



**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)**

**5th Monthly Progress Report for Contaminated
 Mud Pits to the South of The Brothers and at
 East Sha Chau – January 2013**

Revision 0

27 February 2013

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Client:		Project No:			
Civil Engineering and Development Department (CEDD)		0175086			
Summary:		Date:			
This document presents the fifth monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.		27 February 2013			
		Approved by:			
					
		Craig A. Reid Partner			
v0	5 th Monthly Progress Report for CMP V and SB CMPs	RC	JT	CAR	27/2/13
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p> <p>This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.</p>		Distribution <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Internal <input checked="" type="checkbox"/> Public <input type="checkbox"/> Confidential 			
		 			

**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:	5 th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau – January 2013
Date of Report:	21 February 2013
Date prepared by ET:	21 February 2013
Date received by IA:	21 February 2013


Reference EP Condition

Environmental Permit Condition:	Condition No.: 4.4
4 hard copies and 1 electronic copy of monthly EM&A Report shall be submitted to the Director within 2 weeks after the end of the reporting month. The EM&A Reports shall include a summary of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels). The submissions shall be certified by the ET Leader and verified by the Independent Auditor. Additional copies of the submission shall be provided to the Director upon request by the Director.	

ET Certification

I hereby certify that the above referenced document/ plan complies with the above referenced condition of EP-427/2011/A	
Craig A. Reid, Environmental Team Leader:	 Date: 21/2/2013

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: 22/2/2013

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

5th MONTHLY PROGRESS REPORT FOR JANUARY 2013

1.1 BACKGROUND

1.1.1 Since early 1990s, contaminated sediment ⁽¹⁾ arising from various construction works 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) (hereafter referred to as “the Project”) which had been under consideration for a number of years.

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

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

- (1) According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 – Confined Marine Disposal as determined according to this TC(W).
- (2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.
- (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 An *Environmental Permit (EP-427/2011)* was issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 3 November 2011 and varied on 23 December 2011 (*EP-427/2011/A*). Under the requirements of *Condition 4* of the *EP (EP-427/2011/A)*, an Environmental Monitoring and Audit (EM&A) programme as set out in the EM&A Manual is required to be implemented for the SB CMPs. The present EM&A programme undertaken under *Agreement No. CE 23/2012 (EP)* covers the dredging, disposal and capping operations of the SB CMPs.

1.2 **REPORTING PERIOD**

1.2.1 This Monthly Progress Report covers the EM&A activities for the reporting month of January 2013.

1.3 **DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES**

1.3.1 *Impact Water Quality Monitoring during Dredging Operations of CMP 1* was conducted three times per week (ie 3, 5, 8, 10, 12, 15, 17, 19, 21, 24, 26, 29 and 31 January 2013) in this reporting month.

1.4 **DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS**

1.4.1 No outstanding sampling and laboratory analysis remained from January 2013. A summary of field activities are presented in *Annex A*.

1.5 **BRIEF DISCUSSION OF THE MONITORING RESULTS FOR SB CMPs**

1.5.1 All monitoring data collected for SB CMPs in January 2013 will be presented in this monthly report. Detailed discussion will be presented in the corresponding *Quarterly Report*.

1.5.2 ***Impact Water Quality Monitoring during Dredging Operations of CMP 1 – January 2013***

1.5.3 *Impact Water Quality Monitoring during Dredging Operations of CMP 1* was conducted three times per week in a total of thirteen sampling days in January 2013. On the survey day, sampling was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations upstream and five Impact (Downstream) stations downstream of the dredging operations at CMP 1. Monitoring was also conducted at five Sensitive Receiver Stations (Ma Wan, Shum Shui Kok, Tai Mo To and Tai Ho Bay). A total of twelve stations were monitored and locations of the sampling stations are shown in *Figure 1.1*.

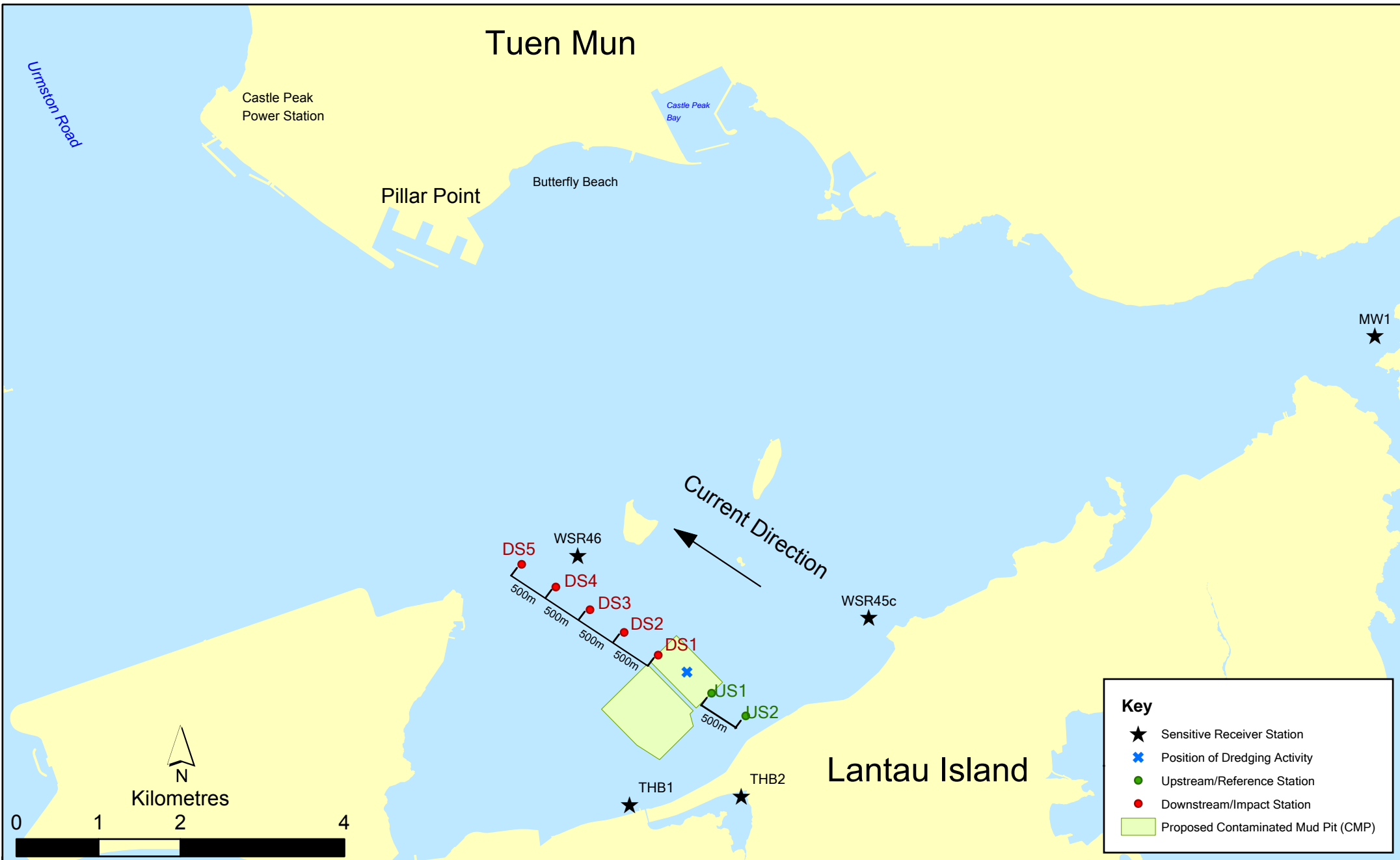


Figure 1.1

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

- 1.5.4 Monitoring results are presented in *Table B1* of *Annex B*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solids (SS) generally complied with the Action and Limit Levels set in the Baseline Monitoring Report ⁽¹⁾, except on 29 January 2013 during the mid-flood tide.
- 1.5.5 On 29 January 2013, levels of SS exceeded the Action Levels at Impact Stations DS1 and DS2 during mid-flood tide.
- 1.5.6 Stations DS1 and DS2 are located in close proximity to the works area of CMP 1. Since Action Level Exceedances of SS were recorded at stations DS1 and DS2 and during one tidal period amongst the 13 monitoring events only, it is considered that the sediment plume was transient and limited to the close vicinity of the works area as predicted in the EIA review of the Project ⁽²⁾. Hence, the dredging works did not appear to cause any unacceptable deterioration in water quality.
- 1.5.7 Overall, the results indicated that the dredging operations at CMP 1 of SB 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.

1.6 *ACTIVITIES SCHEDULED FOR THE NEXT MONTH*

- 1.6.1 *Impact Water Quality Monitoring during Dredging Operations for CMP 1* will be conducted three times per week in the next monthly period of February 2013. 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 C*.

(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.

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

Annex A

Sampling Schedule

Annex A - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (September 2012 - December 2017)

			2012					2013					2014					2015					2016					2017																																														
Baseline Monitoring Prior to Dredging	Code	Frequency	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Far Field Stations	SB-WFA	3 days per week for 4 weeks						*	*																																																																	
	SB-WFB	3 days per week for 4 weeks						*	*																																																																	
	Mid Field Stations	SB-WMA	3 days per week for 4 weeks						*	*																																																																
		SB-WMB	3 days per week for 4 weeks						*	*																																																																
	Near Field Stations	SB-WNAA	3 days per week for 4 weeks						*	*																																																																
		SB-WNAB	3 days per week for 4 weeks						*	*																																																																
		SB-WNBA	3 days per week for 4 weeks						*	*																																																																
		SB-WNBB	3 days per week for 4 weeks						*	*																																																																
	Reference Stations	NM1	3 days per week for 4 weeks						*	*																																																																
		NM2	3 days per week for 4 weeks						*	*																																																																
		NM3	3 days per week for 4 weeks						*	*																																																																
		NM5	3 days per week for 4 weeks						*	*																																																																
		NM6	3 days per week for 4 weeks						*	*																																																																
		Sensitive Receiver Stations	MW1	3 days per week for 4 weeks						*	*																																																															
	THB1		3 days per week for 4 weeks						*	*																																																																
	THB2		3 days per week for 4 weeks						*	*																																																																
WSR45C	3 days per week for 4 weeks							*	*																																																																	
WSR46	3 days per week for 4 weeks							*	*																																																																	
									*	*																																																																
Impact Monitoring for Dredging			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Upstream Stations	US1	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																					
	US2	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																					
Downstream Stations	DS1	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																					
	DS2	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	DS3	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	DS4	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	DS5	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
Sensitive Receiver Stations	MW1	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	THB1	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	THB2	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	WSR45C	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
	WSR46	3 days per week						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*																											
Pit Specific Sediment Chemistry			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D												
SB CMP 1 Active																																																																										
Near-Pit	SB-NNAA	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NNAB	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
Pit-Edge	SB-NEAA	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NEAB	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
Active-Pit	SB-NPAA	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NPAB	Monthly												12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
SB CMP 2 Active																																																																										
Near-Pit	SB-NNBA	Monthly																							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NNBB	Monthly																							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
Pit-Edge	SB-NEBA	Monthly																							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NEBB	Monthly																							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
Active-Pit	SB-NPBA	Monthly																							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																											
	SB-NPBB	Monthly																																																																								

Annex B

Results of Impact
Monitoring during
Dredging Operations of
CMP 1 in January 2013

Table B1 *Summary Table of DO, Turbidity and SS Levels Recorded in January 2013*

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/3	Mid-Ebb	DS1	7.13	7.14	3.29	4.88
		DS2	7.10	7.08	2.92	4.77
		DS3	7.11	7.15	2.80	5.10
		DS4	7.00	7.01	2.67	4.39
		DS5	7.09	7.10	2.56	4.29
		US1	7.62	7.62	4.02	7.99
		US2	7.66	7.66	6.90	8.32
		MW1	7.13	7.11	2.57	5.43
		THB1	7.83	7.84	2.96	5.22
		THB2	-	7.59	9.64	11.53
		WSR45C	7.09	7.08	1.98	4.88
		WSR46	7.18	7.15	3.35	5.74
	Mid-Flood	DS1	7.40	7.40	9.54	11.57
		DS2	7.43	7.42	8.24	9.63
		DS3	7.45	7.47	5.78	7.61
		DS4	7.47	7.50	5.14	6.32
		DS5	-	7.53	5.24	6.53
		US1	7.25	7.27	6.27	8.10
		US2	7.13	7.16	9.40	9.62
		MW1	6.89	6.86	4.12	6.59
		THB1	7.64	7.65	4.55	7.87
		THB2	-	7.07	8.95	7.23
		WSR45C	7.21	7.20	5.67	8.31
		WSR46	7.40	7.41	5.85	9.92
2013/1/5	Mid-Ebb	DS1	7.09	7.07	11.20	14.71
		DS2	7.04	7.06	10.58	14.37
		DS3	7.05	7.07	6.72	11.64
		DS4	7.07	7.08	3.82	7.09
		DS5	7.13	7.11	3.57	6.48
		US1	7.38	7.35	8.43	12.08
		US2	7.28	7.27	6.55	9.71
		MW1	7.31	7.28	1.33	4.76
		THB1	7.59	7.57	5.25	6.80
		THB2	-	7.62	6.12	10.47
		WSR45C	7.32	7.24	1.92	5.26
		WSR46	7.15	7.15	1.90	6.40
	Mid-Flood	DS1	7.09	7.05	3.12	4.89
		DS2	7.09	7.08	3.14	6.14
		DS3	7.13	7.12	2.89	5.48
		DS4	7.48	7.45	4.07	5.92
		DS5	7.66	7.64	4.98	8.18
		US1	6.88	6.91	3.11	6.00
		US2	6.89	6.91	3.05	5.82
		MW1	7.24	7.23	2.71	6.01
		THB1	7.59	7.60	2.32	5.87
		THB2	-	7.60	4.78	6.60
		WSR45C	7.28	7.28	2.98	6.24
		WSR46	7.33	7.31	3.31	5.73

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/8	Mid-Ebb	DS1	7.10	7.11	2.29	4.30
		DS2	7.09	7.09	1.97	4.18
		DS3	7.06	7.08	1.86	4.98
		DS4	7.08	7.08	1.71	4.34
		DS5	7.10	7.12	1.66	4.29
		US1	7.53	7.52	2.59	5.53
		US2	7.64	7.65	6.18	8.65
		MW1	7.21	7.21	1.71	4.31
		THB1	7.88	7.83	1.72	5.25
		THB2	-	7.62	5.30	6.03
		WSR45C	7.30	7.25	1.52	4.58
		WSR46	7.40	7.39	1.67	4.52
	Mid-Flood	DS1	7.44	7.43	2.32	5.61
		DS2	7.86	7.68	2.31	6.56
		DS3	8.33	8.04	2.83	6.12
		DS4	8.92	8.80	3.24	6.18
		DS5	-	8.63	2.63	5.83
		US1	7.33	7.36	1.98	4.53
		US2	7.36	7.41	1.59	5.27
		MW1	7.24	7.22	1.64	5.53
		THB1	8.32	8.32	1.87	5.43
		THB2	-	8.65	7.12	7.67
		WSR45C	7.22	7.29	1.21	3.93
		WSR46	7.22	7.40	1.78	5.09
2013/1/10	Mid-Ebb	DS1	7.04	7.06	2.93	5.92
		DS2	7.07	7.09	2.64	4.76
		DS3	7.11	7.13	2.43	3.86
		DS4	7.12	7.15	2.41	4.03
		DS5	7.27	7.25	2.35	4.16
		US1	7.81	7.83	3.95	5.66
		US2	7.89	7.88	5.08	7.22
		MW1	7.16	7.12	3.30	4.89
		THB1	8.48	8.43	2.66	7.85
		THB2	-	8.51	6.31	8.57
		WSR45C	7.28	7.28	1.90	4.69
		WSR46	7.98	7.70	4.13	6.59
	Mid-Flood	DS1	7.81	7.79	3.46	5.87
		DS2	7.99	7.94	3.02	5.31
		DS3	8.62	8.48	2.99	5.72
		DS4	8.73	8.77	4.16	7.03
		DS5	-	8.78	4.96	7.43
		US1	7.34	7.32	3.29	4.71
		US2	7.33	7.35	3.52	5.07
		MW1	7.63	7.59	2.81	4.71
		THB1	9.13	9.25	2.42	5.55
		THB2	-	9.60	5.81	4.27
		WSR45C	7.72	7.68	2.11	4.70
		WSR46	7.89	7.72	2.85	4.43
2013/1/12	Mid-Ebb	DS1	7.51	7.56	3.58	6.34
		DS2	7.51	7.57	3.52	6.81
		DS3	7.50	7.64	3.33	5.86

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/15	Mid-Flood	DS4	7.58	7.67	3.47	6.14
		DS5	7.89	7.88	3.46	5.64
		US1	7.94	7.97	4.60	7.43
		US2	7.87	7.90	14.14	13.67
		MW1	7.35	7.29	3.65	5.74
		THB1	8.39	8.39	3.12	7.15
		THB2	-	9.03	4.86	7.87
		WSR45C	7.55	7.56	2.59	5.46
		WSR46	7.60	7.66	4.09	7.03
		DS1	7.62	7.64	9.55	13.33
		DS2	7.67	7.68	9.38	11.22
		DS3	7.72	7.68	8.36	10.16
		DS4	8.04	8.07	5.48	7.67
		DS5	-	7.86	4.79	6.83
		US1	7.54	7.54	7.87	9.52
	US2	7.45	7.48	11.23	14.07	
	MW1	7.82	7.76	5.68	7.98	
	THB1	8.41	8.42	3.75	7.37	
	THB2	-	8.01	4.83	6.23	
	WSR45C	7.85	7.82	10.37	10.56	
	WSR46	7.76	7.73	8.14	9.68	
	DS1	7.70	7.71	4.35	6.97	
	DS2	7.65	7.72	4.31	6.09	
	DS3	7.66	7.73	4.35	6.47	
	DS4	7.82	7.88	3.86	5.23	
	DS5	8.15	8.22	3.87	5.81	
	US1	8.06	8.09	6.69	8.41	
	US2	8.14	8.16	8.31	10.63	
	MW1	7.51	7.53	3.57	5.62	
	THB1	8.94	8.99	3.06	5.63	
THB2	-	9.06	6.23	7.93		
WSR45C	7.80	7.94	3.40	5.66		
WSR46	7.76	7.86	3.74	5.66		
DS1	7.78	7.79	9.19	9.91		
DS2	7.84	7.85	9.66	12.72		
DS3	7.87	7.88	7.74	9.18		
DS4	7.84	7.86	8.01	9.86		
DS5	-	7.92	6.27	8.73		
US1	7.85	7.89	8.28	10.60		
US2	7.75	7.77	7.28	9.39		
MW1	7.66	7.65	9.99	11.28		
THB1	8.83	8.88	4.03	7.50		
THB2	-	8.21	4.21	8.97		
WSR45C	7.89	7.91	8.79	11.44		
WSR46	7.92	7.95	10.88	11.60		
DS1	8.01	8.21	9.94	13.43		
DS2	7.70	8.21	4.25	6.10		
DS3	7.79	8.22	4.27	6.76		
DS4	7.66	8.30	3.44	5.70		
DS5	8.26	8.34	3.45	5.86		
US1	8.50	8.50	5.29	7.40		

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/19	Mid-Flood	US2	8.48	8.51	4.41	6.87
		MW1	7.42	7.46	2.57	5.16
		THB1	9.12	9.04	2.79	6.48
		THB2	-	9.40	3.27	8.30
		WSR45C	7.34	7.85	2.89	5.16
		WSR46	7.68	7.89	3.87	6.22
		DS1	7.90	7.90	4.37	6.43
		DS2	7.96	7.96	4.06	5.58
		DS3	8.09	8.09	4.39	6.48
		DS4	8.27	8.28	4.09	6.31
		DS5	8.73	8.62	4.19	6.60
		US1	7.84	7.90	4.35	7.24
		US2	7.62	7.68	5.30	7.90
		MW1	7.27	7.28	4.08	7.28
		THB1	7.96	7.97	3.09	6.18
	THB2	-	8.82	6.19	8.07	
	WSR45C	7.55	7.54	5.63	8.08	
	WSR46	7.63	7.60	6.78	9.78	
	Mid-Ebb	DS1	7.95	8.28	15.94	18.57
	DS2	8.09	8.37	8.41	11.00	
	DS3	7.97	8.48	4.25	6.28	
	DS4	7.93	8.53	2.96	5.11	
	DS5	8.60	8.85	3.21	5.62	
	US1	8.91	8.92	4.65	7.82	
	US2	8.84	8.94	4.68	6.12	
	MW1	7.60	7.59	1.33	4.12	
	THB1	9.54	9.62	3.10	6.43	
	THB2	-	9.23	4.55	7.63	
	WSR45C	7.79	8.35	1.82	4.62	
	WSR46	8.35	8.36	4.00	6.60	
Mid-Flood	DS1	8.10	8.13	5.44	7.92	
DS2	8.25	8.34	4.71	5.96		
DS3	8.37	8.45	4.45	6.59		
DS4	8.74	8.87	4.00	5.67		
DS5	9.41	9.47	3.58	6.27		
US1	7.64	7.95	3.08	4.98		
US2	7.59	8.14	3.01	4.42		
MW1	7.27	7.29	1.90	3.90		
THB1	9.10	9.18	2.33	6.02		
THB2	-	8.76	7.47	7.43		
WSR45C	7.86	8.19	2.29	5.37		
WSR46	7.87	8.25	2.45	5.29		
2013/1/21	Mid-Ebb	DS1	8.88	9.09	3.57	6.01
		DS2	8.54	8.91	2.45	4.97
		DS3	8.21	8.56	2.02	4.61
		DS4	8.02	8.61	1.88	4.11
		DS5	8.23	8.51	2.38	6.34
		US1	8.84	9.08	7.19	9.02
		US2	8.97	9.15	5.77	8.71
		MW1	6.86	7.04	0.82	4.34
		THB1	8.80	8.98	2.55	5.77

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)	
			Bottom	Surface and Mid Depth			
2013/1/24	Mid-Flood	THB2	-	11.06	3.61	5.67	
		WSR45C	7.33	7.99	1.34	4.14	
		WSR46	7.72	8.22	1.71	4.46	
		DS1	9.06	9.12	4.40	6.78	
		DS2	9.65	9.73	5.67	8.50	
		DS3	10.00	10.08	8.25	10.99	
		DS4	10.11	10.17	14.23	16.97	
		DS5	-	10.53	3.68	7.87	
		US1	8.94	8.96	5.49	8.66	
		US2	8.75	8.84	6.34	8.78	
		MW1	7.23	7.22	1.51	4.89	
		THB1	9.54	9.63	2.78	6.75	
		THB2	-	10.84	5.08	7.83	
		WSR45C	7.80	8.49	1.69	6.40	
		WSR46	8.11	8.64	2.08	6.20	
	Mid-Ebb	DS1	8.67	9.16	2.74	4.69	
		DS2	8.41	8.83	2.58	5.08	
		DS3	8.25	8.80	2.62	4.94	
		DS4	8.25	8.84	2.69	5.20	
		DS5	9.19	9.35	2.71	5.70	
		US1	9.25	9.56	4.98	7.54	
		US2	9.38	9.53	5.59	8.98	
		MW1	7.36	7.57	1.62	4.42	
		THB1	9.70	9.86	2.80	6.85	
		THB2	-	9.40	3.78	7.63	
		WSR45C	8.08	8.75	2.03	4.48	
		WSR46	9.08	9.37	2.96	6.08	
		Mid-Flood	DS1	9.80	10.03	6.97	10.28
			DS2	10.27	10.64	4.56	8.18
			DS3	10.24	10.32	6.61	8.99
DS4	10.26		10.31	10.51	13.48		
DS5	10.26		10.96	5.82	9.10		
US1	10.44		10.36	3.25	6.66		
US2	9.53		9.94	3.62	5.64		
MW1	7.61		7.64	2.33	5.31		
THB1	10.45		10.80	3.07	7.05		
THB2	-		12.53	6.14	11.27		
WSR45C	9.64		10.10	2.50	6.52		
WSR46	8.90		9.49	2.39	7.17		
2013/1/26	Mid-Ebb		DS1	8.52	9.08	2.59	5.98
			DS2	8.61	9.56	2.56	5.56
			DS3	8.44	9.05	2.67	5.47
		DS4	8.47	9.07	2.72	5.89	
		DS5	9.00	9.11	3.30	6.23	
		US1	9.61	9.81	5.83	9.23	
		US2	9.54	9.74	7.76	11.04	
		MW1	7.17	7.28	2.13	6.52	
		THB1	10.09	10.21	4.07	8.97	
		THB2	-	8.92	7.46	11.07	
		WSR45C	7.80	8.40	2.00	4.98	
		WSR46	8.77	9.26	3.55	7.07	

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/1/29	Mid-Flood	DS1	9.57	9.71	6.02	9.58
		DS2	9.66	10.15	5.72	9.00
		DS3	9.48	9.84	6.72	9.61
		DS4	9.67	9.67	6.99	10.67
		DS5	10.26	10.30	5.53	9.60
		US1	8.62	9.14	7.40	8.18
		US2	8.06	8.63	6.33	7.52
		MW1	7.75	7.89	2.19	4.68
		THB1	10.22	10.27	3.22	8.07
		THB2	-	9.80	12.56	9.90
	WSR45C	8.50	9.50	2.63	5.64	
	WSR46	8.96	9.34	3.04	6.94	
	Mid-Ebb	DS1	8.23	8.35	4.50	7.57
		DS2	8.17	8.38	3.76	6.14
		DS3	8.25	8.42	4.10	5.48
		DS4	8.33	8.48	4.67	5.73
		DS5	8.58	8.63	4.70	8.47
		US1	8.43	8.45	12.81	14.51
		US2	8.34	8.40	13.33	17.26
		MW1	7.45	7.56	2.05	4.62
THB1		8.71	8.93	3.34	8.57	
THB2		-	9.32	5.21	8.30	
2013/1/31	Mid-Flood	WSR45C	7.47	7.99	2.66	5.01
		WSR46	7.77	7.90	2.85	6.46
		DS1	8.08	8.09	24.71	34.95
		DS2	8.06	8.12	13.00	22.30
		DS3	7.99	8.02	6.92	9.37
		DS4	8.11	8.19	4.65	6.41
		DS5	8.55	8.77	4.25	6.12
		US1	7.91	7.99	5.11	7.31
		US2	7.77	7.81	4.72	7.36
		MW1	7.80	7.90	3.39	9.23
	Mid-Ebb	THB1	8.39	8.45	4.73	9.33
		THB2	-	8.07	4.97	5.57
		WSR45C	8.26	8.23	5.31	6.62
		WSR46	8.16	8.16	7.69	10.09
		DS1	7.94	8.00	7.60	12.37
		DS2	7.79	7.99	5.98	9.69
		DS3	7.81	8.11	3.42	6.03
		DS4	7.80	8.01	3.27	6.09
		DS5	8.01	8.14	3.78	6.42
		US1	8.21	8.17	7.99	12.25
Mid-Flood	US2	8.13	8.12	8.07	11.83	
	MW1	6.98	7.01	2.37	6.64	
	THB1	7.75	7.76	2.84	7.10	
	THB2	-	8.79	5.15	8.47	
	WSR45C	6.97	7.27	2.97	6.29	
	WSR46	7.20	7.30	5.39	9.00	
	DS1	8.03	8.16	14.08	19.35	
	DS2	7.79	7.80	8.32	18.72	
	DS3	7.81	7.81	5.97	9.91	

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
		DS4	7.80	7.81	4.65	7.57
		DS5	7.95	7.91	4.38	7.63
		US1	7.76	7.76	6.54	9.79
		US2	7.65	7.67	7.43	11.52
		MW1	7.41	7.46	2.83	6.93
		THB1	7.62	7.61	3.87	6.50
		THB2	-	7.67	5.38	14.37
		WSR45C	7.52	7.55	7.46	11.31
		WSR46	7.48	7.50	6.90	11.46

Notes:

1. Please refer to Table B2 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.

Table B2 *Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities*

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) ⁽¹⁾	<u>Surface and Mid-depth</u> ⁽²⁾ The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for surface and middle layer = 4.32 mg L⁻¹	<u>Surface and Mid-depth</u> ⁽²⁾ The average of the impact, WSR 45C and WSR 46 station readings are < 4 mg L⁻¹
	and	and
	Significantly less than the reference stations mean DO (at the same tide of the same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)
	<u>Bottom</u> The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for bottom layers = 3.12 mg L⁻¹	<u>Bottom</u> The average of the impact station, WSR 45C and WSR 46 readings are < 2 mg L⁻¹
and	and	
Significantly less than the reference stations mean DO (at the same tide of the same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)	
Depth-averaged Suspended Solids (SS) ⁽³⁾⁽⁴⁾	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data for depth average = 21.60 mg L⁻¹	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data for depth average = 40.10 mg L⁻¹
and	and	
120% of control station's SS at the same tide of the same day	130% of control station's SS at the same tide of the same day	
Depth-averaged Turbidity (Tby) ⁽³⁾⁽⁴⁾	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data = 25.04 NTU	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data = 56.30 NTU
and	and	
120% of control station's Tby at the same tide of the same day	130% of control station's Tby at the same tide of the same day	
Notes:		
(1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.		
(2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.		
(3) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.		
(4) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.		

Annex C

Study Programme

