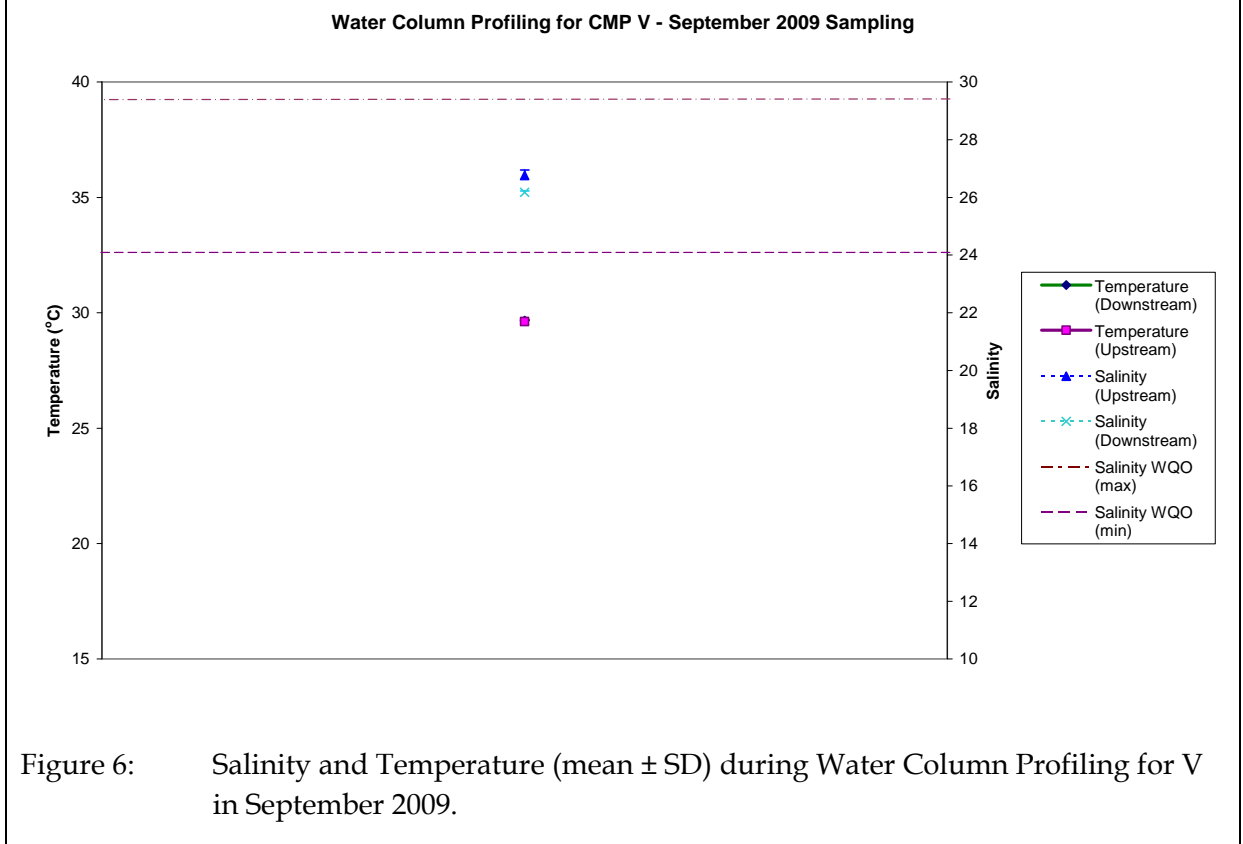


Figure 6: Salinity and Temperature (mean \pm SD) during Water Column Profiling for V in September 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06. 12 Water Column Profiling CMP V\Sept 2009
 Date: 16/12/2009

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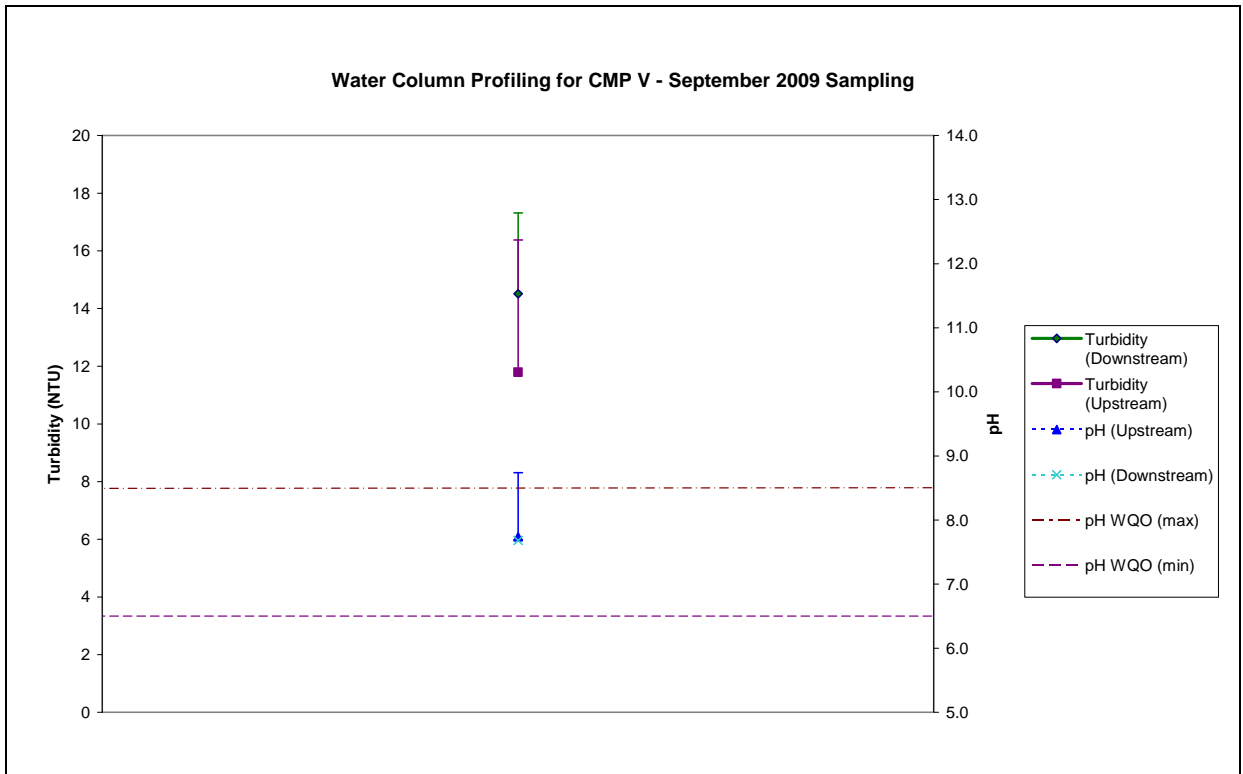


Figure 7: Turbidity and pH (mean \pm SD) during Water Column Profiling for CMP V in September 2009.

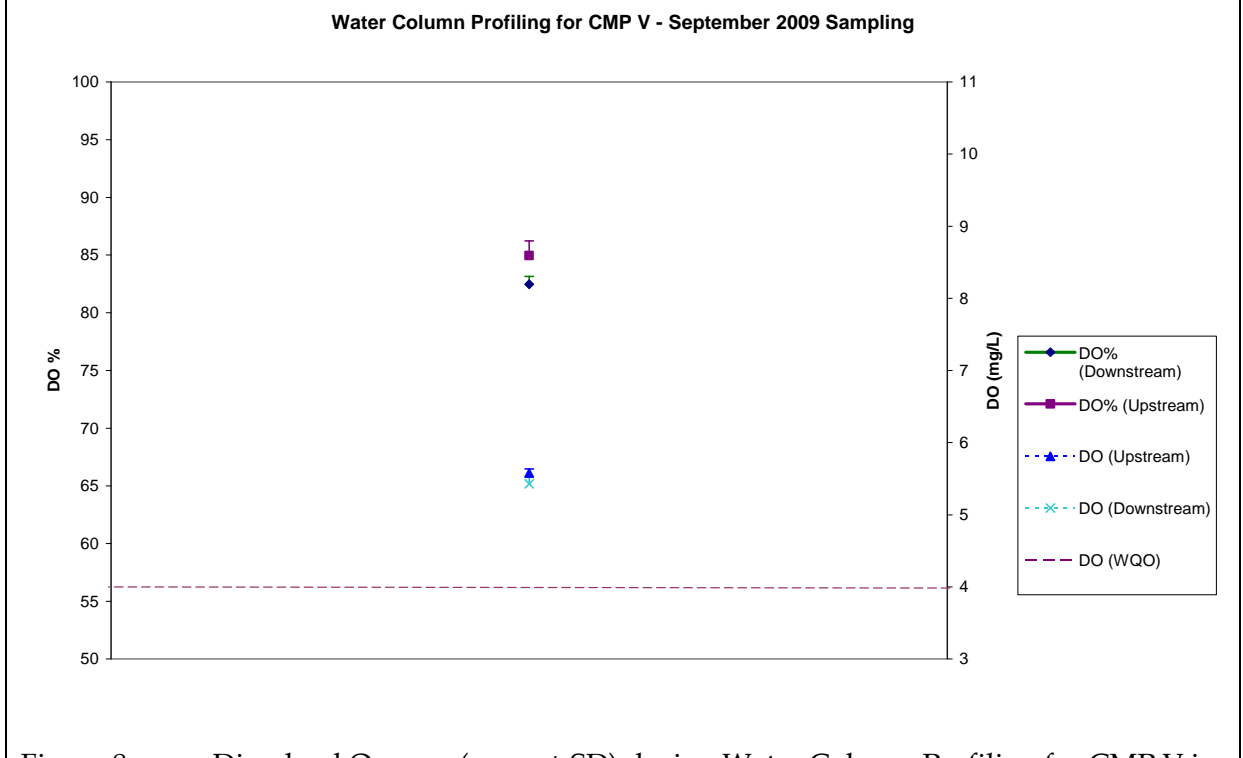


Figure 8: Dissolved Oxygen (mean \pm SD) during Water Column Profiling for CMP V in September 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06. 12 Water Column Profiling CMP V\Nov 2009
 Date: 21/12/2009

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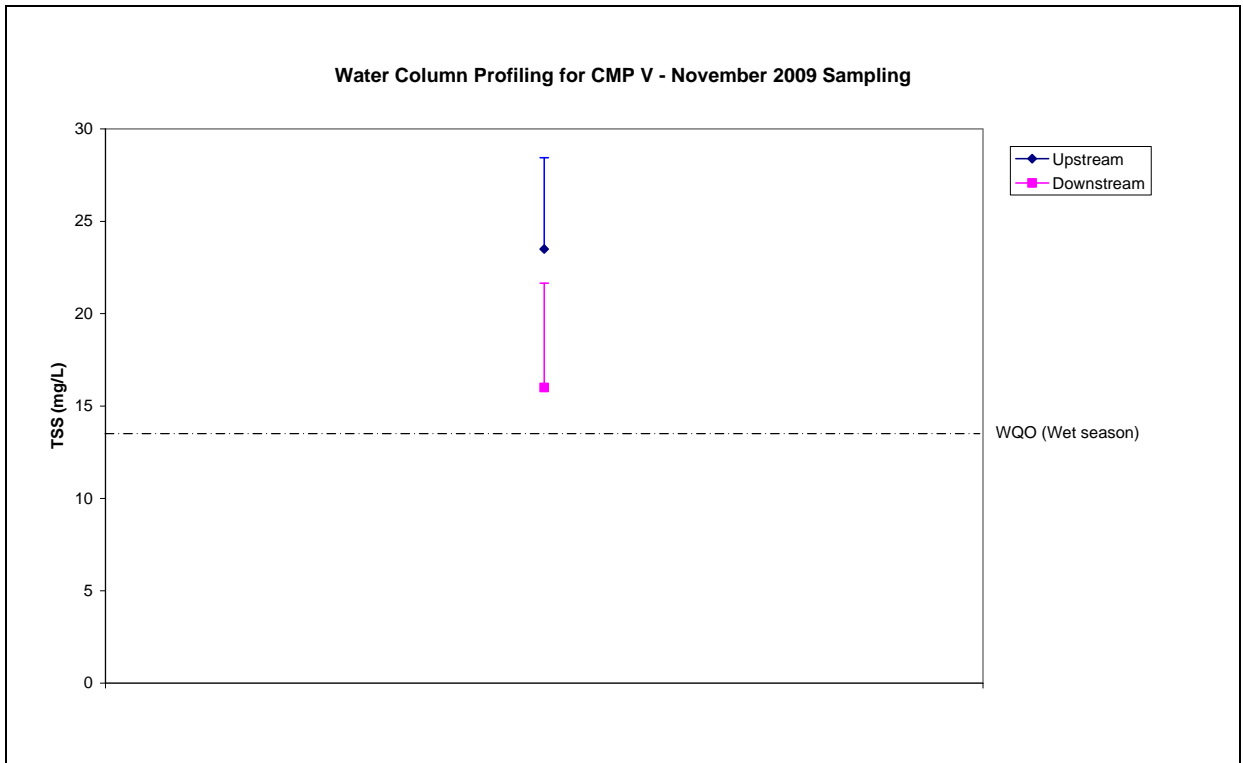


Figure 9: Total Suspended Solids (mean ± SD) during Water Column Profiling for CMP V in November 2009.

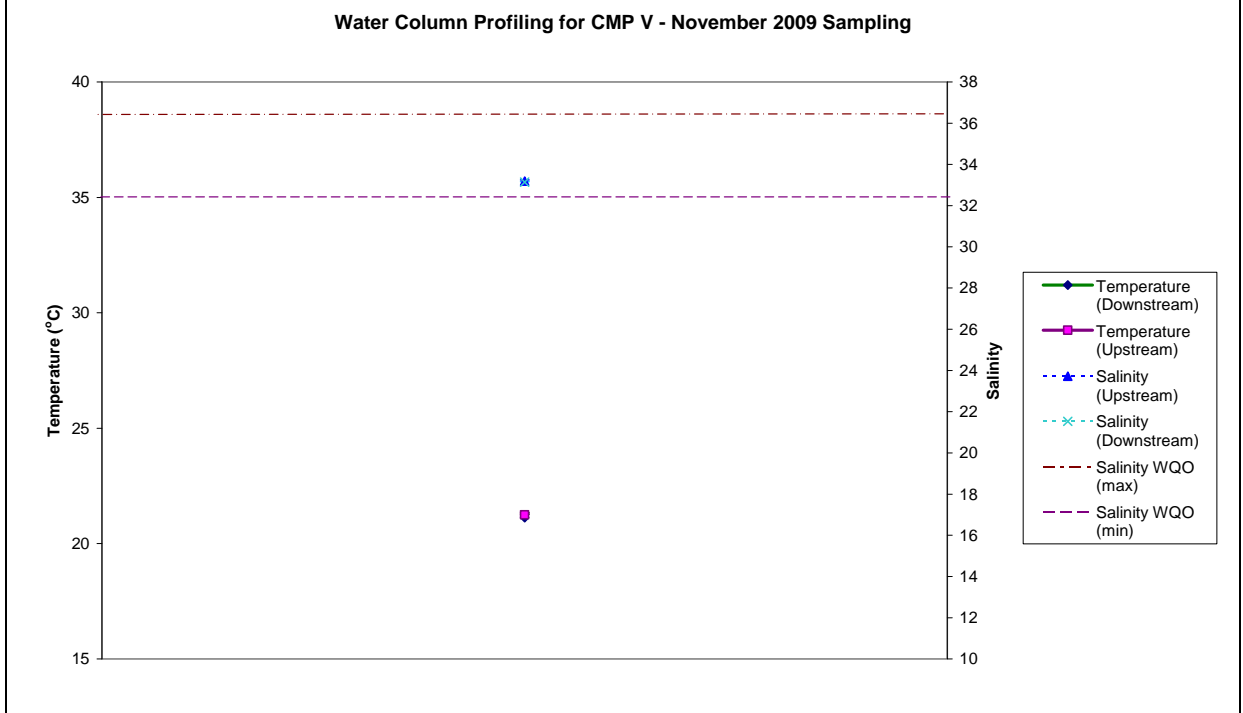


Figure 10: Salinity and Temperature (mean ± SD) during Water Column Profiling for V in November 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06.8 Routine Water Quality Monitoring\Aug 09
 Date: 21/12/2009

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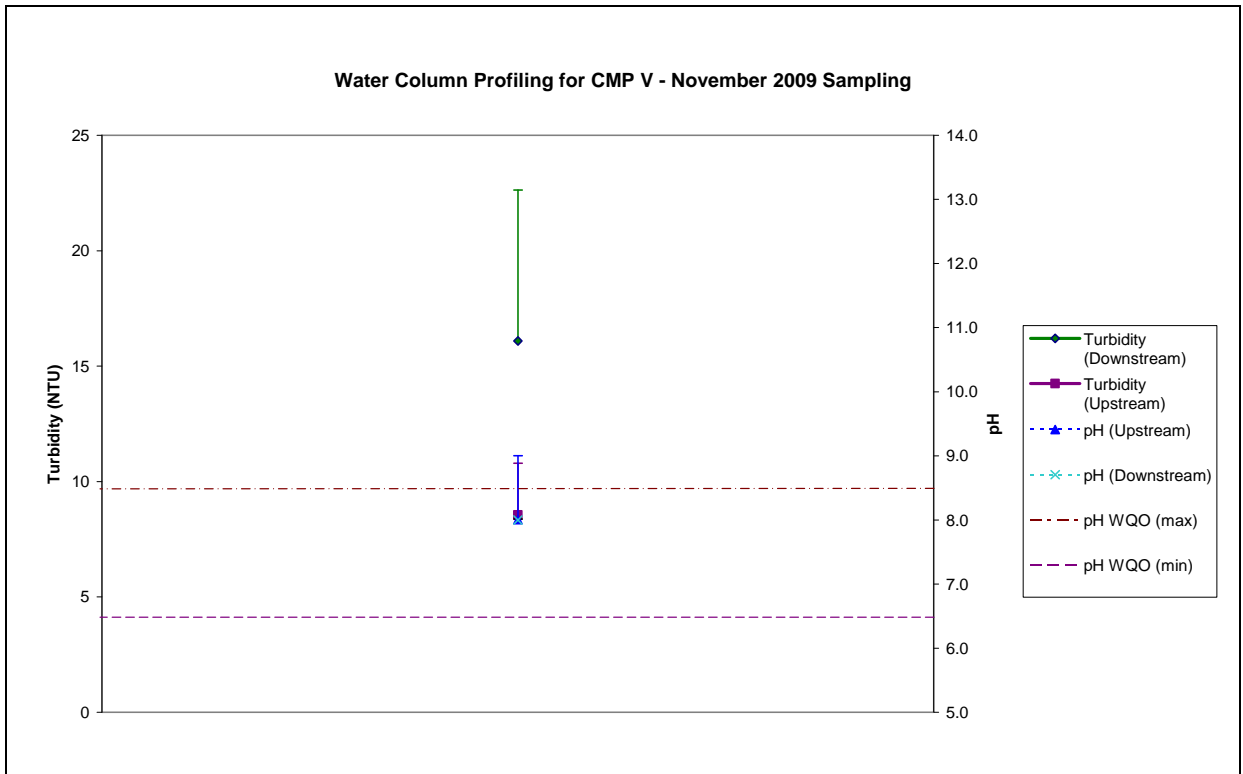


Figure 11: Turbidity and pH (mean ± SD) during Water Column Profiling for CMP V in November 2009.

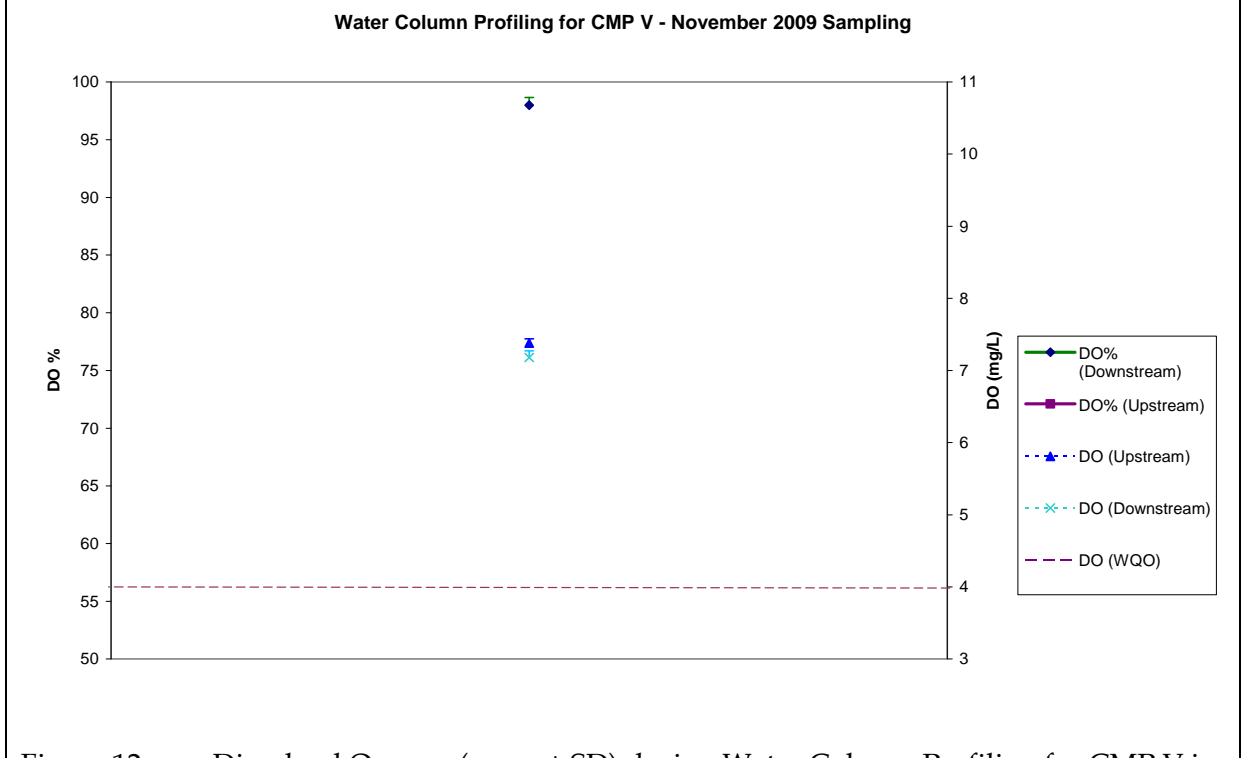


Figure 12: Dissolved Oxygen (mean ± SD) during Water Column Profiling for CMP V in November 2009.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contract Submission (LAM)\06. 12 Water Column Profiling CMP V\Nov 2009
 Date: 21/12/2009

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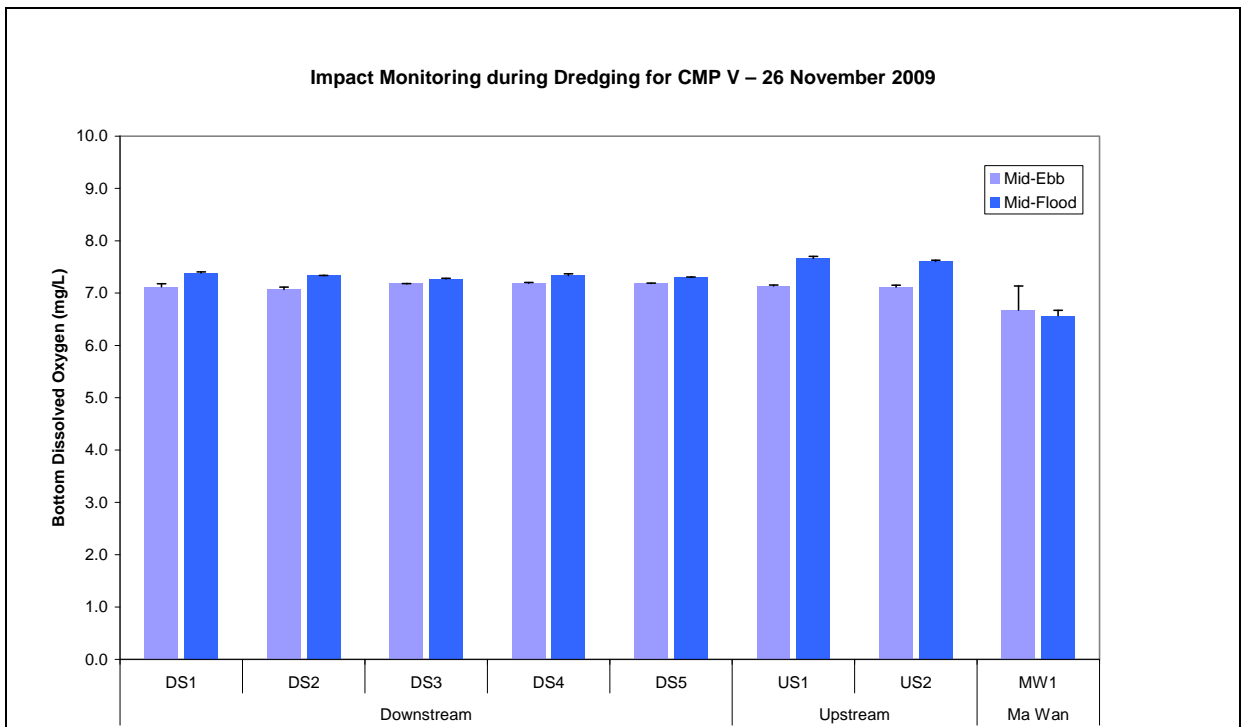


Figure 13: Bottom DO Level (mean \pm SD) at Downstream (DS1, DS2, DS3, DS4 and DS5 stations), Upstream (US1 and US2 stations) and Ma Wan (MW1 station) during Impact Monitoring for Dredging on 26 November 2009.

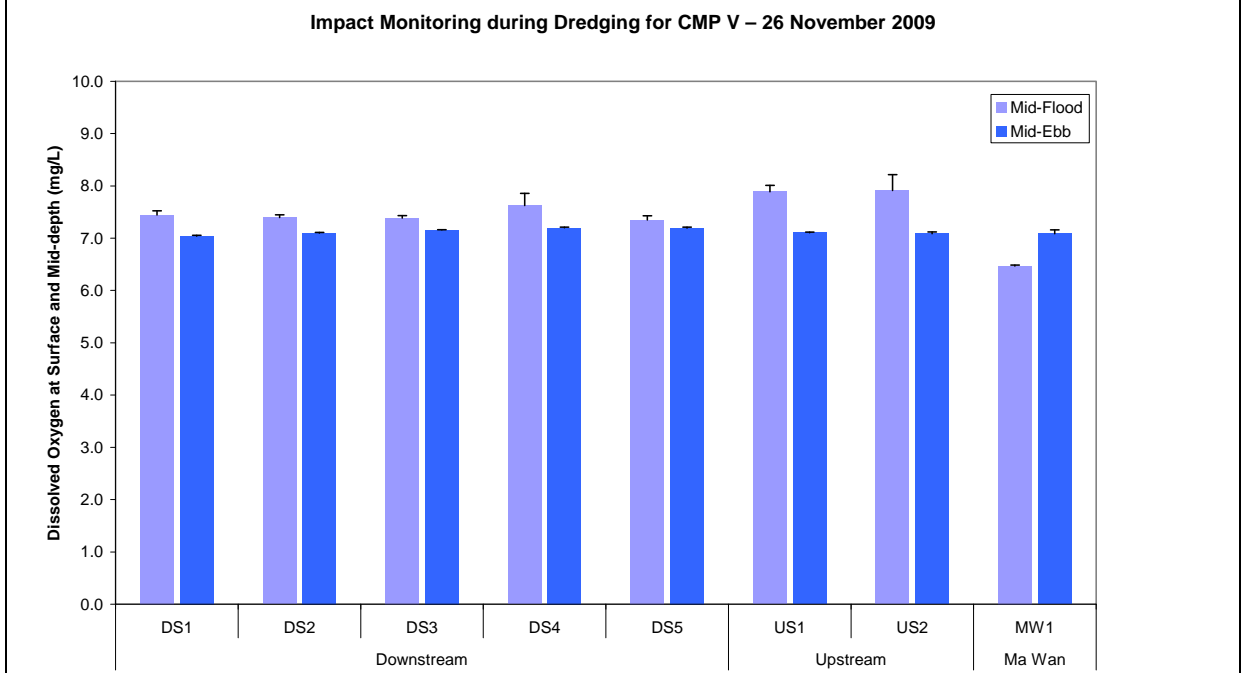


Figure 14: DO Level at Surface and Mid-depth (mean \pm SD) at Downstream (DS1, DS2, DS3, DS4 and DS5 stations), Upstream (US1 and US2 stations) and Ma Wan (MW1 station) during Impact Monitoring for Dredging on 26 November 2009.

Impact Monitoring during Dredging for CMP V – 26 November 2009

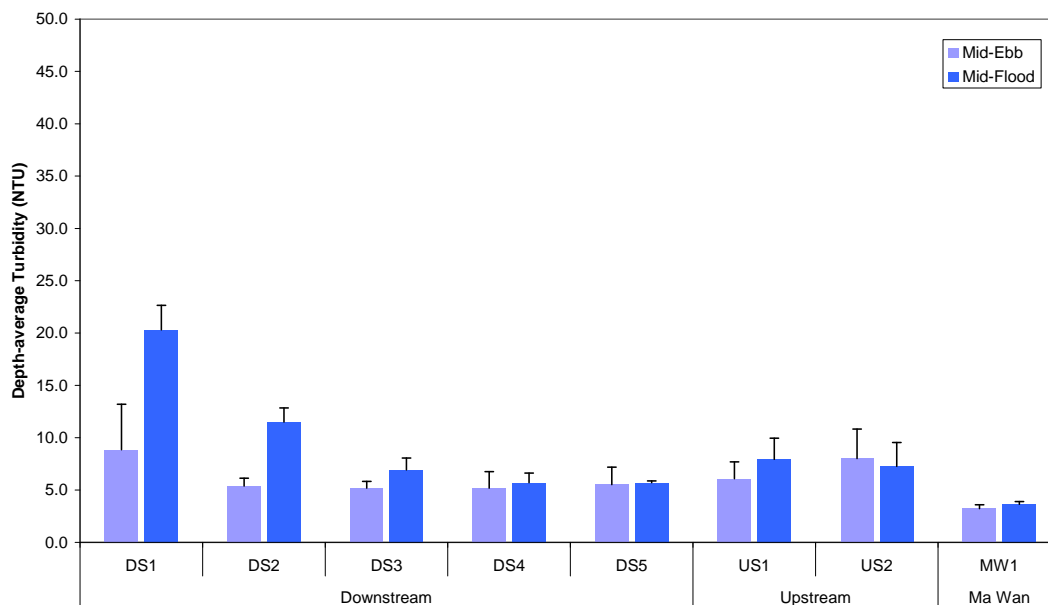


Figure 15: Depth-average Turbidity (mean \pm SD) at Downstream (DS1, DS2, DS3, DS4 and DS5 stations), Upstream (US1 and US2 stations) and Ma Wan (MW1 station) during Impact Monitoring for Dredging on 26 November 2009.

Impact Monitoring during Dredging for CMP V – 26 November 2009

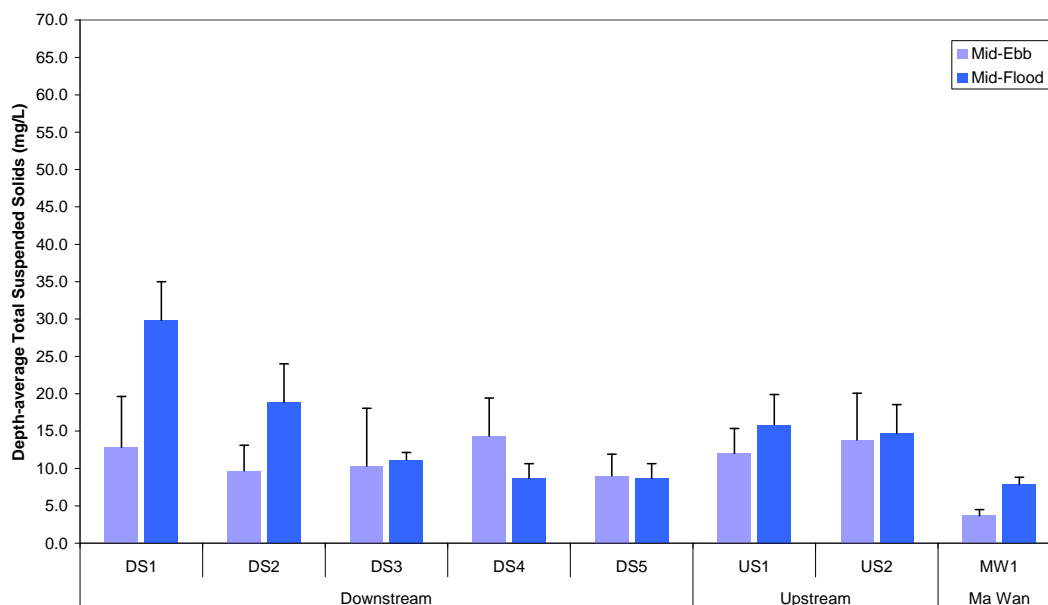


Figure 16: Depth-average Total Suspended Solids (mean \pm SD) at Downstream (DS1, DS2, DS3, DS4 and DS5), Upstream (US1 and US2) and Ma Wan (MW1) stations during Impact Monitoring for Dredging on 26 November 2009.

Annex C

Study Programme

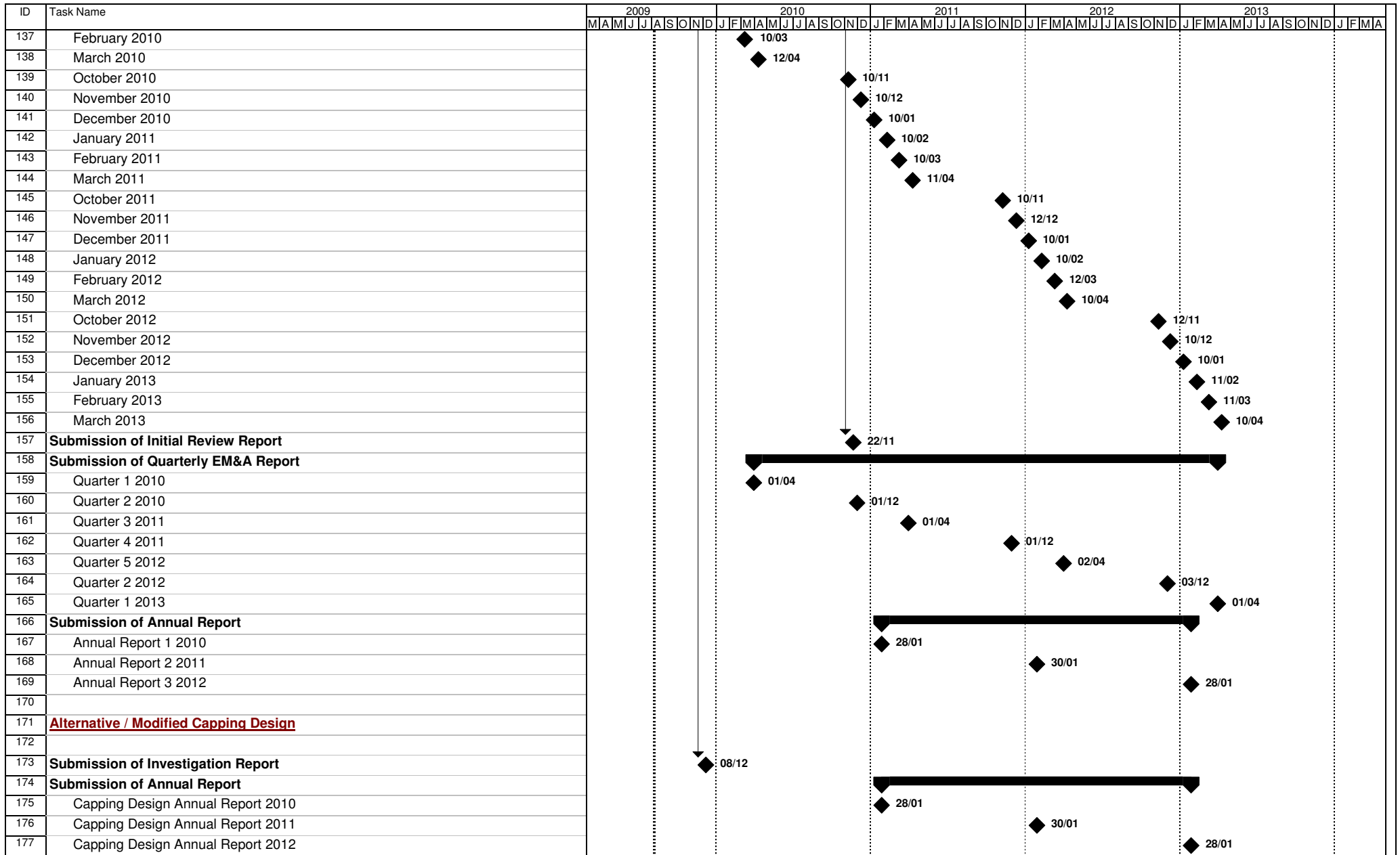


Figure 4.1 - Study Programme

