

- Investigation

Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – January 2022

February 2022

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Agreement No. CE 59/2020 (EP) Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2021-2026) – Investigation

Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – January 2022

February 2022





Dredging, Management and Capping of Contaminated Sediment Disposal

Facility at Sha Chau

Environmental Certification Sheet

Environmental Permit No. EP-312/2008/A

Reference Document /Plan

Document/Plan to be Certified/ Verified:

Monthly EM&A Report for Contaminated Mud Pits to the

East of Sha Chau - January 2022

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Environmental Permit Condition:

Condition 3.4 of EP-312/2008/A:

4 hard copies and 1 electronic copy of monthly EM&A Report shall be submitted to the Director within 10 working days 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 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.

Mum Clin

Ir Thomas Chan,

Environmental Team Leader (ETL): /

Date: 10 February 2022

IA Verification

I hereby verify that the above referenced document/plan complies with the above referenced condition of EP-312/2008/A.

Dr Wang Wen Xiong, Independent Auditor (IA):

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Date: 10 February 2022

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1 Introduction

1.1 Background

The Civil Engineering and Development Department (CEDD) is managing a number of marine disposal facilities in Hong Kong waters, including the Contaminated Mud Pits (CMPs) to the East of Sha Chau (ESC) for the disposal of contaminated sediment, and various open-sea disposal grounds located to the South of Cheung Chau (SCC), East of Tung Lung Chau (ETLC) and East of Ninepins (ENP) for the disposal of uncontaminated sediment.

Environmental Permits (EPs) (Ref. No. EP-312/2008/A) was issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 for the Project - Disposal of Contaminated Sediment – Dredging, Management and Capping of Sediment Disposal Facility at Sha Chau.

Under the requirements of the EP, EM&A programmes which encompass water and sediment chemistry, fisheries assessment, tissue and whole body analysis, sediment toxicity and benthic recolonisation studies as set out in the EM&A Manuals are required to be implemented. EM&A programmes have been continuously carried out during the operation of the CMPs at ESC. A review of the collection and analysis of such environmental data from the monitoring programme demonstrated that there had not been any adverse environmental impacts resulting from disposal activities. The current programme will assess the impacts resulting from dredging, disposal and capping operations of CMP V.

A proposal on the change of number of sample replication of water quality and sediment monitoring as well as combination of routine water quality monitoring and water quality monitoring during capping operation was submitted to EPD and agreed by EPD on 3 December 2020. The proposed changes have been effective for the EM&A activities since December 2020. The latest sampling schedule is provided in **Appendix A**.

The present EM&A programme under Agreement No. CE 59/2020 (EP) covers the dredging, disposal and capping operations of the ESC CMP V (see **Appendix A** for the EM&A programme.) Detailed works schedule for ESC CMP V is shown in **Table 1.1**. In January 2022, the following works were undertaken:

- Disposal of contaminated mud at ESC CMP Vb; and
- Capping operations at ESC CMP Vd.

Table 1.1: Works Schedule for ESC CMP V



¹ ERM (2013) Final Report. Submitted under Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pit at East Sha Chau. For CEDD.

² ERM (2017) Final Report. Submitted under 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). For CEDD.

1.2 Reporting Period

This Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – January 2022 covers the EM&A activities for the reporting period of January 2022 (from 1 to 31 January 2022).

1.3 Details of Sampling and Laboratory Testing Activities

The following monitoring activities were undertaken for ESC CMP V during the reporting period:

- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs;
- Pit Specific Sediment Chemistry of ESC CMP Vb; and
- Demersal Trawling for ESC CMPs.

1.4 Details of Outstanding Sampling or Analysis

No outstanding sampling remained for the reporting month (January 2022). The following analyses are in progress and will be presented in the corresponding quarterly report:

 Species identification of the biota samples collection from Demersal Trawling for ESC CMPs in January 2022.

2 Brief Discussion of Monitoring Results for ESC CMP V

2.1 Introduction

This section presents a brief discussion of the results obtained from the following monitoring activities for ESC CMP V during the reporting period:

- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs; and
- Pit Specific Sediment Chemistry of ESC CMP Vb.

2.2 Water Column Profiling of ESC CMP Vb – in January 2022

Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 11 January 2022. 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 2011 – 2020 from stations in the North Western Water Control Zone (WCZ), where the ESC CMPs are located.³ 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 **Appendix B** for details).

2.2.1 In-situ Measurements

Analyses of results for January 2022 indicated that levels of Salinity, pH and DO complied with the WQOs at both Downstream and Upstream stations (**Table B2** of **Appendix B**). Levels of DO and Turbidity at all stations complied with the Action and Limit Levels (**Tables B1 and B2** of **Appendix B**).

2.2.2 Laboratory Measurements for Suspended Solids (SS)

Analyses of results for January 2022 indicated that the SS level at both Downstream and Upstream stations complied with the WQO and the Action and Limit Levels (**Tables B1 and B2** of **Appendix B**).

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

2.3 Routine Water Quality Monitoring of ESC CMPs – in January 2022

Routine Water Quality Monitoring of ESC CMPs was undertaken on 6 January 2022. The monitoring results have been assessed for compliance with the WQOs (see **Section 2.2** above for details). The monitoring results are shown in **Tables B3 and B4** of **Appendix B** and **Figures 1 to 10** of **Appendix C**. A total of ten (10) monitoring stations were sampled in January 2022 as shown in **Figure 2.1**.

³ http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en

2.3.1 In-situ Measurements

Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in **Figures 1 to 6** of **Appendix C**. Analyses of results indicated that the levels of pH, Salinity and DO complied with the WQOs at all stations in January 2022.

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

Overall, in-situ measurement results of the Routine Water Quality Monitoring indicated that the disposal and capping operation at ESC CMPs did not appear to cause any unacceptable impacts in water quality in January 2022.

2.3.2 Laboratory Measurements

Laboratory analysis of samples obtained during the reporting period indicated that the concentrations of Arsenic, Copper, Lead, Nickel and Zinc were detected in the samples at some/all stations and their concentrations of most metals and metalloids were generally similar across stations, except the concentrations of Lead and Zinc which were lower at Impact (IPF) station (**Table B4** of **Appendix B**; **Figure 7** of **Appendix C**).

For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at all stations complied with the WQO (0.5 mg/L) (**Table B4** of **Appendix B**; **Figure 8** of **Appendix C**). The concentration of Ammonia Nitrogen (NH₃-N) was higher at Intermediate (INF) station (**Table B4** of **Appendix B**; **Figure 8** of **Appendix C**). The concentration of Biochemical Oxygen Demand (BOD₅) were lower at Impact (IPF) station (**Table B4** of **Appendix B**; **Figure 9** of **Appendix C**).

Analyses of results for the reporting period indicated that the SS levels at Reference (RFF), Impact (IPF), Intermediate (INF) and Ma Wan stations were above the dry season WQO (13.1 mg/L) but in compliance with the Action and Limit Levels (**Tables B1 and B4** of **Appendix B**; **Figure 10** of **Appendix C**).

Overall, results of the Routine Water Quality Monitoring indicated that the disposal and capping operation at ESC CMPs did not appear to cause any unacceptable deterioration in water quality during the reporting period. Detailed statistical analysis will be presented in the Quarterly EM&A Report to investigate any spatial and temporal trends of potential concern.

2.4 Pit Specific Sediment Chemistry of ESC CMP Vb – in January 2022

Monitoring locations for Pit Specific Sediment Chemistry for ESC CMP Vb are shown in **Figure 2.2**. A total of six (6) monitoring stations were sampled on 4 January 2022.

The concentrations of all inorganic contaminants were lower than the Lower Chemical Exceedance Levels (LCELs) at all stations (**Figures 11 and 12** of **Appendix C**).

For organic contaminants, the concentration of Total Organic Carbon (TOC) was higher at Pit-Edge station ESC-NECA during the reporting period (**Figure 13** of **Appendix C**). The concentrations of Low Molecular Weight and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) were lower than the LECLs at all stations (**Figure 14** of **Appendix C**). The concentrations of Tributyltin (TBT) were higher at Near-Pit station ESC-NNCA, Pit-Edge station ESC-NECB and Active-Pit station ESC-NPCA (**Figure 15** of **Appendix C**). The concentrations of Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyl-trichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) were below the limit of reporting at all stations during the reporting period.

Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality outside the pit area as a result of the contaminated mud disposal operations at ESC CMP Vb during the reporting period.

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Statistical analysis will be undertaken and presented in the corresponding Quarterly EM&A Report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

3 Future Key Issues

3.1 Activities Scheduled for the Next Reporting Period

The following monitoring activities will be conducted in the next reporting period of February 2022 for ESC CMP V (see **Appendix A** for the sampling schedule):

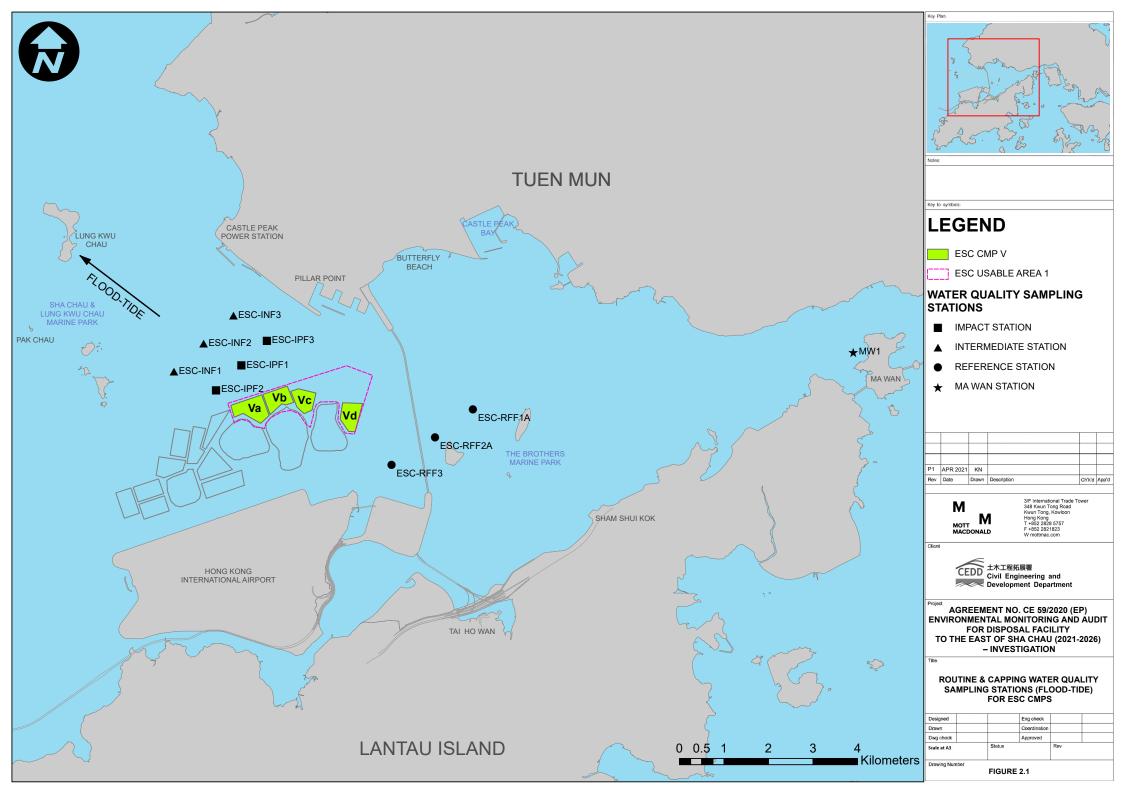
- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs;
- Pit Specific Sediment Chemistry of ESC CMP Vb;
- · Cumulative Impact Sediment Chemistry of ESC CMPs; and
- Demersal Trawling for ESC CMPs.

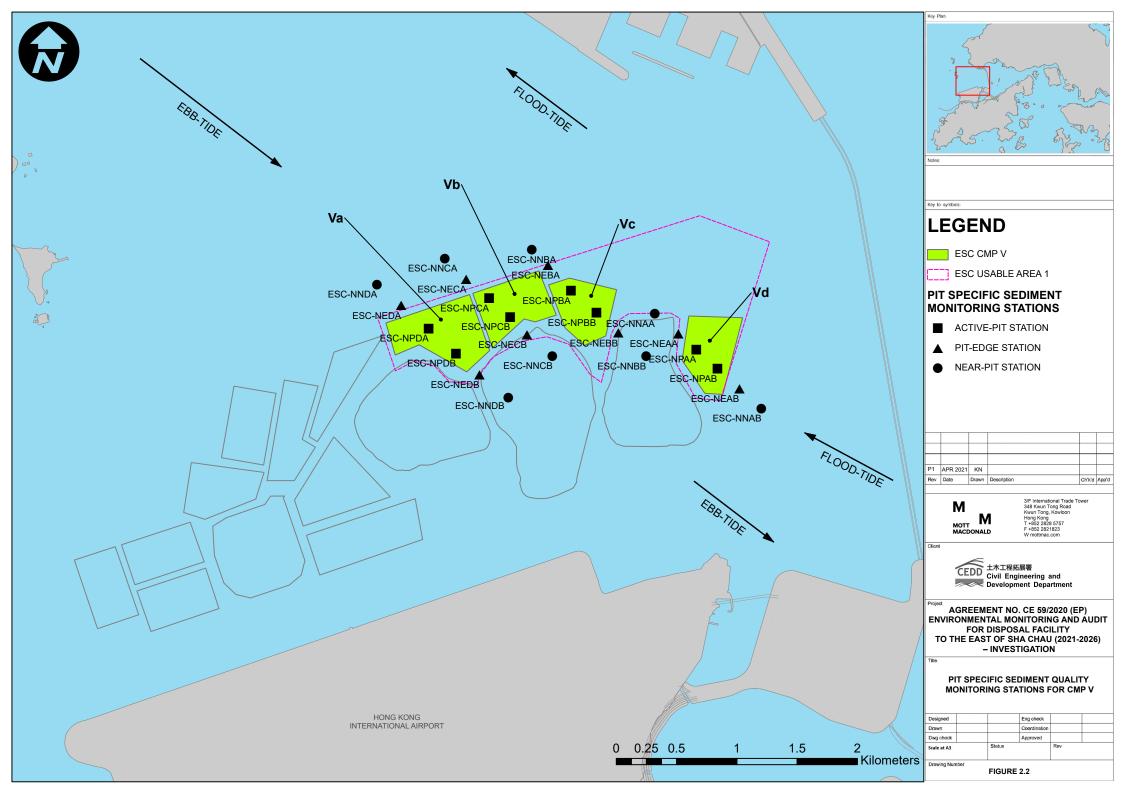
Due to the logistic problem induced by the pandemic which adversely affecting the supply of international species adopted in testing programme of Sediment Toxicity tests, as such, Sediment Toxicity Tests of ESC CMPs originally scheduled in February 2022 will be tentatively postponed to March 2022 (subject to logistic conditions at that time).

3.2 Study Programme

A summary of the Study Programme is presented in **Appendix D**.

Figures





Appendices

Appendix A Sampling Schedule

Appendix B Water Quality Monitoring Results

Appendix C Graphical Presentations

Appendix D Study Programme

Appendix A. Sampling Schedule

East of Sha Chau CMPs Environmental Monitoring and Audit Sampling Schedule (January 2021 - March 2026)

			(January 2021 - March 2026)	
Parameter / Station Type Pit Specific Sediment Ch		Frequency	2021 2022 2023 2024 2025 2025 2024 2025 2025 2025 2024 2025 2025	2026 v Dec Jan Feb Mar
Active-Pit	ESC-NPAA ESC-NPAB	Monthly Monthly	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	
Pit-Edge	ESC-NEAA ESC-NEAB	Monthly Monthly	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6
Near-Pit	ESC-NNAA	Monthly	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6
Cumulative Impact Sedia	ESC-NNAB	Monthly	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	
Near-field Stations	ESC-RNA	4 times per year	6 6 6 6 6 6 6 6 6 6 6 6	6 6
Mid-field Stations	ESC-RNB1	4 times per year 4 times per year	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6
Capped Pit Stations	ESC-RMB ESC-RCA1	4 times per year		6 6
Far-field Stations	ESC-RCB1	4 times per year	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6
Ma Wan Station	ESC-RFB	4 times per year	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6
Sediment Toxicity Tests	MW1	4 times per year	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6 6 6
Near-pit Stations	ESC-TDA	2 times per year	5 5 5 5 5 5 5	5
Reference Stations	ESC-TDB1	2 times per year 2 times per year	5	5
Ma Wan Station	ESC-TRB	2 times per year	5 5 5 5 5 5 5	5
Tissue / Whole Body Sar	MW1	2 times per year	5 5 5 5 5 5 5 5 5 5	V Dec Jan Feb Mar
Near-pit Stations	ESC-INA	2 times per year		*
Reference North	ESC-INB TNA	2 times per year 2 times per year		*
Reference South	TNB	2 times per year 2 times per year		*
Domoreal Traviling	TSB	2 times per year	In Sah Mari And Mari Ing Ind And San Ord New Dac Ing Sah Mari And Mari Ing Ind And San Ord New Dac Ing Sah Mari And Mari Ing Ind And San Ord New Dac Ing Sah Mari And Mari Ing Ind And San Ord New Dac Ing Sah Mari And Mari Ing Ind And San Ord New Dac Ing San Ord New Dac Ing Sah Mari And Mari Ing Ind Ing San Ord New Dac Ing Sah Mari And Mari Ing Ind Ing San Ord New Dac Ing Sah Mari And Mari Ing Ind Ing San Ord New Dac Ing Sah Mari Ing Ind Ing San Ord New Dac Ing Sah Mari Ing Ind Ing San Ord New Dac Ing S	* Dec Jan Feb Mar
Demersal Trawling Near-pit Stations	ESC-INA	4 times per year	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Au	5 5
Reference North	ESC-INB TNA	4 times per year	5 5 <th>5 5</th>	5 5
Reference South	TNB	4 times per year	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 5
	TSB	4 times per year	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 5
Capping * Ebb Tide Impact Station Downcur	rent		Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep Oct Nov Dec Jan Apr May Jun Jul Aug Sep	v Dec Jan Feb Mar
	ESC-IPE1A ESC-IPE2A ESC-IPE3	4 times per year * 4 times per year * 4 times per year *		
Intermediate Station Dec	ESC-IPE4 ESC-IPE5	4 times per year * 4 times per year *		
Intermediate Station Dov	ESC-INE1A ESC-INE2A	4 times per year * 4 times per year *		
		4 times per year * 4 times per year * 4 times per year *		
Reference Station Upcur	ESC-RFE1	4 times per year * 4 times per year *		
	ESC-RFE3 ESC-RFE4	4 times per year * 4 times per year *		
Ma Wan Station	ESC-RFE5 MW1	4 times per year * 4 times per year *		
Flood Tide Impact Station Downcur	rent			
	ESC-IPF1 ESC-IPF2 ESC-IPF3	4 times per year * 4 times per year * 4 times per year *		
Intermediate Station Dov	wncurrent ESC-INF1	4 times per year *		
Reference Station Upcur		4 times per year * 4 times per year *		
		4 times per year * 4 times per year * 4 times per year *		
Ma Wan Station	MW1	4 times per year *		
Routine Water Quality M Ebb Tide			Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Au	v Dec Jan Feb Mar
Impact Station Downcur	ESC-IPE1A ESC-IPE2A	Monthly* Monthly*	4 4	
	ESC-IPE3 ESC-IPE4	Monthly* Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4 4 4 4 4
Intermediate Station Dov	ESC-INE1A	Monthly*		4 4 4 4
	ESC-INE2A ESC-INE3A ESC-INE4A	Monthly* Monthly* Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
Reference Station Upcur	rent ESC-RFE1	Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
	ESC-RFE2 ESC-RFE3	Monthly* Monthly*	4 4	4 4 4 4
Ma Wan Station	ESC-RFE4 ESC-RFE5	Monthly* Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
Flood Tide	MW1	Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
Impact Station Downcur	rent ESC-IPF1 ESC-IPF2	Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
Intermediate Station Dov	ESC-IPF3 wncurrent	Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
	ESC-INF1 ESC-INF2 ESC-INF3	Monthly* Monthly* Monthly*	4 4	4 4 4 4
Reference Station Upcur	ESC-RFF1A ESC-RFF2A		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
Ma Wan Station	ESC-RFF3	Monthly*	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 4 4
Water Column Profiling			Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Au	
Plume Stations	WCP1 WCP2	Monthly* Monthly*	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
Benthic Recoloinisation Capped Stations at CMP	Studies		Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Au	
- appea oranons at GMP	ESCV-CPA ESCV-CPB	2 times per year 2 times per year		
Reference Stations	ESCV-CPD	2 times per year 2 times per year		
	RBA RBB RBC1	2 times per year 2 times per year 2 times per year		
Impact Monitoring for Di		oo per year	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Au	v Dec Jan Feb Mar
Upstream Stations	US1 US2	3 times per week 3 times per week		
Downstream Stations	DS1 DS2	3 times per week 3 times per week		
	DS2 DS3 DS4	3 times per week 3 times per week 3 times per week		
Ma Wan Station	DS5 MW1	3 times per week		

Notes:

(1) The number shown in each cell represents the numbers of replicates per monitoring station. The number shown in green bolded text represented monitoring works have been conducted before/ during the reporting period of this Monthly EM&A Report, while the number shown in black represent planned monitoring works after the reporting period of this Monthly EM&A Report.

⁽²⁾ For the planned Routine Water Quality Monitoring (i.e. the numbers of replicates per monitoring station shown in black), the monitoring will be conducted at mid-ebb OR mid-flood tide. The yearly tidal selection of this monitoring will be based on a principle to obtain 6 months monitoring data at mid-ebb, and 6 months monitoring data at mid-flood.

⁽³⁾ Impact Monitoring for Dredging will be scheduled when dredging operations commence.

⁽⁴⁾ Benthic Recolonisation Studies for CMP V will be scheduled when capping operation for CMP V is completed.

⁽⁴⁾ Benthic Recolonisation Studies for CMP V Will be Scrieduled within Capping Operation to CMP V Will be Scrieduled within Capping Operation to CMP V Will be Scrieduled within Capping Operation to CMP V Will be Scrieduled within Capping Operation to CMP V Will be Scrieduled within Capping Operation to CMP V Will be Scrieduled within Capping Operation of water quality Monitoring and water quality monitoring during capping operation was submitted to EPD and agreed by EPD on 3 December 2020. The proposed changes have been implemented for the EM&A activities since December 2020. Water Quality Monitoring during Capping Operation and Routine Water Quality Monitoring are combined such that Routine Water Quality Monitoring have be conducted monthly starting in December 2020. The number of sampling replicates can be further reduced according to Sections 3 and 4, subject to the findings of the further data review.

Due to the logistic problem induced by the pandemic which adversely affecting the supply of international species adopted in testing programme of Sediment Toxicity tests, as such, Sediment Toxicity Tests of ESC CMPs originally scheduled in February 2022 will be tentatively postponed to March 2022 (subject to logistic conditions at that time).

Appendix B. Water Quality Monitoring Results



Table B1: Action and Limit Levels of Water Quality for Dredging, Disposal and Capping **Activities at ESC CMP V**

Parameters	Action	Limit				
Dissolved Oxygen (DO)	Surface and Middle Depth ⁽²⁾	Surface and Middle Depth ⁽²⁾				
in mg L ⁻¹ (Surface, Middle & Bottom) ⁽¹⁾	5%-ile of baseline data for surface and middle layer = 3.76	1%-ile of baseline data for surface and middle layer = 3.11 ⁽³⁾				
	and	and				
	Significantly less than the reference station's mean DO (at the same tide of the same day)	Significantly less than the reference station's mean DO (at the same tide of the same day)				
	Bottom	Bottom				
	5%-ile of baseline data for surface and middle layer = 2.96	The average of the impact station readings are < 2				
	and	and				
	Significantly less than the reference station's mean DO (at the same tide of the same day)	Significantly less than the reference station's mean DO (at the same tide of the same day)				
Suspended Solids (SS) in mg L ⁻¹	95%-ile of baseline data for depth- averaged = 37.88	99%-ile of baseline data for depth- averaged = 61.92				
(depth-averaged)(5)	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				
Turbidity	95%-ile of baseline data = 28.14	99%-ile of baseline data = 38.32				
in NTU	and	and				
(depth-averaged)(4)(5)	120% of control station's Turbidity at the same tide of the same day	130% of control station's Turbidity at the same tide of the same day				

Notes:

- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- 2. Action and Limit Levels for DO for Surface and Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- Given the Action Level for DO for Surface and Middle layers has already been lower than 4 mg L-1, it is proposed to set 3. the Limit Level at 3.11 mg L⁻¹ which is the first percentile of the baseline data.
- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

 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 Vb in January 2022

Station	Temp.	Salinity	Turbidity	Dissolve	ed Oxygen	рН	Suspended Solids		
	(°C)	(ppt)	(NTU)	(%)	(mg L ⁻¹)		(mg L ⁻¹)		
WCP 1 (Downstream)	19.75	33.88	5.50	88.28	6.60	8.06	7.9		
WCP 2 (Upstream)	19.87	33.81	7.25	88.91	6.64	8.03	8.2		
WQO (Dry Season)	N/A	30.43-37.19#	N/A	N/A	>4	6.5 - 8.5	13.1		

Notes:

- 1. *Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
- 2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
- 3. Cell shaded grey indicates value exceeding the WQO.

Table B3: In-situ Monitoring Results for Routine Water Quality Monitoring of ESC CMPs in January 2022

Station	Temp.	Salinity	Turbidity	Dissolve	Dissolved Oxygen		
	(°C)	(ppt)	(NTU)	(%)	(mg L ⁻¹)		
RFF (Reference)	20.00	32.02	20.27	91.47	6.88	7.95	
IPF (Impact)	20.03	31.75	18.51	91.75	6.91	7.92	
INF (Intermediate)	20.01	31.57	24.43	91.39	6.90	7.92	
Ma Wan	20.00	32.43	27.16	87.49	6.57	7.95	
WQO (Dry Season)	N/A	28.82-35.23#	N/A	N/A	>4	6.5 - 8.5	

Notes:

- 1. *Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
- 2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
- 3. Cell shaded grey indicates value exceeding the WQO.

Table B4: Laboratory Results for Routine Water Quality Monitoring of ESC CMPs in January 2022

Station	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	NH_3	TIN	BOD ₅	SS
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RFF	2.23	<lor< td=""><td><lor< td=""><td>2.06</td><td>0.71</td><td><lor< td=""><td>0.68</td><td><lor< td=""><td>22.62</td><td>0.10</td><td>0.36</td><td>2.63</td><td>28.0</td></lor<></td></lor<></td></lor<></td></lor<>	<lor< td=""><td>2.06</td><td>0.71</td><td><lor< td=""><td>0.68</td><td><lor< td=""><td>22.62</td><td>0.10</td><td>0.36</td><td>2.63</td><td>28.0</td></lor<></td></lor<></td></lor<>	2.06	0.71	<lor< td=""><td>0.68</td><td><lor< td=""><td>22.62</td><td>0.10</td><td>0.36</td><td>2.63</td><td>28.0</td></lor<></td></lor<>	0.68	<lor< td=""><td>22.62</td><td>0.10</td><td>0.36</td><td>2.63</td><td>28.0</td></lor<>	22.62	0.10	0.36	2.63	28.0
IPF	2.24	<lor< td=""><td><lor< td=""><td>2.48</td><td>0.60</td><td><lor< td=""><td>0.75</td><td><lor< td=""><td>21.63</td><td>0.11</td><td>0.42</td><td>1.08</td><td>22.2</td></lor<></td></lor<></td></lor<></td></lor<>	<lor< td=""><td>2.48</td><td>0.60</td><td><lor< td=""><td>0.75</td><td><lor< td=""><td>21.63</td><td>0.11</td><td>0.42</td><td>1.08</td><td>22.2</td></lor<></td></lor<></td></lor<>	2.48	0.60	<lor< td=""><td>0.75</td><td><lor< td=""><td>21.63</td><td>0.11</td><td>0.42</td><td>1.08</td><td>22.2</td></lor<></td></lor<>	0.75	<lor< td=""><td>21.63</td><td>0.11</td><td>0.42</td><td>1.08</td><td>22.2</td></lor<>	21.63	0.11	0.42	1.08	22.2
INF	2.35	<lor< td=""><td><lor< td=""><td>2.74</td><td>1.32</td><td><lor< td=""><td>1.03</td><td><lor< td=""><td>23.26</td><td>0.12</td><td>0.44</td><td>2.18</td><td>32.6</td></lor<></td></lor<></td></lor<></td></lor<>	<lor< td=""><td>2.74</td><td>1.32</td><td><lor< td=""><td>1.03</td><td><lor< td=""><td>23.26</td><td>0.12</td><td>0.44</td><td>2.18</td><td>32.6</td></lor<></td></lor<></td></lor<>	2.74	1.32	<lor< td=""><td>1.03</td><td><lor< td=""><td>23.26</td><td>0.12</td><td>0.44</td><td>2.18</td><td>32.6</td></lor<></td></lor<>	1.03	<lor< td=""><td>23.26</td><td>0.12</td><td>0.44</td><td>2.18</td><td>32.6</td></lor<>	23.26	0.12	0.44	2.18	32.6
Ma Wan	2.35	<lor< td=""><td><lor< td=""><td>2.63</td><td>1.45</td><td><lor< td=""><td>0.65</td><td><lor< td=""><td>24.08</td><td>0.11</td><td>0.35</td><td>2.55</td><td>31.6</td></lor<></td></lor<></td></lor<></td></lor<>	<lor< td=""><td>2.63</td><td>1.45</td><td><lor< td=""><td>0.65</td><td><lor< td=""><td>24.08</td><td>0.11</td><td>0.35</td><td>2.55</td><td>31.6</td></lor<></td></lor<></td></lor<>	2.63	1.45	<lor< td=""><td>0.65</td><td><lor< td=""><td>24.08</td><td>0.11</td><td>0.35</td><td>2.55</td><td>31.6</td></lor<></td></lor<>	0.65	<lor< td=""><td>24.08</td><td>0.11</td><td>0.35</td><td>2.55</td><td>31.6</td></lor<>	24.08	0.11	0.35	2.55	31.6

WQO of TIN: 0.5 mg/L Dry Season WQO of SS: 13.1 mg/L

Notes:

- 1. "<LOR" indicates the concentrations of metals and metalloids are below the limit of reporting.
- 2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
- 3. Cell shaded grey indicates value exceeding the WQO.

Appendix C. Graphical Presentations

Routine Water Quality Monitoring for ESC CMP V - January 2022

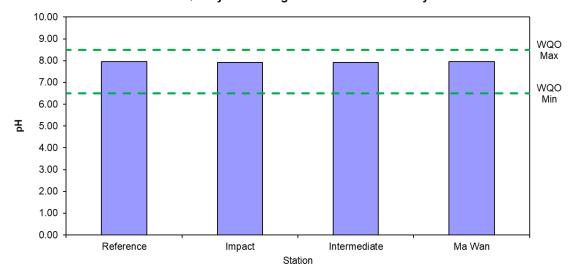


Figure 1: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

Routine Water Quality Monitoring for ESC CMP V - January 2022

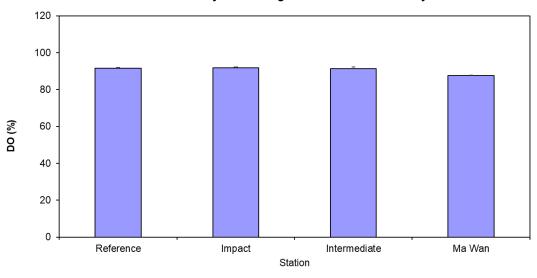


Figure 2: Level of Dissolved Oxygen (DO) (% saturation; mean + SD)¹recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

Routine Water Quality Monitoring for ESC CMP V - January 2022

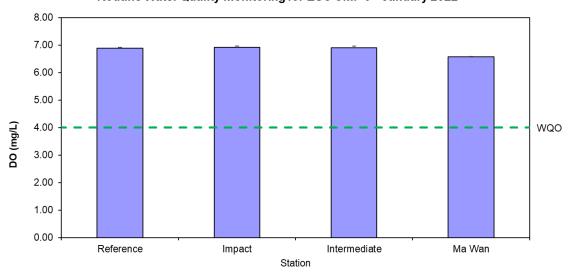


Figure 3: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD)¹recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

Routine Water Quality Monitoring for ESC CMP V - January 2022

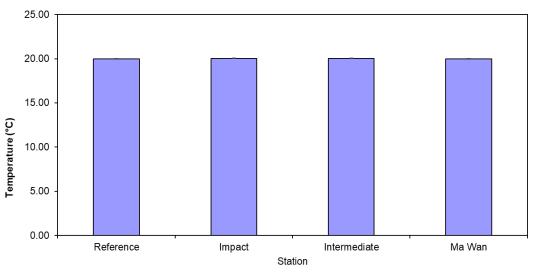


Figure 4: Level of Temperature (°C; mean + SD)¹recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

¹ The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

Routine Water Quality Monitoring for ESC CMP V - January 2022

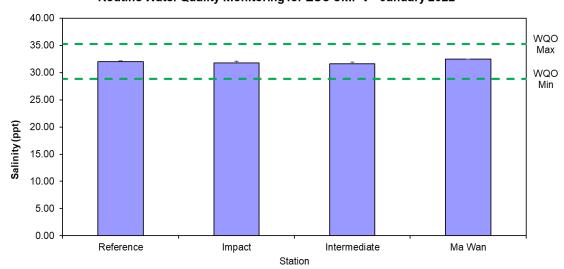


Figure 5: Level of Salinity (ppt; mean + SD)¹recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

Routine Water Quality Monitoring for ESC CMP V - January 2022

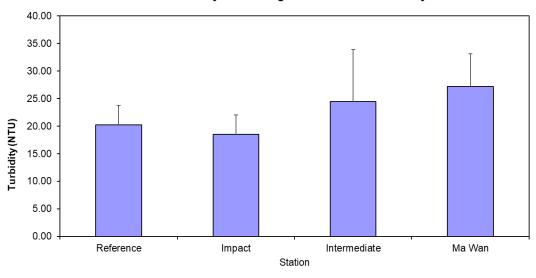
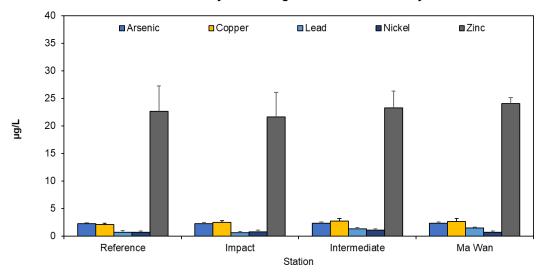


Figure 6: Level of Turbidity (NTU; mean + SD)¹recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

¹ The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

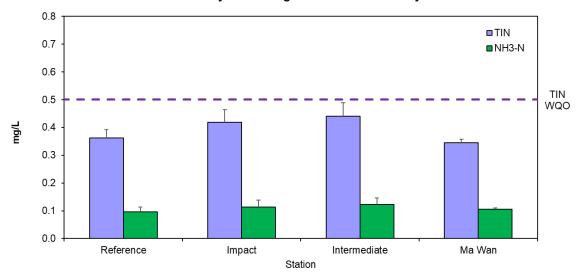


Routine Water Quality Monitoring for ESC CMP V January 2022



Concentration of Arsenic, Copper, Lead, Nickel, and Zinc (µg/L; mean + SD) in water Figure 7: samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

Routine Water Quality Monitoring for Nutrients - January 2022



Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen (NH3-N) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal Figure 8: operations at ESC CMP V in January 2022



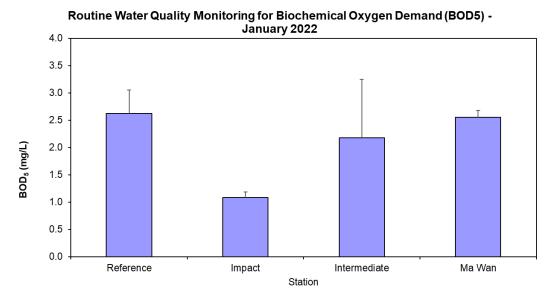


Figure 9: Level of Biochemical Oxygen Demand (BOD5) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in January 2022

45 40 35 30 25 SS (mg/L) 20 15 WQO (Dry 10 5 0 Ma Wan Reference Impact Intermediate Station

Routine Water Quality Monitoring for Suspended Solids - January 2022

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 V in January 2022

Pit Specific Sediment Chemistry for Metal and Metalloid Contaminants at ESC CMP Vb - January 2022

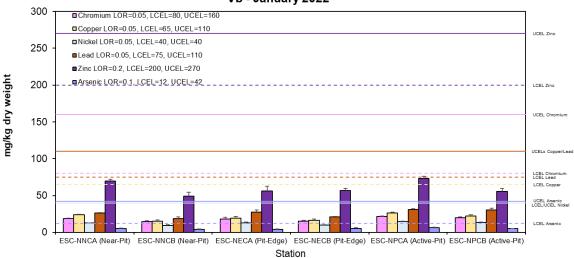


Figure 11: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in January 2022

Pit Specific Sediment Chemistry for Metal Contaminants at ESC CMP Vb - January 2022

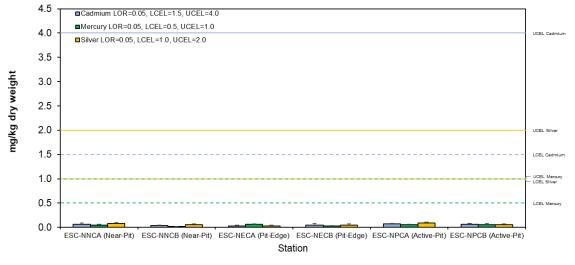


Figure 12: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in January 2022



Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vb - January 2022

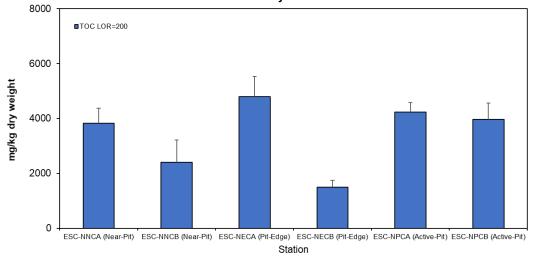


Figure 13: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in January 2022

Pit Specific Sediment Chemistry for Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) at ESC CMP Vb - January 2022

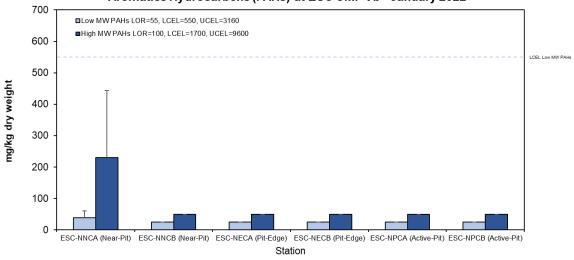
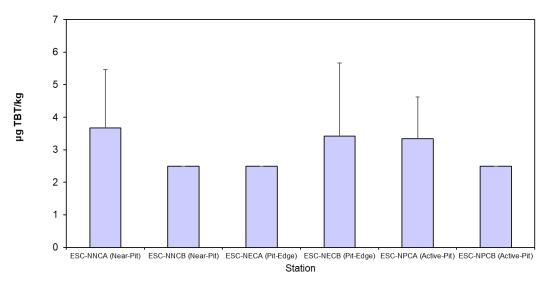


Figure 14: Concentration of Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in January 2022

Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vb - January 2022



Concentration of Tributyltin (TBT) (μ g TBT/kg; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in January 2022 Figure 15:

Appendix D. Study Programme

Study Programme

Agreement No. CE 59/2020 (EP) Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2021-2026) - Investigation

Mott MacDonald Hong Kong Limited

