

**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)**

**53rd Monthly Progress Report for Contaminated
Mud Pits to the South of The Brothers and at
East Sha Chau – January 2017**

Draft (Revision 0)

February 2017

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



**Dredging, Management and Capping of Contaminated Sediment Disposal
Facility at Sha Chau and to the South of The Brothers**

**Environmental Certification Sheet
EP-312/2008/A & EP-427/2011/A**

Reference Document/Plan

Document/ Plan to be Certified/ Verified:	53 rd Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau - January 2017
Date of Report:	7 February 2017
Date prepared by ET:	7 February 2017
Date received by IA:	7 February 2017

Reference EP Condition

Environmental Permit Condition:

Condition 3.4 of EP-312/2008/A and Condition 4.4 of EP-427/2011/A:
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-312/2008/A and EP-427/2011/A

Craig A. Reid,
Environmental Team Leader:



Date: 7/2/2017

IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-312/2008/A and EP-427/2011/A

Dr Wang Wen Xiong,
Independent Auditor:



Date: 7/2/2017

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Environmental Resources Management

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: Civil Engineering and Development Department (CEDD)		Project No: 0175086			
Summary: This document presents the 53 rd monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.		Date: 7 February 2017			
		Approved by:  Craig A. Reid Partner			
v0	53 rd Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	07/02/17
Revision	Description	By	Checked	Approved	Date
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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

53RD MONTHLY PROGRESS REPORT FOR JANUARY 2017

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)*

1.3.2 No monitoring activities were scheduled to be undertaken for SB CMPs in January 2017.

1.4 *DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS*

1.4.1 No outstanding sampling remained for January 2017.

1.4.2 A summary of field activities conducted are presented in *Annex A*. The following analyses are in progress and will be presented in the corresponding quarterly report:

- Species identification of the biota samples collected from *Demersal Trawling for ESC CMPs* in January 2017.

1.4.3 The following laboratory analyses are in progress during the preparation of this monthly report and will be presented in the next monthly report once the data are available:

- Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry of ESC CMP Vd* in January 2017.

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

1.5.1 Brief discussion of the monitoring results of the following activities for ESC CMPs is presented in this *53rd Monthly Progress Report*:

- *Water Column Profiling of ESC CMP Vd* in January 2017;
- *Routine Water Quality Monitoring of ESC CMPs* in January 2017; and
- *Cumulative Impact Sediment Chemistry of ESC CMPs* in December 2016.

1.5.2 *Water Column Profiling of ESC CMP Vd - January 2017*

1.5.3 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 3 January 2017. The monitoring results have been assessed for compliance with the Water Quality Objectives (WQOs) set by Environmental Protection Department (EPD). This consists of a review of the EPD routine water quality monitoring data for the dry season period (November to March) of 2006 - 2015 from stations in the Northwestern Water Control Zone (WCZ), where the ESC CMPs are located ⁽¹⁾. For Salinity, the averaged value obtained from the Reference (Upstream) station was used for the basis as the WQO. Levels of Dissolved Oxygen (DO) and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table B1 of Annex B* for details).

In-situ Measurements

1.5.4 Analyses of results for January 2017 indicated that levels of DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table B2 of Annex B*). In addition, DO and Turbidity at all stations complied with the Action and Limit Levels (*Tables B1 and B2 of Annex B*).

Laboratory Measurements for Suspended Solids (SS)

1.5.5 Analyses of results for January 2017 indicated that the SS levels complied with the WQO at both Upstream and Downstream stations. In addition, SS levels for both Upstream and Downstream stations complied with the Action and Limit Levels (*Tables B1 and B2 of Annex B*).

1.5.6 Overall, the monitoring results indicated that the mud disposal operation at ESC CMP Vd did not appear to cause any deterioration in water quality during this reporting period.

⁽¹⁾ <http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en>

1.5.7 ***Routine Water Quality Monitoring of ESC CMPs – January 2017***

1.5.8 *Routine Water Quality Monitoring of ESC CMPs* was undertaken on 5 January 2017. The monitoring results have been assessed for compliance with the WQOs (see *Section 1.5.3* for details). The monitoring results are shown in *Tables B3 and B4 of Annex B* and *Figures 1 - 10 of Annex C*. A total of ten (10) monitoring stations were sampled in January 2017 as shown in *Figure 1.2*.

In-situ Measurements

1.5.9 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in *Figures 1 - 6 of Annex C*. Analyses of results for January 2017 indicated that the levels of pH, Salinity and DO complied with the WQOs at all stations (Impact, Intermediate, Reference and Ma Wan stations) in January 2017 (*Table B3 of Annex B; Figures 1, 3 and 5 of Annex C*).

1.5.10 The levels of DO and Turbidity complied with the Action and Limit Levels at all stations (*Table B3 of Annex B; Figures 3 and 6 of Annex C*).

1.5.11 Overall, *in-situ* measurement results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable impacts in water quality in January 2017.

Laboratory Measurements

1.5.12 Laboratory analysis of January 2017 results indicated that concentrations of Cadmium, Chromium, Lead, Silver and Mercury were below their limit of reporting at all stations. Arsenic, Nickel, Copper and Zinc were detected in January 2017 samples and the concentrations of these metals and metalloids were similar amongst stations (*Table B4 of Annex B; Figure 7 of Annex C*).

1.5.13 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at Reference and Intermediate stations in January 2017 were higher than the WQO (0.5 mg/L) (*Table B4 of Annex B; Figure 8 of Annex C*). It should be noted that due to the effect of Pearl River, the North Western WCZ has historically experienced higher levels of TIN⁽¹⁾. Therefore, the exceedances of TIN WQO at these stations are unlikely to be caused by the disposal operation at ESC CMP Vd. Concentrations of Ammonia Nitrogen (NH₃-N) were relatively similar amongst all stations (*Table B4 of Annex B; Figure 8 of Annex C*). Levels of 5-day Biochemical Oxygen Demand (BOD₅) appear to be higher at Impact stations in January 2017 (*Table B4 of Annex B; Figure 9 of Annex C*).

1.5.14 Analyses of results for January 2017 indicated that the SS levels at Reference stations were higher than the WQO (13.2 mg/L for dry season), however SS levels at all stations complied with the Action and Limit Levels (*Tables B1 and B4 of Annex B; Figure 10 of Annex C*).

⁽¹⁾ http://www.epd.gov.hk/epd/misc/marine_quality/1986-2005/textonly/eng/index.htm

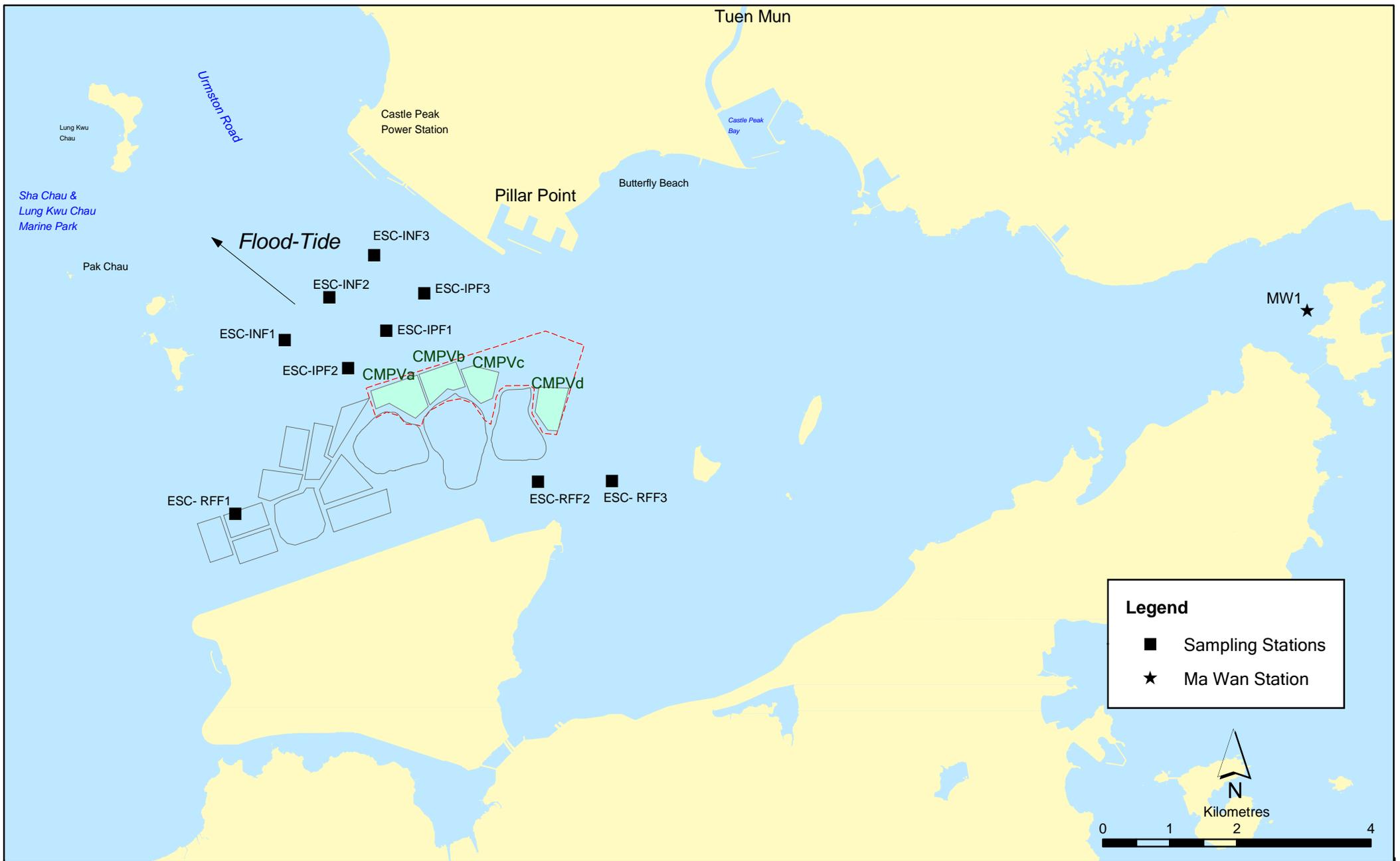


Figure 1.2

Routine & Capping Water Quality Sampling Stations (Flood-Tide) for CMPV

File: CMPV\0103262_R_C_WQMS_flood.mxd
Date: 29/10/2009

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- 1.5.15 Overall, results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality in January 2017. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.
- 1.5.16 ***Cumulative Impact Sediment Chemistry of ESC CMPs – December 2016***
- 1.5.17 Monitoring locations for *Cumulative Impact Sediment Chemistry for ESC CMPs* are shown in *Figure 1.3*. A total of nine (9) monitoring stations were sampled in December 2016.
- 1.5.18 Analyses of results for the *Cumulative Impact Sediment Chemistry Monitoring* indicated that the concentrations of all inorganic contaminants were below the Lower Chemical Exceedance Level (LCEL) in December 2016 (*Figures 11 and 12 of Annex C*).
- 1.5.19 For organic contaminants, concentrations of Total Organic Carbon (TOC) were observed to be similar amongst all stations (*Figure 13 of Annex C*). Concentrations of Tributyltin (TBT) were recorded to be higher at Ma Wan station (*Figure 14 of Annex C*). Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyl-trichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) concentrations were recorded below the limit of reporting at all stations.
- 1.5.20 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vd in December 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.6.1 The following monitoring activities will be conducted in the next monthly period of February 2017 for ESC CMPs:

- *Water Column Profiling of ESC CMP Vd;*
- *Routine Water Quality Monitoring of ESC CMPs;*
- *Cumulative Impact Sediment Chemistry of ESC CMPs;*
- *Pit Specific Sediment Chemistry of ESC CMP Vd₂*
- *Sediment Toxicity Test of ESC CMPs; and*
- *Demersal Trawling of ESC CMPs.*



Figure 1.3

Cumulative Impacts Sediment Quality Monitoring Stations for CMPV

File: 0103262_SQMS_cum impact.mxd
Date: 29/10/2009

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- 1.6.2 No monitoring activities are scheduled in the next monthly period of February 2017 for SB 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
Benthic Recolonisation Studies																																											
Capped Contaminated Mud Pits IVa-c					*								*			*							*			*						*			*								
	ESC-CPA				*								*			*							*			*						*			*								
	ESC-CPB				*								*			*							*			*						*			*								
	ESC-CPC				*								*			*							*			*						*			*								
Reference Stations																																											
	ESC-RBA				*								*			*							*			*					*			*									
	ESC-RBB				*								*			*							*			*					*			*									
	ESC-RBC				*								*			*							*			*					*			*									
Impact Monitoring for Dredging																																											
Upstream/Reference Stations																																											
	US1	*	*	*	*	*	*	*	*	*														*	*	*	*	*	*				*	*	*								
	US2	*	*	*	*	*	*	*	*	*														*	*	*	*	*	*				*	*	*								
Downstream/Impact Stations																																											
	DS1	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
	DS2	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
	DS3	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
	DS4	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
	DS5	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
Ma Wan Station																																											
	MW1	*	*	*	*	*	*	*	*	*													*	*	*	*	*	*				*	*	*									
Capping																																											
Ebb Tide																																											
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												*	*		*	*					*	*		*	*				*	*		*	*									
Flood Tide																																											
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 *Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities at ESC CMPs*

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) ⁽¹⁾	<u>Surface and Mid-depth</u> ⁽²⁾ 5%-ile of baseline data for surface and middle layer = 3.76 mg L⁻¹	<u>Surface and Mid-depth</u> ⁽²⁾ 1%-ile of baseline data for surface and middle layer = 3.11 mg L⁻¹ ⁽³⁾
	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> 5%-ile of baseline data for bottom layers = 2.96 mg L⁻¹	<u>Bottom</u> The average of the impact station 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) ⁽⁴⁾⁽⁵⁾	95%-ile of baseline data for depth average = 37.88 mg L⁻¹	99%-ile of baseline data for depth average = 61.92 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) ⁽⁴⁾⁽⁵⁾	95%-ile of baseline data = 28.14 NTU	99%-ile of baseline data = 38.32 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) Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L⁻¹, it is proposed to set the Limit Level at 3.11 mg L⁻¹ which is the first percentile of the baseline data.
- (4) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- (5) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table B2 *Water Column Profiling Results for ESC CMP Vd in January 2017*

Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen		pH	Suspended Solids
				(%)	(mg L ⁻¹)	(mg L ⁻¹)	(mg L ⁻¹)
WCP 1 (Downstream)	19.99	29.32	8.28	108.03	8.26	8.18	6.63
WCP 2 (Upstream)	20.04	29.45	6.30	109.19	8.34	8.17	6.95
WQO (Dry season)	N/A	26.51 – 32.40 [#]	N/A	N/A	>4	6.5-8.5	13.2

Note:
[#]Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
 Cell shaded yellow / red indicate value exceeding the Action/Limit levels.
 Cell shaded grey indicate value exceeding the WQO.

Table B3 *In-situ Monitoring Results for Routine Water Quality Monitoring of ESC CMPs in January 2017*

Sampling Period	Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen		pH
					(%)	(mg L ⁻¹)	(mg L ⁻¹)
January 2017	RFF (Reference)	20.28	28.32	8.45	106.66	8.16	8.15
	IPF (Impact)	20.32	28.38	5.16	107.08	8.19	8.12
	INF (Intermediate)	20.35	27.85	3.97	107.58	8.25	8.01
	Ma Wan	20.24	29.22	3.27	103.66	7.89	8.12
	WQO	N/A	25.49 – 31.15 [#]	N/A	N/A	>4	6.5-8.5

Notes:
[#]Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
 Cell shaded yellow / red indicate value exceeding the Action/Limit levels.
 Cell shaded grey indicate value exceeding the WQO.

Table B4 *Laboratory Results for Routine Water Quality Monitoring of ESC CMPs in January 2017*

Sampling Period	Stations	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Pb (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	NH ₃ (mg/L)	TIN (mg/L)	BOD ₅ (mg/L)	SS (mg/L)
January 2017	RFF	2.21	<LOR	<LOR	0.87	<LOR	<LOR	0.67	<LOR	8.68	0.14	0.53	1.53	14.97
	IPF	1.85	<LOR	<LOR	0.88	<LOR	<LOR	0.99	<LOR	9.76	0.12	0.50	3.26	8.65
	INF	2.56	<LOR	7.80	0.14	0.59	2.00	8.78						
	Ma Wan	2.49	<LOR	6.79	0.13	0.40	2.49	5.33						

WQO of TIN: 0.5 mg/L
 Dry Season WQO of SS : 13.2 mg/L

Notes:
 Cell shaded yellow / red indicate value exceeding the Action/Limit levels.
 Cell shaded grey indicate value exceeding the WQO.

Annex C

Graphical Presentations

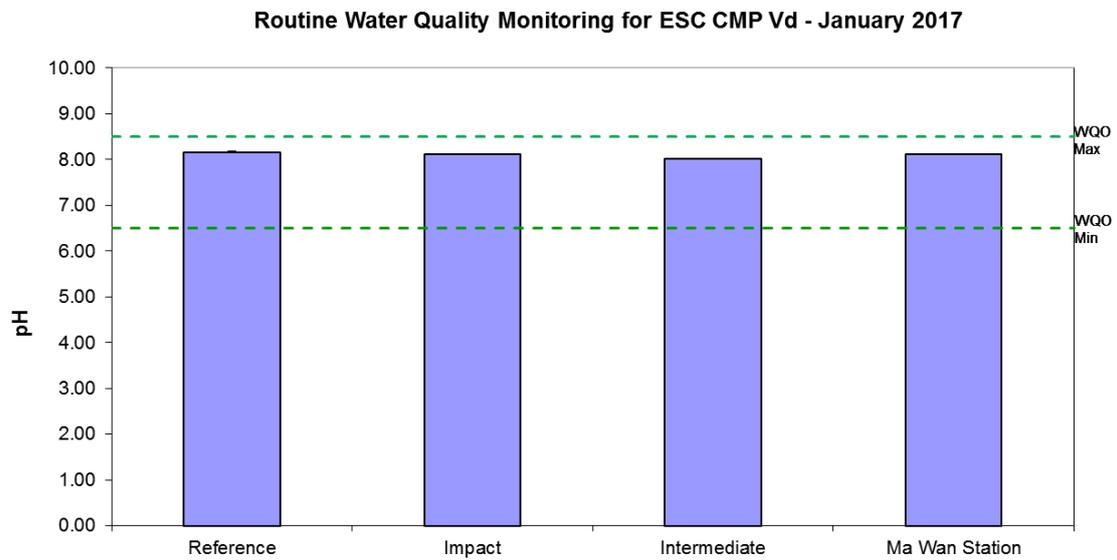


Figure 1: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

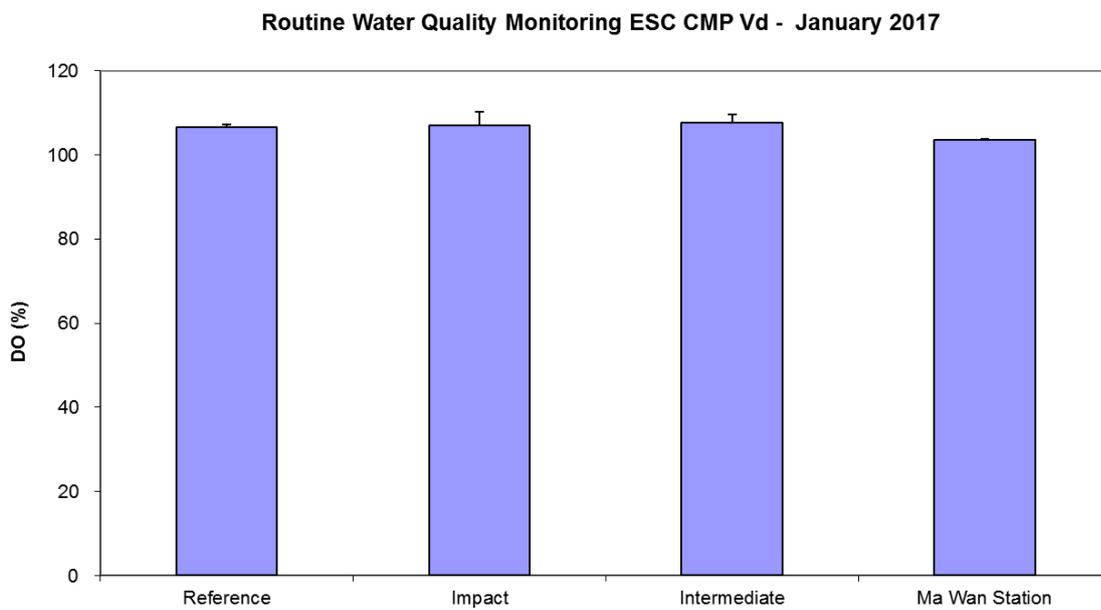


Figure 2: Level of Dissolved Oxygen (DO) (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

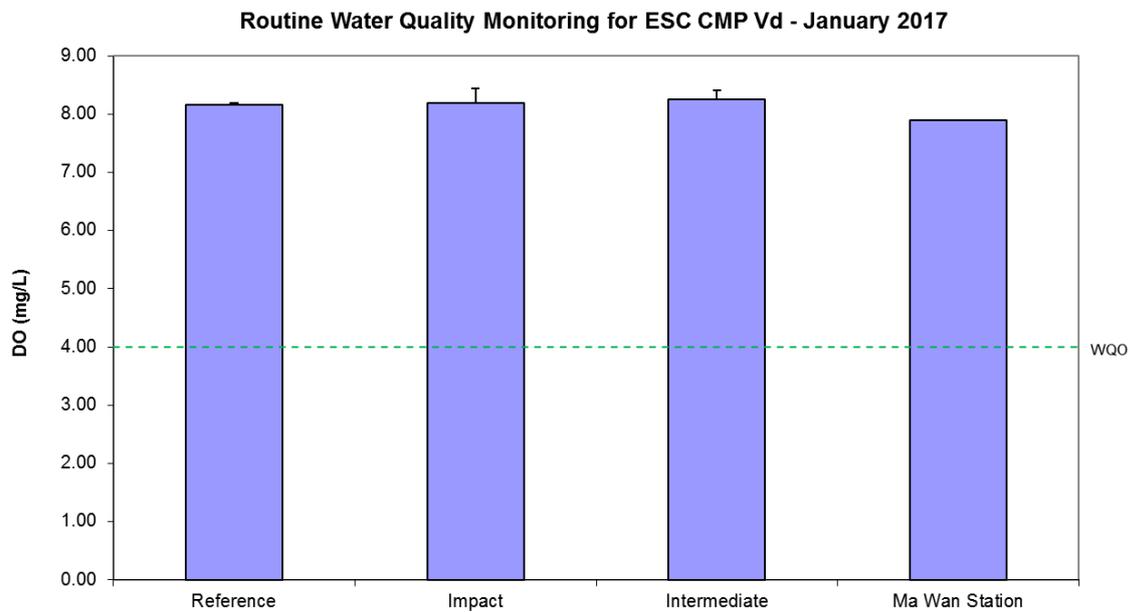


Figure 3: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

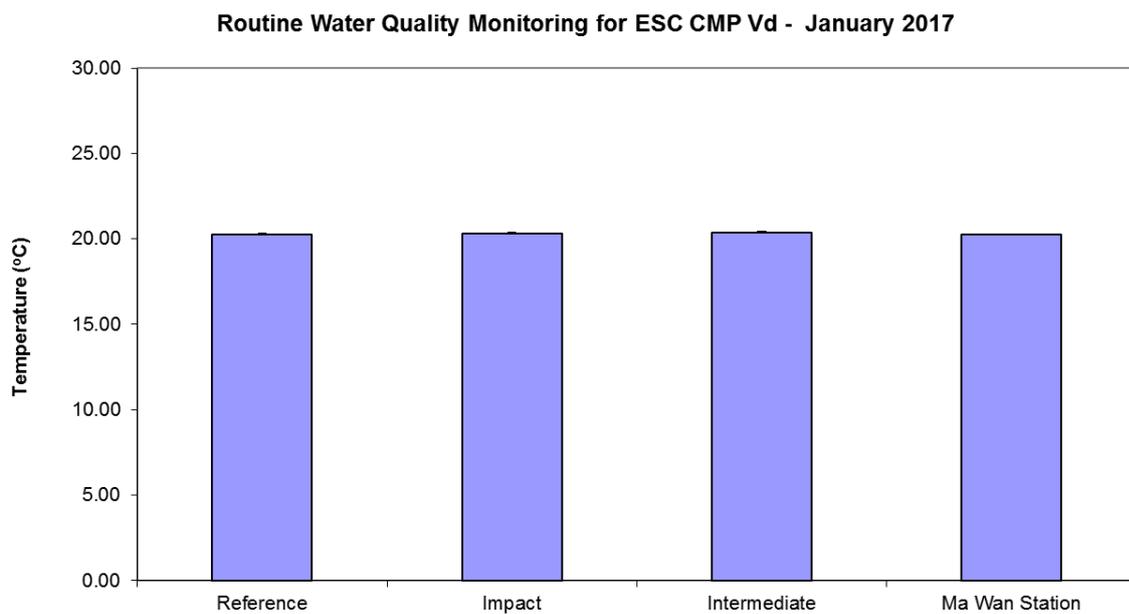


Figure 4: Level of Temperature (°C; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

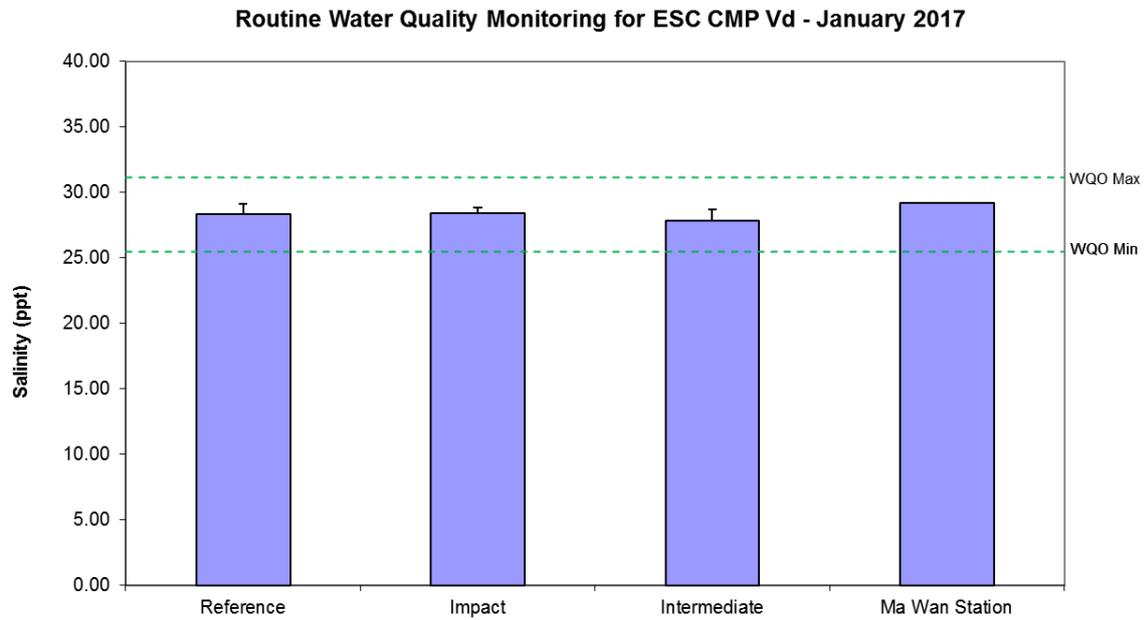


Figure 5: Level of Salinity (ppt; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

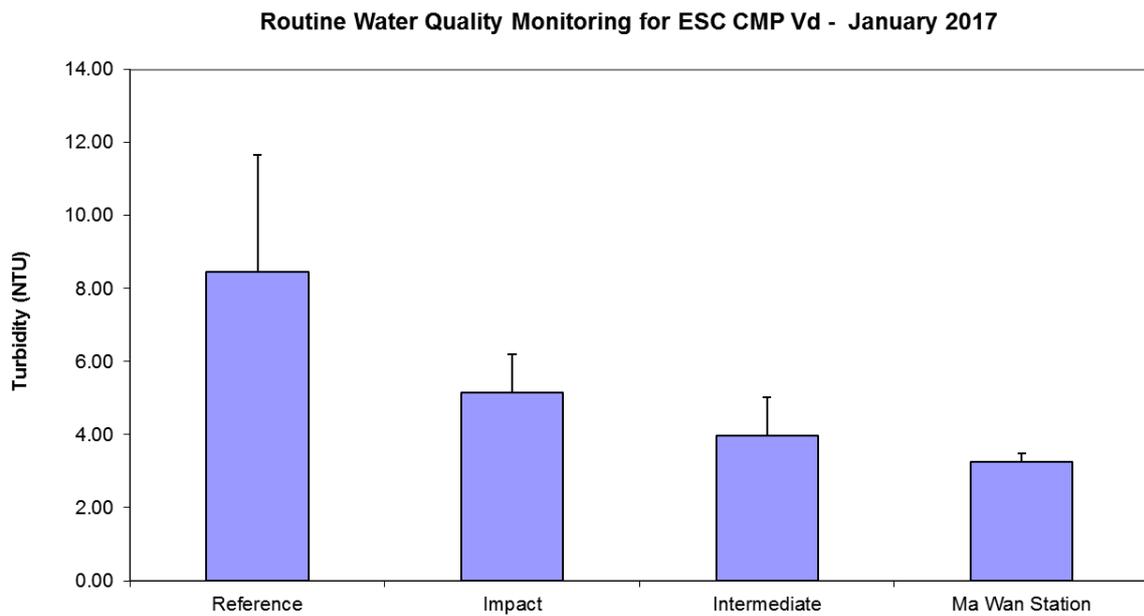


Figure 6: Levels of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

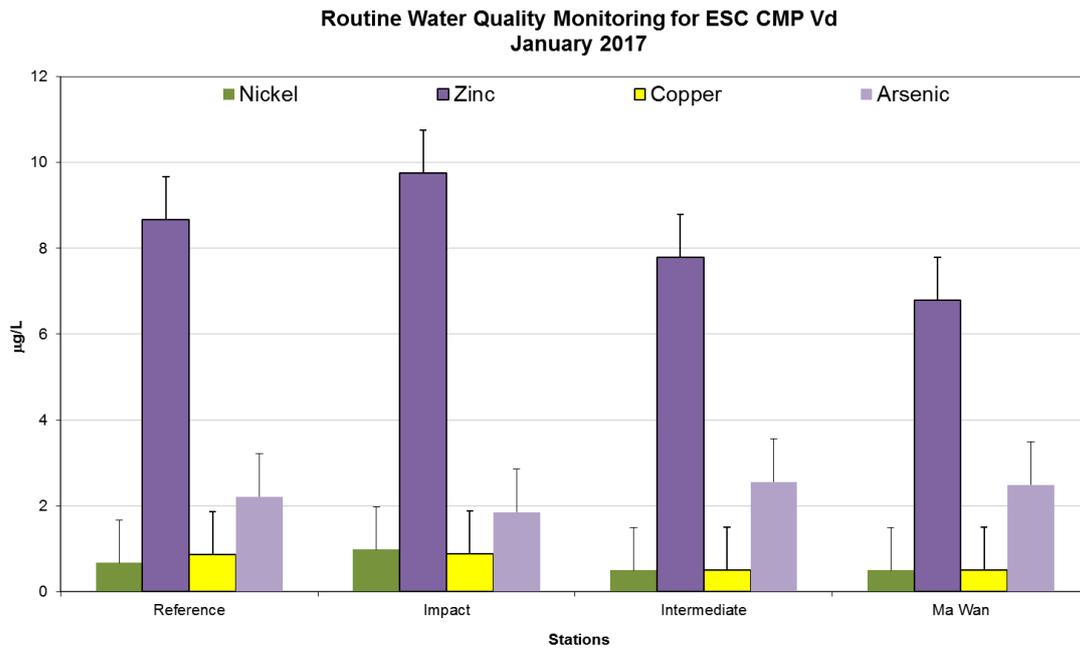


Figure 7: Concentration of Copper, Zinc, Arsenic and Nickel ($\mu\text{g/L}$; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

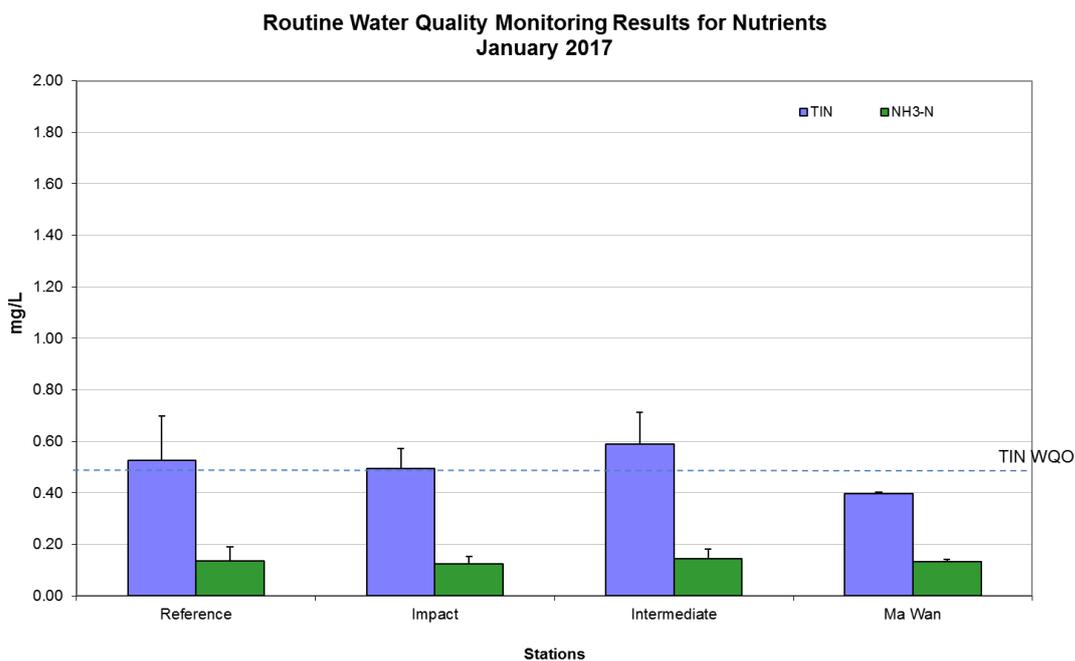


Figure 8: Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen (NH₃-N) ($\mu\text{g/L}$; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

**Routine Water Quality Monitoring Results for Biochemical Oxygen Demand (BOD₅)
January 2017**

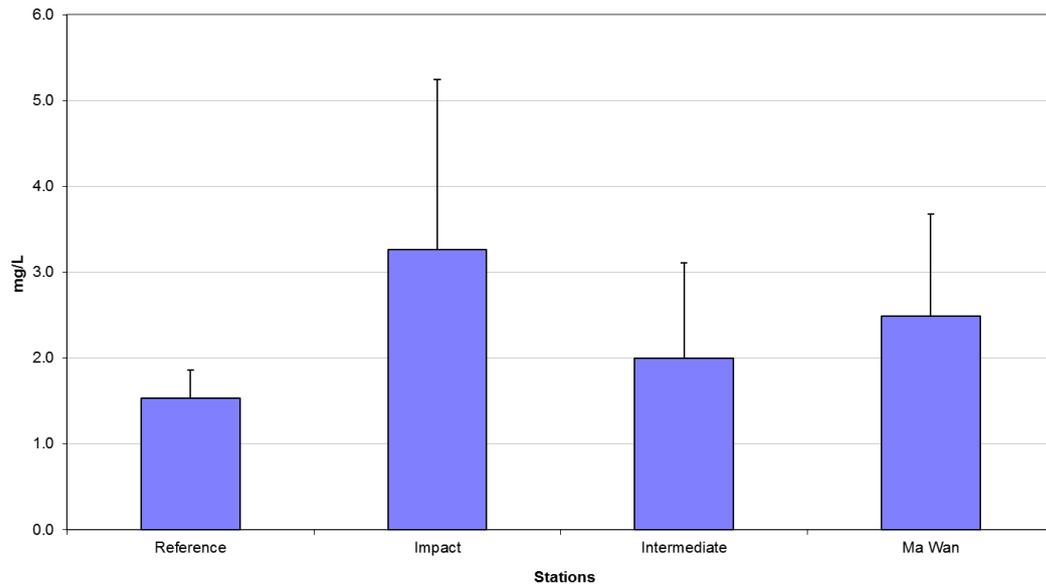


Figure 9: Level of Biochemical Oxygen Demand (BOD₅) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

**Routine Water Quality Monitoring for Suspended Solids
January 2017**

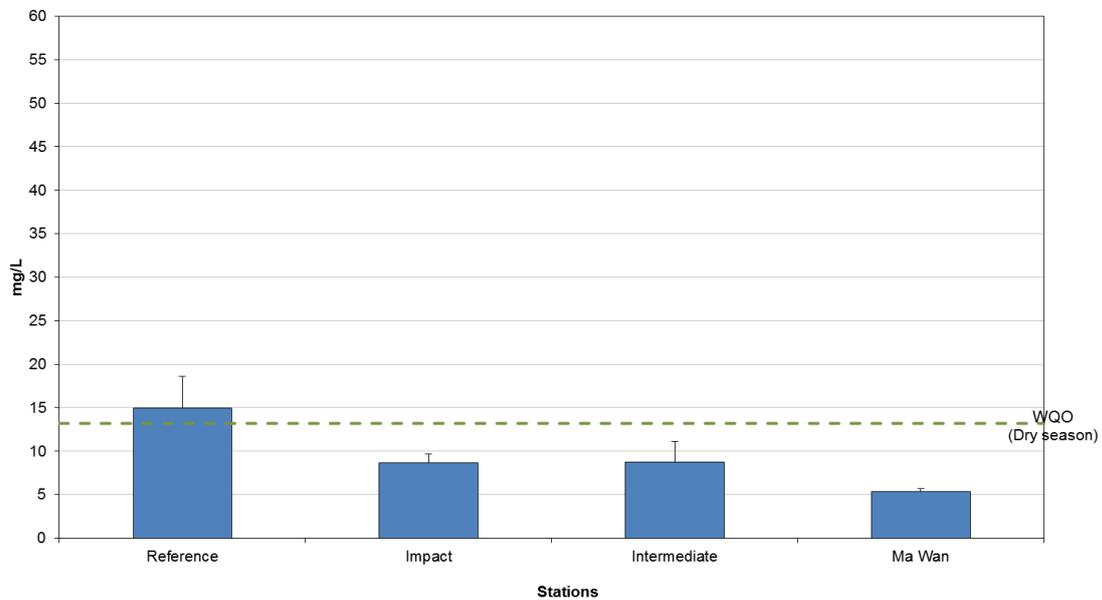


Figure 10: Concentration of Suspended Solids (SS) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in January 2017.

Source: H:\Team\EM\GMS Projects\0175086 CEDD EM&A for South Brothers\02 Deliverable\07 CMP Monthly Report\53rd (January 2017)

Date: February 2017

**Environmental
Resources
Management**



**Cumulative Impact Sediment Chemistry for Metal and Metalloid Contaminants at ESC CMPs
December 2016**

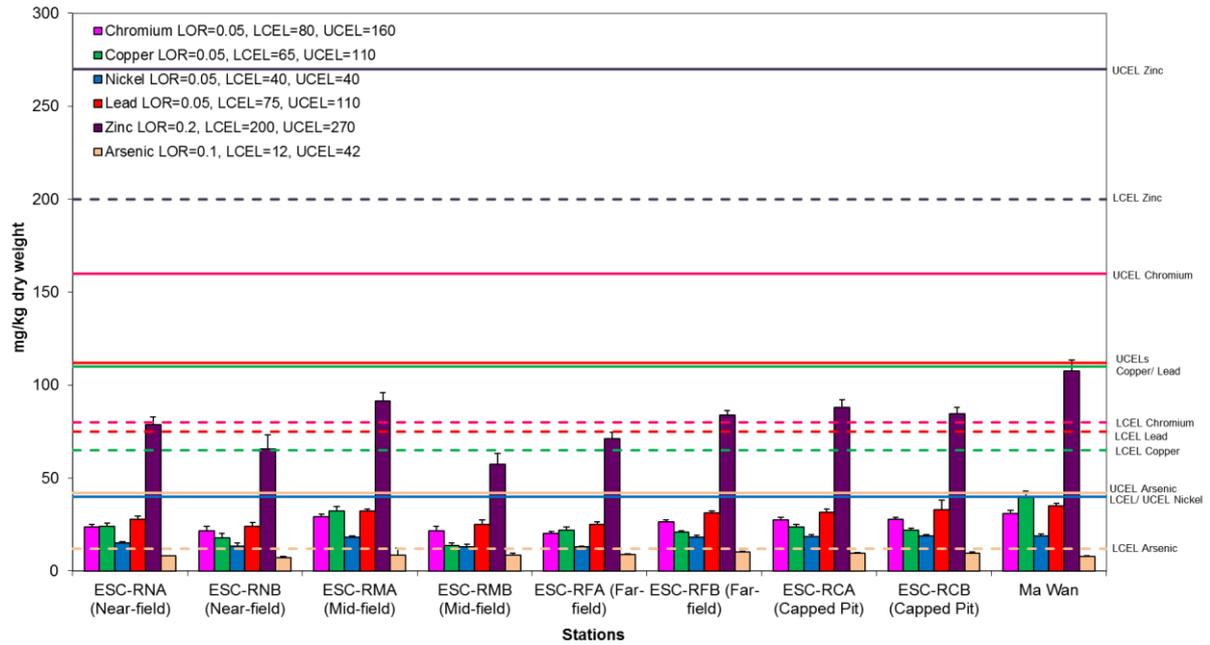


Figure 11: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMPs in December 2016.

**Cumulative Impact Sediment Chemistry for Metal Contaminants at ESC CMPs
December 2016**

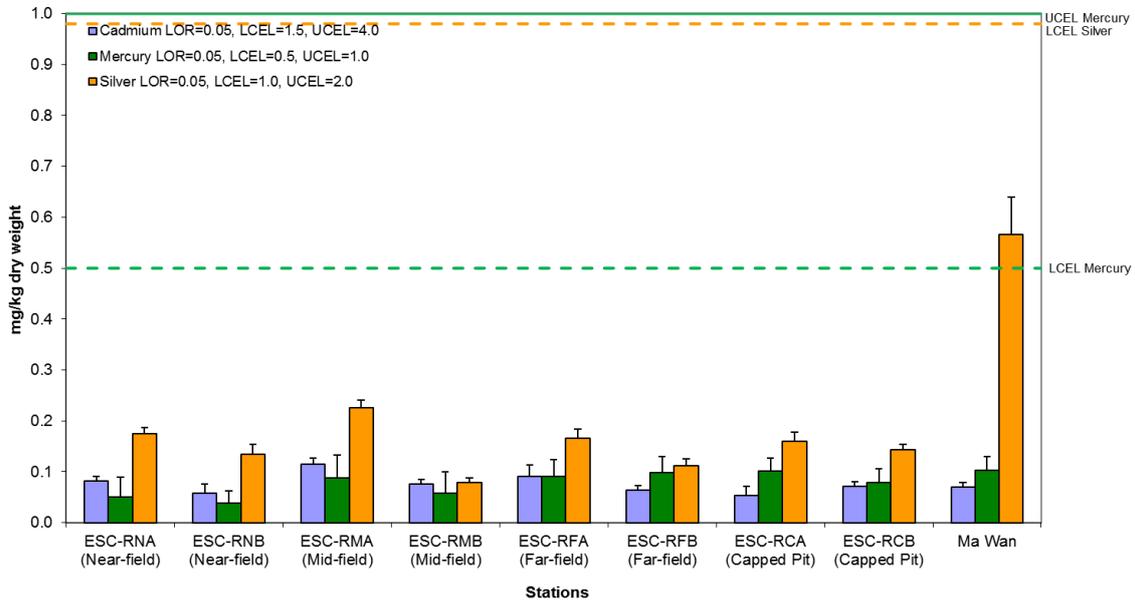


Figure 12: Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMPs in December 2016.

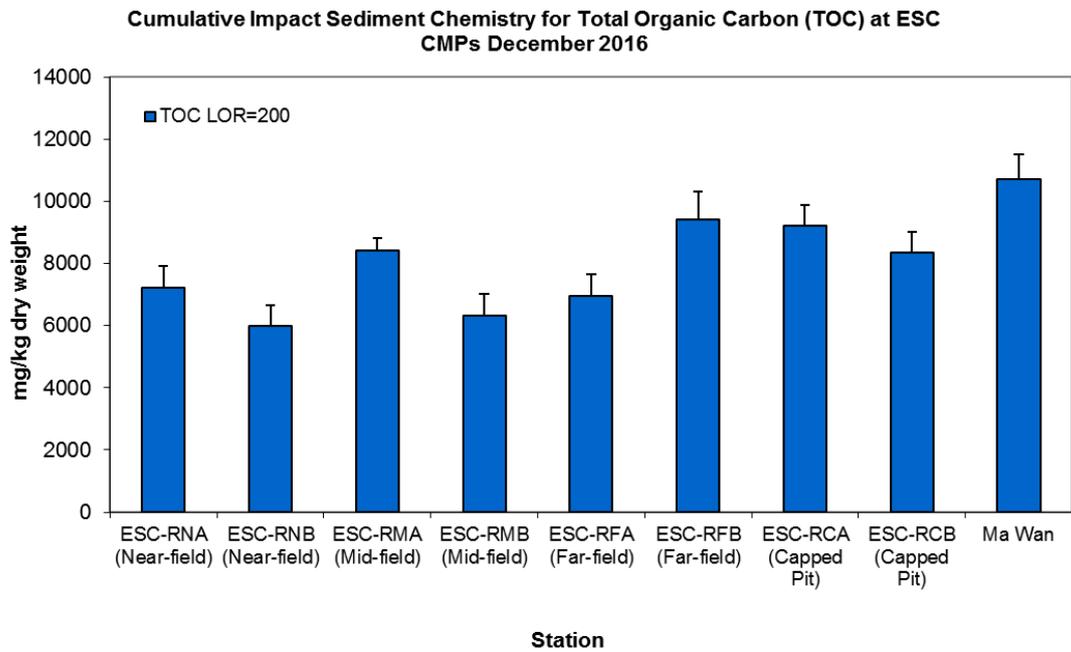


Figure 13: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMPs in December 2016.

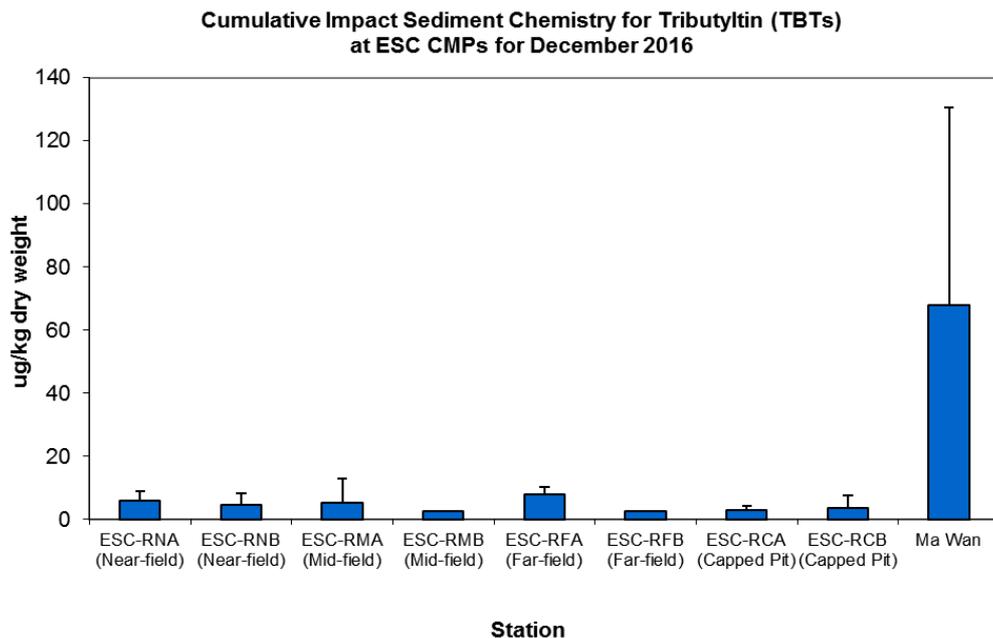


Figure 14: Concentration of Tributyltin ($\mu\text{g TBT/kg}$; mean +SD) in sediment samples collected from Cumulative Impact Sediment Chemistry Monitoring for ESC CMPs in December 2016.

Annex D

Study Programme

