



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)*

6th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau – February 2013

Revision 0

14 March 2013

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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: 6th Monthly Progress Report for Contaminated Mud Pits to

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

2013

Date of Report:

14 March 2013

Date prepared by ET:

14 March 2013

Date received by IA:

14 March 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 noncompliance (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:

14/3/2013

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:

14/3/2013

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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

6TH MONTHLY PROGRESS REPORT FOR FEBRUARY 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 (1) 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 February 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 2, 4, 6, 8, 14, 16, 19, 21, 23, 26 and 28 February 2013) in this reporting month in accordance with the EM&A Manual. No sampling was conducted between 10 to 12 February 2013 since there were no dredging works during that period.

1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS

1.4.1 No outstanding sampling remained from February 2013. Laboratory analysis of Suspended Solids (SS) collected after 23 February 2013 was still in progress during the preparation of this monthly report. 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 Monitoring data collected for SB CMPs from 2 February to 23 February 2013 are presented in this monthly report. Detailed discussion will be presented in the corresponding *Quarterly Report*.

⁽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.

- 1.5.2 Impact Water Quality Monitoring during Dredging Operations of CMP 1 February 2013
- 1.5.3 Impact Water Quality Monitoring during Dredging Operations of CMP 1 was conducted three times per week with a total of eleven (11) sampling days in February 2013. On each 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.
- 1.5.4 Monitoring results from 2 February 2013 to 23 February 2013 are presented in *Table B1* of *Annex B*. Levels of Dissolved Oxygen (DO), Turbidity and SS generally complied with the Action and Limit Levels (see *Table B2* for details) set in the Baseline Monitoring Report ⁽¹⁾, except during mid-flood tide on 2, 19 and 23 February 2013.
- 1.5.5 On 2 February 2013, levels of Turbidity exceeded the Action Level at Impact Stations DS1 and DS2 and levels of SS exceeded the Limit Level at Impact Stations DS1 and DS2 during mid-flood tide.
- 1.5.6 On 19 and 23 February 2013, levels of SS exceeded the Action Level at Impact Station DS1 during mid-flood tide.
- 1.5.7 Stations DS1 and DS2 are located in close proximity to the works area of CMP 1 (ie within 500m from the works area). Since the exceedances were recorded at stations DS1 and DS2 and during one tidal period only, it is considered that the sediment plume was transient in nature 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. It should also be noted that high levels of SS and Turbidity were occasionally recorded during baseline monitoring which are considered to be sporadic events and characteristic of water quality in this area of Hong Kong. As such, the exceedances recorded may also be caused by natural background variation in water quality of the area.
- 1.5.8 Exceedance of Action and Limit Level was not recorded at any Sensitive Receiver stations. As such, the dredging works did not appear to cause any unacceptable water quality impacts at the Sensitive Receivers.

⁽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)

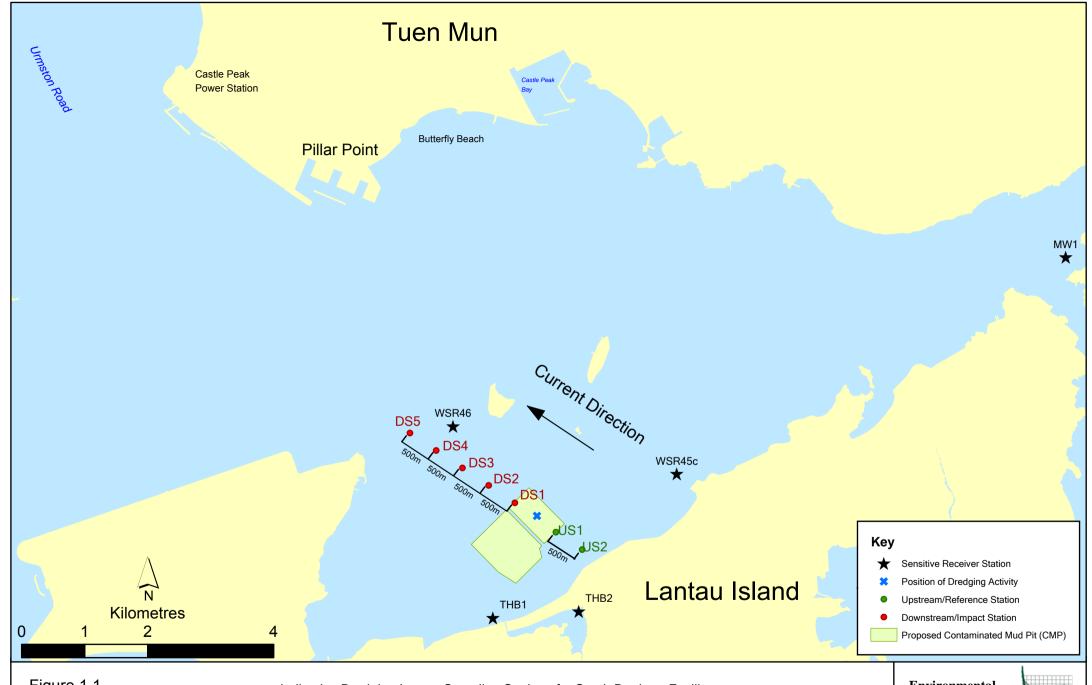


Figure 1.1

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

Environmental Resources Management



1.5.9 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 March 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*.

Annex A

Sampling Schedule

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

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

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Far-Field Stations																																						
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Near-Field				$oxed{\Box}$		Ш				$oldsymbol{\perp}$			$\Box \Gamma$												Ш		\Box			Ш		ДĪ			$\Box \Box$	آللــ	\bot	+
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	SB-TRB	2 times per year				+				1	_			+++		5			5		++	5		_							+++	++				+	+	+++
Near-Field		2 times per year				1 1						1							 												+ + + +	+				+	+	+
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	THB1	2 times per year														5			5			5	i								\bot	$\bot \bot$						\bot
	THB2	2 times per year														5			5			5										ш				ш		
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Tissue/ Whole Body Sampling Near-Pit Stations			J A S	U	N D	J	r IVI	A M J J	A 5	U	N D	J	r N	A M J	J E	A 3	0 .	N D	J F	VI A IVI	1 J	J A	3	UN	D	J F IVI	A	IVI J	J	A	5 0 N D	+	r IV	1 A	IVI	44	A S	UN
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Demersal Trawling			J A S	U	N D	J	r M	A M J J	A 5	U	N D	J	r N	A M J	J A	A 3	0	ир	J F	vi A M	1 J	J A	5	UN	ט	j r M	A	ıvı J	J	A	3 U N D	44	r N	1 A	IVI	,]	A S	UN
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		4 times per year		+					+	+		5	_		5 5			+	5 5			5 5		\dashv	\Box		+	_	+	t	1 1 1	+	_	\top	t	+	+	+++
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Annex A - Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (July 2012 - December 2017)

			2012			2013						2014							20	15						201	.16						2017			
Routine Water Quality Monitoring			J A S O	N D	J F	M A M J J A S	0 1	N D	I	F M	A M	I I	A	s o	N D	J F	M	A M	ı ı	I	A S O	N D	I	F M	A M	Ī	J A S	O N	D	J I	F M	A M	ī	I A	S	0 1
Ebb Tide			- - - - - - - - - - 				—				_	, ,	$\overline{}$					_	- 1									_	$\boldsymbol{\top}$	_	$\overline{}$		+++	—	-	$\overline{}$
Impact Stations Downcurrent				-++	+ +	 	+		1				+													+	+++	+	+		+	\vdash	+	+	+	\vdash
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	SB-IPE2	8 times per year		-++	+ +		8 8	8	8	8	8 8	8	8	8		8 8		8 8		8	8 8	8				+	+++	+	+		+	\vdash	+	+	+	\vdash
	SB-IPE3	8 times per year		-++	+ +		8 8	8	8	8	8 8	8	8		8	8 8		8 8		8	8 8	8				+	+++	+	+		+	\vdash	+	+	+	\vdash
	SB-IPE4	8 times per year		-++	+ +		8 8	8	8	8	8 8	8	8	8	-	8 8		8 8		8	8 8	8				+	+++	+	+		+	\vdash	+	+	+	\vdash
	SB-IPE5	8 times per year		\leftarrow	+++		8 8	8	8	8	8 8	8	8	8		8 8		8 8		8	8 8	8		-		+	+++	+	+	-	+	\vdash	++	+	+	\vdash
Intermediate Stations Downcurrent	00 11 20	o times per year		-++	+ +	 	-					Ü	1	- 0		0 0		0 0				0				+	+++	+	+		+	\vdash	+	+	+	\vdash
memediate stations bownearen	SB-INE1	8 times per year		\leftarrow	+++	 	8 8	8	8	8	8 8	8	8	8	8	8 8		8 8	+	8	8 8	8		-		+	+++	+	+	-	+	\vdash	++	+	+	\vdash
	SB-INE2	8 times per year		\leftarrow	+		8 8		8	8	8 8	8	_ ~	8		8 8		8 8		v	8 8					+	+++	+	+		+	\vdash	++	+	+	\vdash
	SB-INE3	8 times per year		-++				8	8	8	8 8	8	_ ~	8		8 8		8 8		8	8 8			_		+	-+-+	-	+		+		++	+	+	\vdash
	SB-INE4	8 times per year		\leftarrow	+		8 8	O .	8	8	8 8	8	8	8		8 8		8 8		8	-					+	+++	+	+		+	\vdash	++	+	+	\vdash
	SB-INE5	8 times per year			+++		8 8	~	8	0	0 0	0	0	8		8 8		8 8		8	8 8				 	+		+	+		+		++	+	+	\vdash
Reference Stations Upcurrent	3D-IIVE3	o times per year		-++		+++++++	0 0	0	0	0	0		0	0	0	0 0		0 0		0	0 0	0		_	1 1	+	+++	+	+		\dashv	\leftarrow	+	+	+	+
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	SB-RFE2	8 times per year		┍═┼═╂╴			8 8	~	8	0	0 0	0	0	8		8 8		8 8		0	8 8	0		_		+		$-\!\!\!\!\!+\!\!\!\!\!-$	+		\dashv	\vdash	++	+	$+\!-\!\!\!\!\!-$	\vdash
	SB-RFE3	8 times per year		-++			8 8	8	8	8	8 8	8	8		_	8 8		8 8		8	8 8	8		_	 	+		$-\!$	+		\dashv	\vdash	++	+	+	\vdash
		8 times per year		$oldsymbol{oldsymbol{+++}}$				8	8	8	8 8	8	8		8			0 0		8	8 8	8			 	+		+	+		+	\vdash	+	+	$+\!-\!\!\!-$	+
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	SB-RFE5	8 times per year		\leftarrow			8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8			.	\bot	\longrightarrow		\bot			\vdash	\bot	_	——'	+
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	MW1	8 times per year					8 8	8	8	8	8 8	8	8	8		8 8		8 8		8	8 8	8				\bot			\perp		\perp	\vdash	$\perp \perp$		<u> </u>	₩.
	THB1	8 times per year		igspace			8 8	~	8	8	8 8	8	8	8		8 8		8 8		8	8 8								$oldsymbol{oldsymbol{\sqcup}}$		$oldsymbol{ol}}}}}}}}}}}}}}}}}}$	$oldsymbol{\sqcup}$	$\bot \bot$		'	ш.
	THB2	8 times per year					8 8	Ü	8	8	8 8	8	8	8		8 8		8 8		8	8 8											Щ.	\perp		<u> </u>	Щ.
	WSR45C	8 times per year		igspace			8 8		8	v	8 8	8	8	8	_	8 8		8 8		8	8 8	8							$oldsymbol{oldsymbol{\sqcup}}$		$oldsymbol{ol}}}}}}}}}}}}}}}}}}$	$oldsymbol{\sqcup}$	$\bot \bot$		'	ш.
	WSR46	8 times per year					8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8										ш_	\perp			ш
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	SB-IPF1	8 times per year					8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8				T					\Box				T	
	SB-IPF2	8 times per year					8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8									\top				\top	
	SB-IPF3	8 times per year					8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8				1					77		1		+	
Intermediate Stations Downcurrent																										1					77		1		+	
	SB-INF1	8 times per year					8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8				1					77		1		+	
	SB-INF2	8 times per year				 	8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8				1 1			+		+			\neg	T	\Box
	SB-INF3	8 times per year				 	8 8	8	8	8	8 8	8	8	8	8	8 8		8 8		8	8 8	8				1		\neg	+		+	\Box	+	\neg	+	\Box
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at a minimum at a	SB-RFF1	8 times per year		ot	+	 	8 8	8	8	8	8 8	8	8	8	8	8 8	+	8 8		8	8 8	8		_		+		+	+ +	-	+	\vdash	++	+	+	一十
	SB-RFF2	8 times per year		-++			8 8	8	8	8	8 8	8	8	8		8 8	+	8 8		8	8 8					+		-	+		+	\leftarrow	++	+	+	\vdash
	SB-RFF3	8 times per year		-++	+		8 8	8	8	8	8 8	R	8	8	_	8 8		8 8	_	8	8 8			+	+	+		+	+	-	+	\vdash	++	+	+	-+
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CHAINTE NECESVES MANUELS	MW1	8 times per year		-+	+	 	8 8	8	8	8	8 8	Q	8	8	8	8 8	++	8 8	+	8	8 8	8	+	+	+ + -	+		+	+		+	\vdash	++	+	+	\vdash
	THB1			-++	+		8 8	R	8	8	8 8	0	8	8		8 8		8 8		8	8 8		+	-	+ + -	+	- 	+	+	-	+	-	++	+	+	\vdash
	THB1	8 times per year		++	++		8 8	~		8	0 0	8	0	8		8 8		8 8		8			\vdash	+	+	+		+	+		$\dashv \dashv$	\vdash	++	+	+	\vdash
		8 times per year		++	++		8 8	0	8	0	0 0	8	0	8	_	8 8		8 8		8			\vdash		+	+		+	+	_	\dashv	\vdash	++	+	+	\vdash
	WSR45C	8 times per year		$oldsymbol{+}oldsymbol{+}$	+			0	8	0	0 8	8	8		0				_	8	0 8	0	$\vdash \vdash$		+	+		+	+		\dashv	\vdash	++	+	+	\vdash
	WSR46	8 times per year					8 8	0	ŏ	6	0 8	8	8	8	0	8 8		8 8		8	0 8	δ				ш			ш			——	ш	—	ш	
Water Column Profiling			J A S O	N D	J F	M A M J J A S	1 0	N D	J	F M	A M	JJ	Α	S O	N D	JF	M	A N	1 J	J	A S O	N D	J	F M	A M	J	J A S	O N	D	JI	F M	A M	J	J A	S	0 1
Plume Stations	WCP1	Monthly		$\overline{}$					Ĺ	4 4	4 4	4 4	4			4 4			,		4 4 4	_						-	\blacksquare		+	\leftarrow	\leftarrow	+	-	$\overline{}$

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

				2012				2013	3				2014						2015					201	16						2017			
Capping Water Quality Monitoring			TΔ) I	F M	Δ λ		J A S O N	D I	F	мΙΔ		A S O	N D	I F	М	ΔМ		0 1	N D	I F	МА			S	0 N	D	I E N	A A N	T T	ΙΔ	S) N
Ebb Tide			J A	3 0 1	<i>,</i> , , ,	I IVI	A W	1)	J A S O N	<i>D</i> ,	1	IVI A	. IVI J J	A 3 0	IV D	J r	171	A W	J J A 3	0 1	V D	j r	IVI A	IVI J	J A	3 (JIV		T IVI	I A W	+++) A	3	/ N
Impact Stations Downcurrent				++++	-	-		+++		-		_	+ + +						+ + + +				+ + +	-	-		$+\!-\!\!\!-$	\vdash	+++	++	++	_		+
Impact stations Bownearrent	SB-IPE1	8 times per year																	+ + + + +			3 3	3	3	3 3		3 3	\vdash	++	+	++	_		+
	SB-IPE2	8 times per year																				3 3		3	3 3		3 3		\top	+				
	SB-IPE3	8 times per year																				3 3			3 3		3 3		\top	+				
	SB-IPE4	8 times per year																				3 3	3	3	3 3		3 3							
	SB-IPE5	8 times per year																				3 3	3	3	3 3		3 3	i i						
Intermediate Stations Downcurrent																																		
	SB-INE1	8 times per year																				3 3	3	3	3 3		3 3							
	SB-INE2	8 times per year																				3 3			3 3		3 3							
	SB-INE3	8 times per year																				3 3			3 3		3 3							
	SB-INE4	8 times per year																				3 3			3 3		3 3			\bot	$\perp \perp \downarrow$			
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	SB-RFF3	8 times per year																				3 3	3	3	3 3		3 3			+				
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	THB2	8 times per year								1																								
	WSR45C	8 times per year																				3 3	3	3	3 3		3 3							
	WSR46	8 times per year																				3 3	3	3	3 3		3 3	Щ						
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Notes:
"*" = Number of replicates depends on parameters
Naming of stations are tentative only and will be subjected to changes

Annex B

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

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

Sampling Date	Tidal Period	Station		DO Levels ng/L)	Average Turbidity	Average S Level
			Bottom	Surface and	Level	(mg/L)
				Mid Depth	(NTU)	
2013/2/2	Mid-Ebb	DS1	7.82	7.91	7.11	12.17
		DS2	7.88	7.88	5.82	9.07
		DS3	7.64	7.93	3.16	5.40
		DS4	7.70	7.91	3.36	5.97
		DS5	7.59	7.65	3.49	6.55
		US1	7.66	7.66	7.66	27.93
		US2	7.62	7.59	11.40	15.65
		MW1	7.10	7.16	2.10	4.81
		THB1	7.59	7.61	3.15	6.55
		THB2	-	7.79	4.52	8.67
		WSR45C	6.90	7.26	2.79	4.91
		WSR46	6.89	7.06	4.28	7.89
	Mid-Flood	DS1	7.65	7.67	27.96	40.67
		DS2	7.66	7.69	32.08	49.63
		DS3	7.74	7.74	5.11	8.42
		DS4	7.80	7.80	4.97	7.77
		DS5	7.91	7.88	4.83	9.66
		US1	7.66	7.73	5.15	7.76
		US2	7.55	7.72	4.98	6.66
		MW1	7.04	7.16	2.60	5.79
		THB1	7.41	7.45	3.03	6.33
		THB2	_	6.73	6.86	6.97
		WSR45C	7.09	7.24	4.75	8.53
		WSR46	7.22	7.27	7.90	12.13
2013/2/4	Mid-Ebb	DS1	7.52	7.82	14.46	12.39
,,		DS2	7.71	7.87	3.52	6.69
		DS3	7.75	7.99	3.06	5.04
		DS4	7.57	7.82	2.86	5.13
		DS5	7.81	7.97	2.45	4.57
		US1	7.77	7.75	6.13	8.58
		US2	7.74	7.73	6.87	11.02
		MW1	6.94	7.03	1.41	5.30
		THB1	7.50	7.67	3.57	7.53
		THB2	-	7.84	3.57	6.10
		WSR45C	7.29	7.45	3.53	7.39
		WSR46	6.90	7.43	2.76	6.47
	Mid-Flood	DS1	7.50	7.63	3.36	7.25
	Wild-1 lood	DS2	7.50	7.66	4.51	7.23
		DS3	7.66	7.66 7.69	3.44	6.23
		DS4	7.70	7.73	2.98	6.23
		DS5	7.70	7.70	3.69	6.39
		US1	7.34		3.69	5.27
		US2		7.58 7.51		
		MW1	7.33 6.75	7.51	2.68	4.84
		THB1	6.75 7.47	6.94 7.62	1.63	5.92 5.85
			7.47	7.62	2.58	5.85
		THB2	7.00	6.73	14.18	10.23
		WSR45C	7.09	7.37	2.19	4.62

Sampling Date	Tidal Period	Station		DO Levels ng/L)	Average Turbidity	Average SS Level
			Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
2013/2/6	Mid-Ebb	DS1	7.38	7.50	3.70	6.38
		DS2	7.39	7.55	1.84	4.20
		DS3	7.29	7.37	2.05	4.30
		DS4	7.31	7.38	2.20	4.56
		DS5	7.37	7.39	2.90	5.40
		US1	7.67	7.83	2.11	4.50
		US2	7.66	7.73	4.16	6.42
		MW1	6.75	6.78	1.45	5.78
		THB1	7.44	7.55	1.93	6.98
		THB2	-	7.23	4.14	11.97
		WSR45C	6.77	6.99	1.50	4.42
		WSR46	6.91	7.23	2.25	4.39
	Mid-Flood	DS1	7.85	7.93	6.33	12.80
		DS2	7.89	8.22	3.53	6.52
		DS3	7.68	8.02	4.00	6.60
		DS4	7.82	7.90	4.44	6.93
		DS5	7.82	8.25	3.41	6.17
		US1	7.42	8.01	2.55	5.12
		US2	7.24	8.04	2.38	5.00
		MW1	6.53	6.60	1.83	4.11
		THB1	7.12	7.39	2.69	5.48
		THB2	-	8.62	4.74	7.70
		WSR45C	6.75	7.34	1.97	5.58
		WSR46	6.51	7.20	2.17	4.98
2013/2/8	Mid-Ebb	DS1	7.36	7.36	2.56	5.04
		DS2	7.38	7.38	2.49	5.17
		DS3	7.30	7.33	2.36	5.44
		DS4	7.29	7.29	2.33	4.77
		DS5	7.28	7.30	2.51	5.63
		US1	7.39	7.39	2.93	5.75
		US2	7.42	7.43	6.66	9.95
		MW1	7.16	7.12	2.33	6.03
		THB1	7.69	7.73	3.13	8.13
		THB2	-	7.98	6.95	12.67
		WSR45C	7.31	7.37	2.06	5.41
		WSR46	7.54	7.77	3.68	6.79
	Mid-Flood	DS1	7.64	7.62	5.31	10.62
		DS2	7.66	7.70	9.35	14.67
		DS3	7.57	7.69	4.79	8.42
		DS4	7.63	7.66	3.81	7.27
		DS5	7.73	7.76	3.13	5.57
		US1	7.35	7.44	2.26	5.41
		US2	7.28	7.44	2.52	4.93
		MW1	7.26	7.25	2.18	4.92
		THB1	7.79	7.23	2.96	6.55
		THB2	-	8.71	5.13	9.23
		WSR45C	7.28	7.43	2.18	5.90
		WSR46	7.50	7.43	3.08	6.34
2013/2/14	Mid-Ebb	DS1	7.83	7.76	5.05	8.51
2010/2/14	MIM-EDD	DS1 DS2	7.83	7.89 7.99	3.20	6.32
						(11/

Sampling Date	Tidal Period	Station		DO Levels	Average Turbidity	Average S Level
			Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
		DS4	7.83	7.97	3.04	6.17
		DS5	7.72	7.83	2.90	5.90
		US1	8.10	8.19	3.14	5.38
		US2	8.22	8.23	5.43	9.85
		MW1	7.09	7.23	1.75	4.59
		THB1	8.02	8.01	3.71	7.25
		THB2	-	8.02	4.20	9.37
		WSR45C	7.05	7.38	3.37	7.03
		WSR46	7.56	7.63	2.99	6.57
	Mid-Flood	DS1	7.65	7.65	3.74	6.78
		DS2	7.68	7.67	4.80	9.25
		DS3	7.66	7.68	3.29	6.22
		DS4	7.65	7.64	3.75	6.75
		DS5	7.70	7.72	2.78	5.91
		US1	7.66	7.64	3.13	6.04
		US2	7.42	7.52	3.88	6.66
		MW1	7.27	7.33	2.13	4.74
		THB1	7.56	7.60	3.06	7.60
		THB2	-	7.32	3.07	6.63
		WSR45C	7.35	7.46	3.67	7.03
		WSR46	7.47	7.43	3.44	6.61
2013/2/16	Mid-Ebb	DS1	7.80	8.07	2.95	4.63
		DS2	7.64	8.11	3.75	5.37
		DS3	7.69	8.07	3.57	6.16
		DS4	7.66	7.99	1.87	3.72
		DS5	7.87	8.02	2.02	3.53
		US1	8.33	8.46	4.03	6.40
		US2	8.39	8.54	4.60	6.37
		MW1	7.55	7.64	1.22	2.14
		THB1	8.83	8.89	2.49	4.38
		THB2	-	8.46	3.30	5.17
		WSR45C	7.42	7.72	1.65	3.68
		WSR46	7.71	8.24	2.66	6.60
	Mid-Flood	DS1	7.99	8.04	4.76	6.93
		DS2	8.00	8.04	5.46	9.83
		DS3	8.06	8.07	3.73	6.80
		DS4	8.10	8.11	2.69	4.33
		DS5	8.16	8.19	2.68	3.68
		US1	7.61	7.78	2.31	4.17
		US2	7.56	7.73	2.91	4.38
		MW1	7.42	7.47	1.60	5.52
		THB1	8.07	8.10	2.62	5.12
		THB2	-	7.52	6.29	5.63
		WSR45C	7.62	7.83	2.56	4.72
		WSR46	7.69	8.01	2.35	5.06
2013/2/19	Mid-Ebb	DS1	9.74	9.77	6.09	5.11
,,		DS2	9.93	9.86	2.58	5.89
		DS3	10.07	10.31	2.81	6.11
		DS4	10.15	10.30	1.84	3.33
		DS5	10.27	10.28	2.21	4.00
		US1	9.87	10.18	2.76	4.67

Sampling Date	Tidal Period	Station		DO Levels ng/L)	Average Turbidity	Average S Level
Dute	Terrou		Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
		US2	9.63	9.64	4.07	6.67
		MW1	7.44	7.85	0.57	4.89
		THB1	10.60	10.52	2.54	6.00
		THB2	-	9.78	2.91	5.67
		WSR45C	8.56	9.90	1.54	5.11
		WSR46	8.07	9.34	1.34	5.11
	Mid-Flood	DS1	8.27	8.42	20.44	37.50
		DS2	8.41	8.75	4.63	9.67
		DS3	9.06	9.11	3.43	6.50
		DS4	9.07	9.13	3.83	5.67
		DS5	8.99	9.06	2.58	4.11
		US1	8.57	8.77	1.82	5.00
		US2	8.01	8.24	1.89	5.67
		MW1	7.41	7.53	1.00	5.00
		THB1	9.21	9.25	2.54	5.17
		THB2	-	7.65	7.94	10.00
		WSR45C	7.43	8.21	1.28	6.67
		WSR46	7.80	8.63	2.18	7.11
2013/2/21	Mid-Ebb	DS1	9.02	9.86	1.92	5.00
2010/2/21	Wild Lob	DS2	9.58	9.93	13.34	8.44
		DS3	8.58	9.73	2.96	3.11
		DS4	8.97	10.04	1.76	4.44
		DS5	9.64	9.75	1.38	1.00
		US1	8.79	8.90	3.60	5.33
		US2	8.40	8.55	5.23	6.17
		MW1	8.53	8.90	1.04	2.22
		THB1	9.85	10.39	2.22	3.00
		THB1	9.65 -	9.42	4.01	3.33
		WSR45C			2.48	
		WSR45C WSR46	8.59	9.22		3.00
	Mid-Flood	DS1	7.84	9.28	3.23	2.22
	MIG-FIOOG		9.00	9.38	1.30	2.17
		DS2	9.47	9.90	1.37	2.67
		DS3	9.25	9.94	2.40	3.17
		DS4	9.42	10.01	2.00	5.00
		DS5	8.78	9.37	2.72	3.11
		US1	8.37	9.33	1.09	2.44
		US2	8.12	8.95	1.03	3.56
		MW1	7.30	7.50	0.81	2.33
		THB1	9.10	9.82	1.43	4.67
		THB2	-	9.46	2.04	5.33
		WSR45C	7.60	8.21	0.95	2.22
2012 /2 /22	M: 1 171 1	WSR46	7.85	8.72	0.95	3.56
2013/2/23	Mid-Ebb	DS1	9.03	9.20	1.22	6.17
		DS2	8.75	8.81	1.21	6.22
		DS3	8.15	8.99	1.21	6.00
		DS4	8.44	9.08	1.48	4.44
		DS5	9.04	9.29	1.92	7.00
		US1	9.74	10.52	3.50	9.33
		US2	9.96	10.24	3.60	9.83
		MW1	7.36	7.56	1.34	6.78
		THB1	10.21	10.54	1.79	7.00

Sampling Date	Tidal Period	Station	_	DO Levels ng/L)	Average Turbidity	Average SS Level
Date	i enou		Bottom	Surface and Mid Depth	Level (NTU)	(mg/L)
		THB2	-	10.07	9.61	8.67
		WSR45C	7.82	8.85	1.05	4.89
		WSR46	8.37	9.78	3.15	6.56
	Mid-Flood	DS1	10.20	10.42	17.90	23.33
		DS2	10.65	10.89	2.98	6.67
		DS3	11.03	11.08	3.17	4.83
		DS4	11.03	11.07	2.68	5.17
		DS5	11.16	11.19	3.14	5.89
		US1	10.37	10.68	1.88	6.22
		US2	8.73	10.43	1.57	6.22
		MW1	7.95	8.09	0.88	4.11
		THB1	11.30	11.40	1.49	4.50
		THB2	-	10.44	3.11	5.00
		WSR45C	8.67	10.27	1.66	5.11
		WSR46	8.68	10.46	2.46	6.22

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)	Surface and Mid-depth (2)	Surface and Mid-depth (2)
Dibberved Oxygen (DO)	The average of the impact, WSR	The average of the impact, WSR
	45C and WSR 46 station readings	45C and WSR 46 station readings
	are < 5%-ile of baseline data for	are < 4 mg L ⁻¹
	surface and middle layer = 4.32 mg	are tring 2
	L-1	and
	2	uru
	and	Significantly less than the reference
		stations mean DO (at the same tide
	Significantly less than the reference	of the same day)
	stations mean DO (at the same tide	3,
	of the same day)	
	37	
	Bottom	<u>Bottom</u>
	The average of the impact, WSR	The average of the impact station,
	45C and WSR 46 station readings	WSR 45C and WSR 46 readings are
	are < 5%-ile of baseline data for	< 2 mg L ⁻¹
	bottom layers = 3.12 mg L^{-1}	
		and
	and	
		Significantly less than the reference
	Significantly less than the reference	stations mean DO (at the same tide
	stations mean DO (at the same tide	of the same day)
	of the same day)	
Depth-averaged	The average of the impact, WSR	The average of the impact, WSR
Suspended Solids (SS) (3) (4)	45C and WSR 46 station readings	45C and WSR 46 station readings
	are > 95%-ile of baseline data for	are > 99%-ile of baseline data for
	depth average = 21.60 mg L ⁻¹	depth average = 40.10 mg L ⁻¹
	and	and
	and	and
	120% of control station's SS at the	130% of control station's SS at the
	same tide of the same day	same tide of the same day
	,	,
Depth-averaged Turbidity	The average of the impact, WSR	The average of the impact, WSR
(Tby) (3) (4)	45C and WSR 46 station readings	45C and WSR 46 station readings
	are > 95%-ile of baseline data =	are > 99%-ile of baseline data =
	25.04 NTU	56.30 NTU
	and	and
	120% of control station's Tby at the	130% of control station's Tby at the
	same tide of the same day	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

