

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 – May 2023

June 2023

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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 – May 2023
Date of Report:	8 June 2023
Date prepared by ET:	8 June 2023
Date received by IA:	8 June 2023

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

Thum Chen

Ir Thomas Chan, Environmental Team Leader (ETL):

Date: 8 June 2023

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):

Issue and Revision Record

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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.^{1,2} 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. In early 2022, after implementing the Phase 1 optimisation for at least one year, a further data review was conducted. The monitoring data has been reviewed and demonstrated that the data robustness and representativeness are maintained. Therefore, a technical note presenting the data review results served as a supplementary information was submitted to EPD and presented that Phase 2 optimization of sample replication of water quality and sediment monitoring for the Project will be implemented in 2022. EPD expressed no comment on the review and note the implementation of Phase 2 optimization of sample replication on 18 May 2022, and thus this optimization has been effective for the EM&A activities since July 2022.

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 May 2023, the following works were undertaken:

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

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.

Table 1.1: Works Schedule for ESC CMP V



1.2 Reporting Period

This *Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – May 2023* covers the EM&A activities for the reporting period of May 2023 (from 1 to 31 May 2023).

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; and
- Pit Specific Sediment Chemistry of ESC CMP Vb.

1.4 Details of Outstanding Sampling or Analysis

No outstanding sampling remained for the reporting month (May 2023).

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 May 2023

Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 5 May 2023. 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 2012 – 2021 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 May 2023 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 May 2023 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 May 2023

Routine Water Quality Monitoring of ESC CMPs was undertaken on 4 May 2023. 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, B4 and B5 of Appendix B and Figures 1 to 11 of Appendix C. A total of sixteen (16) monitoring stations were sampled in May 2023 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, Salinities and DO complied with the WQOs at all stations in May 2023. 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 May 2023.

2.3.2 Laboratory Measurements

Laboratory analysis of samples obtained during the reporting period indicated that the concentrations of Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc were detected in the samples at some/ all stations and their concentrations were generally similar across stations; except the concentrations of Zinc were slightly higher at Ma Wan (MW1) station. The concentrations of Lead were only detected at Intermediate (INE) Station. (**Table B4** of **Appendix B**; **Figure 7 and 8 of Appendix C**).

For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at all stations were lower than with the WQO (0.5 mg/L). (**Table B5** of **Appendix B**; **Figure 9** of **Appendix C**). The concentration of Ammonia Nitrogen (NH₃-N) were generally similar across stations (**Table B5** of **Appendix B**; **Figure 9** of **Appendix C**). The concentrations of Biochemical Oxygen Demand (BOD₅) were slightly higher at Impact (IPE) station. (**Table B5** of **Appendix B**; **Figure 10** of **Appendix C**).

Analyses of results for the reporting period indicated that the SS levels complied with the Action and Limit Levels at all stations, while SS level were higher than the wet season WQO (11.7 mg/L) at Reference (RFE) stations, where Reference stations are located at upstream of the ESC CMPs and thus this is considered to be presenting the background water quality condition during the time of sampling. (Tables B1 and B5 of Appendix B; Figure 11 of Appendix C).

Based on the available results of the Routine Water Quality Monitoring which 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 May 2023

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 3 May 2023.

The concentrations of most inorganic contaminants were lower than the Lower Chemical Exceedance Levels (LCELs) at all stations, except for Arsenic, Copper and Silver. The concentrations of Arsenic were higher than the LCEL at Near-Pit station ESC-NNCA and Pit-Edge station ESC-NECA; the concentrations of Copper were higher than LCEL at Active-Pit station ESC-NPCB; the concentrations of Silver was higher than LCEL at Active-Pit station ESC-NPCB. (Figures 12 and 13 of Appendix C).

Whilst the average concentration of Arsenic in the Earth's crust is generally ~2mg/kg, significantly higher Arsenic concentrations (median = 14 mg/kg) have been recorded in Hong Kong's onshore sediments.⁴ It is presumed that the natural concentrations of Arsenic are similar in onshore and

⁴ Sewell RJ (1999) Geochemical Atlas of Hong Kong. Geotechnical Engineering Office, Government of the Hong Kong Special Administrative Region

offshore sediments,⁵ and relatively high Arsenic levels may thus occur throughout Hong Kong. Therefore, the LCEL exceedances of Arsenic are unlikely to be caused by the disposal operations at ESC CMP Vb but rather as a result of naturally occurring deposits.

Considering that the higher levels of Copper and Silver occurred within Active-Pit station only but not at the Pit-Edge and Near-Pit stations, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vb in May 2023.

For organic contaminants, the concentrations of Total Organic Carbon (TOC) were higher at Active-Pit station ESC-NPCB. (**Figure 14** of **Appendix C**). The concentrations of Low Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) were higher than UCEL (Upper Chemical Exceedance Level) at Active-Pit stations ESC-NPCA and ESC-NPCB.

For High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), the concentrations were higher than LCEL at Active-Pit station ESC-NPCB; and were higher than UCEL at Active-Pit station ESC-NPCA. (Figures 15a and 15b of Appendix C). The concentrations of Tributyltin (TBT) was higher at Active Pit station ESC-NPCB (Figure 16 of Appendix C).

The concentrations of Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyltrichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) were below the limit of reporting at all stations during the reporting period.

Considering that the higher levels of Low Molecular Weight and High Molecular Weight PAHs are only occurred within Active-Pit stations ESC-NPCA and ESC-NPCB only, 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.

⁵ Whiteside PGD (2000) Natural geochemistry and contamination of marine sediments in Hong Kong. In: The Urban Geology of Hong Kong (ed. Page A & Reels SJ). Geological Society of Hong Kong Bulletin No. 6, p109-121

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 June 2023 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; and
- Cumulative Impact Sediment Chemistry of ESC CMPs.

3.2 Study Programme

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

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Figures





Appendices

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

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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	Station ID	Frequency		2026 Dec Jan Feb Mar
Active-Pit	soo usu			
Ph E day	ESC-NPAA ESC-NPAB	Monthly	0 0	2 2 2 2 2
Pit-Eage	ESC-NEAA	Monthly	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	2 2 2 2
Near-Pit	ESC-NEAB	Monthly		2 2 2 2 2
	ESC-NNAA ESC-NNAB	Monthly Monthly	6 6	2 2 2 2 2 2 2 2
Cumulative Impact Sedin	nent Chemistry	y*	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 I Sec Jan Feb Mar Apr N Sec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Sec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Sec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Sec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Sec Jan Feb Mar Apr May Jun Jul Au	Dec Jan Feb Mar
Near-field Stations	ESC-RNA	4 times per year		2 2
Mid-field Stations	ESC-RNB1	4 times per year		2 2
	ESC-RMA ESC-RMB	4 times per year 4 times per year	6 6 6 6 6 6 2	2 2 2 2
Capped Pit Stations	ESC-RCA1	4 times per year		2 2
Far-field Stations	ESC-RCB1	4 times per year		2 2
	ESC-RFA ESC-RFB	4 times per year 4 times per year	6 6 6 6 6 2	2 2 2 2
Ma Wan Station	MW1	4 times per year		2 2
Sediment Toxicity Tests			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 I	Dec Jan Feb Mar
Near-pit Stations	ESC-TDA	2 times per year		5
Reference Stations	ESC-TDB1	2 times per year	5 5 5 5 5 5 5 5 5	5
	ESC-TRA ESC-TRB	2 times per year 2 times per year	5 5	5
Ma Wan Station	M\0/1	2 times per vear		5
Tissue / Whole Body Sar	maling	z unes per year		Dec Jan Feb Mar
Near-pit Stations		2 times per year		s sail rep mai
Poforonco North	ESC-INB	2 times per year		*
Reference North	TNA	2 times per year		*
Reference South	TOA	2 unes per year		
	TSB	2 times per year		*
Demersal Trawling			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 I Dec	Dec Jan Feb Mar
Near-pit Stations	ESC-INA	4 times per year	5 5	5 5
Reference North	ESC-INB	4 umes per year		5 5
Deference Couth	TNB	4 times per year 4 times per year	5 5	5 5
Reference South	TSA TSB	4 times per year	5 5	5 5
Capping *	155	4 unes per year		Deel Jan Fehl Mar
Ebb Tide	rent			Dec San reb mai
Impact Station Downcum	ESC-IPE1A	4 times per year *		
	ESC-IPE3	4 times per year *		
Intermediate Station Dov	ESC-IPE5	4 times per year *		
	ESC-INE1A ESC-INE2A	4 times per year * 4 times per year *		
	ESC-INE3A ESC-INE4A	4 times per year * 4 times per year *		
Reference Station Upcur	ESC-INE5A	4 times per year *		
	ESC-RFE1 ESC-RFE2	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	4 times per year *		
	MW1	4 times per year *		
Flood Tide Impact Station Downcurr	rent			
	ESC-IPF1 ESC-IPF2	4 times per year * 4 times per year *		
Intermediate Station Dow	ESC-IPF3 vncurrent	4 times per year *		
	ESC-INF1 ESC-INF2	4 times per year * 4 times per year *		
Reference Station Upcur	ESC-INF3	4 times per year *		
	ESC-RFF1A ESC-RFF2A	4 times per year * 4 times per year *		
Ma Wan Station	ESC-RFF3	4 times per year *		
	MVV1	4 times per year *		Deal load Each Mar
Ebb Tide				Dec Jan Feb mar
Impact Station Downcum	ESC-IPE1A	Monthly*		2 2 2 2 2 2 2
	ESC-IPE3	Monthly*		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Intermediate Station Dov	ESC-IPE5	Monthly*		2 2 2 2 2
	ESC-INE1A ESC-INE2A	Monthly* Monthly*		2 2 2 2 2 2 2 2
	ESC-INE3A ESC-INE4A	Monthly* Monthly*	4 4 4 4 4 4 4 4 2	2 2 2 2 2 2 2 2
Reference Station Upcur	ESC-INE5A	Monthly*		2 2 2 2
	ESC-RFE1 ESC-RFE2	Monthly* Monthly*	4 4 4 4 4 4 4 4 4 2	2 2 2 2 2 2 2 2
	ESC-RFE3 ESC-RFE4	Monthly* Monthly*	4 4 4 4 4 4 4 4 4 2	2 2 2 2 2 2 2 2
Ma Wan Station	ESC-RFE5	Monthly*		2 2 2 2
	MW1	Monthly*		2 2 2 2
Flood Tide Impact Station Downcurr	rent			0 0101
	ESC-IPF1 ESC-IPF2	Monthly* Monthly*	a a	2 2 2 2 2 2 2 2 2 0 0 0
Intermediate Station Dow	esc-IPF3	Monthly*		2 2 2 2 2
	ESC-INF1 ESC-INF2	Monthly*	1 1 1 4 4 4 4 2	2 2 2 2 2 2 2 2 2 0 0 0
Reference Station Upcur	rent	Monthly*		2 2 2 2 2
	ESC-RFF1A ESC-RFF2A	Monthly*	7 7	2 2 2 2 2
Ma Wan Station	ESG-RFF3	Monthly*		2 2 2 2 2
Water Only Room	17177	wonthly		
Plume Stations	WOR	Monthlet		2 2 2 2 2 2
	WCP2	Monthly*	x x	2 2 2 2 2
Benthic Recoloinisation	Studies		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 I Dec Ja	Dec Jan Feb Mar
Capped Stations at CMP	ESCV-CPA	2 times per year		
	ESCV-CPB	∠ times per year 2 times per year		
Reference Stations	RBA	2 times per year		
1		- and polycal		

1100	z unos por your																	
RBC1	2 times per year																	

Impact Monitoring for Dredging		Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	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 Ma
Upstream Stations							
US1	3 times per week		2 2 2 2 2 2				
US2	3 times per week		2 2 2 2 2 2				
Downstream Stations							
DS1	3 times per week		2 2 2 2 2 2				
DS2	3 times per week		2 2 2 2 2 2				
DS3	3 times per week		2 2 2 2 2 2				
DS4	3 times per week		2 2 2 2 2 2				
DS5	3 times per week		2 2 2 2 2 2				
Ma Wan Station							
MW1	1 3 times per week		2 2 2 2 2 2				

Notes: Cance particular to an optimize 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 numbers of replicates per 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.

(3) Impact Monitoring for Dredging will be scheduled when dredging operations commence.
 (4) Benthic Recolonisation Studies for CMP V will be scheduled when dredging operations commence.
 (4) Benthic Recolonisation Studies for CMP V will be scheduled when dredging operations commence.
 (4) Benthic Recolonisation Studies for CMP V will be scheduled when dredging operations commence.
 (4) Benthic Recolonisation Studies for CMP V will be scheduled when dredging operations for CMP V is completed.
 * A proposal on the change of number of sample replication of water quality Aster Quality Monitoring and water quality monitoring during capping operation and Routine Water Quality Monitoring are combined such that Routine Water Quality Monitoring have been conducted monthy starting in December 2020. A technical note presenting the data review results served as a supplementary information was submitted to EPD and presented that Phase 2 optimization of sample replication of water quality and deversely affecting the supply of international species adopted in testing programme of Sediment Toxicity Tests, as such, Sediment Toxicity Tests, as such, Sediment Toxicity Tests, as such, Sediment Toxicity Tests, as such set or singinally scheduled in February 2022 were postponed to March 2022.
 * To enable the required Research Fishing Permit could be granted by the time undertaking the Demensal Trawling, trawling originally scheduled in July and August 2022 was postponed to August and September 2022.

Appendix B. Water Quality Monitoring Results



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.				

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

Notes:

1. 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 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 Vb in May 2023

Station	Temp.	Salinity	Turbidity	Dissolve	d Oxygen	рН	Suspended Solids			
	(°C)	(ppt)	(NTU)	(%)	(mg L ⁻¹)		(mg L ⁻¹)			
WCP 1 (Downstream)	25.47	27.76	15.88	103.96	7.28	7.71	7.0			
WCP 2 (Upstream)	25.64	27.42	11.33	104.86	7.33	7.70	7.5			
WQO (Wet Season)	N/A	24.68-30.16#	N/A	N/A	>4	6.5-8.5	11.7			

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 May 2023

Station	Temp.	Salinity	Turbidity	Dissolve	d Oxygen	рН
	(°C)	(ppt)	(NTU)	(%)	(mg L ⁻¹)	
RFE (Reference)	24.78	29.29	10.84	104.19	7.32	7.84
IPE (Impact)	24.97	29.01	6.00	107.56	7.54	7.98
INE (Intermediate)	24.86	29.29	6.20	106.02	7.43	7.97
Ma Wan	24.70	30.50	3.12	109.02	7.61	7.91
WQO (Wet Season)	N/A	26.36-32.22#	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 Dissolved Metals and Metalloid in Routine Water Quality Monitoring of ESC CMPs in May 2023

Station	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
	(µg/L)								
RFE	1.55	0.03	0.14	0.59	ND	0.004	0.74	ND	1.63
IPE	1.59	0.02	0.15	0.71	ND	0.003	0.72	ND	0.23
INE	1.59	0.02	0.15	0.67	0.01	0.003	0.76	ND	0.69
Ma Wan	1.65	0.02	0.13	0.56	ND	0.002	0.57	ND	4.03

Note:

"ND" indicates the concentrations of metals and metalloids are not detected. 1.

Table B5: Laboratory Results for Nutrients and Suspended Solid in Routine Water Quality Monitoring of ESC CMPs in May 2023

Station	NH ₃	TIN	BOD ₅	SS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RFE	0.03	0.39	0.89	19.6
IPE	0.04	0.41	1.03	8.7
INE	0.04	0.40	0.83	9.1
Ma Wan	0.05	0.32	0.85	5.5
				WQO of TIN: 0.5 mg/L
			Wet Seesen	WOO of SS: 11.7 mg/l

Wet Season WQO of SS: 11.7 mg/L

Notes:

"<LOR" indicates the concentrations of contaminants are below the limit of reporting. 1.

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

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 – May 2023

Appendix C. Graphical Presentations



Routine Water Quality Monitoring for ESC CMP V - May 2023

Figure 1: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023



Routine Water Quality Monitoring for ESC CMP V - May 2023

Figure 2: Level of Dissolved Oxygen (DO) (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023

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 - May 2023

Figure 3: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023



Routine Water Quality Monitoring for ESC CMP V - May 2023

Figure 4: Level of Temperature (°C; mean + SD)¹ recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023

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 - May 2023

Figure 5: Level of Salinity (ppt; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023



Routine Water Quality Monitoring for ESC CMP V - May 2023

Level of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Figure 6: Monitoring for disposal operations at ESC CMP V in May 2023

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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 May 2023

Figure 7: Concentration of Arsenic, Copper, Nickel, and Zinc (μg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023



Routine Water Quality Monitoring for ESC CMP V May 2023

Figure 8: Concentration of Cadmium, Chromium, Lead, Mercury (μg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in May 2023

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Routine Water Quality Monitoring for Nutrients - May 2023





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

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 Figure 10: in May 2023

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Routine Water Quality Monitoring for Suspended Solids - May 2023









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Figure 13: 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 May 2023



Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vb - May 2023

Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean + SD) in Figure 14: sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in May 2023

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Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vb - May 2023

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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

			100 (2021 202	.0)	investig	ation									
ID	Task Name	Start	Finish	021 1	02 03 0	2022 Q4 Q1	2 Q2 Q3	2023 Q4 Q1	Q2 Q3	202 Q4 Q1	4 Q2 Q3 Q4	2025 I Q1	02 03 0	2026 4 Q1	02 03
1	COMMENCEMENT OF AGREEMENT NO. CE 59/2020 (EP)	01/04/21													
2	EAST OF SHA CHAU CONTAMINATED MUD PITS (ESC CMPs) BETWEEN 2021 & 2026	01/04/21	25/06/26												-
3	Draft Report of First Review of EM&A Manual (for ESC CMPs)		30/04/21		•										
4	Final Report of First Review of EM&A Manual (for ESC CMPs)		20/05/21		٠										
5	Draft Report of Subsequent Review of EM&A Manual (for ESC CMPs) - annual basis assumed	30/04/22	30/04/25				\$		\$		\$		\$		
10	Final Report of Subsequent Review of EM&A Manual (for ESC CMPs) - annual basis assumed	20/05/22	20/05/25				\diamond		\$		\$		\$		
15	Regular Site Inspections of CMP Contractors	01/04/21	31/03/26									_		Î	
16	Monthly EM&A Report	14/05/21	14/04/26		00000C	>>>>	>>>>>>>	*****	*****	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	\$\$\$\$\$\$\$\$	>0000	\$\$\$\$\$\$	>>>>>	>
77	Quarterly EM&A Report	30/07/21	30/04/26		\$	◊ ◊	$\diamond \diamond$	◊ ◊	♦ ♦	♦♦	$\diamond \diamond \diamond$	\$	$\diamond \diamond \diamond$	 \$ 	\$
98	Annual EM&A Report	30/01/22	30/01/26			\diamond		\diamond		\$		\$		\$	
104	Annual Risk Assessment Report	31/05/22	31/05/26				\$		\$		\$		\diamond		\$
110	Draft Final Report		30/04/26												•
111	Final Report		04/06/26												٠
112	Draft Executive Summary		04/06/26												•
113	Final Executive Summary		25/06/26												٠
114	EAST OF TUNG LUNG CHAU (ETLC) DISPOSAL FACILITY (MONITORING PERIOD: SEPTEMBER 2021 & MARCH-APRIL 2022)	23/11/21	31/08/22												
115	Monthly EM&A Report	23/11/21	06/06/22			\$	$\diamond \diamond$								
119	Quarterly EM&A Report	15/07/22	15/07/22				\diamond								
121	Annual EM&A Report	31/08/22	31/08/22				\$								
	Start/End of ET Services	Start of Agreen	nent		•										
Progr	amme Revision: C Location	Submission													
	Repeating Task	Multiple-Occas	sion Submission		\diamond										