



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

26th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau – October 2014

Final (Revision 1)

02 December 2014

Environmental Resources Management

16/F Berkshire House 25 Westlands Road Quarry Bay, Hong Kong Telephone (852) 2271 3000 Facsimile (852) 2723 5660 www.erm.com



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16/F Berkshire House 25 Westlands Road Quarry Bay Hong Kong

Telephone: (852) 2271 3000 Facsimile: (852) 2723 5660 E-mail: post.hk@erm.com http://www.erm.com

Client:	Project No) :		
Civil Engineering and Development Department (CEDD)	0175086	6		
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	Approved	by:		
This document presents the 26 th monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.	h	` <u>`</u>		
	Craig A. <i>Partner</i>	Reid		
v1 26 th Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	02/12/14
v0 26 th Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	14/11/14
Revision Description	Ву	Checked	Approved	Date
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Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers

Environmental Certification Sheet EP-427/2011/A

Reference Document/Plan

Document/Plan to be Certified/ Verified:

26th Monthly Progress Report for Contaminated Mud Pits to

the South of The Brothers and at East Sha Chau - October

2014

Date of Report:

14 November 2014

Date prepared by ET:

14 November 2014

Date received by IA:

14 November 2014

Reference EP Condition

Environmental Permit Condition:

Condition No.: 4.4

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

ET Certification

I hereby certify that the above referenced document/ $\frac{1}{plan}$ complies with the above referenced condition of EP-427/2011/A

Craig A. Reid,

Environmental Team Leader:

Date:

14/11/2014

IA Verification

I hereby verify that the above referenced document/plan complies with the above referenced condition of

EP-427/2011/A

Dr Wang Wen Xiong, Independent Auditor: Date:

14/11/2014

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

26TH MONTHLY PROGRESS REPORT FOR OCTOBER 2014

Chau (2012-2017) - Investigation

1.1 BACKGROUND

- 1.1.1 Since early 1990s, contaminated sediment (1) arising from various construction works (e.g. dredging and reclamation projects) in Hong Kong has been disposed of at a series of seabed pits at East of Sha Chau (ESC). In late 2008, a review indicated that the existing and planned facilities at ESC would not be able to meet the disposal demand after 2012. In order to meet this demand, the Hong Kong Special Administrative Region Government (HKSARG) decided to implement a new contained aquatic disposal (CAD) (2) facility at the South of The Brothers (SB CMPs) which had been under consideration for a number of years.
- 1.1.2 The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) study completed in 2005 under *Agreement No. CE 12/2002(EP)* ⁽³⁾. The Director of Environmental Protection (DEP) approved this EIA report under the *Environmental Impact Assessment Ordinance* (*Cap. 499*) (*EIAO*) in September 2005 (*EIA Register No.: AEIAR-089/2005*).
- 1.1.3 In accordance with the EIA recommendation, prior to commencement of construction works for the SB CMPs, the Civil Engineering and Development Department (CEDD) undertook a detailed review and update of the EIA findings for the SB site (4). Findings of the EIA review undertaken in 2009/2010 confirmed that the construction and operation of the SB site had been predicted to be environmentally acceptable.

- According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 - Confined Marine Disposal as determined according to this TC(W).
- (2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.7
- (3) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/ East of Sha Chau Area (Agreement No. CE 12/2002(EP))
- (4) Under the CEDD study Contaminated Sediment Disposal Facility to the South of The Brothers (Agreement No. FM 2/2009)

- 1.1.4 Environmental Permits (EPs) (EP-312/2008/A and EP-427/2011A) were issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 for ESC CMP V and on 23 December 2011 for SB CMPs, respectively. Under the requirements of the EPs, an Environmental Monitoring and Audit (EM&A) programme as set out in the EM&A Manuals (1) (2) is required to be implemented for the CMPs.
- 1.1.5 The present EM&A programme under *Agreement No. CE 23/2012 (EP)* covers the dredging, disposal and capping operations of the SB CMPs as well as ESC CMPs. Detailed works schedule for both CMPs is shown in *Figure 1.1*. In October 2014, the following works were being undertaken at the CMPs:
 - Capping was being undertaken at ESC CMP IVc and CMP Va;
 - Disposal of contaminated mud was taking place at SB CMP 1; and
 - Dredging operations were taking place at SB CMP 2.

Figure 1.1 Works Schedule for ESC CMPs and SB CMPs

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1.2 REPORTING PERIOD

1.2.1 This 26th Monthly Progress Report covers the EM&A activities for the reporting month of October 2014.

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

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

- 1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES
- 1.3.1 No monitoring activity was scheduled to be undertaken for ESC CMPs in October 2014.
- 1.3.2 The following monitoring activities have been undertaken for SB CMPs in October 2014:
 - Impact Water Quality Monitoring during Dredging Operations was undertaken for CMP 2 three times per week on 3, 5, 7, 9, 11, 13, 15, 18, 20, 22, 24, 27, 29 and 31 October 2014;
 - Water Column Profiling for CMP 1 was undertaken on 8 October 2014;
 - Routine Water Quality Monitoring for CMP 1 was undertaken on 14 October 2014; and
 - *Pit Specific Sediment Chemistry* for CMP 1 was undertaken on 16 October 2014.
- 1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS
- 1.4.1 No outstanding sampling remained for October 2014. The following laboratory analyses were still in progress during the preparation of this monthly report and hence are not presented in this monthly report:
 - Laboratory analyses of water samples collected for *Routine Water Quality Monitoring of CMP 1* in October 2014.
 - Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry of CMP 1* in October 2014.
- 1.4.2 A summary of field activities conducted are presented in *Annex A*.

1.5 Brief Discussion of the Monitoring Results for SB CMPs

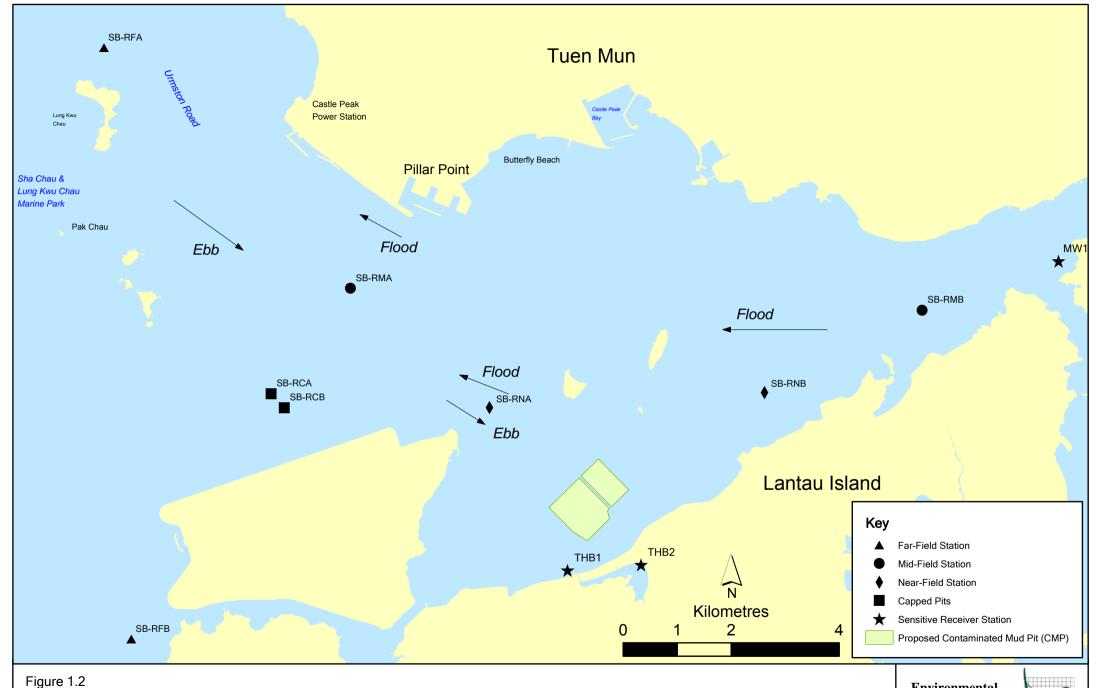
- 1.5.1 Brief discussion of the monitoring results of the following activities for SB CMPs is presented in this 26th Monthly Progress Report:
 - Cumulative Impact Sediment Chemistry of CMP 1 conducted in August 2014;
 - Pit Specific Sediment Chemistry of CMP 1 conducted in September 2014;
 - Sediment Chemistry after a Major Storm for CMP 1 conducted in September 2014;
 - Impact Water Quality Monitoring during Dredging Operations of CMP 2 conducted in October 2014; and
 - Water Column Profiling of CMP 1 conducted on 8 October 2014.

1.5.2 Cumulative Impact Sediment Chemistry of CMP 1 - August 2014

- 1.5.3 Monitoring locations for *Cumulative Impact Sediment Chemistry for CMP 1* are shown in *Figure 1.2*. A total of eleven (11) monitoring stations were sampled in August 2014.
- 1.5.4 Analyses of results for the *Cumulative Impact Sediment Chemistry Monitoring* indicated that the concentrations of most inorganic contaminants, except Arsenic, were below the Lower Chemical Exceedance Level (LCEL) in August 2014 (*Figures 1* and 2 of *Annex B*). Concentration of Arsenic exceeded the LCEL at Capped Pit station SB-RCA.
- 1.5.5 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 LCEL exceedances of Arsenic are unlikely to be caused by the disposal operations at CMP 1 but rather as a result of naturally occurring deposits.

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



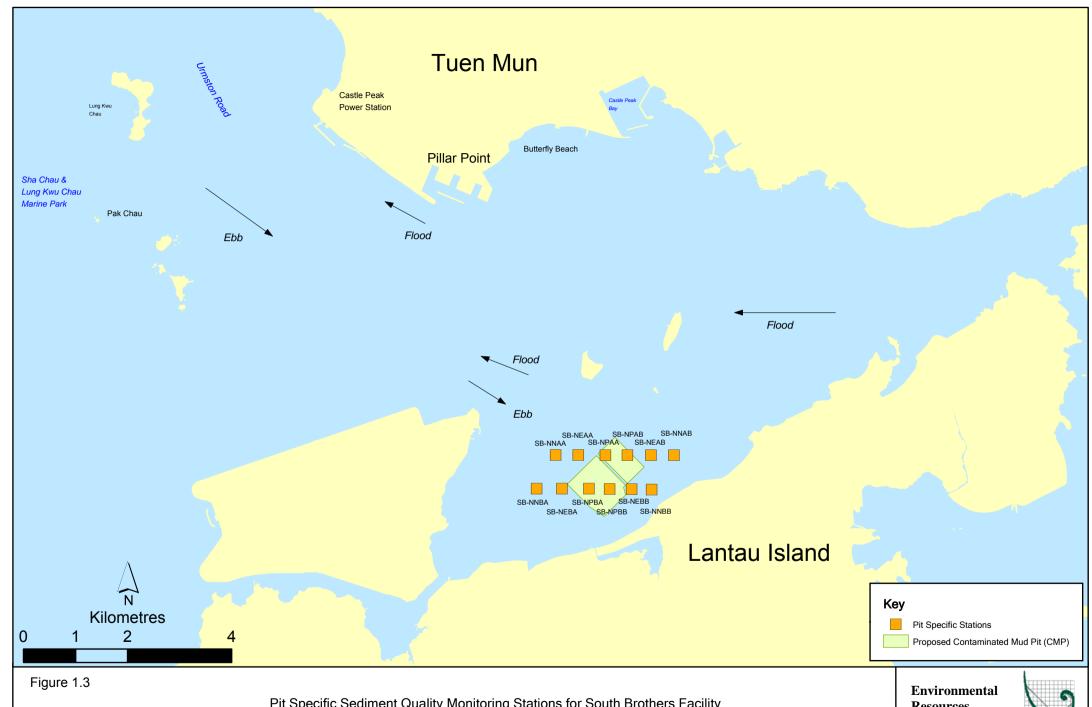
Cumulative Impacts Sediment Quality Monitoring Stations for South Brothers Facility

Environmental Resources Management



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- 1.5.6 For organic contaminants, concentration of Total Organic Carbon (TOC) at Tai Ho Bay Station 2 (THB2) was recorded to be higher than other stations (*Figure 3* of *Annex B*). Concentrations of Tributyltin (TBTs) were recorded to be higher at Near-field station SB-RNB and Mid-field station SB-RMB (*Figure 4* of *Annex B*). Total Dichloro-Diphenyl-Trichloroethane (DDT), 4,4'-Dichloro-Diphenyl-Dichloroethylene (4,4'-DDE), Total Polychlorinated Biphenyls (PCBs) as well as Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (MW PAHs) were recorded below the limit of reporting at all stations.
- 1.5.7 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP 1 in August 2014.
- 1.5.8 Pit Specific Sediment Chemistry of CMP 1 September 2014
- 1.5.9 Monitoring locations for *Pit Specific Sediment Chemistry for CMP 1* are shown in *Figure 1.3*. A total of six (6) monitoring stations were sampled in September 2014.
- 1.5.10 The concentrations of all inorganic contaminants were lower than the LCEL at all stations in September 2014 (*Figures 5* and 6 of *Annex B*).
- 1.5.11 For organic contaminants, the concentrations of TOC and TBTs were observed to be higher at Active Pit station SB-NPAB (*Figures 7* and *8* of *Annex B*). Low MW PAHs, High MW PAHs, Total DDT, 4,4′-DDE and Total PCBs were recorded below the limit of reporting at all stations in September 2014.
- 1.5.12 As higher TOC and TBTs concentrations were recorded within the Active Pit station only which were receiving contaminated mud during the reporting month, there is no evidence indicating any dispersal of contaminants from the active pit.
- 1.5.13 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP 1 in September 2014.
- 1.5.14 Sediment Chemistry after a Major Storm of CMP 1 September 2014
- 1.5.15 Sampling for Sediment Chemistry after a Major Storm Event was conducted at eleven (11) monitoring stations (*Figure 1.2*) on 19 September 2014 after the visit of Typhoon Kalmaegi, which led to the issue of Gale or Storm Wind Signal No.8 on 16 September 2014. The track of Kalmaegi is shown in *Figure 1.4*.



Pit Specific Sediment Quality Monitoring Stations for South Brothers Facility

Resources Management



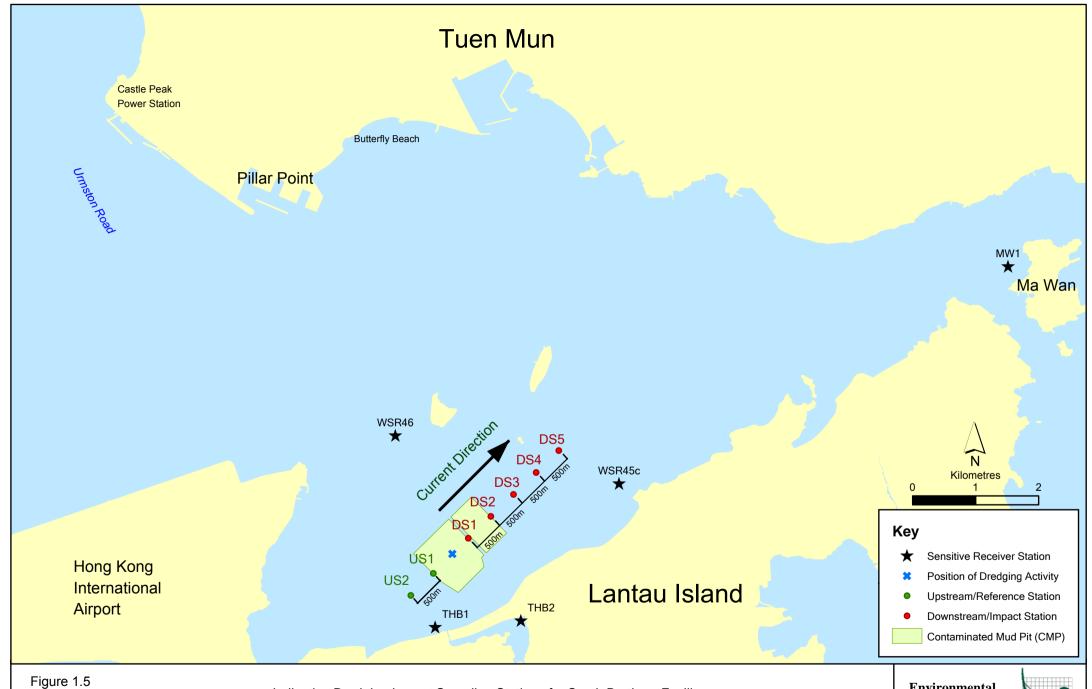
Figure 1.4 Track of Typhoon Kalmaegi from 12 to 17 September 2014 (Source: Hong Kong Observatory)



- 1.5.16 Analyses of results for the *Sediment Chemistry after a Major Storm* indicated that the concentrations of most inorganic contaminants, except Arsenic, were below the LCEL (*Figures 9* and 10 of *Annex B*). Concentration of Arsenic exceeded the LCEL at Capped Pit stations SB-RCA and SB-RCB. As discussed in *Section 1.5.5*, the slight exceedances of the LCEL for Arsenic are unlikely to be caused by the disposal operations at CMP 1 but rather as a result of naturally occurring deposits.
- 1.5.17 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 September 2014.

- 1.5.18 Impact Water Quality Monitoring during Dredging Operations of CMP 2 October 2014
- 1.5.19 Impact Water Quality Monitoring during Dredging Operations of CMP 2 was conducted three times per week from 1 to 31 October 2014 during the reporting period. On each survey day, monitoring was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations and five Impact (Downstream) stations of the dredging operations at CMP 2. Monitoring was also conducted at five Sensitive Receiver Stations situated in Ma Wan, Shum Shui Kok, Tai Mo To and Tai Ho Bay. A total of twelve (12) stations were monitored and locations of the sampling stations are shown in Figure 1.5.
- 1.5.20 Monitoring results are presented in *Table C1* of *Annex C*. Daily dredging volume in October 2014 is reported in *Annex D*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solids (SS) generally complied with the Action and Limit Levels (see *Table C2* of *Annex C* for details) set in the *Baseline Monitoring Report* (1), except for the following occasion of exceedances discussed in *Table 1.1* below.
- 1.5.21 As presented in *Table 1.1*, the results indicated that the dredging operations at CMP 2 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*-427/2011/A), are considered necessary for the dredging operations.

⁽¹⁾ ERM (2012) Baseline Monitoring Report. Environmental Monitoring and Audit for Contaminated Mud Pits to the South of the Brothers and at East Sha Chau (2012-2017) – Investigation. Agreement No. CE 23/2012(EP). Submitted to EPD in October 2012.



Indicative Dredging Impact Sampling Stations for South Brothers Facility

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



Table 1.1 Details of Exceedances Recorded at CMP 2 between 1 and 31 October 2014

Date	Tide	Parameter	Station	Type	Remarks
7 October 2014	Mid-Flood	Turbidity	DS2	Action	These exceedances were not considered as indicating any unacceptable impacts from the dredging
9 October 2014	Mid-Flood	SS	DS3	Action	operations to Water Sensitive Receivers (WSRs) outside the works area due to the following reason:
9 October 2014	Mid-Flood	Turbidity	WSR45C	Limit	CLUC DC2 DC2 IAICD4EC LIAICD4C L L (
9 October 2014	Mid-Flood	Turbidity	WSR46	Action	• Stations DS2, DS3, WSR45C and WSR46 are located further away from the works area of CMP 2 when
11 October 2014	Mid-Flood	SS	DS2	Action	compared to station DS1 at which the levels of Turbidity and SS did not exceed the Action and Limit
20 October 2014	Mid-Flood	SS	DS2	Action	Levels during the same tidal period.
20 October 2014	Mid-Flood	SS	DS3	Action	
24 October 2014	Mid-Ebb	SS	WSR45C	Action	
24 October 2014	Mid-Ebb	SS	WSR46	Action	
27 October 2014	Mid-Ebb	SS	DS2	Action	
27 October 2014	Mid-Flood	SS	DS2	Action	
29 October 2014	Mid-Flood	SS	DS2	Action	
22 October 2014	Mid-Flood	Turbidity	DS1	Limit	These exceedances were not considered as indicating any unacceptable impacts from the dredging
22 October 2014	Mid-Flood	Turbidity	DS2	Limit	operations to WSRs outside the works area due to the following reason:
22 October 2014	Mid-Flood	SS	DS1	Action	Astion / Limit Lored Event demand of Trushidity and CC arrangement of at Chatiana DC1 and DC2 which are
22 October 2014	Mid-Flood	SS	DS2	Action	 Action / Limit Level Exceedances of Turbidity and SS were recorded at Stations DS1 and DS2 which are located in the vicinity of the works area during one tidal period only, and exceedances were not
					recorded at stations WSR45C and WSR46 which are the nearest WSRs. It is thus considered that the
					exceedances were not indicating any unacceptable impacts from the dredging operations to the nearby
					WSRs.
9 October 2014	Mid-Ebb	SS	DS1	Action	These exceedances were not considered as indicating any unacceptable impacts from the dredging
9 October 2014	Mid-Ebb	Turbidity	DS4	Action	operations to WSRs outside the works area due to the following reason:
9 October 2014	Mid-Ebb	Turbidity	DS5	Action	•
9 October 2014	Mid-Ebb	SS	DS4	Action	• Station DS1 is located close to the works area whilst stations DS4 and DS5 are located further away
9 October 2014	Mid-Ebb	SS	DS5	Action	from the works area of CMP 2 when compared to stations DS2-3 at which the levels of Turbidity and SS
) October 2011	Wild Edd	55	200	riction	did not exceed the Action and Limit Levels during the same tidal period. These exceedances were
					thus not considered as indicating any unacceptable impacts from the dredging operations to WSR
					outside the works area.

1.5.22 Water Column Profiling of CMP 1 - October 2014

1.5.23 Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 8 October 2014. The water quality monitoring results have been assessed for compliance with the Water Quality Objectives (WQOs) through a review of the Environmental Protection Department (EPD) routine water quality monitoring data for the wet season period (April to October) of 2003-2012 from stations in the North Western Water Control Zone (WCZ), where CMP is located. The monitoring results were also compared with the Action and Limit Levels set in Baseline Monitoring Report (see Table C2 of Annex C for details).

In-situ Measurements

1.5.24 Analyses of results for October 2014 indicated that levels of Salinity, turbidity, DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table C3* of *Annex C*).

Laboratory Measurements for SS

- 1.5.25 Analyses of results for September 2014 indicated that the SS levels at Upstream station complied with the WQO. The Downstream station exceeded the WQO. SS levels at all stations complied with the Action and Limit Levels (*Table C3* of *Annex C*).
- 1.5.26 Overall, the monitoring results indicated that the mud disposal operation at CMP 1 did not appear to cause any deterioration in water quality during this reporting period.

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

- 1.6.1 The following monitoring activities will be conducted in the next monthly period of November 2014 for SB CMPs:
 - *Pit Specific Sediment Chemistry of CMP 1;*
 - Impact Monitoring during Dredging Operations of CMP 2;
 - Routine Water Quality Monitoring of CMP 1; and
 - Water Column Profiling of CMP 1.
- 1.6.2 No monitoring activity is scheduled to be undertaken in the next monthly period of November 2014 for ESC CMPs.
- 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 <i>Annex E</i> .

Annex A

Sampling Schedule

impact stations																l																											
	ESC-INA			*	*				* *																							*	*					*	*				*
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Reference Stations																																											
	ESC-TNA			*	*				* *																							*	*					*	*				*
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Plume Stations	WCP1	* *	*	* *	*	, ,																																					

Annex A1 - Environmental Monito	oring ana Auait S	Samplin	ig Sched 2012		r East	t of Sna C	nau (r 2012 - F 113	eoruai	ry 2017	')				2	2014								2015							20	16				2017
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Annex A1 - Environmental Monitoring and Audit Sampling Schedule for East of Sha Chau (September 2012 - February 2017)

Annex A1 - Environmental Work	o .		2012			,			2013		3	,						201	Į.								20	015							2016				2017	
Routine Water Quality Monito	ring	S	0 N	N D	J :	F M	Α	M J	J	A	S	O N	D	J F	M	A	M	J	J A	S	0	N D	J	F	M A	M		J	A S	O N	N D	J	F M	A M	I I	A S	O N	D	J F	7
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	ESC-IPE2		* *		*	*	*	*	*	*																						*	*	* *	*	*	* *		* *	ŕ
	ESC-IPE3		* *		*	*	*	*	*	*																						*	*	* *	*	*	* *		* *	ŕ
	ESC-IPE4		* *		*	*	*	*	*	*																						*	*	* *	*	*	* *		* *	F
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	ESC-RFE4		* *		*	*	*	*	*	*							 															*	*	* *	*	*	* *		* *	ł
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Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

				201	2						2013									20	014								2015							201	16					2
Baseline Monitoring Prior to Dredging	Code	Frequency	J A			D	J	F M	A			A	S	O N	I D	J	F	M	A M			A 5	s o	N	D	J	F :			Α	S	0	N I	D J	F M A M			A S	0	N	D	
Far Field Stations						П																			П																	T
	SB-WFA	3 days per week for 4 weeks	* *	*																																						
	SB-WFB	3 days per week for 4 weeks	* *	*																																						
Mid Field Stations																																										
	SB-WMA	3 days per week for 4 weeks	* *	*																																						┸
	SB-WMB	3 days per week for 4 weeks	* *	*																																						┸
Near Field Stations																																										┸
		3 days per week for 4 weeks	* *	*																																						┸
	SB-WNAB	3 days per week for 4 weeks	* *	*																																						┸
	SB-WNBA	3 days per week for 4 weeks	* *	*																																						┸
	SB-WNBB	3 days per week for 4 weeks	* *	*																																						┸
Reference Stations																																										┸
	NM1	3 days per week for 4 weeks	* *	*																																						┸
	NM2	3 days per week for 4 weeks	* *	*																																						L
	NM3	3 days per week for 4 weeks	* *	*																																						L
	NM5	3 days per week for 4 weeks	* *	*																																						┸
	NM6	3 days per week for 4 weeks	* *	*					1																																_	丄
Sensitive Receiver Stations				\perp					1																																_	丄
1	MW1	3 days per week for 4 weeks	* *	*																										Ш												$oldsymbol{\perp}$
	THB1	3 days per week for 4 weeks	* *	*																										Ш												$oldsymbol{\perp}$
	THB2	3 days per week for 4 weeks		*					1																																_	丄
	WSR45C	3 days per week for 4 weeks	* *	*																																						L
	WSR46	3 days per week for 4 weeks	* *	*																																						丄
								_																																		
Impact Monitoring for Dredging			J A	AS	O N	D	J 1	F M	A	M	J J	A	S	O N	I D	J	F	M .	A M	I J	J	A 5	s o	N	D	J	F :	M A M J	J	A	S	О	N I	D J	F M A M	J	J A	A S	О	N	D	J
Upstream Stations	*****					*	* :		.						*		*	*	* *															_							-	╄
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	DS3	3 days per week		+++	*	*	* :	* *	*	*	* *		*	* *	*	*			* *	*		* 1	* *	*	+ +			++++						+							-	+
	DS4	3 days per week		+++	*	*	* :	* *	*	*	* *	*	*	* *	*	*		*	* *	*	*	* 1	* *	*	1 1	-		++++	-				-	+								+
	DS5	3 days per week		+++	*	*	* :	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*	+ +									1								+
Sensitive Receiver Stations	200	o days per week							1							1 1												1 1 1	+				+	1								\mathbf{T}
	MW1	3 days per week			*	*	* :	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*				1 1 1	+				+	1								\mathbf{T}
	THB1	3 days per week			*	*	* :	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*	1 1																	\mathbf{T}
	THB2	3 days per week			*	*	*	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*																		1
	WSR45C	3 days per week			*	*	* :	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*																		1
	WSR46	3 days per week			*	*	* :	* *	*	*	* *	*	*	* *	*	*	*	*	* *	*	*	* 1	* *	*																		L
Pit Specific Sediment Chemistry			J A	A S	O N	D	J I	F M	A	M	J J	A	S	O N	I D	J	F	M .	A M	J	J	A S	s o	N	D	J	F :	M A M J	J	A	S	О	N I	D J	F M A M	J	J A	A S	О	N	D	J
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Near-Pit Pit-Edge	SB-NNBB	Monthly													-		1					-			12	12	12	2 12 12 12	12	12			12 1	.2						-		十
Near-Pit	SB-NNBB SB-NEBA	Monthly Monthly																													12	12										F
Near-Pit	SB-NNBB	Monthly Monthly																							12	12	12	2 12 12 12	12	12	12	12	12 1	.2								Ė
Near-Pit	SB-NEBA SB-NEBB	Monthly Monthly Monthly																							12 12	12 12	12	2 12 12 12 2 12 12 12 2 12 12 12 12 12 12	12 12	12 12	12 12 12	12 12 12	12 1 12 1	2 .2								
Near-Pit Pit-Edge	SB-NNBB SB-NEBA	Monthly Monthly Monthly Monthly																							12 12 12	12 12 12	12 12 12	2 12 12 12 2 12 12 12 12	12 12 12	12 12 12	12 12 12 12	12 12 12 12	12 1 12 1 12 1	2 2 2								

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

				2012					,	2013						2014	1					2015						2016				2017
Cumulative Impact Sediment Chemist	rv		I A	A S (D I	F	M A			s o	N I	D I	F	M A	M I	I A S	0	N D	I	F M	1 A M J		s o	N D) I	F M A M J		A S	0	N D	
Near-field Stations	<i>y</i>									Ť			Ť				,									T						
	SB-RNA	4 times per year								12		1	12	12		12	12		12		12	12	12		12	2						
	SB-RNB	4 times per year								12		1	12	12		12	12		12		12	12	12		12	2						
Mid-field Stations	on n			_ _															- 1-	1						\perp						+-+
	SB-RMA	4 times per year	-					-		12 12			12	12 12		12	12		12 12		12	12	12		12					1	_	+-+
Far-Field Stations	SB-RMB	4 times per year								12			12	12		12	12		12	+ +	12	12	12		12	2			-			++
Par-Pield Stations	SB-RFA	4 times per year				-				12		1	12	12		12	12		12	1 .	12	12	12		12	2			+			++
	SB-RFB	4 times per year								12			12	12		12	12		12		12	12	12		12							++
Capped Pit Stations		1 ,																														
	SB-RCA	4 times per year								12		1	12	12		12	12		12		12	12	12		12	2						
	SB-RCB	4 times per year								12		1	12	12		12	12		12		12	12	12		12	2						$\perp \perp$
Sensitive Receiver Stations										.																						$\bot \bot$
	MW1	4 times per year			_					12			12	12		12	12		12		12	12	12		12							
	THB1 THB2	4 times per year 4 times per year	-							12 12			12 12	12 12		12 12	12 12		12 12		12 12	12	12 12		12 12						_	+-+
	11102	4 times per year								12		1	1.2	12		12	12		12		1.2	12	12		12	_						
Sediment Toxicity Tests			J	A S C) N	D J	F	М А	M J	J A	S O	N I	D J	F	M A	M J	J A S	0	N D	J	F M	I A M J	J A	S O	N D	р	F M A M J	J	A S	0	N D	JI
SB CMP 1 Active																																
Reference						_1												L			╧									L		
1	SB-TRA	2 times per year								5					5		5															\Box
L	SB-TRB	2 times per year								5					5	\bot	5			$oxed{\Box}$										Щ		$oxed{\Box}$
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	SB-TAA SB-TAB	2 times per year		\bot	+	-	 			5					5	+	5			+	_	+ $+$ $+$					-	+		\vdash		\vdash
Sensitive Receiver Stations	SB-1AB	2 times per year			-					5			_		5		5			+ +		++++						+				+-+
Sensitive Receiver Stations	MW1	2 times per year		+++	-	-				5					5	++	5			1		+ + + +		-				+	-			++
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Annex A2 - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - February 2017)

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

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	SB-RFF2	8 times per year												3 3		3 3			3	3		3 3	3 3		3 3	++	\neg
	SB-RFF3	8 times per year									 			3 3		3 3			3	3		3 3	3 3		3 3	++	
Sensitive Receiver Stations		· · · · · · · · · · · · · · · · · · ·		++		 	+ +	 	1		 				+ +	-		+ + + + *	+ +	Ť				+		++	\dashv
	MW1	8 times per year		+		 	++	 			 			3 3	+	3 3		3 3	3	3	3	3 3	3 3	1 1	3 3	++	\exists
	THB1	8 times per year		+		 	+	 	1 1		 				+					Ť				1 1		++	\neg
	THB2	8 times per year		+		 	+		1 1		 	1			1 1									1 1		++	\exists
	WSR45C	8 times per year		+		 	++	 			 			3 3	+	3 3		3 3	3	3	3	3 3	3 3	1 1	3 3	++	\exists
	WSR46	8 times per year		+		 	+	 	1 1		 			3 3		3 3			3	3	<u> </u>	3 3	3 3		3 3	++	٦
		1 7		1 1													<u> </u>				1 1 1		<u> </u>		<u> </u>		_
Benthic Recolonisation Studies			JA	s o	N D I	F M A M	I I	A S O N D	J	F M	A M J J A	S	O N	D J F	M	A M	J	A S O	NI) I	F M	A M I	JA	S	O N I	D I	F
Capped Contaminated Mud Pits																				Ť							
T I	SB-CPA	2 times per year		+		 	++	 			 			++	+			12	1	2			12	2	1	12	\dashv
	SB-CPB	2 times per year		++	 	 	+ +	 	+ +		 			+ +	+ +	+		12	1			++	12			12	\dashv
		· r - J		+		 	+	 	1 1		 	1			1 1			12	1	_			12			12	\exists
Reference Stations				+		 	++	 			 			++	+			 	+ + -	Ť				1 1	+ + +	++	\exists
	RBA	2 times per year		+		 	++	 			 			++	+			12	1	2			12	2	1	12	\exists
	RBB	2 times per year		+		 	++	 			 			++	+			12	1				12			12	\exists
	RBC	2 times per year		++		 	+ +	 	+ +		 				+ +	+		12	1				12			12	\dashv
<u> </u>	-	1 /								_		1															—

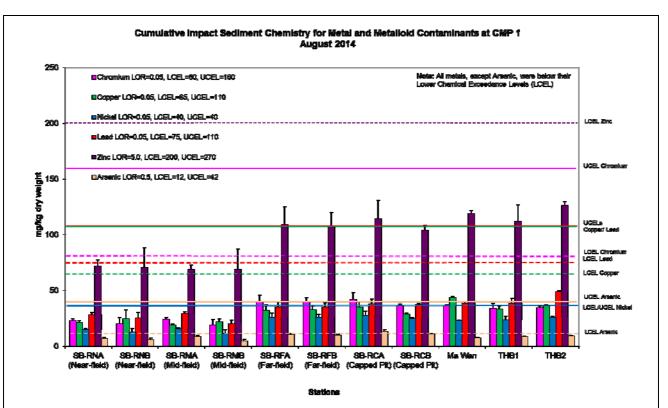
Notes:

"*" = Number of replicates depends on parameters

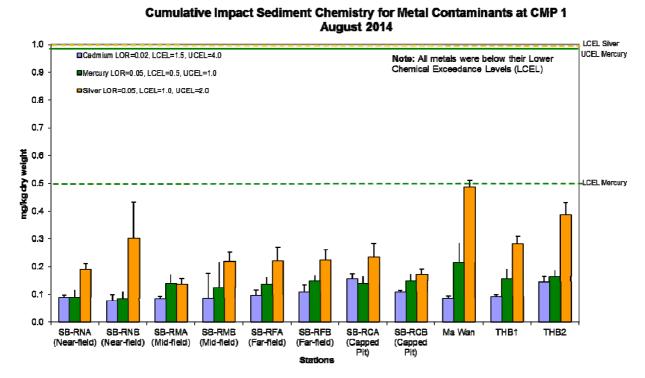
Naming of stations are tentative only and will be subjected to changes

Annex B

Graphical Presentations



Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry for CMP 1 in August 2014.



Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Figure 2: Cumulative Impact Sediment Chemistry for CMP 1 in August 2014.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02

Deliverable\07 CMP Monthly Report\26th (October 2014)

14/11/2014 Date:



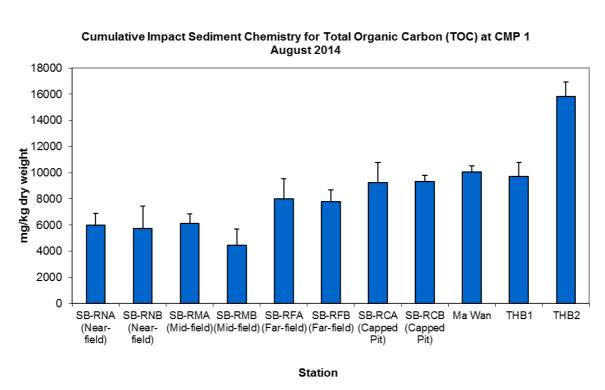


Figure 3: Concentration of Total Organic Carbon (mg/kg dry weight; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry for CMP 1 in August 2014.

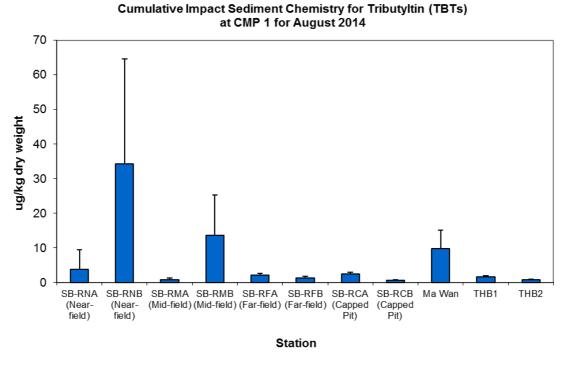


Figure 4: Concentration of Tributyltin (µg TBT/kg; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry for CMP 1 in August 2014.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02

Deliverable\07 CMP Monthly Report\26th (October 2014)

Date: 14/11/2014



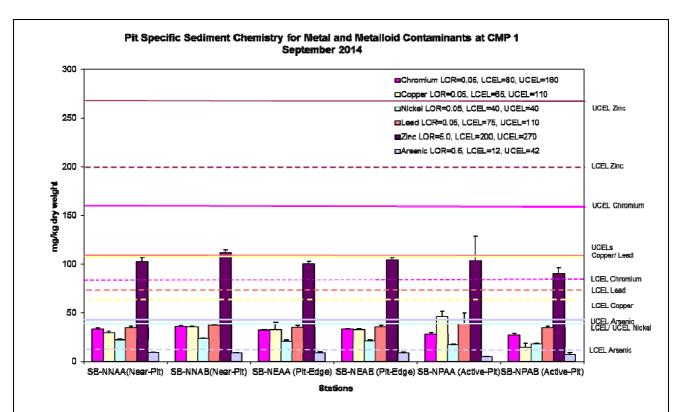
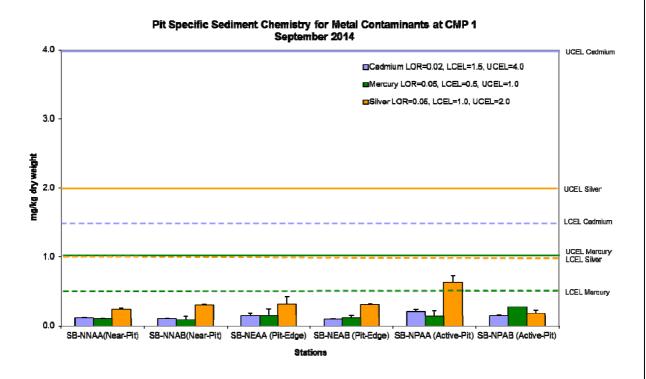


Figure 5: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 1 in September 2014.



Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 1 in September 2014.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02

Deliverable\07 CMP Monthly Report\26th (October 2014)

14/11/2014 Date:



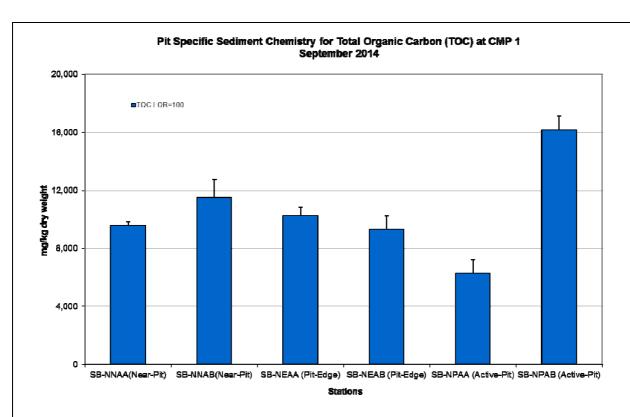


Figure 7: Concentration of Total Organic Carbon (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 1 in September 2014.

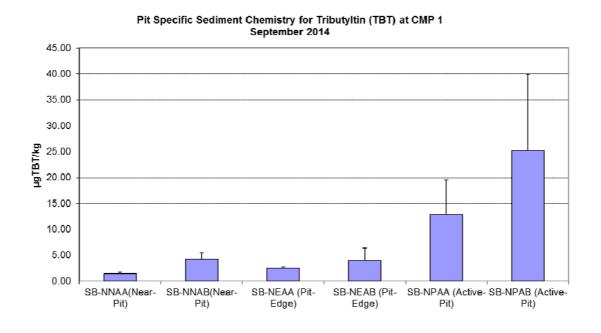


Figure 8: Concentration of Tributyltin (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring of CMP 1 in September 2014.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02 Deliverable\07 CMP Monthly Report\26th (October 2014)

Date: 14/11/2014



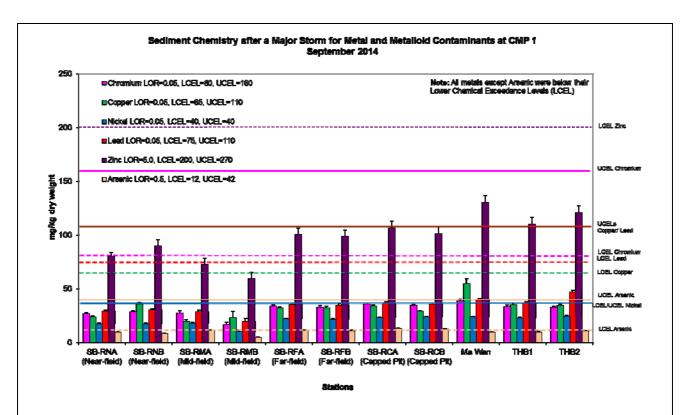


Figure 9: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from *Sediment Chemistry after a Major Storm* for CMP 1 in September 2014.

Sediment Chemistry after a Major Storm for Metal Contaminants at CMP 1 September 2014 LCEL Silver 1.0 □Cadmium LOR=0.02, LCEL=1.5, UCEL=4.0 **UCEL Mercury** Note: All metals were below their Lower Chemical Exceedance Levels (LCEL) 0.9 ■Mercury LOR=0.05, LCEL=0.5, UCEL=1.0 ■Silver LOR=0.05, LCEL=1.0, UCEL=2.0 0.8 0.7 0.6 0.5 0.4 0.4 0.3 0.2 0.1 0.0 SB-RNA SB-RNB SB-RMA S8-RMB SB-RFA SB-RCB Ma Wan THB1 (Near-field) (Near-field) (Mid-field) (Mid-field) (Capped Pit) (Far-field) (Far-field)

Figure 10: Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from *Sediment Chemistry after a Major Storm* for CMP 1 in September 2014.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02 Deliverable\07 CMP Monthly Report\26th (October 2014)

Date: 14/11/2014



Annex C

Water Quality Monitoring Results

Table C1 Summary Table of DO, Turbidity and SS Levels Recorded between 3 and 31 October 2014

Sampling	Tidal	Station	•	DO Levels	Average	Average SS
Date	Period			ng/L)	Turbidity	Level
			Bottom	Surface and	Level	(mg/L)
2011/10/02	3 6: 1 7:11	D01		Mid Depth	(NTU)	
2014/10/03	Mid-Ebb	DS1	4.97	5.29	20.42	16.13
		DS2	5.27	5.50	4.90	4.43
		DS3	5.15	5.45	5.19	7.26
		DS4	4.90	5.33	6.49	8.37
		DS5	5.29	5.37	4.12	5.20
		US1	4.89	5.33	17.43	14.33
		US2	5.62	5.91	6.05	5.10
		MW1	4.34	5.35	3.12	4.98
		THB1	5.55	5.79	4.00	6.63
		THB2	_	4.96	14.60	6.97
		WSR45C	4.88	5.31	6.96	4.46
		WSR46	4.92	5.90	4.84	5.91
	Mid-Flood	DS1	6.06	6.01	12.78	15.13
		DS2	6.16	6.29	10.10	12.95
		DS3	6.39	6.44	10.92	12.02
		DS4	5.55	6.18	10.01	11.10
		DS5	6.65	6.66	7.50	8.30
		US1				
			5.36	5.94	4.05	3.77
		US2	5.20	6.07	4.38	4.55
		MW1	4.37	4.53	7.18	11.58
		THB1	5.50	6.06	11.88	11.43
		THB2	-	4.98	16.43	5.87
		WSR45C	4.49	5.10	7.96	9.97
		WSR46	4.83	5.65	20.78	11.99
2014/10/05	Mid-Ebb	DS1	4.45	4.89	14.19	13.60
		DS2	4.39	4.92	7.56	10.02
		DS3	4.53	4.78	6.57	7.13
		DS4	4.73	4.74	5.76	8.42
		DS5	4.84	5.17	7.36	8.54
		US1	4.29	4.63	10.20	12.60
		US2	4.42	4.76	12.50	11.29
		MW1	4.57	4.74	5.24	6.11
		THB1	5.89	5.96	4.72	7.15
		THB2	_	4.73	8.33	7.73
		WSR45C	4.47	5.14	4.99	4.91
		WSR46	4.61	5.16	9.54	9.66
	Mid-Flood	DS1	5.50	5.61	5.89	6.37
	11000	DS2	5.35	5.80	11.41	11.07
		DS3	5.18	5.77	10.46	14.47
		DS3 DS4			9.57	
		DS4 DS5	5.49 5.72	5.93		9.68
			5.72	6.37	9.80	14.12
		US1	4.73	4.99	14.69	16.16
		US2	4.71	5.38	6.87	8.07
		MW1	4.49	4.55	11.02	12.97
		THB1	5.71	5.67	5.07	7.53
		THB2	-	5.04	13.30	7.77
		WSR45C	4.51	4.88	8.26	11.72
		WSR46	4.70	5.24	19.22	14.24

Sampling Date	Tidal Period	Station	_	DO Levels ng/L)	Average Turbidity	Average SS Level
Dute	Terrou		Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
2014/10/07	Mid-Ebb	DS1	5.86	6.03	8.57	11.85
		DS2	5.14	6.03	6.16	10.54
		DS3	5.01	5.66	6.37	8.80
		DS4	4.78	4.99	12.50	14.67
		DS5	4.70	4.85	14.16	16.34
		US1	5.53	6.18	6.77	15.55
		US2	5.25	5.94	10.00	10.45
		MW1	4.71	4.75	5.73	8.06
		THB1	5.95	6.12	4.10	5.00
		THB2	-	5.12	9.17	5.10
		WSR45C	4.58	5.11	10.89	9.96
		WSR46	5.11	5.26	18.80	18.07
	Mid-Flood	DS1	5.19	5.62	12.17	17.58
		DS2	5.78	6.17	25.50	21.47
		DS3	5.61	6.07	16.72	20.32
		DS4	5.40	5.68	15.02	14.67
		DS5	-	6.01	11.57	14.07
		US1	5.51	5.52	12.72	24.85
		US2	5.12	5.11	14.19	18.61
		MW1	4.85	4.88	14.17	15.94
		THB1	5.80	6.23	13.35	17.32
		THB2	-	5.93	14.20	7.43
		WSR45C	4.85	4.98	17.59	15.97
		WSR46	4.98	6.10	13.92	16.36
2014/10/09	Mid-Ebb	DS1	5.27	5.51	11.40	27.10
		DS2	5.24	5.36	8.26	10.40
		DS3	5.03	5.21	10.89	15.13
		DS4	4.98	5.08	29.97	31.53
		DS5	5.03	5.07	27.66	26.86
		US1	5.73	5.78	22.17	21.82
		US2	5.60	5.66	10.60	15.27
		MW1	4.85	4.91	7.63	9.78
		THB1	6.09	6.24	4.70	6.37
		THB2	-	5.92	7.23	8.60
		WSR45C	4.87	5.20	16.47	13.54
		WSR46	5.11	5.28	15.21	14.38
	Mid-Flood	DS1	5.61	5.71	11.00	15.02
		DS2	5.80	5.89	15.12	18.80
		DS3	5.78	5.77	20.20	27.80
		DS4	5.77	5.80	12.49	14.00
		DS5	5.76	5.77	16.59	19.38
		US1	5.42	5.47	12.88	13.75
		US2	5.36	5.38	25.03	22.07
		MW1	5.01	5.00	15.37	19.37
		THB1	6.00	6.01	13.92	16.52
		THB2	-	5.40	11.43	11.47
		WSR45C	5.10	5.20	33.99	20.21
		WSR46	5.27	5.39	31.89	16.96
2014/10/11	Mid-Ebb	DS1	5.28	5.39	7.64	9.33
_011/10/11	11110 1100	DS1 DS2	5.02	5.10	7.04	8.68
		DS3	5.02	5.10	7.13 7.51	7.10

Sampling Date	Tidal Period	Station	_	DO Levels	Average Turbidity	Average SS Level
Date	remou		Bottom	ng/L) Surface and Mid Depth	Level (NTU)	(mg/L)
		DS5	4.95	5.36	8.87	8.16
		US1	5.60	5.60	5.95	8.23
		US2	5.50	5.70	6.33	10.05
		MW1	5.15	5.32	5.14	7.66
		THB1	5.67	5.79	5.04	7.23
		THB2	-	5.25	7.00	7.33
		WSR45C	4.91	5.35	11.72	12.76
		WSR46	5.07	5.23	12.50	14.04
	Mid-Flood	DS1	5.29	5.33	8.26	9.05
		DS2	5.23	5.25	20.04	22.35
		DS3	5.31	5.28	9.57	10.99
		DS4	5.42	5.45	8.90	11.54
		DS5	5.60	5.60	7.78	13.10
		US1	5.42	5.39	7.65	8.43
		US2	5.19	5.32	5.60	6.67
		MW1	4.85	4.95	13.50	14.60
		THB1	5.12	5.14	11.81	13.80
		THB2	-	5.02	12.18	7.53
		WSR45C	4.96	5.07	23.38	18.08
		WSR46	5.16	5.32	9.57	9.24
2014/10/13	Mid-Ebb	DS1	5.75	5.83	12.41	17.07
		DS2	5.64	5.79	7.70	9.70
		DS3	5.40	5.69	5.65	8.21
		DS4	5.11	5.54	7.10	10.10
		DS5	5.08	5.54	6.26	8.56
		US1	5.82	5.96	5.85	12.72
		US2	5.78	5.94	7.77	9.48
		MW1	5.16	5.19	4.46	8.08
		THB1	5.93	6.02	9.00	13.90
		THB2	-	6.07	7.36	11.23
		WSR45C	5.06	5.47	6.00	10.49
		WSR46	5.28	5.59	8.39	9.68
	Mid-Flood	DS1	5.61	5.65	13.48	19.07
		DS2	5.60	5.57	20.62	19.62
		DS3	5.73	5.73	11.92	21.15
		DS4	5.99	6.01	8.50	11.11
		DS5	5.85	5.92	8.90	12.71
		US1	5.73	5.70	7.82	11.30
		US2	5.63	5.66	7.00	11.47
		MW1	5.09	5.21	8.84	10.30
		THB1	5.62	5.60	12.57	15.10
		THB2	-	5.34	14.88	10.60
		WSR45C	5.18	5.48	8.22	13.98
0014/10/15	3 (* 1 T) 1	WSR46	5.36	5.63	10.98	11.12
2014/10/15	Mid-Ebb	DS1	5.52	5.76	17.02	17.02
		DS2	5.35	5.58	8.79	10.91
		DS3	5.37	5.56	7.42	9.43
		DS4	5.29	5.43	6.46	10.36
		DS5	5.30	5.48	6.02	8.23
		US1	5.92	5.93	9.09	10.85
		US2	5.80	5.85	5.70	5.87
		MW1	5.11	5.15	3.11	4.51

Sampling	Tidal	Station	_	DO Levels	Average	Average SS
Date	Period		Bottom	ng/L) Surface and Mid Depth	Turbidity Level (NTU)	Level (mg/L)
		THB1	5.87	5.83	5.67	8.95
		THB2	-	5.94	4.26	5.20
		WSR45C	5.26	5.49	5.75	6.97
		WSR46	5.84	6.05	7.28	9.69
	Mid-Flood	DS1	6.14	6.21	16.19	17.10
	17114 1 1004	DS2	6.08	6.14	13.24	13.80
		DS3	6.22	6.24	8.65	14.25
		DS4	5.56	6.06	9.26	10.86
		DS5	5.91	6.25	6.65	10.56
		US1	5.72	6.03	7.97	9.57
		US2	5.22	6.09	6.26	7.57
		MW1	5.77	5.30	4.40	7.33
		THB1	6.32	6.30	7.58	8.55
		THB1	-	5.54	8.69	7.73
		WSR45C	- 5.14	5.83	5.14	9.91
		WSR45C WSR46	5.42	5.67	9.24	9.91 14.47
2014/10/18	Mid-Ebb	DS1	6.12		9.24	13.13
2014/10/10	MIG-EDD	DS1 DS2	6.03	6.12 6.10	5.05	7.82
		DS3	5.88	5.89		
		DS3 DS4			6.11 5.26	10.10
		DS5	5.83	5.90	5.26	7.72
		US1	6.01	6.06	3.77	6.68
			6.30	6.27	13.08	15.10
		US2	6.34	6.38	9.20	14.73
		MW1	5.25	5.36	2.06	6.42
		THB1	6.28	6.24	4.82	8.05
		THB2	-	5.61	8.66	5.83
		WSR45C	5.48	5.92	4.43	8.20
	1 C 1 E 1	WSR46	5.97	6.59	6.11	10.07
	Mid-Flood	DS1	6.95	7.54	9.76	18.80
		DS2	7.27	7.32	8.98	13.98
		DS3	6.62	6.66	10.69	14.98
		DS4	6.77	6.82	8.92	12.11
		DS5	6.79	7.10	5.33	7.83
		US1	7.12	7.65	15.08	15.40
		US2	6.57	7.49	6.61	9.63
		MW1	5.30	5.45	5.50	8.26
		THB1	6.65	7.05	12.25	13.52
		THB2	-	6.65	9.02	10.70
		WSR45C	5.33	6.47	5.59	7.81
		WSR46	6.19	6.99	19.57	13.79
2014/10/20	Mid-Ebb	DS1	6.71	6.82	9.71	14.10
		DS2	6.81	7.05	6.43	12.06
		DS3	6.55	7.12	6.21	10.36
		DS4	6.14	7.20	5.79	8.38
		DS5	6.13	7.20	6.14	8.77
		US1	7.39	7.58	7.24	14.05
		US2	7.66	7.83	5.64	10.45
		MW1	5.58	5.68	4.18	6.33
		THB1	7.61	7.87	6.50	11.13
		THB2	-	6.90	12.15	6.53
		WSR45C	6.03	7.07	3.83	6.18
		WSR46	6.93	8.17	6.26	8.93

Date	Period		(+			Average SS	
			Bottom	ng/L) Surface and	Turbidity Level	Level (mg/L)	
			Dottom	Mid Depth	(NTU)	(mg/L)	
	Mid-Flood	DS1	8.23	8.73	7.76	16.58	
		DS2	8.58	8.62	23.52	26.83	
		DS3	8.36	8.28	18.80	23.38	
		DS4	8.61	8.71	9.38	14.14	
		DS5	9.24	9.37	5.29	9.56	
		US1	7.22	8.01	13.17	19.26	
		US2	7.20	7.98	7.18	8.54	
		MW1	5.78	5.93	8.97	12.92	
		THB1	7.64	7.68	19.25	21.20	
		THB2	-	7.83	10.29	8.30	
		WSR45C	6.38	7.33	9.72	12.32	
		WSR46	6.71	7.52	11.91	14.59	
2014/10/22	Mid-Ebb	DS1	8.56	8.64	8.10	11.60	
		DS2	8.25	8.49	7.21	10.89	
		DS3	7.74	7.93	12.92	15.30	
		DS4	7.07	7.96	10.48	13.10	
		DS5	7.32	8.06	9.81	12.99	
		US1	8.76	8.76	5.47	6.73	
		US2	8.62	8.76	6.47	8.65	
		MW1	6.29	6.57	7.32	11.84	
		THB1	8.54	8.78	6.29	7.63	
		THB2	-	7.26	7.23	7.13	
		WSR45C	7.58	8.30	7.01	7.52	
		WSR46	7.02	8.20	7.67	10.81	
	Mid-Flood	DS1	7.87	7.86	48.20	28.87	
		DS2	7.94	7.95	33.92	23.62	
		DS3	8.35	8.26	20.58	19.69	
		DS4	8.17	8.25	10.14	12.72	
		DS5	-	8.79	5.41	7.40	
		US1	8.08	8.19	11.27	15.85	
		US2	6.80	8.03	12.99	15.09	
		MW1	5.67	5.77	15.19	18.88	
		THB1	7.99	8.01	84.99	23.27	
		THB2	-	7.38	20.97	8.23	
		WSR45C	6.29	7.07	10.34	13.58	
		WSR46	7.13	8.18	15.51	15.66	
2014/10/24	Mid-Ebb	DS1	6.01	6.06	8.85	11.94	
		DS2	5.82	5.87	11.19	15.21	
		DS3	5.74	5.99	10.78	14.24	
		DS4	5.78	6.03	12.25	15.40	
		DS5	5.65	5.91	11.29	15.83	
		US1	6.04	6.11	12.03	12.88	
		US2	6.37	6.39	6.64	9.10	
		MW1	5.70	5.76	6.59	27.40	
		THB1	5.79	5.92	13.11	13.97	
		THB2	-	6.04	9.05	11.77	
		WSR45C	5.59	5.88	13.23	25.24	
		WSR46	5.94	6.01	14.58	22.64	
	Mid-Flood	DS1	6.01	5.98	17.00	21.23	
		DS2	6.10	6.20	12.17	13.13	
		DS3	6.15	6.37	10.11	12.13	
		DS4	6.10	6.32	10.30	12.20	
				-		.=-	

Sampling Date	Tidal Period	Station	_	DO Levels ng/L)	Average Turbidity	Average SS Level
			Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
		DS5	6.21	6.25	9.97	9.19
		US1	6.08	6.09	15.10	23.41
		US2	6.03	6.04	14.27	17.93
		MW1	5.70	5.81	12.00	14.09
		THB1	5.89	6.19	12.69	16.20
		THB2	-	5.49	8.69	12.83
		WSR45C	6.05	6.09	22.18	22.70
		WSR46	6.00	6.02	13.49	15.69
2014/10/27	Mid-Ebb	DS1	5.88	5.89	9.07	11.90
		DS2	5.71	5.87	11.05	23.61
		DS3	5.59	5.95	10.71	13.87
		DS4	5.56	5.99	9.84	12.96
		DS5	5.52	5.90	10.34	12.29
		US1	6.05	6.14	11.78	14.53
		US2	6.13	6.21	10.51	13.02
		MW1	5.54	5.66	5.18	9.97
		THB1	5.99	6.05	9.08	13.63
		THB2	-	5.44	11.52	10.23
		WSR45C	5.49	5.81	9.53	11.83
	M: J Elas J	WSR46	5.85	5.93	18.66	19.87
	Mid-Flood	DS1 DS2	5.74	5.79 5.71	13.92	14.78
		DS2 DS3	5.71	5.71	22.84	24.67
		DS3 DS4	5.78 5.80	5.80 5.89	14.98 13.48	19.85 14.53
		DS5	5.82	5.84	10.88	14.33
		US1	5.85	5.86	10.09	12.88
		US2	5.72	5.76	11.24	12.50
		MW1	5.46	5.58	11.24	14.76
		THB1	5.60	5.60	13.72	15.53
		THB2	- -	5.47	8.95	8.87
		WSR45C	5.68	5.72	24.87	19.52
		WSR46	5.75	5.80	13.00	19.10
2014/10/29	Mid-Ebb	DS1	6.02	6.02	10.12	12.69
011/10/>	1/110 200	DS2	6.11	6.12	8.38	12.00
		DS3	5.82	5.97	7.95	10.89
		DS4	5.66	5.88	10.31	12.19
		DS5	5.67	5.82	8.50	11.37
		US1	6.36	6.30	14.22	14.27
		US2	6.43	6.40	10.04	11.13
		MW1	5.64	5.67	4.48	9.14
		THB1	6.21	6.20	11.71	11.53
		THB2	-	6.57	10.22	10.57
		WSR45C	5.59	5.74	7.83	11.07
		WSR46	6.17	6.18	11.01	14.59
	Mid-Flood	DS1	6.28	6.28	14.67	16.47
		DS2	6.25	6.20	17.58	22.43
		DS3	6.24	6.21	21.15	21.05
		DS4	6.42	6.39	11.02	13.61
		DS5	6.38	6.39	9.65	12.30
		US1	6.20	6.18	8.81	12.43
		US2	6.10	6.06	8.86	11.67
		MW1	5.70	5.74	8.47	13.53

Sampling	Tidal	Station	Average	DO Levels	Average	Average SS
Date	Period		(n	ng/L)	Turbidity	Level
			Bottom	Surface and	Level	(mg/L)
				Mid Depth	(NTU)	
		THB1	5.94	5.97	19.35	18.70
		THB2	-	6.17	16.57	12.63
		WSR45C	6.01	6.01	11.48	16.09
		WSR46	6.08	6.10	7.05	10.58
2014/10/31	Mid-Ebb	DS1	5.90	5.95	7.87	-
		DS2	5.81	5.94	9.90	-
		DS3	5.78	5.80	6.71	-
		DS4	5.71	5.85	5.39	-
		DS5	5.68	5.81	6.24	-
		US1	6.12	6.08	9.71	-
		US2	6.28	6.21	17.35	-
		MW1	5.68	5.69	3.86	-
		THB1	6.06	6.09	12.52	-
		THB2	-	6.04	8.85	-
		WSR45C	5.61	5.90	5.05	-
		WSR46	5.82	6.09	9.11	-
	Mid-Flood	DS1	6.12	6.16	9.44	-
		DS2	6.12	6.23	12.97	-
		DS3	6.07	6.19	15.11	-
		DS4	6.30	6.29	11.89	-
		DS5	6.47	6.44	9.32	-
		US1	5.93	5.94	14.28	-
		US2	5.84	6.14	8.44	-
		MW1	5.71	5.77	5.79	-
		THB1	6.03	6.10	20.41	-
		THB2	-	6.20	11.29	-
		WSR45C	5.74	5.90	9.87	-
		WSR46	5.82	5.97	19.21	

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.
- 4. Only mid-depth water was sampled at Station THB2 because water depth was less than 3m.
- 5. SS laboratory analysis on 31/10/2014 is still in progress and will be discussed in the next monthly report.

Table C2 Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities

face and Mid-depth (2) e average of the impact, WSR 45C I WSR 46 station readings are < 5%- of baseline data for surface and ddle layer = 4.32 mg L-1 I	Surface and Mid-depth (2) The average of the impact, WSR 45C and WSR 46 station readings are < 4 mg L-1 and
	and
ions mean DO (at the same tide of same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)
tom e average of the impact, WSR 45C I WSR 46 station readings are < 5%- of baseline data for bottom layers = 2 mg L-1	Bottom The average of the impact station, WSR 45C and WSR 46 readings are < 2 mg L-1 and
nificantly less than the reference ions mean DO (at the same tide of same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)
e average of the impact, WSR 45C I WSR 46 station readings are > 6-ile of baseline data for depth rage = 21.60 mg L-1	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data for depth average = 40.10 mg L-1
l	and
% of control station's SS at the same of the same day	130% of control station's SS at the same tide of the same day
e average of the impact, WSR 45C I WSR 46 station readings are > 6-ile of baseline data = 25.04 NTU	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data = 32.68 NTU
I	and
% of control station's Thy at the	130% of control station's Tby at the
	WSR 46 station readings are > o-ile of baseline data for depth rage = 21.60 mg L-1 % of control station's SS at the same of the same day average of the impact, WSR 45C WSR 46 station readings are > o-ile of baseline data = 25.04 NTU

Notes:

- (1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- (3) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- (4) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table C3 Water Column Profiling Results for CMP 1 on 8 October 2014

Stations	Temp	Salinity	Turbidity	Dissolved Oxygen		pН	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L-1)	(mg L-1)	(mg L-1)
WCP 1 (Downstream)	28.81	28.92	17.28	76.58	5.04	7.80	15.10
WCP 2 (Upstream)	28.74	28.39	5.95	88.87	5.87	7.80	8.43
WQO (wet season)	N/A	25.79- 31.23#	N/A	N/A	>4	6.5-8.5	12.00

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

Annex D

Dredging Record for CMP 2 in October 2014

Date	Daily Dredging Volume (m³)	Weekly Dredging Volume (m³) (From Sunday to Saturday)			
28-Sep-2014	6,500				
29-Sep-2014	7,150				
30-Sep-2014	6,500				
01-Oct-2014	7,150	54,600			
02-Oct-2014	9,100				
03-Oct-2014	9,750				
04-Oct-2014	8,450				
05-Oct-2014	9,750				
06-Oct-2014	11,700	1			
07-Oct-2014	11,700	1			
08-Oct-2014	11,050	79,300			
09-Oct-2014	11,050	1			
10-Oct-2014	13,000	1			
11-Oct-2014	11,050	1			
12-Oct-2014	11,050				
13-Oct-2014	10,400	1			
14-Oct-2014	10,400	1			
15-Oct-2014	10,400	72,800			
16-Oct-2014	10,400	1			
17-Oct-2014	10,400	1			
18-Oct-2014	9,750	1			
19-Oct-2014	9,750				
20-Oct-2014	10,400	1			
21-Oct-2014	13,000	1			
22-Oct-2014	12,350	78,000			
23-Oct-2014	10,400	1			
24-Oct-2014	12,350	1			
25-Oct-2014	9,750	†			
26-Oct-2014	9,100				
27-Oct-2014	9,750	†			
28-Oct-2014	8,450	50.550			
29-Oct-2014	9,750	56,550			
30-Oct-2014	9,100	† I			
31-Oct-2014	10,400	1			

Annex E

Study Programme

