

Agreement No. CE 23/2012 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pits to the South of The Brothers and at East Sha
Chau (2012-2017) - Investigation

51ST MONTHLY PROGRESS REPORT FOR NOVEMBER 2016

1.1 BACKGROUND

- 1.1.1 Since early 1990s, contaminated sediment ⁽¹⁾ arising from various construction works (e.g. dredging and reclamation projects) in Hong Kong has been disposed of at a series of seabed pits at East of Sha Chau (ESC). In late 2008, a review indicated that the existing and planned facilities at ESC would not be able to meet the disposal demand after 2012. In order to meet this demand, the Hong Kong Special Administrative Region Government (HKSARG) decided to implement a new contained aquatic disposal (CAD) ⁽²⁾ facility at the South of The Brothers (SB CMPs) which had been under consideration for a number of years.
- 1.1.2 The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) study completed in 2005 under *Agreement No. CE 12/2002(EP)* ⁽³⁾. The Director of Environmental Protection (DEP) approved this EIA report under the *Environmental Impact Assessment Ordinance (Cap. 499)* (EIAO) in September 2005 (*EIA Register No.: AEIAR-089/2005*).
- 1.1.3 In accordance with the EIA recommendation, prior to commencement of construction works for the SB CMPs, the Civil Engineering and Development Department (CEDD) undertook a detailed review and update of the EIA findings for the SB site ⁽⁴⁾. Findings of the EIA review undertaken in 2009/2010 confirmed that the construction and operation of the SB site had been predicted to be environmentally acceptable.

- (1) According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 - Confined Marine Disposal as determined according to this TC(W).
- (2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.⁷
- (3) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/ East of Sha Chau Area (Agreement No. CE 12/2002(EP))
- (4) Under the CEDD study *Contaminated Sediment Disposal Facility to the South of The Brothers* (Agreement No. FM 2/2009)

1.1.4 *Environmental Permits (EPs) (EP-312/2008/A and EP-427/2011/A) were issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 for ESC CMP V and on 23 December 2011 for SB CMPs, respectively. Under the requirements of the EPs, an Environmental Monitoring and Audit (EM&A) programme as set out in the EM&A Manuals ^{(1) (2)} is required to be implemented for the CMPs.*

1.1.5 The present EM&A programme under *Agreement No. CE 23/2012 (EP)* covers the dredging, disposal and capping operations of the SB CMPs as well as ESC CMPs. Detailed works schedule for ESC CMPs and SB CMPs is shown in *Figure 1.1*. In November 2016, the following works were being undertaken:

- Dredging operation at ESC CMP Vb;
- Disposal of contaminated mud at ESC CMP Vd; and
- Capping operation at SB CMP 2.

Figure 1.1 Works Schedule for ESC CMPs and SB CMPs

Pit	Operation	2012			2013			2014			2015			2016			2017		
		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
ESC CMP	Dredging																		
	Backfilling																		
	Capping																		
SB CMP 1	Dredging																		
	Backfilling																		
	Capping																		
SB CMP 2	Dredging																		
	Backfilling																		
	Capping																		

1.2 REPORTING PERIOD

1.2.1 This 51st Monthly Progress Report covers the EM&A activities for the reporting month of November 2016.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1 The following monitoring activities have been undertaken for ESC CMPs in November 2016:

- Routine Water Quality Monitoring of ESC CMPs was undertaken on 1 November 2016;

(1) ERM (2012) Environmental Monitoring and Audit (EM&A) Manual. Final First Review. Environmental Monitoring and Audit for Contaminated Mud Pits to the South of the Brothers and at East Sha Chau (2012-2017) - Investigation. Agreement No. CE 23/2012(EP). Submitted to EPD in November 2012.

(2) ERM (2010) Environmental Monitoring and Audit (EM&A) Manual. Final Second Review. Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation. Agreement No. CE 4/2009(EP). Submitted to EPD in November 2010.

- *Water Quality Monitoring During Dredging of ESC CMP Vb* was undertaken on 2, 4, 8, 10, 12, 14, 16, 18, 21, 23, 25, 28 and 30 November 2016;
- *Pit Specific Sediment Chemistry of ESC CMP Vd* was undertaken on 7 November 2016; and
- *Water Column Profiling of ESC CMP Vd* was undertaken on 9 November 2016.

1.3.2 No monitoring activities were scheduled to be undertaken for SB CMPs in November 2016.

1.4 *DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS*

1.4.1 No outstanding sampling remained for November 2016.

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

- Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry of ESC CMP Vd* in November 2016.

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

1.5.1 Brief discussion of the monitoring results of the following activities for ESC CMPs is presented in this 51st Monthly Progress Report:

- *Water Quality Monitoring During Dredging of ESC CMP Vb* in November 2016;
- *Water Column Profiling of ESC CMP Vd* in November 2016;
- *Routine Water Quality Monitoring of ESC CMPs* in November 2016; and
- ~~*Pit Specific Sediment Chemistry of ESC CMP Vd* in November 2016.~~

批注 [RC1]: Did we receive data for this?

Not yet, sentence deleted.

1.5.2 *Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vb - November 2016*

1.5.3 ~~Dredging activities were carried out on 2–30 November 2016 during this reporting period and~~ Water quality monitoring was conducted three times per week during the reporting period on 2, 4, 8, 10, 12, 14, 16, 18, 21, 23, 25, 28 and 30 November 2016. During ~~the each~~ survey day, monitoring was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations and five Impact (Downstream) stations around the dredging operations at ESC CMP Vb. Monitoring was also conducted at one Sensitive Receiver station situated in Ma Wan. A total of eight (8) stations were monitored and locations of the sampling stations are shown in *Figure 1.2*.

1.5.4 Monitoring results are presented in *Table B1* of *Annex B*. Daily dredging volume in November 2016 is reported in *Annex C*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solid (SS) complied with the Action and Limit Levels (see *Table B2* of *Annex B* for details) set in the *Baseline Monitoring Report* ⁽¹⁾, except for the following occasion of exceedances discussed in *Table 1.1* below.

批注 [RC2]: We should start calculating the cumulative weekly volume from 30 Oct, so that the weekly dredging volume can be shown.
Revised.

1.5.5 The results indicated that the dredging operations at ESC CMP Vb did not appear to cause any unacceptable deterioration in water quality during this reporting period. Therefore, no further action, except for those recommended in the Environmental Permit (*EP-312/2008/A*), are considered necessary for the dredging operations.

(1) ERM (2009). Draft Second Review of the EM&A Manual. Under Agreement No. CE 4/2009 (EP) EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation

Table 1.1 Details of Exceedances Recorded at ESC CMP Vb between 2 and 30 November 2016

Date	Tide	Parameter	Station	Type	Remarks
16 November 2016	Mid-Flood	Turbidity	DS1	Action	<p>It is suspected that the non-compliance of Turbidity was related to the dredging activities at CMP Vb. Linear Regression Analysis was carried out and there was no spatial trend of increasing turbidity with proximity to the pit due to dredging activities. Moreover, level of Turbidity in Sensitive Receiver station (MW1) did not exceed the Action and Limit Level. Therefore, it is considered that the high levels of Turbidity were localized around the dredging location.</p> <p>In addition, levels of suspended solid (SS) at most stations complied with the Action and Limit levels, except SS levels of DS4 exceeded Action Level. Therefore, it is considered that the dredging operations did not cause adverse water quality impact in terms of SS levels, which are more representative to determine the effects of dredging operation to nearby sensitive receivers (e.g. fisheries). The Contractor was informed on the exceedances and ensured the proper execution of the good dredging practice measures, e.g. reduced operations speed of the dredger and tightly closed the grab during translocating the dredged material from the seabed to the barge. Subsequent water quality monitoring on 21 November 2016 indicated that DO, Turbidity and SS levels at all stations complied with the Action and Limit levels. These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to WSRs outside the works area because dredging activities were not carried out during the period of 10 – 17 November 2016.</p> <p>These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to Water Sensitive Receivers (WSRs) outside the works area due to the following reason: It is suspected that the non-compliance of Turbidity was related to the dredging activities at CMP Vb. Linear Regression Analysis was carried out and there was no spatial trend of increasing turbidity with proximity to the pit due to dredging activities. Moreover, level of Turbidity in Sensitive Receiver station (MW1) did not exceed the Action and Limit Level. Therefore, it is considered that the high levels of Turbidity were localized around the dredging location.</p> <p>In addition, levels of suspended solid (SS) at all stations complied with the Action and Limit levels. Therefore, it is considered that the dredging operations did not cause adverse water quality impact in terms of SS levels, which are more representative to determine the effects of dredging operation to nearby sensitive receivers (e.g. fisheries). The Contractor was informed on the exceedances and ensured the proper execution of the good dredging practice measures, e.g. reduced operations speed of the dredger and tightly closed the grab during</p>
16 November 2016	Mid-Flood	Turbidity	DS2	Limit	
16 November 2016	Mid-Flood	Turbidity	DS3	Limit	
16 November 2016	Mid-Flood	Turbidity	DS4	Limit	
16 November 2016	Mid-Flood	Turbidity	DS5	Limit	
16 November 2016	Mid-Flood	Turbidity	US1	Action	
16 November 2016	Mid-Flood	Turbidity	US2	Action	
16 November 2016	Mid-Flood	SS	DS4	Action	
18 November 2016	Mid-Flood	Turbidity	DS1	Action	<p>These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to Water Sensitive Receivers (WSRs) outside the works area due to the following reason: It is suspected that the non-compliance of Turbidity was related to the dredging activities at CMP Vb. Linear Regression Analysis was carried out and there was no spatial trend of increasing turbidity with proximity to the pit due to dredging activities. Moreover, level of Turbidity in Sensitive Receiver station (MW1) did not exceed the Action and Limit Level. Therefore, it is considered that the high levels of Turbidity were localized around the dredging location.</p> <p>In addition, levels of suspended solid (SS) at all stations complied with the Action and Limit levels. Therefore, it is considered that the dredging operations did not cause adverse water quality impact in terms of SS levels, which are more representative to determine the effects of dredging operation to nearby sensitive receivers (e.g. fisheries). The Contractor was informed on the exceedances and ensured the proper execution of the good dredging practice measures, e.g. reduced operations speed of the dredger and tightly closed the grab during</p>
18 November 2016	Mid-Flood	Turbidity	US1	Action	
18 November 2016	Mid-Flood	Turbidity	US2	Action	

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- 批注 [RC3]: No dredging was conducted on 16 November 2016. Therefore, the exceedance was not
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- 批注 [RC4]: US1 and US2 are refer
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Date	Tide	Parameter	Station	Type	Remarks
					<p>translocating the dredged material from the seabed to the barge. Subsequent water quality monitoring on 21 November 2016 indicated that DO, Turbidity and SS levels at all stations complied with the Action and Limit levels.</p> <ul style="list-style-type: none"> The Action Level Exceedance of Turbidity was recorded at Station DS1 which are located in the vicinity of the works area during one tidal period only, and exceedances were not recorded at stations WSR45C and WSR46 which are the nearest WSRs. It is thus considered that the exceedances were not indicating any unacceptable impacts from the dredging operations to the nearby WSRs. Reference stations US1 and US2 have high Turbidity levels similar to the levels recorded at station DS1 during the same tidal period. The Action Level Exceedance of Turbidity at station DS1 is considered to be isolated sporadic event which may be caused by natural background variation in water quality characteristics of the monitoring area.

批注 [RC5]: Please review these paragraphs. As exceedance occurred at DS1 only, did it really reflect it is due to dredging activities? Moreover, the turbidity at upstream stations were also high. I believe we can trim down the explanation.

Revised:

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1.5.6 *Water Column Profiling of ESC CMP Vd – November 2016*

1.5.7 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 9 November 2016. 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-dry~~ season period (~~April-November~~ to ~~October-March~~) of 2006 - 2015 from stations in the Northwestern Water Control Zone (WCZ), where the ESC CMPs are located ⁽¹⁾. For Salinity, the averaged value obtained from the Reference stations was used for the basis as the WQO. Levels of DO and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table B2 of Annex B* for details).

In-situ Measurements

1.5.8 Analyses of results for November 2016 indicated that levels of DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table B3 of Annex B*). In addition, DO and Turbidity at all stations complied with the Action and Limit Levels (*Tables B2 and B3 of Annex B*).

Laboratory Measurements for Suspended Solids (SS)

1.5.9 Analyses of results for November 2016 indicated that the SS levels at all stations complied with the WQOs and the Action and Limit Levels (*Tables B2 and B3 of Annex B*).

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

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

1.5.11 **Routine Water Quality Monitoring of ESC CMPs – November 2016**

1.5.12 Routine Water Quality Monitoring of ESC CMPs was undertaken on 1 November 2016. The monitoring results have been assessed for compliance with the WQOs (see Section 1.5.7 for details). The monitoring results are shown in Tables B4 and B5 of Annex B and Figures 1 - 10 of Annex D. A total of sixteen (16) monitoring stations were sampled in November 2016 as shown in Figure 1.3.

In-situ Measurements

1.5.13 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in Figures 1 - 6 of Annex D. Analyses of results for November 2016 indicated that the levels of pH, Salinity and DO complied with the WQOs at all stations (Impact, Intermediate, Reference and Ma Wan stations) in November 2016 (Table B4 of Annex B; Figures 1, 3 and 5 of Annex D).

批注 [RC6]: Please update Figure 3 (DO in mg/L). The WQO line is not 4mg/L.
Updated.

1.5.14 The levels of DO and Turbidity complied with the Action and Limit Levels at all stations (Table B4 of Annex B; Figures 3 and 6 of Annex D).

1.5.15 Overall, *in-situ* measurement results of the Routine Water Quality Monitoring indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable impacts in water quality in November 2016.

Laboratory Measurements

1.5.16 Laboratory analysis of November 2016 results indicated that concentrations of Cadmium, Silver, Lead and Mercury were below their limit of reporting at all stations. Arsenic, Chromium, Nickel, Copper, Lead and Zinc were detected in November 2016 samples and the concentrations of these metals and metalloids were similar amongst stations (Table B5 of Annex B; Figure 7 of Annex D).

批注 [RC7]: Seems Lead is not below LOR at all stations from Table B5. Please check.
Updated.

1.5.17 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at all stations except Ma Wan station in November 2016 were higher than the WQO (0.5 mg/L) (Table B5 of Annex B; Figure 8 of Annex D). It should be noted that due to the effect of Pearl River, the North Western WCZ has historically experienced higher levels of TIN⁽¹⁾. ~~Since TIN concentrations were recorded to be similar amongst all stations~~ Therefore, the exceedances of TIN WQO at all these stations are unlikely to be caused by the disposal operation at ESC CMP Vd. Concentrations of Ammonia Nitrogen (NH₃-N) were relatively similar amongst all stations (Table B5 of Annex B; Figure 8 of Annex D). Levels of 5-day Biochemical Oxygen Demand (BOD₅) appear to be higher at Reference stations in November 2016 (Table B5 of Annex B; Figure 9 of Annex D).

批注 [RC8]: Please check and see if Lead should be discussed here. If yes, please update Figure 7.
Updated.

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

1.5.18 Analyses of results for November 2016 indicated that the SS levels at Intermediate and Ma Wan stations were higher than the WQO (13.2 mg/L for dry season), however SS levels at all stations complied with the Action and Limit Levels (Tables B2 and B5 of Annex B; Figure 10 of Annex D).

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1.5.19 Overall, results of the Routine Water Quality Monitoring indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality in November 2016. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.

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1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.6.1 The following monitoring activities will be conducted in the next monthly period of December 2016 for ESC CMPs:

- Water Column Profiling of ESC CMP Vd;
- Routine Water Quality Monitoring of ESC CMPs Vd;
- Water Quality Monitoring During Dredging of ESC CMP Vb;
- Pit Specific Sediment Chemistry of ESC CMP Vd;
- Cumulative Impact Sediment Chemistry of ESC CMPs; and
- Benthic Recolonisation Studies of ESC CMP IV.

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1.6.2 The following monitoring activities will be conducted in the next monthly period of December 2016 for SB CMPs:

- Water Quality Monitoring During Capping of SB CMPs;
- Benthic Recolonisation Studies of SB CMP 1.

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1.6.3 The sampling schedule is presented in Annex A.

1.7 STUDY PROGRAMME

1.7.1 A summary of the Study programme is presented in Annex E.

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ANNEX E	STUDY PROGRAMME

批注 [RC9]: Please update Annex Cover

Updated.

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