

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 – October 2021

November 2021

Mott MacDonald 3/F International Trade Tower 348 Kwun Tong Road Kwun Tong Kowloon Hong Kong

T +852 2828 5757 mottmac.hk

Civil Engineering and Development Department Fill Management Division 5/F, Civil Engineering and Development Building 101 Princess Margaret Road Homantin, Kowloon

# 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 – October 2021

November 2021





# 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 – October 2021
Date of Report:	9 November 2021
Date prepared by ET:	9 November 2021
Date received by IA:	9 November 2021

### **Reference EP Condition**

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/<del>plan</del> complies with the above referenced condition of EP-312/2008/A.

Ir Thomas Chan, Environmental Team Leader (ETL):

Date:

Date: 9 November 2021

### IA Verification

I hereby verify that the above condition of EP-312/2008/A.	referenced document/plan complies	with the above referenced
	1/1 11	
Dr Wang Wen Xiong, Independent Auditor (IA):	Very Nay	Date: 9 November 2021

# **Issue and Revision Record**

Date	Originator	Checker	Approver	Description
Nov 2021	Various	Thomas Chan	Eric Ching	Revision A of Submission

### Document reference: 423134 | 06/05/07 | A

#### Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the abovecaptioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

# Contents

1	Intro	duction	1
	1.1	Background	1
	1.2	Reporting Period	2
	1.3	Details of Sampling and Laboratory Testing Activities	2
	1.4	Details of Outstanding Sampling or Analysis	2
2	Brie	f Discussion of Monitoring Results for ESC CMP V	3
	2.1	Introduction	3
	2.2	Water Column Profiling of ESC CMP Vb – in October 2021	3
		2.2.1 In-situ Measurements	3
		2.2.2 Laboratory Measurements for Suspended Solids (SS)	3
	2.3	Routine Water Quality Monitoring of ESC CMPs – in October 2021	3
		2.3.1 In-situ Measurements	4
		2.3.2 Laboratory Measurements	4
	2.4	Pit Specific Sediment Chemistry of ESC CMP Vb – in October 2021	4
	2.5	Sediment Chemistry after a Major Storm of ESC CMP V – October 2021	5
3	Futu	ire Key Issues	6
	3.1	Activities Scheduled for the Next Reporting Period	6
	3.2	Study Programme	6

### **Tables**

Table 1.1 Works Schedule for ESC CMP V

## **Figures**

- Figure 2.1 Routine & Capping Water Quality Sampling Stations (Ebb-Tide) for ESC CMPs
- Figure 2.2 Pit Specific Sediment Quality Monitoring Stations for CMP V
- Figure 2.3 Sediment Chemistry after A Major Storm Monitoring Stations for ESC CMPs
- Figure 2.4 Track of Tropical Cyclone Lionrock
- Figure 2.5 Track of Tropical Cyclone Kompasu

### **Appendices**

- Appendix A Sampling Schedule
- Appendix B Water Quality Monitoring Results
- Appendix C Graphical Presentations
- Appendix D Study Programme

# 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.<sup>1,2</sup> 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 October 2021, 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



<sup>&</sup>lt;sup>1</sup> 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.

<sup>&</sup>lt;sup>2</sup> 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 – October 2021* covers the EM&A activities for the reporting period of October 2021 (from 1 to 31 October 2021).

### **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
- Sediment Chemistry after a Major Storm of ESC CMP V.

### 1.4 Details of Outstanding Sampling or Analysis

No outstanding sampling remained for the reporting month (October 2021).

# 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;
- Pit Specific Sediment Chemistry of ESC CMP Vb; and
- Sediment Chemistry after a Major Storm of ESC CMP V.

### 2.2 Water Column Profiling of ESC CMP Vb – in October 2021

Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 7 October 2021. 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 wet season period (April to October) of 2010 - 2019 from stations in the North Western Water Control Zone (WCZ), where the ESC CMPs are located.<sup>3</sup> 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 October 2021 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 October 2021 indicated that the SS level at the Upstream station was higher than the WQO while the SS level at the Downstream station complied with the WQO, but levels complied with 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 October 2021

Routine Water Quality Monitoring of ESC CMPs was undertaken on 5 October 2021. 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 sixteen (16) monitoring stations were sampled in October 2021 as shown in Figure 2.1.

<sup>&</sup>lt;sup>3</sup> <u>http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en</u>

### 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 October 2021.

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 October 2021.

### 2.3.2 Laboratory Measurements

Laboratory analysis of samples obtained during the reporting period indicated that the concentrations of Arsenic, Chromium, Copper, Lead, Nickel, Silver 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 Zinc which were lower at Impact (IPE) 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 (NH<sub>3</sub>-N) was generally similar across stations (**Table B4** of **Appendix B**; **Figure 8** of **Appendix C**). The concentration of Biochemical Oxygen Demand (BOD<sub>5</sub>) was generally similar across stations (**Table B4** of **Appendix C**).

Analyses of results for the reporting period indicated that the SS levels at Intermediate (INE) and Ma Wan stations complied with the wet season WQO (11.8 mg/L) and the Action and Limit Levels. SS levels at Reference (RFE) and Impact (IPE) stations were above the wet season WQO 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 October 2021

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 5 October 2021.

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 concentrations of Total Organic Carbon (TOC) were lower at Near-Pit station ESC-NNCB 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 Active-Pit stations ESC-NPCA and ESC-NPCB (**Figure 15** of **Appendix C**). The concentrations of Total Polychlorinated Biphenyls (PCBs), Total dichlorodiphenyl-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.

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.

### 2.5 Sediment Chemistry after a Major Storm of ESC CMP V – October 2021

Sampling for Sediment Chemistry after a Major Storm Event was conducted at nine (9) monitoring stations (see **Figure 2.3** for the locations of the monitoring stations) on 18 October 2021 after the visit of tropical cyclones Lionrock and Kompasu, which led to the issue of No. 8 Gale or Storm Signal on 9 to 10 October 2021 and 12 to 13 October 2021 respectively. The tracks of Lionrock and Kompasu are shown in **Figure 2.4** and **2.5** respectively.

Figure 2.4: Track of Tropical Cyclone Lionrock (Source: Hong Kong Observatory)



Figure 2.5: Track of Tropical Cyclone Kompasu (Source: Hong Kong Observatory)



Analyses of results for the Sediment Chemistry after a Major Storm indicated that the concentrations of all inorganic contaminants were below the LCEL in October 2021 (Figures 16 and 17 of Appendix C).

Overall, there appeared to be no evidence showing the failure of ESC CMP V in retaining disposed mud or causing contamination of sediments after the major storm event in October 2021.

# 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 November 2021 for ESC CMP V (see **Appendix A** for the sampling schedule):

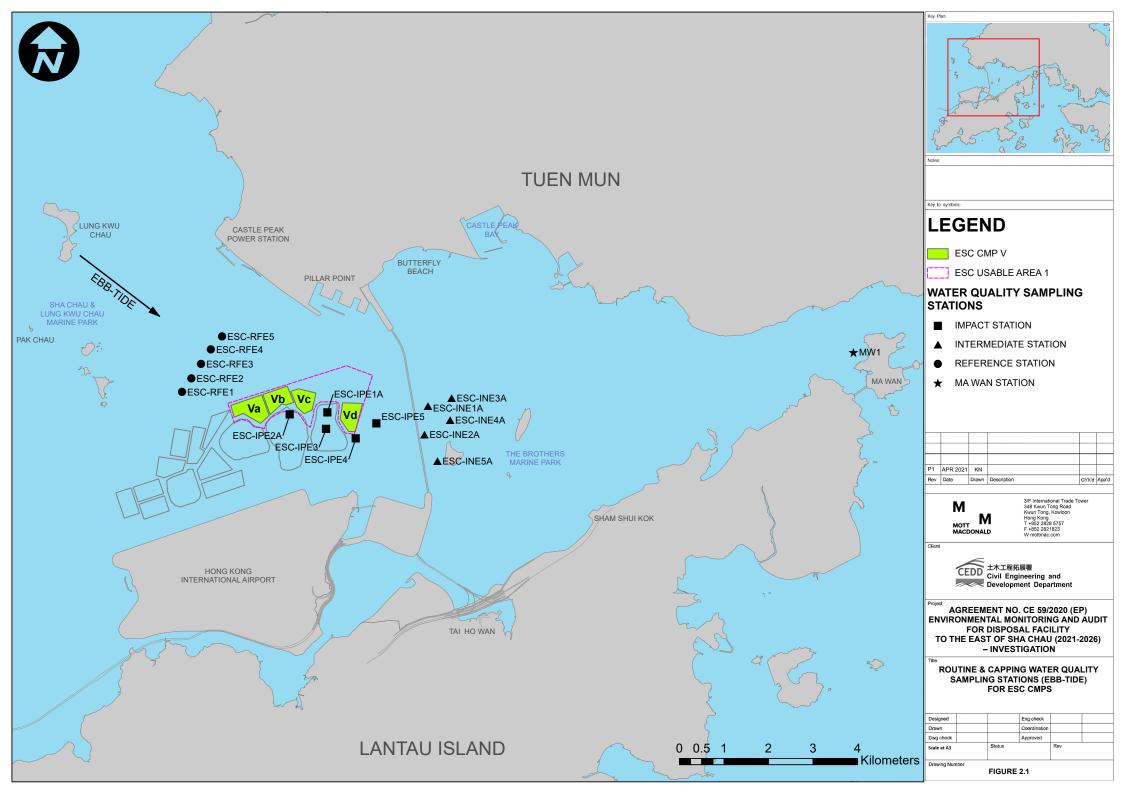
- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs; and
- Pit Specific Sediment Chemistry of ESC CMP Vb.

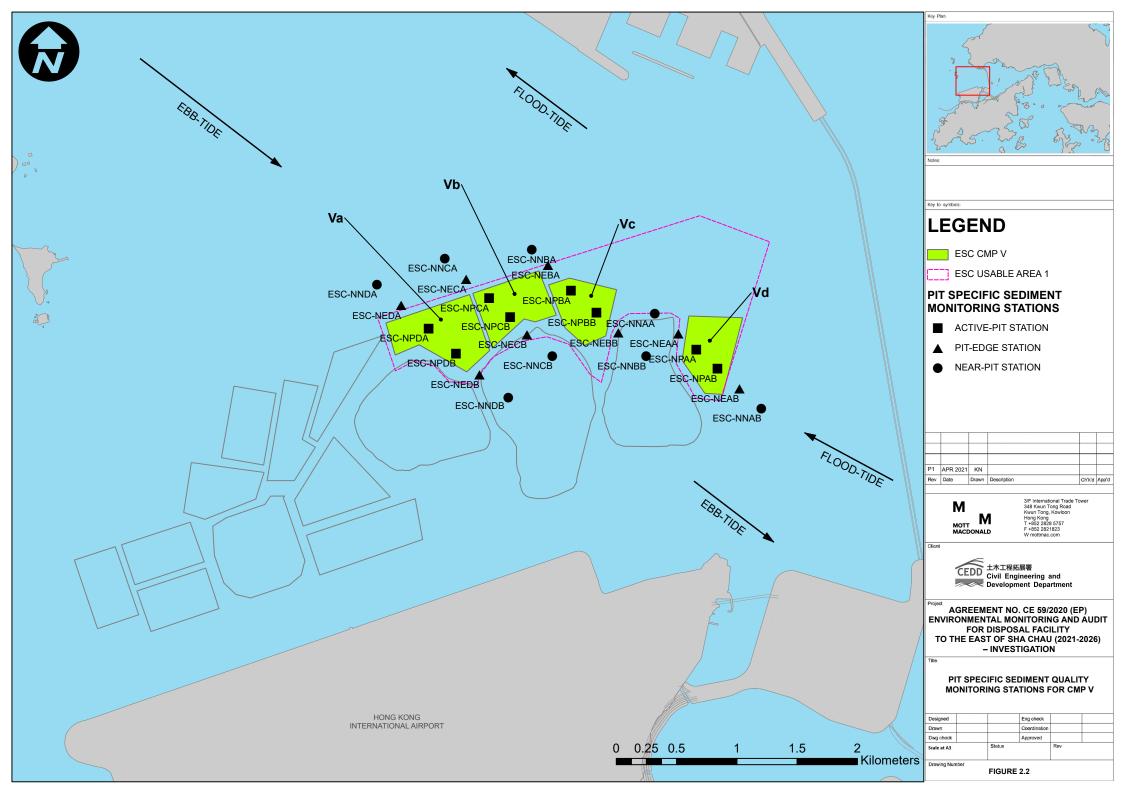
### 3.2 Study Programme

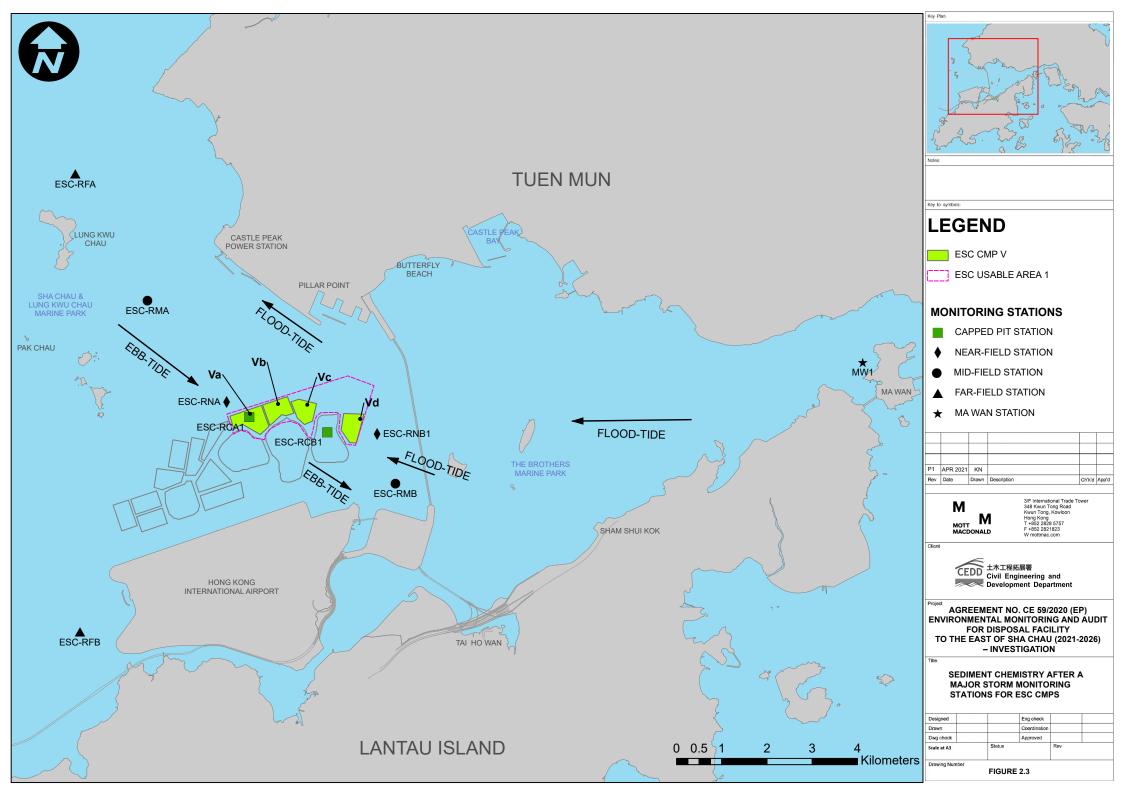
A summary of the Study Programme is presented in Appendix D.

Mott MacDonald | Agreement No. CE59/2020(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 – October 2021

# **Figures**







# Appendices

- Appendix A Sampling Schedule
- Appendix B Water Quality Monitoring Results
- Appendix C Graphical Presentations
- Appendix D Study Programme

Mott MacDonald | Agreement No. CE59/2020(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 – October 2021

# **Appendix A. Sampling Schedule**

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

Parameter / Station Type Pit Specific Sediment Ch		Frequency	2021 Jan Feb M	ar Apr May Jur	n Jul Aug S	ep Oct Nov Dec	2022 Jan Feb Mar	Apr May Jun	Jul Aug Sep	Oct Nov De	2023 Jan Feb Ma	r Apr May	Jun Jul Aug	Sep Oct Nov	2024 / Dec Jan F	eb Mar Apr	May Jun Jul A	ug Sep Oct	2025 Nov Dec Jan F	eb Mar Apr	May Jun Jul	Aug Sep Oct	2026 Nov Dec Jan Feb
Active-Pit	ESC-NPAA ESC-NPAB	Monthly Monthly	6 6 0 6 6 0	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
Near-Pit	ESC-NNAA ESC-NNAB	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 6 6 6 6								6 6 6 6				6 6 6 6 6 6		6 6 6 6 6 6 6 6
Cumulative Impact Sedin Near-field Stations	ment Chemistr	y*	Jan Feb M	ar Apr May Jur	n Jul Aug S	ep Oct Nov Dec	Jan Feb Mar	Apr May Jun	Jul Aug Sep	Oct Nov Der	<mark>Jan Feb</mark> Ma	ar Apr May	Jun Jul Aug	Sep Oct Nov	/ Dec Jan F	eb Mar Apr	May Jun Jul A	ug Sep Oct	Nov Dec Jan F	eb Mar Apr	May Jun Jul	Aug Sep Oct	Nov Dec Jan Feb
Mid-field Stations	ESC-RNA 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 6	6		6 6	6	6 6	6 6 6 6
Capped Pit Stations	ESC-RMA ESC-RMB	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	6	6 6	~	÷	6 6	6	6 6	6 6 6 6
Far-field Stations	ESC-RCA1 ESC-RCA2	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	6 6	6 6		6 6	6 6	6 6	6 6 6 6
	ESC-RFA ESC-RFB	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 6	6 6 6 6
Ma Wan Station	MW1	4 times per year	6	6	6	6	6	6	Ţ	6			6 6		÷	6		6	Ţ	6	6	6	6 6
Sediment Toxicity Tests Near-pit Stations	ESC-TDA	2 times per year	Jan Feb M	ar Apr May Jur	n Jul Aug So	ep Oct Nov Dec	Jan Feb Mar 5	Apr May Jun	Jul Aug Sep	Oct Nov Der	Jan Feb Ma	r Apr May .	Jun Jul Aug	Sep Oct Nov	/ Dec Jan F	eb Mar Apr		ug Sep Oct		eb Mar Apr	May Jun Jul	Aug Sep Oct I	Nov Dec Jan Feb
Reference Stations	ESC-TDB1 ESC-TRA	2 times per year 2 times per year	5		5		5		5		5		5			5		5		5		5	5
Ma Wan Station	ESC-TRB	2 times per year 2 times per year	5		5		5		5		5		5			5				5		5	5
Tissue / Whole Body Sar		2 times per your		ar Apr May Jur		ep Oct Nov Dec		Apr May Jun	÷	Oct Nov De		ır Apr May .									May Jun Jul	÷	Nov Dec Jan Feb
Near-pit Stations	ESC-INA ESC-INB	2 times per year 2 times per year	•		•		*		*		*		*			*	,	•		*		*	*
Reference North	TNA TNB	2 times per year 2 times per year	•		•		*		*		*		*			*	,	•		*		*	*
Reference South	TSA TSB	2 times per year 2 times per year							*		*		*			•				*		*	
Demersal Trawling Near-pit Stations			Jan Feb M	ar Apr May Jur	n Jul Aug S	ep Oct Nov Dec	Jan Feb Mar	Apr May Jun	Jul Aug Sep	Oct Nov De	<mark>Jan Feb M</mark> a	r Apr May .	Jun Jul Aug	Sep Oct Nov	/ Dec Jan F	eb Mar Apr	May Jun Jul A	ug Sep Oct	Nov Dec Jan F	eb Mar Apr	May Jun Jul	Aug Sep Oct	Nov Dec Jan Feb
Reference North	ESC-INA ESC-INB	4 times per year 4 times per year	5 5 5 5		5 5 5 5		5 5 5 5		5 5 5 5		5 5 5 5		55 55		5	5	55		5		5 5	5 5	555
	TNA TNB	4 times per year 4 times per year	5 5 5 5		55 55		5 5 5 5		5 5 5 5		5 5 5 5		5 5 5 5		5	5	5		5	5 5	5	5 5	5 5 5 5
Reference South	TSA TSB	4 times per year 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 5 5		5	5	5		5		5	5 5	55
Capping * Ebb Tide			Jan Feb M	ar Apr May Jur	n Jul Aug S	ep Oct Nov Dec	Jan Feb Mar	Apr May Jun	Jul Aug Sep	Oct Nov Der	<mark>Jan Feb</mark> Ma	r Apr May	Jun Jul Aug	Sep Oct Nov	/ Dec Jan F	eb Mar Apr	May Jun Jul A	ug Sep Oct	Nov Dec Jan F	eb Mar Apr	May Jun Jul	Aug Sep Oct	Nov Dec Jan Feb
Impact Station Downcur	ESC-IPE1A ESC-IPE2A	4 times per year * 4 times per year *																					
	ESC-IPE3 ESC-IPE4 ESC-IPE5	4 times per year * 4 times per year * 4 times per year *																					
Intermediate Station Dov	wncurrent	4 times per year *																					
	ESC-INE3A ESC-INE4A	4 times per year * 4 times per year * 4 times per year *																					
Reference Station Upcur	ESC-RFE1	4 times per year *																					
	ESC-RFE3 ESC-RFE4	4 times per year * 4 times per year * 4 times per year *																					
Ma Wan Station	ESC-RFE5	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	ESC-INF1 ESC-INF2	4 times per year * 4 times per year *																					
Reference Station Upcur	ESC-INF3	4 times per year * 4 times per year *																					
Ma Wan Station	ESC-RFF2A	4 times per year * 4 times per year *																					
Routine Water Quality M	MW1	4 times per year *	Jan Feb M	ar Apr May In		ep Oct New Dec	Jan Feb Mar	Apr May Ive		Oct Nov Do	Jan Feb M	r Apr May	Jun Jul Are	Sep. Oct. Nov	Dec Jan 5	eb Mar Apr	May Jun Jul A	ug Sen Oct	Nov Dec las	eb Mar Acc	May Jun Int	Aug Sen Oct	Nov Dec Jan Feb
Ebb Tide Impact Station Downcur		Monthly*																					4 4 4 4 4
	ESC-IPE2A ESC-IPE3	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 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 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	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		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	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 4 4 4 4
	ESC-INE1A ESC-INE2A ESC-INE3A	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 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	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	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       4     4     4       4     4     4       4     4     4
Reference Station Upcur		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 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 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 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
	ESC-RFE2 ESC-RFE3	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 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 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-RFE4	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	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 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 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 4	4 4 4	4 4 4 4
Flood Tide Impact Station Downcur	ESC-IPF1	Monthly*	4 4 4																				4 4 4 4 4 4 4 4
Intermediate Station Dov		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 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 4 4	4 4 4 4
	ESC-INF1 ESC-INF2 ESC-INF3	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 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 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	ESC-RFF1A ESC-RFF2A	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 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 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	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 4	4 4 4	4 4 4 4
Water Column Profiling Plume Stations		,																					Nov Dec Jan Feb
. Anno GlauOlis	WCP1 WCP2	Monthly* Monthly*	2 2 2 2 2 2	2 2 2 2 2 2 2 2		2 2 2 2 2 2 2 2					2 2 2 2 2 2			2 2 2 2 2 2									2 2 2 2 2 2 2 2
			Jan Feb M																				

Benthic Recoloinisation Studies	Jan Feb	Mar Apr	May Ju	n Jul /	Aug Sep	Oct No	ov Dec	Jan Feb	Mar /	Apr May	y Jun .	Jul Au	ıg Sep C	Oct Nov	v Dec .	Jan Fel	o Mar A	pr May	Jun	Jul Aug	Sep (	Oct Nov De	Jan	Feb Ma	ar Apr	May Ju	n Jul	Aug Sep	Oct No	ov Dec	Jan F	eb Mar	Apr N	lay Jun	n Jul A	Aug Se	p Oct N	lov Dec	c Jan I	eb Mar
Capped Stations at CMP V																																								
ESCV-CPA 2 times per year																																								
ESCV-CPB 2 times per year																																								
ESCV-CPC 2 times per year																																								_
ESCV-CPD 2 times per year																																								
Reference Stations																																						_		
RBA 2 times per year																																								
RBB 2 times per year																																								
RBC1 2 times per year																																								

Impact Monitoring for D	redging		Jan Fel	Mar J	Apr May	Jun J	ul Aug S	ep Oct	Nov De	Jan F	eb Ma	r Apr I	May Ju	n Jul	Aug Se	ep Oct	Nov D	ec Jan	Feb Ma	ar Apr	May Jur	ı Jul /	Aug Sep	Oct Nov	Dec	Jan Feb	Mar A	pr May	Jun J	Jul Aug	Sep O	ct Nov	Dec	Jan Fel	o Mar	Apr M	ay Jun	Jul	Aug Se	p Oct I	lov Dec	Jan F	ab Ma
Upstream Stations																																			-								
	US1	3 times per week																																									
	US2	3 times per week																																									
Downstream Stations												• •																															
	DS1	3 times per week																																-									T
	DS2	3 times per week																																									
	DS3	3 times per week																																									
	DS4	3 times per week																																_									_
	DS5	3 times per week																																							_		
Ma Wan Station													-				· · · ·																					• •			-		<u> </u>
	MW1	3 times per week																																	TT						_		1

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 QR 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.

(e) Definite Reconstantial forduces to Come V will be scheduled when capping operation to Come V is Completed. **Remarks:** \* A proposal on the change of number of sample replication of water quality & sediment monitoring and 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 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.

# Appendix B. Water Quality Monitoring Results

Μ

Parameters	Action	Limit
Dissolved Oxygen (DO)	Surface and Middle Depth <sup>(2)</sup>	Surface and Middle Depth <sup>(2)</sup>
in mg L <sup>-1</sup> (Surface, Middle & Bottom) <sup>(1)</sup>	5%-ile of baseline data for surface and middle layer = <b>3.76</b>	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 = <b>2.96</b>	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 <sup>-1</sup>	95%-ile of baseline data for depth- averaged = <b>37.88</b>	99%-ile of baseline data for depth- averaged = <b>61.92</b>
(depth-averaged) <sup>(5)</sup>	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) <sup>(4)(5)</sup>	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

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

Notes:

For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits. 1.

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<sup>1</sup>, it is proposed to set 3. the Limit Level at 3.11 mg L<sup>-1</sup> 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 Vb in October 2021

Station	Temp.	Salinity	Turbidity	Dissolve	ed Oxygen	рН	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L <sup>-1</sup> )		(mg L <sup>-1</sup> )
WCP 1 (Downstream)	29.48	28.52	15.09	84.15	5.49	7.95	9.7
WCP 2 (Upstream)	29.45	28.91	27.05	83.08	5.41	7.93	11.9
WQO (Wet Season)	N/A	26.02-31.80#	N/A	N/A	>4	6.5 - 8.5	11.8

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 October 2021

Station	Temp.	Salinity	Turbidity	Dissolve	ed Oxygen	рН
	(°C)	(ppt)	(NTU)	(%)	(mg L <sup>-1</sup> )	
RFE (Reference)	29.91	27.54	12.45	88.97	5.79	7.94
IPE (Impact)	29.86	27.85	20.38	89.06	5.79	7.97
INE (Intermediate)	29.72	28.13	11.09	86.64	5.64	7.95
Ma Wan	29.37	30.02	4.28	74.49	4.82	7.85
WQO (Wet Season)	N/A	24.78-30.29#	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 October 2021

Station	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	NH <sub>3</sub>	TIN	BOD <sub>5</sub>	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)
RFE	2.91	<lor< td=""><td>1.76</td><td>4.24</td><td>1.36</td><td><lor< td=""><td>1.32</td><td>0.53</td><td>26.76</td><td>0.16</td><td>0.49</td><td>1.67</td><td>12.6</td></lor<></td></lor<>	1.76	4.24	1.36	<lor< td=""><td>1.32</td><td>0.53</td><td>26.76</td><td>0.16</td><td>0.49</td><td>1.67</td><td>12.6</td></lor<>	1.32	0.53	26.76	0.16	0.49	1.67	12.6
IPE	2.86	<lor< td=""><td>1.77</td><td>4.30</td><td>1.70</td><td><lor< td=""><td>1.13</td><td><lor< td=""><td>20.95</td><td>0.15</td><td>0.44</td><td>1.75</td><td>18.2</td></lor<></td></lor<></td></lor<>	1.77	4.30	1.70	<lor< td=""><td>1.13</td><td><lor< td=""><td>20.95</td><td>0.15</td><td>0.44</td><td>1.75</td><td>18.2</td></lor<></td></lor<>	1.13	<lor< td=""><td>20.95</td><td>0.15</td><td>0.44</td><td>1.75</td><td>18.2</td></lor<>	20.95	0.15	0.44	1.75	18.2
INE	3.05	<lor< td=""><td>1.73</td><td>4.10</td><td>1.07</td><td><lor< td=""><td>1.23</td><td><lor< td=""><td>25.48</td><td>0.17</td><td>0.48</td><td>1.65</td><td>11.8</td></lor<></td></lor<></td></lor<>	1.73	4.10	1.07	<lor< td=""><td>1.23</td><td><lor< td=""><td>25.48</td><td>0.17</td><td>0.48</td><td>1.65</td><td>11.8</td></lor<></td></lor<>	1.23	<lor< td=""><td>25.48</td><td>0.17</td><td>0.48</td><td>1.65</td><td>11.8</td></lor<>	25.48	0.17	0.48	1.65	11.8
Ma Wan	2.80	<lor< td=""><td>1.60</td><td>3.98</td><td>0.90</td><td><lor< td=""><td>0.78</td><td><lor< td=""><td>24.63</td><td>0.16</td><td>0.40</td><td>1.65</td><td>6.8</td></lor<></td></lor<></td></lor<>	1.60	3.98	0.90	<lor< td=""><td>0.78</td><td><lor< td=""><td>24.63</td><td>0.16</td><td>0.40</td><td>1.65</td><td>6.8</td></lor<></td></lor<>	0.78	<lor< td=""><td>24.63</td><td>0.16</td><td>0.40</td><td>1.65</td><td>6.8</td></lor<>	24.63	0.16	0.40	1.65	6.8
											WQO d	of TIN: 0	.5 mg/L

Wet Season WQO of SS: 11.8 mg/L

Notes:

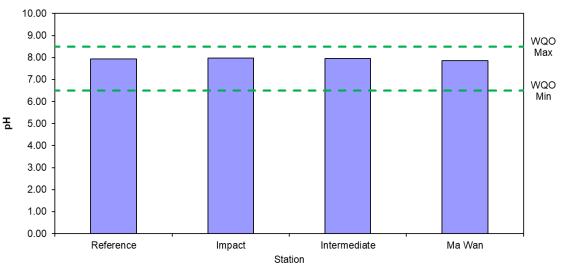
1. "<LOR" indicates the concentrations of metals and metalloids are below the limit of reporting.

2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.

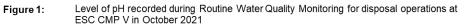
3. Cell shaded grey indicates value exceeding the WQO.

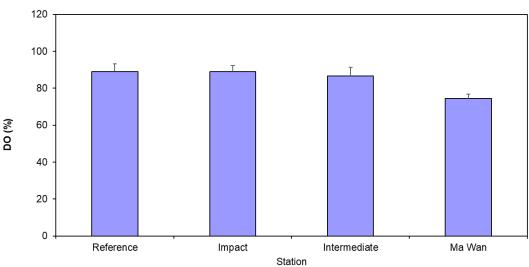
Mott MacDonald | Agreement No. CE59/2020(EP) Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2021-2026) – Investigation Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – October 2021

# **Appendix C. Graphical Presentations**

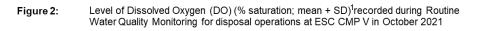




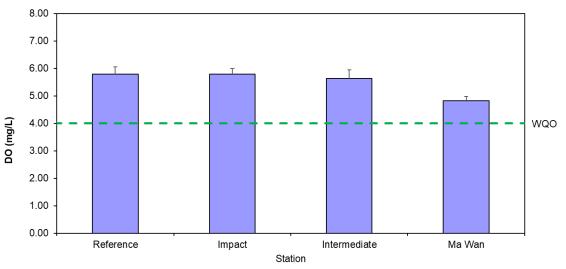




#### Routine Water Quality Monitoring for ESC CMP V - October 2021

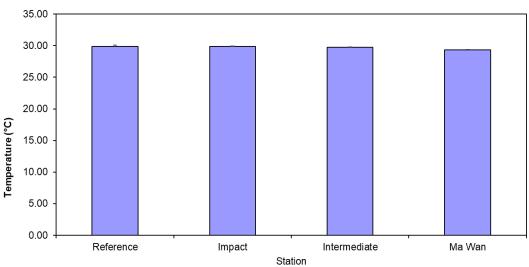


The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.



Routine Water Quality Monitoring for ESC CMP V - October 2021

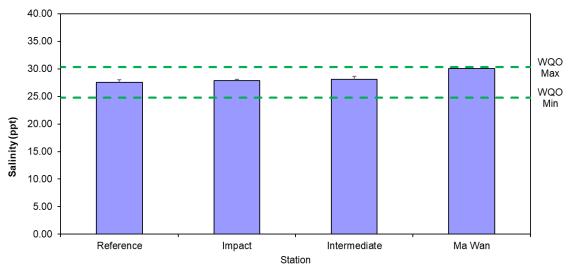
 Figure 3:
 Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD)<sup>1</sup>recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in October 2021



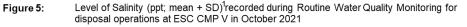
Routine Water Quality Monitoring for ESC CMP V - October 2021

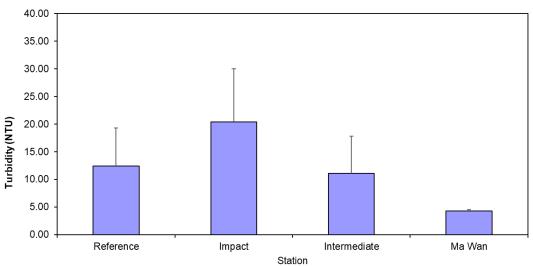
Figure 4: Level of Temperature (°C; mean + SD)<sup>1</sup>recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in October 2021

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

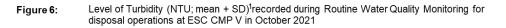


### Routine Water Quality Monitoring for ESC CMP V - October 2021

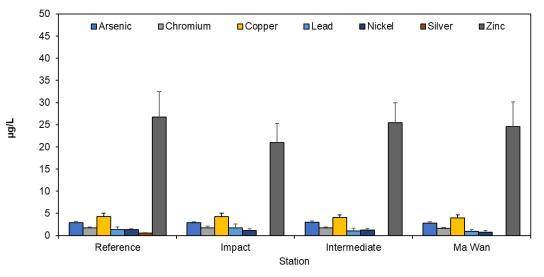




#### Routine Water Quality Monitoring for ESC CMP V - October 2021

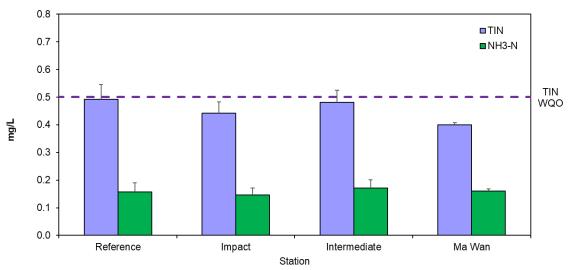


The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.



### Routine Water Quality Monitoring for ESC CMP V October 2021

Figure 7: Concentration of Arsenic, Chromium, Copper, Lead, Nickel, Silver, and Zinc (µg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in October 2021



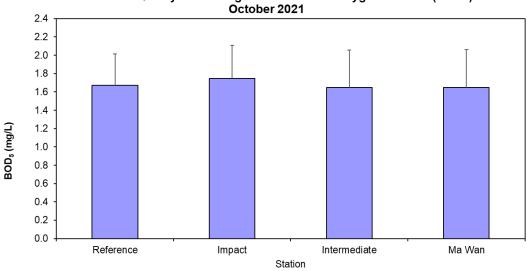
#### **Routine Water Quality Monitoring for Nutrients - October 2021**

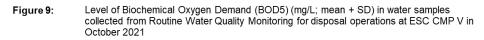
Figure 8: Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen (NH3-N) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in October 2021

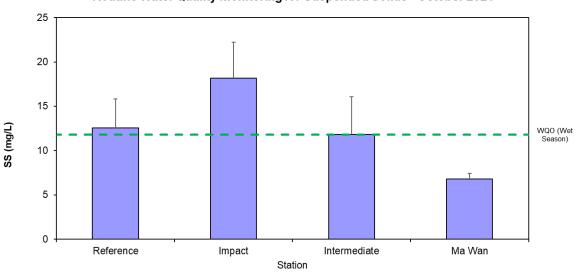
Appendix C - 4



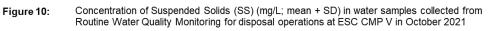
# Routine Water Quality Monitoring for Biochemical Oxygen Demand (BOD5) -



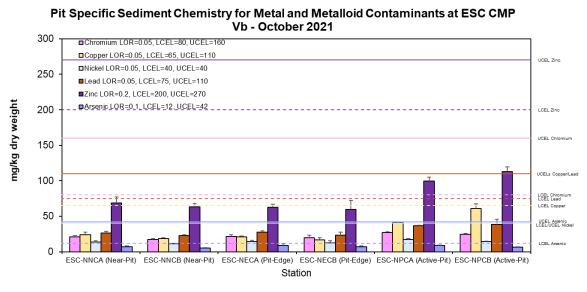




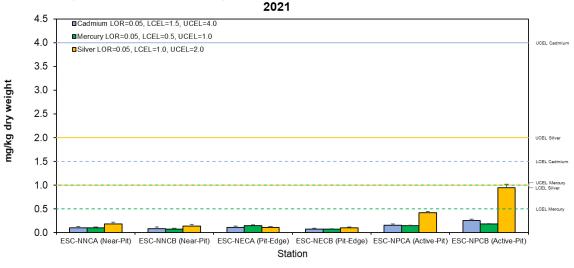
#### Routine Water Quality Monitoring for Suspended Solids - October 2021



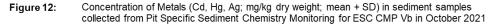
Μ



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 Figure 11: CMP Vb in October 2021

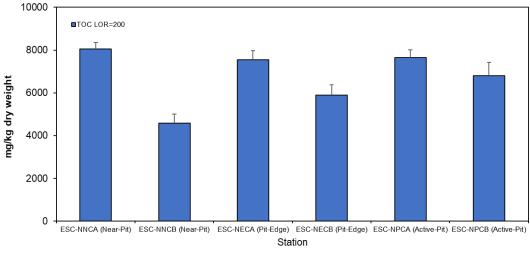


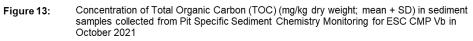
Pit Specific Sediment Chemistry for Metal Contaminants at ESC CMP Vb - October

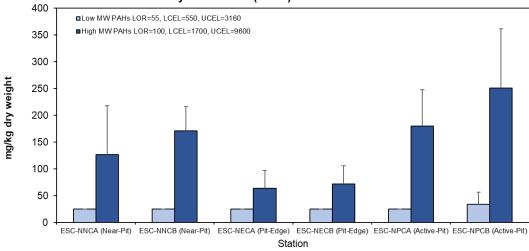




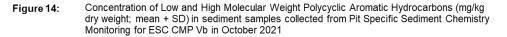
#### Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vb -October 2021

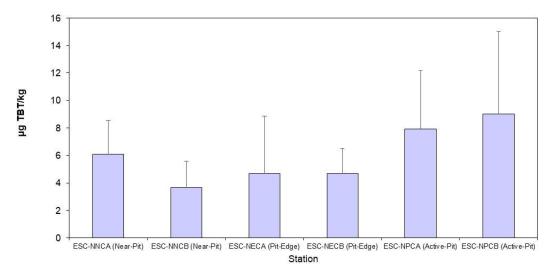






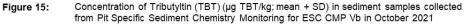
#### Pit Specific Sediment Chemistry for Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) at ESC CMP Vb - October 2021

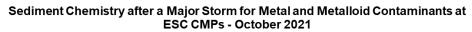


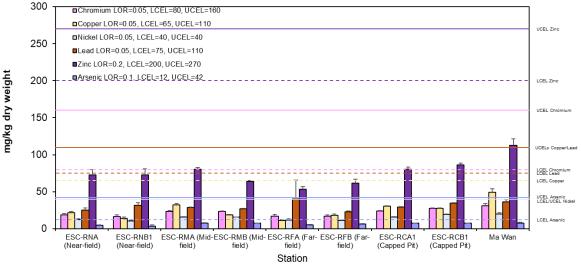


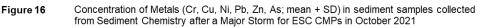
#### Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vb - October 2021

Μ



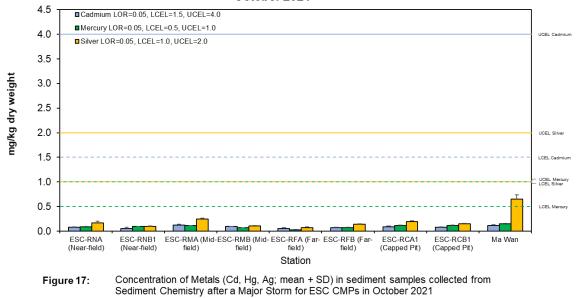








#### Sediment Chemistry after a Major Storm for Metal Contaminants at ESC CMPs -October 2021



Mott MacDonald | Agreement No. CE59/2020(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 – October 2021

# **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

		to the	East of Sha Ch	nau (2021-202	26) - Inves	stigatio	on											
ID	Task Name		Start	Finish	021 1 Q2 Q3 F M A M J J A S	202 04 01	02		2023 Q1		Q4 Q1		3 Q4	2025 Q1	02 03	Q4	2026 Q1	22 03
1	COMMENCEMENT OF AGREEMENT NO	D. CE 59/2020 (EP)	Thu 01/04/21		•		V  A  V  J .		<u>7   7   7    7    7    7    7    7    </u>	MINI J J M 3		<u>  V  A  V  J </u> ]	A 3 0 N	J 7 101	M IVI J J M	<u>13 0 N D</u>	<u>J       V   /</u>	[W] J J M.
2	EAST OF SHA CHAU CONTAMINATED N 2026	MUD PITS (ESC CMPs) BETWEEN 2021 &	Thu 01/04/21	Thu 25/06/26														-
3	Draft Report of First Review of EM&A Manual	I (for ESC CMPs)		Fri 30/04/21	•													
4	Final Report of First Review of EM&A Manual	(for ESC CMPs)		Thu 20/05/21	•													
5	Draft Report of Subsequent Review of EM&A	Manual (for ESC CMPs) - annual basis assumed	Sat 30/04/22	Wed 30/04/25			$\diamond$			\$		$\diamond$			\$			
10	Final Report of Subsequent Review of EM&A	Manual (for ESC CMPs) - annual basis assumed	Fri 20/05/22	Tue 20/05/25			$\diamond$			\$		$\diamond$			\$			
15	Regular Site Inspections of CMP Contractors		Thu 01/04/21	Tue 31/03/26													1	
16	Monthly EM&A Report		Fri 14/05/21	Tue 14/04/26	00000	><<<	~~~~	>0000	>000<	>>>>>>	0000C	><<	0000	0000·	****	~~~~	\$\$\$\$	,
77	Quarterly EM&A Report		Fri 30/07/21	Thu 30/04/26	\$	◊ ◊	$\diamond$	◊ ◊	$\diamond$	◊ ◊	<ul> <li></li> </ul>	<u> </u>	>	$\diamond$	◊ ◊	$\diamond$	$\diamond$	\$
98	Annual EM&A Report		Sun 30/01/22	Fri 30/01/26	_	\$			$\diamond$		$\diamond$			$\diamond$			\$	
104	Annual Risk Assessment Report		Tue 31/05/22	Sun 31/05/26			$\diamond$			$\diamond$		$\diamond$			\$			\$
110	Draft Final Report			Thu 30/04/26														•
111	Final Report			Thu 04/06/26														٠
112	Draft Executive Summary			Thu 04/06/26														٠
113	Final Executive Summary			Thu 25/06/26														•
114	ETLC DISPOSAL FACILITY (OCTOBER TC programme to be confirmed by CEDD)	) MID-MARCH) (subject to actual disposal	Sun 14/11/21	Fri 14/04/23						I								
115	Monthly EM&A Report (if any new disposals of	during reporting period)	Sun 14/11/21	Sat 14/01/23	_	$\diamond \diamond \diamond$		\$	>¢									
122	Quarterly EM&A Report (if any new disposals	during reporting period)	Fri 14/01/22	Sat 14/01/23		\$			\$									
125	Annual EM&A Report (if any new disposals du	uring reporting period)	Thu 14/04/22	Fri 14/04/23			\$		<	>								
	ramme Revision: B : Tue 06/07/21	Start/End of ET Services     Location     Repeating Task	Start of Agreen Submission Multiple-Occa	ment sion Submission	◆ ◆ ◇													<u>    i                                </u>