

**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)**

**25th Monthly Progress Report for Contaminated
 Mud Pits to the South of The Brothers and at
 East Sha Chau – September 2014**

Revision 0

14 October 2014

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Client: Civil Engineering and Development Department (CEDD)		Project No: 0175086			
Summary: This document presents the 25 th monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.		Date: 14 October 2014			
		Approved by:  Craig A. Reid Partner			
v0	25 th Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	14/10/14
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>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p>			
		 			



**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:	25 th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau - September 2014
Date of Report:	14 October 2014
Date prepared by ET:	14 October 2014
Date received by IA:	14 October 2014

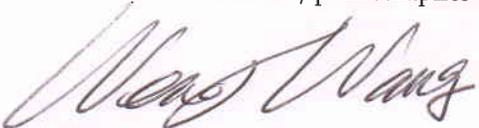
Reference EP Condition

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/ plan complies with the above referenced condition of EP-427/2011/A	
Craig A. Reid, Environmental Team Leader:	 Date: 14/10/2014

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: 14/10/2014

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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
Chau (2012-2017) - Investigation

25TH MONTHLY PROGRESS REPORT FOR SEPTEMBER 2014

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.

(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.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)*

1.2 **REPORTING PERIOD**

1.2.1 This 25th Monthly Progress Report covers the EM&A activities for the reporting month of September 2014.

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

1.3.1 No monitoring activity was scheduled to be undertaken for ESC CMPs in September 2014.

1.3.2 The following monitoring activities have been undertaken for SB CMPs in September 2014:

- *Impact Water Quality Monitoring during Dredging Operations* was undertaken for CMP 2 three times per week on 1, 3, 5, 8, 11, 13, 15, 18, 20, 22, 24, 26 and 29 September 2014;
- *Pit Specific Sediment Chemistry* for CMP 1 was undertaken on 18 September 2014; and
- *Water Column Profiling* for CMP 1 was undertaken on 12 September 2014.

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

1.4.1 No outstanding sampling remained for September 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 sediment samples collected for *Pit Specific Sediment Chemistry of CMP1* in September 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 25th *Monthly Progress Report*:

- *Impact Water Quality Monitoring during Dredging Operations of CMP 2* conducted in September 2014; and
- *Water Column Profiling of CMP 1* conducted on 12 September 2014.

1.5.2 ***Impact Water Quality Monitoring during Dredging Operations of CMP 2 – September 2014***

1.5.3 *Impact Water Quality Monitoring during Dredging Operations of CMP 2* was conducted three times per week from 1 to 30 September 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 stations were monitored and locations of the sampling stations are shown in *Figure 1.2*. Monitoring at station THB2 during mid-ebb tide of 8 September 2014 and during both mid-flood 13 September 2014 were cancelled due to adverse weather condition. Sampling was only conducted at stations MW1, THB1 and WSR45C during mid-flood tide on 15 September 2014 due to adverse weather condition.

1.5.4 Monitoring results are presented in *Table B1* of *Annex B*. Daily dredging volume in September 2014 is reported in *Annex C*. Levels of DO, Turbidity and SS generally complied with the Action and Limit Levels (see *Table B2* of *Annex B* for details) set in the *Baseline Monitoring Report* ⁽¹⁾, except for the following occasion of exceedances discussed in *Table 1.1* below.

1.5.5 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.

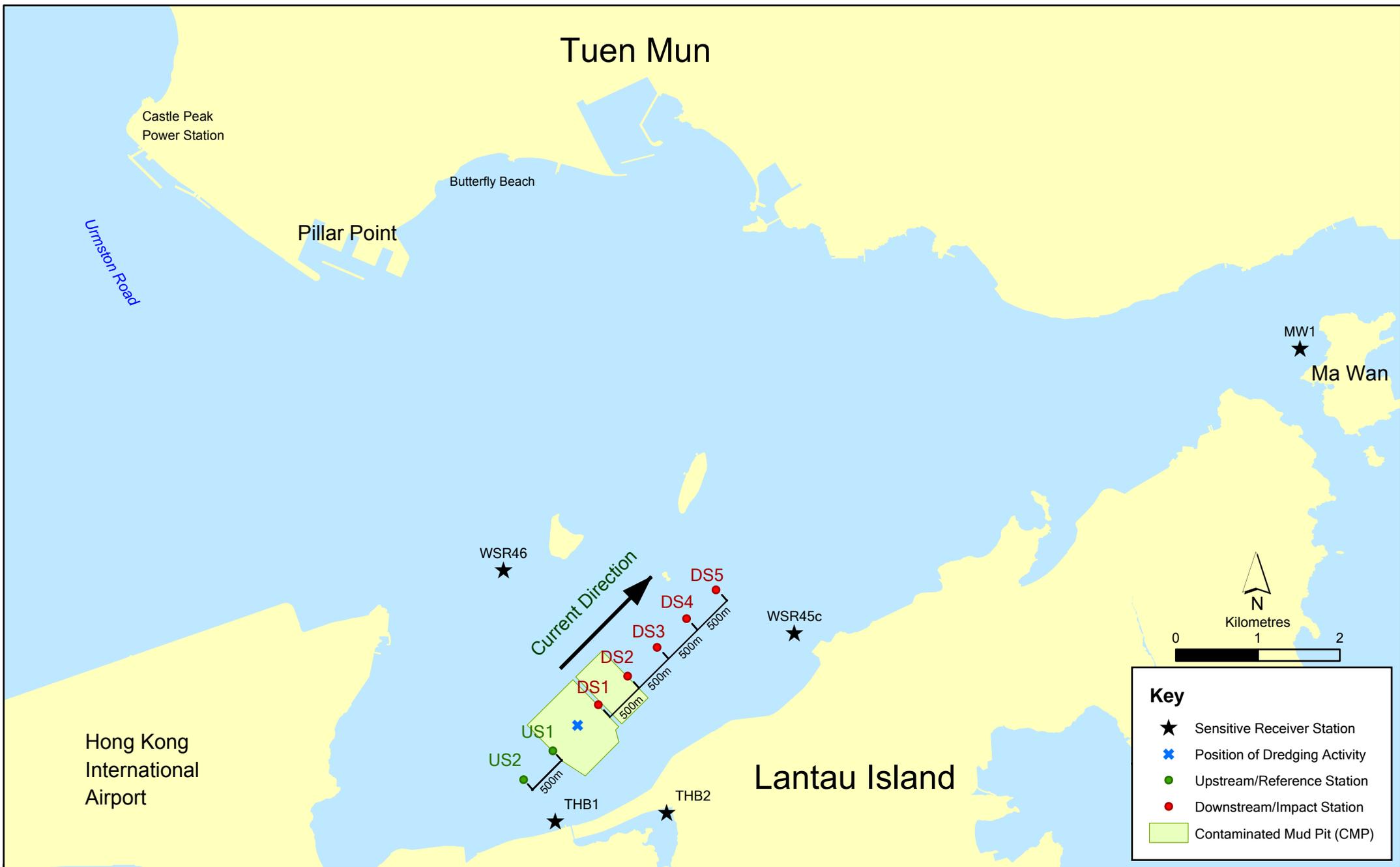


Figure 1.2

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 30 September 2014

Date	Tide	Parameter	Station	Type	Remarks
1 September 2014	Mid-Flood	Turbidity	DS2	Action	<p>These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to WSRs outside the works area due to the following reason:</p> <ul style="list-style-type: none"> Stations DS2, DS4, DS5, WSR45C and WSR46 are located further away from the works area of CMP 2 when compared to station DS1 at which the levels of bottom DO, surface and mid-depth DO, Turbidity and SS did not exceed the Action and Limit Levels during the same tidal period.
5 September 2014	Mid-Ebb	Surf and Mid DO	DS4	Action	
5 September 2014	Mid-Ebb	Surf and Mid DO	DS5	Action	
5 September 2014	Mid-Ebb	Surf and Mid DO	WSR45C	Action	
5 September 2014	Mid-Flood	Bottom DO	WSR45C	Action	
5 September 2014	Mid-Flood	Surf and Mid DO	WSR45C	Limit	
11 September 2014	Mid-Ebb	Surf and Mid DO	DS4	Action	
11 September 2014	Mid-Ebb	Surf and Mid DO	DS5	Action	
11 September 2014	Mid-Ebb	Surf and Mid DO	WSR45C	Action	
11 September 2014	Mid-Ebb	Turbidity	DS4	Action	
11 September 2014	Mid-Ebb	Turbidity	DS5	Action	
11 September 2014	Mid Flood	SS	WSR46	Action	
13 September 2014	Mid-Flood	Surf and Mid DO	WSR45C	Action	
13 September 2014	Mid-Flood	Surf and Mid DO	WSR46	Action	
22 September 2014	Mid-Flood	SS	DS4	Action	
22 September 2014	Mid-Flood	SS	WSR45C	Action	
3 September 2014	Mid-Flood	Turbidity	DS1	Action	
3 September 2014	Mid-Flood	SS	DS1	Action	
22 September 2014	Mid-Ebb	SS	DS1	Action	
24 September 2014	Mid-Flood	SS	DS1	Action	<p>These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to WSRs outside the works area due to the following reason:</p> <ul style="list-style-type: none"> Reference station US2 has high SS level similar to the levels recorded at stations DS1 and DS3 during the same tidal period. The Action Level Exceedances of SS at stations DS1 and DS3 are considered to be isolated sporadic event which may be caused by natural background variation in water quality characteristics of the monitoring area.
24 September 2014	Mid-Flood	SS	DS3	Action	

1.5.6 *Water Column Profiling of CMP 1 – September 2014*

1.5.7 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 12 September 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 B2 of Annex B* for details).

In-situ Measurements

1.5.8 Analyses of results for September 2014 indicated that levels of Salinity, turbidity, DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table B3 of Annex B*).

Laboratory Measurements for SS

1.5.9 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 B3 of Annex B*).

1.5.10 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 October 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 activities is scheduled to be undertaken in the next monthly period of October 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 *Annex D*.

Annex A

Sampling Schedule

Annex A1 - Environmental Monitoring and Audit Sampling Schedule for East of Sha Chau (September 2012 - February 2017)

		2012				2013					2014					2015					2016					2017																	
		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
Routine Water Quality Monitoring																																											
<i>Ebb Tide</i>																																											
Impact Station	ESC-IPE1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPE2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPE3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPE4	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPE5	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Intermediate Station	ESC-INE1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INE2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INE3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INE4	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INE5	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Reference Station	ESC-RFE1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFE2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFE3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFE4	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFE5	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Ma Wan Station	MW1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
<i>Flood Tide</i>																																											
Impact Station	ESC-IPF1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPF2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-IPF3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Intermediate Station	ESC-INF1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INF2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-INF3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Reference Station	ESC-RFF1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFF2	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
	ESC-RFF3	*	*			*	*			*	*																			*	*			*	*			*	*			*	*
Ma Wan Station	MW1	*	*			*	*			*	*																			*	*			*	*			*	*			*	*

Annex B

Water Quality Monitoring Results

Table B1 *Summary Table of DO, Turbidity and SS Levels Recorded between 1 and 29 September 2014*

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2014/09/01	Mid-Ebb	DS1	4.55	5.32	7.73	9.18
		DS2	4.10	5.00	9.18	9.67
		DS3	4.82	5.60	5.32	6.54
		DS4	4.09	5.27	5.90	6.36
		DS5	4.05	5.34	8.51	8.12
		US1	4.81	6.28	11.60	12.83
		US2	5.66	6.34	6.84	9.43
		MW1	4.36	5.30	2.39	3.60
		THB1	4.92	5.84	8.65	9.93
		THB2	-	5.90	7.13	6.67
		WSR45C	4.09	5.39	9.39	7.04
		WSR46	4.27	5.29	8.65	7.07
	Mid-Flood	DS1	5.27	5.52	3.79	6.13
		DS2	5.13	5.28	27.54	19.92
		DS3	5.27	5.57	10.46	14.20
		DS4	5.09	5.29	11.52	11.43
		DS5	4.76	5.39	6.74	6.81
		US1	4.77	5.30	4.67	4.37
		US2	4.26	4.77	8.34	17.58
		MW1	4.05	4.66	3.53	4.79
		THB1	5.13	5.18	25.69	21.20
		THB2	-	4.32	9.55	4.97
		WSR45C	4.06	4.84	9.58	10.88
		WSR46	4.16	5.14	11.85	10.81
2014/09/03	Mid-Ebb	DS1	5.77	6.02	3.54	4.23
		DS2	3.57	5.23	5.05	3.62
		DS3	4.23	5.23	4.47	5.59
		DS4	4.07	5.21	4.09	5.67
		DS5	3.67	4.77	7.13	7.82
		US1	5.68	5.68	4.85	4.85
		US2	5.22	5.87	5.89	9.17
		MW1	3.44	4.93	1.98	2.26
		THB1	5.62	6.06	3.81	5.78
		THB2	-	6.38	4.80	2.50
		WSR45C	3.30	5.23	9.85	7.66
		WSR46	4.14	5.32	4.20	5.61
	Mid-Flood	DS1	6.21	6.40	30.80	22.52
		DS2	6.82	6.89	9.61	10.77
		DS3	6.24	6.61	15.08	19.22
		DS4	6.26	6.70	6.88	8.21
		DS5	4.80	7.06	8.25	9.07
		US1	5.14	6.43	4.54	4.95
		US2	3.80	5.45	7.55	9.26
		MW1	2.98	4.07	3.47	5.36
		THB1	6.69	6.85	5.39	6.87
		THB2	-	6.89	11.29	6.07
		WSR45C	3.36	5.22	10.21	10.60

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)		
			Bottom	Surface and Mid Depth				
		WSR46	3.97	5.23	16.37	9.90		
2014/09/05	Mid-Ebb	DS1	4.20	6.20	3.56	5.07		
		DS2	3.78	4.61	3.86	4.80		
		DS3	3.45	4.53	7.11	7.58		
		DS4	3.64	4.20	4.28	4.87		
		DS5	3.74	4.26	4.38	5.81		
		US1	5.46	6.80	7.13	12.23		
		US2	3.79	5.41	11.12	13.32		
		MW1	2.88	4.56	2.38	3.56		
		THB1	4.89	5.67	3.85	5.23		
		THB2	-	5.81	4.93	6.00		
			WSR45C	3.18	4.12	6.54	6.31	
			WSR46	4.18	5.29	7.38	8.30	
		Mid-Flood	DS1	6.02	6.08	3.91	7.77	
			DS2	5.89	6.52	8.17	8.62	
			DS3	5.87	6.28	13.30	15.48	
			DS4	5.65	6.49	7.73	9.23	
			DS5	5.54	6.44	6.50	8.14	
			US1	4.54	5.58	3.79	3.67	
			US2	3.60	4.82	4.25	4.83	
			MW1	2.97	3.51	4.48	4.74	
	THB1		5.49	6.21	10.65	16.33		
	THB2		-	7.58	7.86	8.67		
		WSR45C	2.85	3.71	7.89	8.57		
		WSR46	3.78	5.28	9.45	10.74		
2014/09/08	Mid-Ebb	DS1	5.29	5.62	6.62	6.90		
		DS2	4.26	4.91	11.29	11.01		
		DS3	4.55	5.03	10.02	11.77		
		DS4	4.28	4.93	14.50	15.23		
		DS5	4.32	4.88	17.17	16.29		
		US1	5.30	5.81	7.89	11.02		
		US2	5.24	5.50	9.13	9.15		
		MW1	4.50	4.64	11.06	14.17		
		THB1	5.18	6.01	5.35	6.42		
		THB2	-	-	-	-		
				WSR45C	4.28	4.78	18.77	17.50
				WSR46	4.34	4.73	19.48	14.72
		Mid-Flood	DS1	4.82	5.01	11.39	12.33	
			DS2	4.91	5.02	11.42	14.92	
			DS3	5.24	5.33	5.97	8.83	
			DS4	5.10	5.49	7.64	7.84	
			DS5	4.72	5.45	7.41	8.84	
			US1	4.70	4.96	8.04	9.54	
			US2	4.22	4.78	12.29	10.39	
			MW1	4.19	4.64	7.45	8.12	
			THB1	4.87	4.95	11.01	12.20	
			THB2	-	4.61	10.22	4.47	
				WSR45C	4.68	5.01	7.48	8.58
				WSR46	4.28	4.81	15.73	13.74
	2014/09/11		Mid-Ebb	DS1	4.43	4.63	9.06	9.65
				DS2	4.05	4.32	14.88	13.61

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
		DS3	4.06	4.41	11.57	14.56
		DS4	3.99	4.12	26.53	16.59
		DS5	4.00	4.20	28.69	14.99
		US1	4.69	4.68	11.67	9.25
		US2	4.71	4.74	13.13	12.73
		MW1	4.14	4.48	8.18	10.74
		THB1	4.60	4.69	9.08	9.53
		THB2	-	4.61	6.70	5.27
		WSR45C	4.13	4.23	17.60	17.28
		WSR46	4.10	4.42	12.93	14.31
	Mid-Flood	DS1	4.41	4.44	12.48	12.82
		DS2	4.43	4.51	11.79	16.05
		DS3	4.33	4.39	12.67	14.12
		DS4	4.67	4.50	10.44	10.91
		DS5	4.86	4.69	7.49	9.90
		US1	4.26	4.31	15.23	15.51
		US2	4.01	4.29	11.64	13.11
		MW1	3.64	4.02	16.58	16.74
		THB1	4.40	4.52	11.69	15.57
		THB2	-	3.59	20.30	4.53
		WSR45C	4.07	4.24	18.28	15.28
		WSR46	4.06	4.33	22.49	25.43
2014/09/13	Mid-Ebb	DS1	4.52	4.60	6.99	9.85
		DS2	4.28	4.82	7.46	7.52
		DS3	4.27	4.76	10.17	12.09
		DS4	3.87	4.50	10.09	13.37
		DS5	3.96	4.59	10.23	11.39
		US1	4.20	4.88	11.78	15.35
		US2	4.86	5.14	10.85	8.93
		MW1	3.92	4.31	6.71	9.62
		THB1	4.69	5.44	10.24	12.60
		THB2	-	4.53	8.65	6.47
		WSR45C	4.06	4.51	11.71	12.20
		WSR46	4.26	4.64	24.70	17.71
	Mid-Flood	DS1	4.68	4.70	18.66	15.88
		DS2	4.53	4.71	10.14	12.98
		DS3	4.48	4.59	11.83	14.62
		DS4	4.54	4.75	15.57	16.56
		DS5	4.80	4.83	12.00	12.67
		US1	4.28	4.54	14.07	14.06
		US2	4.14	4.44	9.68	6.21
		MW1	3.43	3.91	9.52	12.87
		THB1	4.55	4.63	13.42	16.45
		THB2	-	-	-	-
		WSR45C	3.89	4.16	16.53	16.36
		WSR46	3.88	4.31	22.94	15.24
2014/09/15	Mid-Ebb	DS1	-	-	-	-
		DS2	-	-	-	-
		DS3	-	-	-	-
		DS4	-	-	-	-
		DS5	-	-	-	-

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
		US1	-	-	-	-
		US2	-	-	-	-
		MW1	-	-	-	-
		THB1	-	-	-	-
		THB2	-	-	-	-
		WSR45C	-	-	-	-
		WSR46	-	-	-	-
	Mid-Flood	DS1	-	-	-	-
		DS2	-	-	-	-
		DS3	-	-	-	-
		DS4	-	-	-	-
		DS5	-	-	-	-
		US1	-	-	-	-
		US2	-	-	-	-
		MW1	3.59	3.87	7.26	8.96
		THB1	5.14	5.19	9.84	12.28
		THB2	-	-	-	-
		WSR45C	3.72	4.13	10.17	9.97
		WSR46	-	-	-	-
2014/09/18	Mid-Ebb	DS1	5.76	5.89	4.24	4.77
		DS2	5.77	5.84	4.70	6.50
		DS3	5.69	5.81	4.65	5.08
		DS4	5.60	5.74	4.24	5.84
		DS5	5.33	5.78	9.88	5.21
		US1	5.89	5.91	20.20	25.33
		US2	5.90	5.90	5.03	5.25
		MW1	4.44	5.61	3.35	5.02
		THB1	5.69	5.68	5.59	6.60
		THB2	-	4.87	14.68	4.27
		WSR45C	4.31	5.57	5.41	6.44
		WSR46	5.56	5.84	4.78	5.81
	Mid-Flood	DS1	6.08	6.27	9.37	11.93
		DS2	6.29	6.43	9.18	12.12
		DS3	6.21	6.21	12.69	13.87
		DS4	6.07	6.30	8.32	8.97
		DS5	5.94	6.30	8.56	8.39
		US1	5.88	6.29	4.09	5.30
		US2	5.41	5.77	8.17	11.96
		MW1	4.49	4.75	7.10	8.87
		THB1	6.12	6.26	16.51	16.08
		THB2	-	7.33	14.11	5.47
		WSR45C	4.68	5.68	10.86	11.20
		WSR46	5.22	5.85	8.50	9.09
2014/09/20	Mid-Ebb	DS1	4.61	4.99	4.79	6.08
		DS2	4.42	5.40	5.37	7.51
		DS3	4.59	5.62	5.62	5.90
		DS4	4.70	5.42	3.06	5.96
		DS5	4.34	5.53	7.73	6.00
		US1	5.39	6.48	5.95	7.27
		US2	4.75	6.77	7.58	7.08
		MW1	4.59	4.97	4.73	8.53

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
		THB1	5.38	6.80	5.50	8.85
		THB2	-	6.90	5.96	6.47
		WSR45C	4.46	4.91	7.57	8.29
		WSR46	4.69	5.60	5.45	7.64
	Mid-Flood	DS1	7.07	7.43	10.52	13.72
		DS2	7.43	7.92	12.34	12.00
		DS3	5.35	7.05	12.00	11.73
		DS4	5.25	6.81	8.31	10.87
		DS5	7.27	8.11	5.33	7.73
		US1	6.42	7.20	2.77	5.17
		US2	4.79	6.09	4.25	8.27
		MW1	4.67	4.86	7.20	9.83
		THB1	7.25	7.53	7.50	9.62
		THB2	-	8.52	9.65	9.87
		WSR45C	4.51	4.84	10.45	13.28
		WSR46	4.66	5.75	5.86	6.92
2014/09/22	Mid-Ebb	DS1	4.83	5.35	20.88	32.91
		DS2	5.08	5.85	7.52	11.20
		DS3	5.02	5.80	8.21	11.47
		DS4	4.96	5.67	6.45	8.56
		DS5	4.89	5.56	6.89	13.60
		US1	5.02	5.66	6.52	11.08
		US2	5.17	6.10	6.46	10.55
		MW1	4.66	4.72	6.51	9.29
		THB1	5.77	6.91	5.47	8.77
		THB2	-	5.75	9.35	4.93
		WSR45C	4.70	5.47	6.26	9.00
		WSR46	5.61	6.79	14.22	15.23
	Mid-Flood	DS1	6.14	6.68	9.18	9.63
		DS2	6.12	7.08	13.15	19.37
		DS3	6.10	6.54	19.35	13.30
		DS4	5.29	5.99	20.39	24.51
		DS5	5.21	6.10	8.88	10.27
		US1	6.33	6.67	9.37	15.57
		US2	5.52	5.63	18.71	19.82
		MW1	4.81	4.95	10.77	15.63
		THB1	6.35	7.36	14.89	14.87
		THB2	-	6.55	13.85	2.57
		WSR45C	4.97	5.47	11.99	27.19
		WSR46	5.22	6.53	10.28	18.17
2014/09/24	Mid-Ebb	DS1	5.86	6.09	6.88	9.03
		DS2	5.91	6.09	6.57	7.10
		DS3	5.42	5.54	11.88	11.99
		DS4	5.31	5.56	18.61	19.00
		DS5	5.36	5.65	15.69	23.37
		US1	6.52	6.69	9.09	12.40
		US2	6.36	6.41	10.69	12.33
		MW1	4.98	5.03	9.05	11.18
		THB1	6.59	6.92	8.72	18.85
		THB2	-	6.52	13.71	5.83
		WSR45C	5.41	5.67	15.89	8.32

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
	Mid-Flood	WSR46	5.58	5.70	16.16	18.74
		DS1	6.03	5.91	25.07	28.58
		DS2	6.33	6.27	19.90	18.07
		DS3	6.67	6.74	35.34	37.55
		DS4	6.51	6.69	11.19	9.62
		DS5	6.51	6.74	13.15	14.82
		US1	5.82	5.80	8.93	10.40
		US2	5.44	5.60	55.79	32.11
		MW1	4.91	5.06	17.25	20.78
		THB1	6.09	6.31	22.65	22.13
		THB2	-	6.19	13.38	6.13
		WSR45C	5.30	5.55	19.33	18.00
		WSR46	6.15	5.70	21.02	16.04
		2014/09/26	Mid-Ebb	DS1	5.41	5.49
DS2	5.47			5.62	8.17	10.01
DS3	5.47			5.39	8.00	11.31
DS4	5.13			5.40	9.31	9.80
DS5	5.17			5.26	12.83	13.48
US1	5.76			5.75	9.63	10.33
US2	5.77			5.77	8.28	9.28
MW1	5.15			5.42	6.87	9.44
THB1	5.53			5.57	10.05	19.93
THB2	-			6.00	5.90	4.20
WSR45C	5.14			5.26	13.77	12.63
WSR46	5.05			5.26	11.75	9.91
Mid-Flood	DS1		5.36	5.35	10.40	10.48
	DS2		5.37	5.41	19.73	17.68
	DS3		5.41	5.41	9.69	11.12
	DS4		5.54	5.42	11.57	13.14
	DS5		5.67	5.64	14.36	15.08
	US1		5.39	5.39	8.92	8.58
	US2		5.16	5.38	10.78	11.98
	MW1		4.99	5.16	9.16	12.39
	THB1		5.31	5.35	16.44	13.83
	THB2		-	5.23	8.22	7.03
	WSR45C		5.09	5.32	16.49	14.84
	WSR46		5.09	5.33	13.96	11.41
2014/09/29	Mid-Ebb	DS1	5.02	5.42	8.27	10.91
		DS2	4.76	5.12	10.83	12.12
		DS3	4.91	5.38	8.14	10.18
		DS4	4.63	5.46	9.19	10.40
		DS5	5.05	5.54	15.08	13.57
		US1	4.90	5.26	8.60	13.67
		US2	5.09	5.21	9.20	13.00
		MW1	5.27	5.47	5.93	7.62
		THB1	5.23	5.54	10.43	11.73
		THB2	-	6.27	8.12	7.40
		WSR45C	4.65	5.40	12.57	15.67
		WSR46	4.77	5.13	15.03	14.88
	Mid-Flood	DS1	5.05	5.13	10.47	15.13
		DS2	5.21	5.25	13.30	14.17

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
		DS3	5.07	5.48	11.64	11.68
		DS4	5.27	5.61	9.02	10.70
		DS5	5.22	5.58	9.17	8.71
		US1	4.70	5.13	11.48	14.06
		US2	4.70	5.05	6.53	7.40
		MW1	4.58	4.78	10.21	11.26
		THB1	5.04	5.22	15.37	15.67
		THB2	-	5.11	13.38	14.70
		WSR45C	4.69	5.06	10.22	10.70
		WSR46	4.71	5.06	14.06	14.84

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. Sampling at Station THB2 during mid-ebb tide on 8 September 2014 was cancelled due to adverse weather condition.
6. Sampling at Station THB2 during mid-flood tide on 13 September 2014 was cancelled due to adverse weather condition.
7. Sampling was only conducted at stations MW1, THB1 and WSR45C during mid-flood tide on 15 September 2014 due to adverse weather condition.

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 Significantly less than the reference stations mean DO (at the same tide of the same day)	and 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 Significantly less than the reference stations mean DO (at the same tide of the same day)	and 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 120% of control station's SS at the same tide of the same day	and 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 = 32.68 NTU
	and 120% of control station's Tby at the same tide of the same day	and 130% of control station's Tby at the same tide of the same day

Notes:

- (1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- (3) "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 B3

Water Column Profiling Results for CMP 1 on 12 September 2014

Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen		pH	Suspended Solids
				(%)	(mg L ⁻¹)	(mg L ⁻¹)	(mg L ⁻¹)
WCP 1 (Downstream)	28.67	24.43	13.66	62.34	4.21	7.64	13.25
WCP 2 (Upstream)	28.60	24.74	9.80	61.52	4.15	7.64	11.58
WQO (wet season)	N/A	21.51- 26.53 [#]	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 C

Dredging Record for CMP 2 in September 2014

Table C1 Dredging Record at SB CMP 2

Date	Daily Dredging Volume (m ³)	Weekly Dredging Volume (m ³) (From Sunday to Saturday)
31-Aug-2014	7,800	59,800
01-Sep-2014	8,450	
02-Sep-2014	9,750	
03-Sep-2014	5,850	
04-Sep-2014	9,100	
05-Sep-2014	10,400	
06-Sep-2014	8,450	
07-Sep-2014	3,250	19,500
08-Sep-2014	3,900	
09-Sep-2014	650	
10-Sep-2014	650	
11-Sep-2014	3,250	
12-Sep-2014	4,550	
13-Sep-2014	3,250	
14-Sep-2014	2,600	20,800
15-Sep-2014	2,600	
16-Sep-2014	0	
17-Sep-2014	1,950	
18-Sep-2014	3,900	
19-Sep-2014	4,550	
20-Sep-2014	5,200	
21-Sep-2014	7,150	35,750
22-Sep-2014	8,450	
23-Sep-2014	3,900	
24-Sep-2014	4,550	
25-Sep-2014	1,950	
26-Sep-2014	4,550	
27-Sep-2014	5,200	
28-Sep-2014	6,500	20,150
29-Sep-2014	7,150	
30-Sep-2014	6,500	

Annex D

Study Programme

