

Castle Peak Power Company Limited

Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station

Updated Contamination Assessment Plan

9 November 2020

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Updated Contamination Assessment Plan



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Acronyms and Abbreviations

<u>Name</u>	<u>Description</u>
CAPCO	Castle Peak Power Company Ltd
CAP	Contamination Assessment Plan
CAR/RAP	Contamination Assessment Report / Remediation Action Plan
CPPS	Castle Peak Power Station
DEP	Director of Environmental Protection
DG	Dangerous Goods
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
ERR	Environmental Review Report
FSD	Fire Service Department
GEO	Geotechnical Engineering Office
GI	Ground Investigation
m bgl	metres below ground level
mPD	metres above the Hong Kong Principal Datum
PCRs	Petroleum Carbon Ranges
PLCA	Pilot Land Contamination Assessment
RBRGs	Risk Based Remediation Goals
SI	Site Investigation
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WPCO	Water Pollution Control Ordinance
WDO	Waste Disposal Ordinance

1. INTRODUCTION

1.1 Background

The Castle Peak Power Company Ltd (CAPCO) currently uses the West Ash Lagoons at Tsang Tsui for disposal of surplus ashes, which consist mainly of raw Pulverised Fuel Ash (PFA), rejected PFA and Furnace Bottom Ash (FBA) generated from the Castle Peak Power Station (CPPS); and storage of process water/ stormwater runoff arising from the CPPS. Hong Kong SAR Government plans to use the West Ash Lagoon for the WENT Landfill Extension which will impact on the daily operations of CPPS, especially on ash and stormwater management. CAPCO therefore plans to implement an enhanced ash utilisation and water management scheme at the CPPS to ensure the effective operation of the CPPS. CPPS is an exempted Designated Project under Section 9(2)(g) of the Environmental Impact Assessment Ordinance (EIAO). The proposed new ash management facilities are classified as a Designated Project (DP) under Item G.6, Part I, Schedule 2 – A waste disposal facility for pulverised fuel ash, furnace bottom ash or gypsum. Therefore the implementation of the enhancement scheme will require an EP under the EIAO.

A design scheme was put forward in 2012 to enhance ash utilisation and water management facilities at the CPPS before handing over of the West Ash Lagoon to the Government. Pursuant to the EIAO, a Project Profile was submitted to apply directly for an EP. An EP (EP-441/2012) was issued to CAPCO by the Director of Environmental Protection (DEP) on 23 July 2012.

In 2017, CAPCO revised the design and developed a new scheme (hereinafter referred as ‘the 2017 scheme’). To facilitate the changes, an Environmental Review Report (ERR) was submitted to DEP to apply for Variation of Environmental Permit (VEP). The revised EP (No: EP-441/2012/A) was issued by DEP on 29 June 2018.

As part of the ERR, a Contamination Assessment Plan (hereinafter referred as “ERR-CAP”) was prepared and accepted by Environmental Protection Department (EPD) in March 2018. The ERR-CAP identified four (4) Works Areas with potential land contamination sources

- Works Area A: Contractor Village;
- Works Area B: South of Lagoon No.1;
- Works Area C: West Coal Stockyard and;
- Works Area D: Existing Silos A1 and A2 along Sea Bank Road West.

In the ERR-CAP, ERM conducted a review of a Preliminary Land Contamination Assessment (PLCA) completed during the period between August 2016 and October 2017 in accordance with EPD’s RBRGs Practice Guide and Guidance Note. The Site Investigation (SI) for PLCA was undertaken at three (3) locations, i.e. TP1, AEBH1 and AEBH2 in Works Areas A, B and D respectively (see *Figure 1*). All soil and groundwater samples collected indicated no exceedance in RBRGs for industrial land uses. For Works Area C, the SI for 19 boreholes proposed within the West Coal Stockyard (hereinafter referred as “WCS” or “the Site”) were put on-hold as the site was still occupied by the coal stockpile. This SI was therefore scheduled to be conducted after the clearance of coal stockpile.

The proposed SI arrangement for the 19 boreholes within the WCS were accepted by EPD in the revised EP. According to the *Section 2 Specific Conditions* of the revised EP (No: EP-441/2012/A), CAPCO shall submit an updated CAP and a Contamination Assessment Report (CAR) at least one month before the partial decommissioning works of WCS.

1.1.1 Updated Engineering Design of the Partial Decommission Area of West Coal Stockyard in 2020

According to the latest engineering design of the partial decommissioning area in WCS provided by CAPCO, the existing perimeter drain and retaining structures will be removed for the construction of a U-channel along the western boundary of the existing WCS. A new retaining wall together with a perimeter drain will be constructed along the eastern boundary of Works Area C. The excavation

works in the WCS will be limited to approximately 2.5m to 3.0m below the existing ground level. The decommissioning area between the new U-channel and new retaining wall will be left as an open space (see *Figure 2*).

1.1.2 Decommissioning Programme of West Coal Stockyard in 2020

According to CAPCO's information, the WCS is scheduled to be decommissioned in the fourth quarter of 2020 and hence it will be available for further SI after clearance of coal in the WCS. In addition, the site conditions between 2018 and 2020 shall be updated (if necessary) to determine the appropriate sampling strategy before further SI. Therefore, an Updated CAP will be prepared for submission to EPD for agreement of the sampling and testing requirements taking account of the latest conditions of the Site.

1.1.3 Updated CAP in 2020

Given the requirements stipulated in *Section 2 Specific Conditions* of the revised EP, the updated engineering design of the partial decommissioning of WCS, and the latest decommissioning programme, ERM-Hong Kong, Limited (ERM) was commissioned by CAPCO to conduct an Updated Land Contamination Assessment for the WCS in CPPS prior to the partial decommissioning of the West Coal Stockyard (hereafter referred to as "the Project") (see *Figure 2*).

1.2 Objectives of the Updated CAP

This Updated CAP presents the past and present land uses of the Site in relation to potential soil and groundwater contamination. This Updated CAP will also outline the methodology for an intrusive SI at the Site to confirm if the soil and groundwater are contaminated with respect to the RBRG standards and if contamination is found, to identify the nature and extent of on-site contamination.

1.3 Structure of this Updated CAP

Following this introduction section, the subsequent sections of the Updated CAP are structured as follows.

- *Section 2* outlines the statutory requirements and the evaluation criteria for land contamination assessment;
- *Section 3* presents the findings of the site appraisal, including site survey, information on the past and present land uses;
- *Section 4* proposes the sampling plan to assess the potential land contamination of the Site;
- *Section 5* proposes the proposed sampling methodology; and
- *Section 6* presents the conclusion and recommendations.

This CAP is supplemented with the following annexes:

<i>Annex A</i>	<i>Dangerous Goods License Record provided by Fire Service Department</i>
<i>Annex B</i>	<i>Previous Ground Investigation Record</i>
<i>Annex C</i>	<i>Site Walkover Checklists</i>
<i>Annex D</i>	<i>Site Walkover Photos</i>
<i>Annex E</i>	<i>Referenced Aerial Photographs</i>
<i>Annex F</i>	<i>Details of Historical Site Investigation Data</i>
<i>Annex G</i>	<i>Schematic Drawing of Groundwater Monitoring Well</i>
<i>Annex H</i>	<i>Risk-Based Remediation Goals</i>

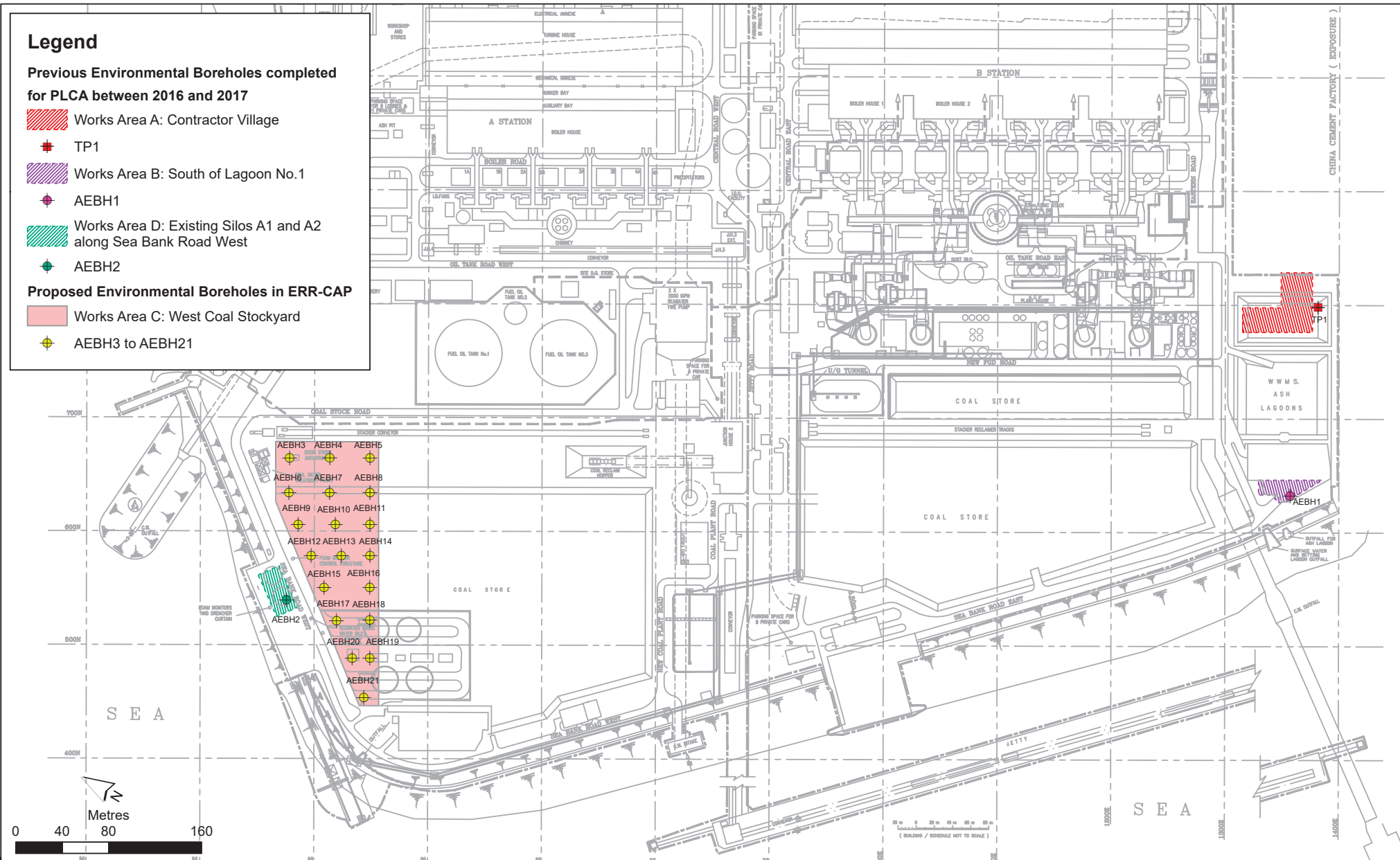
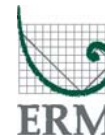


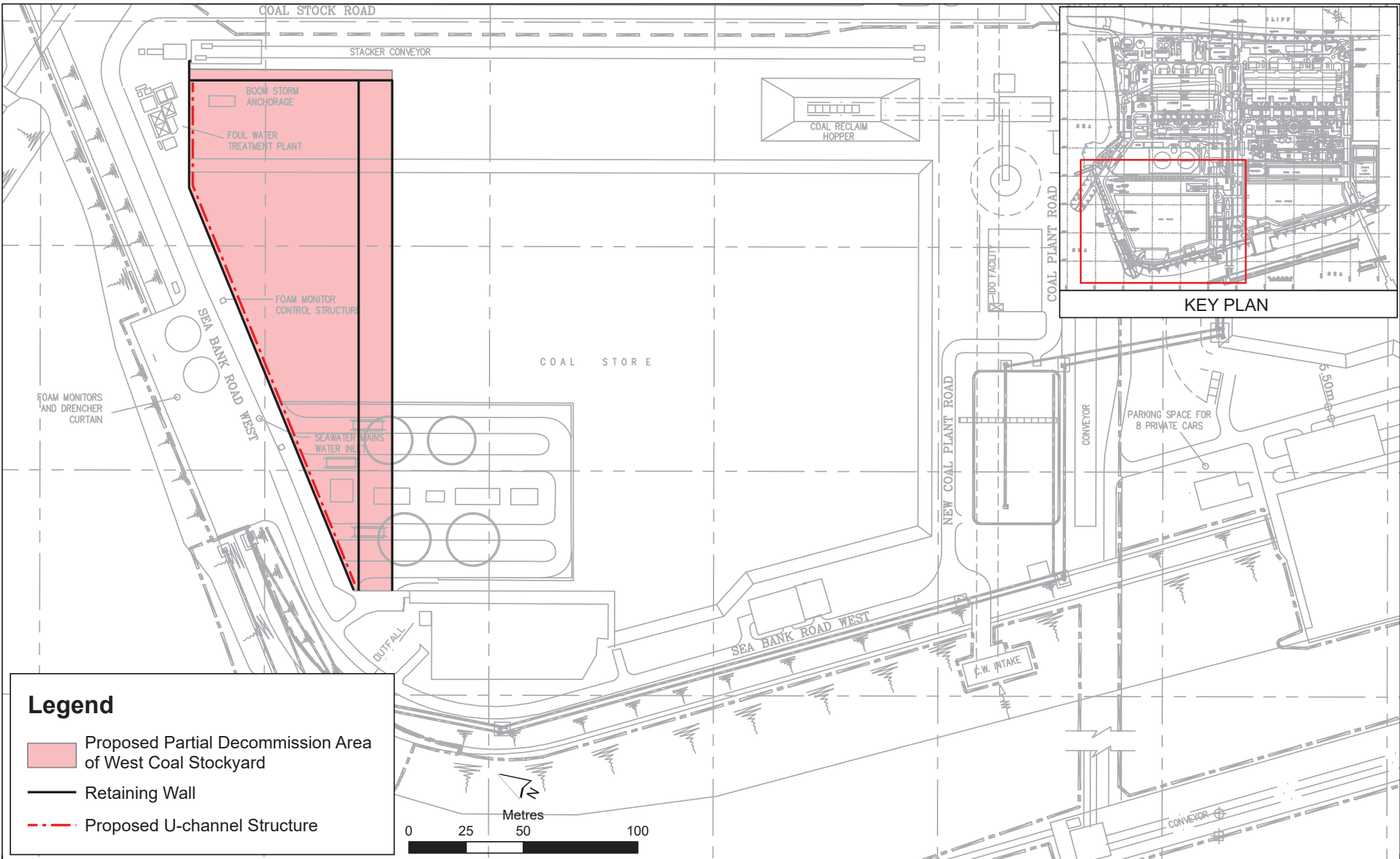
Figure 1

CPPS Works Areas and Previous SI locations for ERR-CAR

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Date: 23/7/2020

Environmental
Resources
Management





2. STATUTORY REQUIREMENTS AND EVALUATION CRITERIA

2.1 Statutory Framework

The following EPD's guiding documents are referenced for this land contamination assessment:

- *Guidance Note for Contaminated Land Assessment and Remediation* (the RBRGs Guidance Note);
- *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (the RBRGs Guidance Manual); and
- *Practice Guide for Investigation and Remediation of Contaminated Land* (the Practice Guide).

The following legislation, documents and guidelines may cover or have some bearing upon the assessment of contamination and the handling, treatment and disposal of contaminated materials for this Project:

- *Water Pollution Control Ordinance* (WPCO) (Cap 358);
- *Waste Disposal Ordinance* (WDO) (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354C); and
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

2.2 Selection of RBRGs Land Use Scenario

In accordance with Section 2 of the RBRGs Guidance Note, the Site's future land use and the appropriate set of RBRGs corresponding to the land use scenarios should be determined prior to the site appraisal. The Hong Kong RBRGs are developed for four different post-restoration land use scenarios, namely urban residential, rural residential, industrial, and public parks.

As the future land use of the Site will be continued as industrial use for the operation in the CPPS, the RBRGs conceptual site model under industrial land use scenarios will be adopted. Therefore, the RBRGs for industrial land use shall be adopted in this Project. The adopted RBRGs for soil and groundwater are presented in *Table 2.1*.

Table 2.1 RBRGs for Industrial Land Use for Soil and Groundwater & Soil Saturation Limit / Solubility Limit

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C_{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)
Metals				
Lead	2,290	-	-	-
Antimony	261	-	-	-
Arsenic	196	-	-	-
Barium	1.00E+04*	-	-	-
Cadmium	653	-	-	-
Cobalt	1.00E+04*	-	-	-
Copper	1.00E+04*	-	-	-
Manganese	1.00E+04*	-	-	-
Molybdenum	3,260	-	-	-
Nickel	1.00E+04*	-	-	-
Tin	1.00E+04*	-	-	-
Zinc	1.00E+04*	-	-	-
Chromium III	1.00E+04*	-	-	-
Chromium VI	1,960	-	-	-

LAND CONTAMINATION ASSESSMENT FOR WEST COAL STOCKYARD MODIFICATION WORK IN CASTLE PEAK POWER STATION

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C _{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)
Mercury	38.4	-	6.79	-
Petroleum Carbon Ranges (PCRs)				
C6 - C8	1.00E+04*	1,000	1,150	5.23
C9 - C16	1.00E+04*	3,000	9,980	2.8
C17 - C35	1.00E+04*	5,000	178	2.8
Volatile Organic Compounds (VOCs)				
Acetone	1.00E+04*	***	1.00E+04*	***
Benzene	9.21	336	54	1,750
Bromodichloromethane	2.85	1,030	26.2	6,740
2-Butanone	1.00E+04*	***	1.00E+04*	***
Chloroform	1.54	1,100	11.3	7,920
Ethylbenzene	8,240	138	1.00E+04*	169
Methyl tert-Butyl Ether	70.1	2,380	1,810	***
Methylene Chloride	13.9	921	224	***
Styrene	1.00E+04*	497	1.00E+04*	310
Tetrachloroethene	0.777	97.1	2.95	200
Toluene	1.00E+04*	235	1.00E+04*	526
Trichloroethene	5.68	488	14.2	1,100
Xylenes (Total)	1,230	150	1,570	175
Semi Volatile Organic Compounds (SVOCs)				
Acenaphthene	1.00E+04*	60.2	1.00E+04*	4.24
Acenaphthylene	1.00E+04*	19.8	1.00E+04*	3.93
Anthracene	1.00E+04*	2.56	1.00E+04*	0.0434
Benzo(a)anthracene	91.8	-	-	-
Benzo(a)pyrene	9.18	-	-	-
Benzo(b)fluoranthene	17.8	-	7.53	0.0015
Benzo(g,h,i)perylene	1.00E+04*	-	-	-
Benzo(k)fluoranthene	918	-	-	-
bis-(2-Ethylhexyl)phthalate	91.8	-	-	-
Chrysene	1,140	-	812	0.0016
Dibenzo(a,h)anthracene	9.18	-	-	-
Fluoranthene	1.00E+04*	-	1.00E+04*	0.206
Fluorene	1.00E+04*	54.7	1.00E+04*	1.98
Hexachlorobenzene	0.582	-	0.695	6.2
Indeno(1,2,3-cd)pyrene	91.8	-	-	-
Naphthalene	453	125	862	31
Phenanthrene	1.00E+04*	28	1.00E+04*	1
Phenol	1.00E+04*	7,260	-	-
Pyrene	1.00E+04*	-	1.00E+04*	0.135
Dioxins / PCBs				
Dioxins (I-TEQ)	0.005	-	-	-
PCBs	0.748	-	5.1100	0.031
Other Inorganic Compounds				
Cyanide, free	1.00E+04*	-	-	-
Organometallics				
TBTO	196	-	-	-

Notes:

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C_{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)

* indicates a 'ceiling limit' concentration.

*** indicates that the C_{sat} value / solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

3. SITE APPRAISAL

The site appraisal comprises a description of general site setting; and a review of historical spillage and leakage records, (hydro) geology and underground soil profile, current and past land uses, historical aerial photographs and maps at the Site and the adjacent areas.

3.1 General Site Setting

The Site is situated within the western corner of Castle Peak Power Station – A (CPPS-A). Surrounding land uses of the neighbouring environment of the assessment areas are summarised as follow:

- North: Sea Bank Road West. Further west is a vacant area occupied by temporary contractor offices
- East: Coal Stock Road. Further north is an outdoor storage area for miscellaneous equipment and spare parts.
- South: Remaining area of Coal Store and New Coal Plant Road. Further south is a conveyor facility which transfers coal received from the Coal Pier to the Coal Grinder in CPPS-A.
- West: Sea Bank Road West. Further south is a Wastewater Treatment Plant..

Figure 2 presents the location of the Site and the surrounding structures.

3.2 Review of Historical Spillage and Leakage Record

Enquiries were made to the EPD and the Fire Services Department (FSD) on chemical waste producer records and historical spillage and leakage records of the corresponding potential contaminated sites identified in this CAP. A visit to the Chemical Waste Collection Licensing Section of the EPD Territorial Control Office was arranged and information related to Chemical Waste Producer (CWP) registered for the Site was extracted.

A total of 21 chemical waste producers were registered in CPPS. However, upon further confirmation with CAPCO, all chemical waste producers and their activities lead to chemical waste generation were not located within the Site.

An information request was sent to FSD regarding any historical Dangerous Goods (DG) licence records and incident records within the Site from the year 1990 to present. According to FSD's existing record, three (3) valid DG licences were found in CPPS. However, CAPCO confirmed that no DGs were currently and historically stored within the Site. In addition, no incident records was found within CPPS. Information provided by FSD are provided in *Annex A*

3.3 (Hydro) Geology and Underground Soil Profile

Previous Ground Investigation (GI) records within the Site obtained from CAPCO were reviewed. According to the drillhole records completed within the WCS in 2012, the geological strata encountered were in general a fill material of cobbles and rock fragments with slightly silty fine to coarse sand from 0 to 1.8 m bgl), and boulder sized strong granite and rock fragments (from 1.8 to 7.5m bgl). The groundwater level measured was at approximately 3.0m bgl. Copies of the previous borehole record are attached in *Annex B*.

3.4 Review of Current Land Use

Site walkover and site management interview were conducted on 8 May 2020 to observe and update the Site conditions. "Standard Form 3.1 – Current Use" in accordance with the RBRGs Guidance Manual is included as *Table 3.2*. *Annex C* presents the Site Walkover Checklist. *Annex D* presents the selected site walkover photos.

3.5 Review of Past Land Use

A review of past land uses at the Site were conducted by reviewing the aerial photographs in the years of 1976, 1981, 1984, 1996, 2008, 2016, 2018 and 2019. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. Key changes of site setting observed within the Site are summarised in *Table 3.1 and 3.2* using the 'Standard Form 3.1 – Current Use' and 'Standard Form 3.2 – Past Use' in accordance with the RBRGs Guidance Manual. The referenced aerial photographs are attached in *Annex E*.

Table 3.1 Standard Form 3.1 Summary of On-Site Land Use – Current Use

Site	Type of Existing Facility/Business	On-site Property Land Use	Date Began/Period	Description of Site Walkovers and Interviews Findings	Owner or Occupier	Approximate Size of On-site Property (m ²)	Off-site Property Affected?
West Coal Stockyard	Industrial	Open Storage	1986	The Site has been used for open stockpile of coal since 1986. No significant change of site conditions and no change in land use were observed during the site walkover compared to 2018. Ground conditions of the area could not be inspected as the entire area was homogeneously covered by coal.	CAPCO	16,000m ²	No

Table 3.2 Standard Form 3.2 Summary of On-Site Land Use – Past Use

Site	Type of Facility/Business	On-site Property Land Use	Date Began/Period	Description of Site History	Owner or Occupier	Approximate Size of On-site Property (m ²)	Off-site Property Affected?
West Coal Stockyard	Industrial	Open Storage	1981	Reclamation completed and the CPPS was under construction. Constructions (Temporary low-rise housing structures / container offices / workshops) were found within the southern part of the works area.	CAPCO	16,000m ²	No
			1984	The West Coal Stockyard was established. Part of the area was constructed with three consecutive single - storey buildings which resembled warehouses / workshops.			
			1986	The warehouses were removed. The whole works area was used as West Coal Stockyard.			

3.6 Review of Previous Site Investigations

3.6.1 Land Contamination Assessment at West Coal Stockyard in 2012

A Land Contamination Assessment was conducted between June 2011 and March 2012 (hereinafter referred to as 2012 LCA) for the preparation of the Project Profile of the 2012 Scheme of the Project.

A total of six (6) soil samples and four (4) groundwater samples (including one (1) soil duplicate and one (1) groundwater duplicate sample) were taken from three (3) sampling locations, i.e. EBH2, EBH3 and EBH4, within the area of existing WCS.

The laboratory analysis results indicate no exceedances of the RBRGs industrial land use for metals, PCRs, VOCs and SVOCs for all the soil and groundwater samples tested. In addition, no signs of non-aqueous phase liquid (NAPL) including stains and abnormal odour were observed during the groundwater sampling events.

Review of the borehole logs indicates the geological strata of the WCS is in general a thin fill layer of sand (0 – 0.5m bgl) followed by medium gravel sized rocks fragments (0.5 – 1.5m bgl) and boulder sized granite (1.5m bgl and below). The amount of soil encountered below 0.5m bgl in the WCS was minimal.

The results indicated that the overall ground condition of the Site was good and soil and groundwater were uncontaminated.

Annex B presents the borehole logs for these three (3) sampling locations. The as-built sampling locations are shown in *Figure 3*. *Table 3.3* summarises the drilling and sampling details and the analysis results of the soil and groundwater samples.

Table 3.3 Summary of Land Contamination Assessment Results of WCS during the 2012 LCA

Sampling Location	As-built Coordinates	Drilling Depth (m bgl) ^(a)	Sampling Date	Sampling Depths (m bgl) ^(b)	No. of Soil Samples collected	No. of Groundwater Samples collected	Testing Parameters exceeding RBRGs for industrial land use (Y/N)				
							Metals	PCRs	VOCs	SVOCs	Free Cyanide
EBH2	E: 809375.91 N: 826410.24	7.1	6 to 9 Mar 2012	0.5	1	1	N	N	N	N	N
EBH3	E: 809353.89 N: 826381.00	7.5	29 Feb to 5 Mar 2012	0.4	1	1	N	N	N	N	N
EBH4	E: 809335.89 N: 826353.30	7.2	29 Feb to 3 Mar 2012	0.5, 0.8, 3.70-3.99	4 ^(c)	2 ^(d)	N	N	N	N	N

Notes:

- (a) m bgl denotes meters below ground level.
- (b) Exact sampling depth is adjusted from the proposed sampling depths in the CAP. This is due to the presence of boulders/ rock at the proposed sampling depths as advised by drilling contractor and onsite land contamination specialist.
- (c) Soil duplicate sample was collected at 0.5 m bgl.
- (d) Groundwater duplicate sample was collected.

3.6.2 Pilot Land Contamination Assessment at West Coal Stockyard in 2020

A Pilot Land Contamination Assessment for West Coal Stockyard (PLCA-WCS) was conducted during the periods between 3 and 16 June 2020 in order to provide more recent data, verify the ground condition at the Site, and therefore provide more assurance of the coal yard decommissioning programme should remediation be required. Although the WCS was still covered by a thin layer of coal in June 2020, three (3) best available sampling locations were selected for the PLCA. Three (3) sampling locations at the top, middle and bottom of the West Coal Stockyard were selected from the 19 proposed sampling locations in the ERR-CAP to represent the overall ground condition of the Site.

A total of seven (7) soil samples and four (4) groundwater samples (including 1 soil duplicate and 1 groundwater duplicate) were collected by borehole drilling method from three (3) sampling locations – AEBH4, AEBH10 and AEBH18 in accordance with the approved ERR-CAP and EPD's RBRGs Guidance Note and Practice Guide. The SI and soil and groundwater sampling were supervised by ERM Land Contamination Specialist. The sampling locations were adjusted due to actual Site conditions and safety concern. *Annex F1* shows the details of drilling method, sampling method and decontamination of equipment. *Annex F2* presents the borehole logs. The as-built sampling locations are shown in *Figure 3*.

The laboratory analysis results indicate no exceedances of the RBRGs for industrial land uses with respect to metals, PCR, VOCs and SVOCs for all the soil and groundwater samples tested. Only background concentration of metals were detected in all soil samples. Concentrations of PCRs, VOCs, SVOCs and free cyanide in all soil and groundwater samples were below detection limits. No signs of non-aqueous phase liquid (NAPL) including stains and abnormal odour were observed during the groundwater sampling. Quality control samples (1 set of soil duplicate, 1 set of groundwater duplicate, 1 set of field blank, 1 set of equipment blank and 5 sets of trip blanks) were taken and no evidence of cross contamination was found.

The preliminary results indicate that the overall ground condition of the Site is good and soil and groundwater were not contaminated with respect to the RBRGs. The details of the SI and detailed laboratory analysis results will be presented in the Contamination Assessment Report (CAR).

In addition, there were no changes of land uses and no significant changes of site operations in the works areas since the completion of PLCA-WCS. It is therefore considered that the SI data collected from the PLCA-WCS is valid and representative for the land contamination assessment of this Project.

4. SAMPLING AND TESTING PLAN

4.1 Proposed Sampling Locations

Based on the site appraisal and review of previous SI findings presented in *Section 3*, there is no significant changes of the site condition and operation since 2018. The proposed 19 sampling locations based on the grid sampling pattern adopted in the ERR-CAP will be followed in this Updated CAP.

Since the SI conducted at AEBH4, AEBH10 and AEBH18 during the PLCA-WCS was carried out in accordance with the approved ERR-CAP and EPD's RBRGs Guidance Note and Practice Guide, their sampling method and data are considered valid and representative for the land contamination assessment of this Project. As such, the proposed sampling locations will not repeat at AEBH4, ABH10 and AEBH18 and will focus on the remaining 16 proposed sampling locations. In addition, groundwater samples obtained in the 2012 LCA and 2020 PCLA-WCS were both uncontaminated with no detected contaminants. No signs of groundwater contamination due to coal storage was identified.

4.2 Sampling and Analysis Plan

Considering the information presented in *Section 3* and *Section 4.1*, a SI plan for the Project is presented in this section. The proposed sampling locations are determined and verified by the Land Contamination Specialist of ERM to provide a representation of the potential contamination impacts based on the site appraisal findings and observations made at the time of site walkover.

The SI result from 2012 LCA and 2020 PLCA-WCS both show that the geological strata of the Site is a thin fill layer followed by cobbles rocks/ boulders within 0 - 1.5m bgl. Materials below 1.5m bgl are mostly boulder sized rocks with no soil layer. In addition, the excavation level of the decommissioning works will be limited to 3.0m bgl. Therefore, the borehole termination depth is proposed at 3.0m bgl for the collection of soil samples at three default sampling depth 0.5m, 1.5m and 3.0m bgl (subject to the geological profile of each location).

Although the groundwater samples obtained in both the 2012 LCA and 2020 PLCA-WCS were considered clean and the concerned contaminants were well below their respective detection limit, it is proposed that groundwater samples shall be collected at the remaining 16 proposed sampling locations as a confirmatory sampling.

Table 4.1 summarises the details of the sampling plan, including number of sampling locations, the sampling methods, the number of samples, the selected RBRGs land use scenario, and the parameters that will be analysed. The proposed sampling locations are presented in *Figure 4*.

Table 4.2 presents the laboratory analytical methods and reporting limits proposed for the soil and groundwater samples.

Table 4.1 Proposed Sampling and Analysis Plan

Sampling Location ID	Proposed Coordinates	Soil		Groundwater	
		Sampling Arrangement - Depths (m bgl) ^(a)	Proposed Testing Parameters	Sampling Arrangement	Proposed Testing Parameters
AEBH3	E: 809483.40 N: 826508.52	<p>For AEBH3, AEBH5 to AEBH9, AEBH11 to AEBH17, and AEBH19 to AEBH21</p> <p>Manual excavation of Inspection Pit (0-1.5m bgl):</p> <ul style="list-style-type: none"> ■ To collect disturbed sample at 0.5m bgl <p>Rotary Drilling of boreholes (1.5-3.0m bgl):</p> <ul style="list-style-type: none"> ■ Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a maximum depth of 3 m bgl ■ To collect undisturbed soil samples at 1.5 and 3.0 m bgl <p>For AEBH4, AEBH10 and AEBH18^(f)</p> <ul style="list-style-type: none"> ■ No soil samples required. 	<p>Metals ^(b), PCR^s ^(c), VOC^s ^(d), SVOC^s ^(e), free Cyanide</p>	<p>For AEBH3, AEBH5 to AEBH9, AEBH11 to AEBH17, and AEBH19 to AEBH21</p> <ul style="list-style-type: none"> ■ Collect one (1) groundwater sample at static groundwater level from each new groundwater well. <p>For AEBH4, AEBH10 and AEBH18^(f)</p> <ul style="list-style-type: none"> ■ No groundwater samples required. 	<p>Metal (mercury) ^(b), PCR^s ^(c), VOC^s ^(d), SVOC^s ^(e), free Cyanide</p>
AEBH4	E: 809500.73 N: 826478.59				
AEBH5	E: 809518.04 N: 826448.58				
AEBH6	E: 809457.16 N: 826493.94				
AEBH7	E: 809474.66 N: 826463.71				
AEBH8	E: 809492.05 N: 826433.57				
AEBH9	E: 809437.44 N: 826473.46				
AEBH10	E: 809460.03 N: 826451.08				
AEBH11	E: 809468.41 N: 826419.92				
AEBH12	E: 809419.41 N: 826450.16				
AEBH13	E: 809432.41 N: 826427.64				
AEBH14	E: 809444.77 N: 826406.27				
AEBH15	E: 809401.40 N: 826426.89				
AEBH16	E: 809421.11 N: 826392.68				
AEBH17	E: 809382.17 N: 826403.35				
AEBH18	E: 849407.07 N: 826392.66				
AEBH19	E: 809360.77 N: 826375.39				
AEBH20	E: 809368.28 N: 826362.32				
AEBH21	E: 809336.66 N: 826349.99				

LAND CONTAMINATION ASSESSMENT FOR WEST COAL STOCKYARD MODIFICATION WORK IN CASTLE PEAK POWER STATION

Sampling Location ID	Proposed Coordinates	Soil		Groundwater	
		Sampling Arrangement - Depths (m bgl) ^(a)	Proposed Testing Parameters	Sampling Arrangement	Proposed Testing Parameters

Notes:

m bgl = meter below ground level.

- (a) By experience, the exact sampling locations will be determined by on-site land contamination specialist and subject to adjustment due to site-specific conditions/ constraints (e.g. presence of underground utilities, foundations, insufficient headroom, spaces occupied by vehicles, etc) during the actual SI.
- (b) Metals: For soil: Antimony, Arsenic, Barium, Cadmium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Tin, Zinc, Mercury, Chromium (III) and Chromium (VI); For groundwater: Mercury
- (c) Petroleum Carbon Range (PCRs): C6 – C8, C9 – C16 and C17 – C35
- (d) VOCs: For soil and groundwater: Acetone, Benzene, Bromodichloromethane, 2-Butanone, Chloroform, Ethylbenzene, Methyl tert-Butyl Ether, Methylene Chloride, Styrene, Tetrachloroethene, Toluene, Trichloroethene and Xylenes (Total)
- (e) SVOCs: For soil: Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Bis-(2-ethylhexyl)phthalate, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3cd)pyrene, Naphthalene, Phenanthrene, Phenol and Pyrene. For groundwater: Acenaphthylene, Acenaphthene, Anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene and Pyrene.
- (f) Soil and groundwater sampling at proposed locations AEBH4, AEBH10 and AEBH18 were conducted in 2020 PLCA.

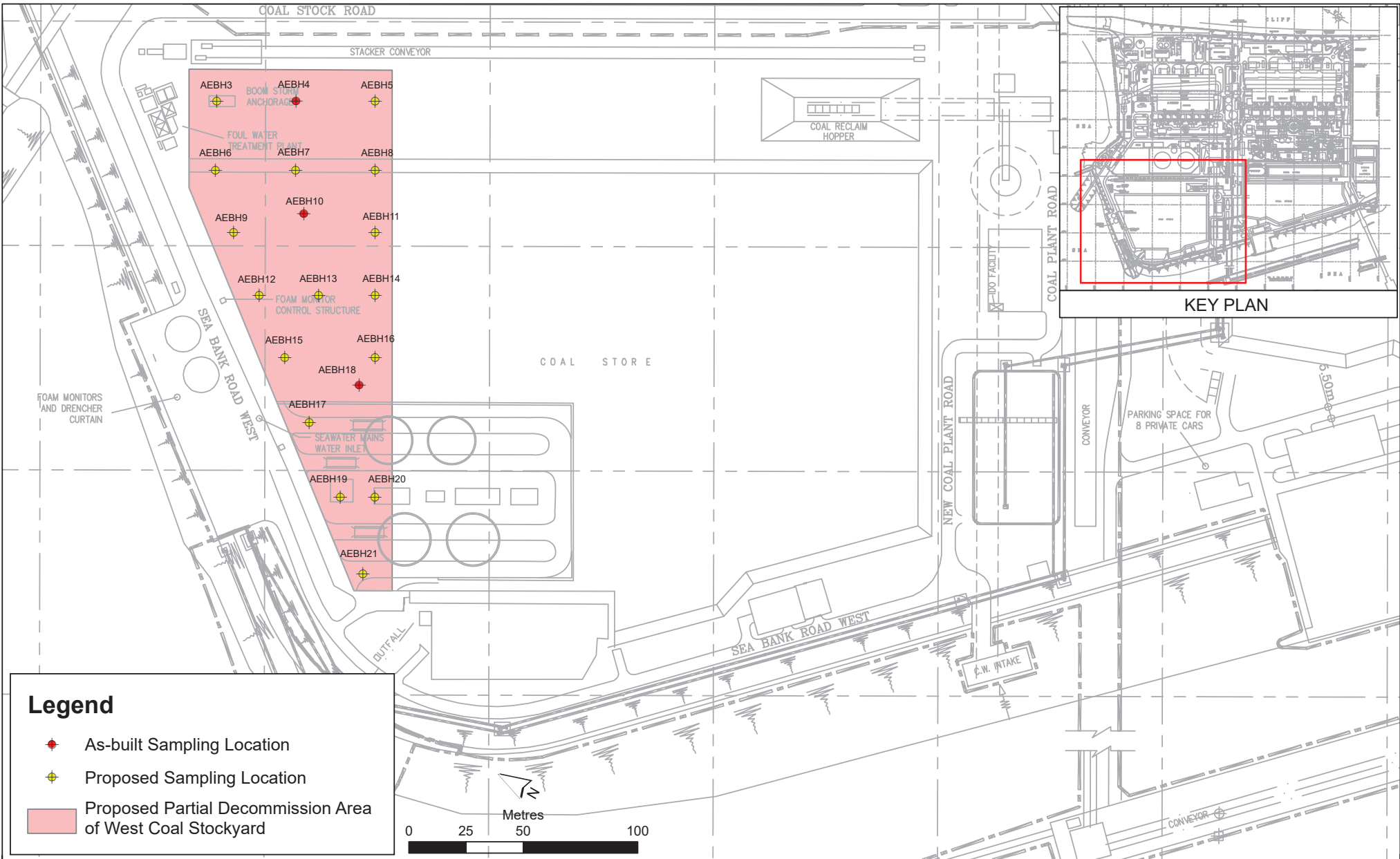


Figure 4

Proposed Sampling Locations

Table 4.2 Laboratory Testing Methods and Reporting Limits

Test Parameter	Soil		Groundwater	
	Reference Method	Reporting Limit (mg/kg)	Reference Method	Reporting Limit (µg/L)
Metals ^(b)				
Lead	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Antimony	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Arsenic	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Barium	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Cadmium	USEPA 6020	0.2	USEPA 6020	Not to be tested ^(a)
Cobalt	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Copper	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Manganese	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Molybdenum	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Nickel	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Tin	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Zinc	USEPA 6020	1	USEPA 6020	Not to be tested ^(a)
Chromium III	By Calculation	1	By Calculation	Not to be tested ^(a)
Chromium VI	USEPA3060	1	APHA3500 Cr:D	Not to be tested ^(a)
Mercury	APHA3500Cr:D	0.05	APHA3112B	0.5
Petroleum Carbon Ranges ^(b)				
C6-C8	USEPA 8015	5	USEPA 8015	20
C9-C16	USEPA 8015	200	USEPA 8015	500
C17-C35	USEPA 8015	500	USEPA 8015	500
VOCs ^(b)				
Benzene	USEPA 8260	0.2	USEPA 8260	5
Toluene	USEPA 8260	0.5	USEPA 8260	5
Ethylbenzene	USEPA 8260	0.5	USEPA 8260	5
Stryene	USEPA 8260	0.5	USEPA 8260	5
Xylenes (Total)	USEPA 8260	2	USEPA 8260	20
Acetone	USEPA 8260	50	USEPA 8260	500
2-Butanone	USEPA 8260	5	USEPA 8260	50
Methylene chloride	USEPA 8260	0.5	USEPA 8260	50
Trichloroethene	USEPA 8260	0.1	USEPA 8260	5
Tetrachloroethene	USEPA 8260	0.04	USEPA 8260	5
Chloroform	USEPA 8260	0.04	USEPA 8260	5
Bromodichloromethane	USEPA 8260	0.1	USEPA 8260	5
Methyl tert-Butyl Ether	USEPA 8260	0.5	USEPA 8260	5
SVOCs ^(b)				
Acenaphthene	USEPA 8270	0.5	USEPA 8270	2
Acenaphthylene	USEPA 8270	0.5	USEPA 8270	2
Anthracene	USEPA 8270	0.5	USEPA 8270	2
Benzo(a)anthracene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Benzo(a)pyrene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Benzo(b)fluoranthene	USEPA 8270	0.5	USEPA 8270	1
Benzo(k)fluoranthene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)

Test Parameter	Soil		Groundwater	
	Reference Method	Reporting Limit (mg/kg)	Reference Method	Reporting Limit (µg/L)
Benzo(g,h,i)perylene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Bis-(2-Ethylhexyl)phthalate	USEPA 8270	5	USEPA 8270	Not to be tested ^(a)
Chrysene	USEPA 8270	0.5	USEPA 8270	1
Dibenzo(a,h)anthracene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Fluoranthene	USEPA 8270	0.5	USEPA 8270	2
Fluorene	USEPA 8270	0.5	USEPA 8270	2
Hexachlorobenzene	USEPA 8270	0.2	USEPA 8270	4
Indeno(1,2,3-cd)pyrene	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Napthalene	USEPA 8270	0.5	USEPA 8270	2
Phenanthrene	USEPA 8270	0.5	USEPA 8270	2
Phenol	USEPA 8270	0.5	USEPA 8270	Not to be tested ^(a)
Pyrene	USEPA 8270	0.5	USEPA 8270	2

Other Inorganic Compounds

Cyanide, free	APHA 500CN:L	1	APHA 500CN:L	10
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Notes:

(a) Not to be tested – No corresponding RBRGs was established for groundwater.

(b) All analysis shall be conducted according to the reference test methods accredited by HOKLAS or one of its Mutual Recognition Arrangement partners, along with laboratory internal Quality Assurance/Quality Control (QA/QC) procedures.

5. SAMPLING METHODOLOGY

5.1 Overview

Borehole drilling is proposed as the means of sampling to investigate and determine the presence of potential soil and groundwater contamination. The drilling works and soil and groundwater sampling will be supervised by a land contamination specialist of ERM. The soil sampling methodologies are based on the RBRGs Practice Guide. These methods include decontamination procedures, sample collection, preparation and preservation, and chain-of-custody documentation as described in the following sections.

5.2 Role of Land Contamination Specialist during the Site Investigation

The land contamination specialist of ERM will be responsible for management and oversight of the SI and sampling works. The land contamination specialist shall:

- Provide full-time onsite supervision and management of the whole SI and sampling works;
- Conduct adequate soil and groundwater sampling and arrange laboratory testing in accordance with the agreed CAP; and
- Prepare on-site records (e.g. photo records, site field records) to demonstrate the SI works and sampling works meet the requirements stated in agreed CAP and the land contamination guidelines published by EPD.

5.3 Borehole Drilling

The borehole will be advanced by means of dry rotary drilling method, i.e. without the use of a flushing medium, as far as practicable. Adjustment of sampling locations will be considered in order to facilitate the drilling if rocks/ large boulders are encountered during the drilling.

For safety reasons and to inspect for underground utilities, utility scanning will be performed at all proposed borehole locations to ensure sufficient clearance from underground utilities prior to excavation. In addition, an inspection pit will be excavated down manually to about 1.5 m bgl to perform underground utility clearance at each of the borehole locations before drilling commences.

Disturbed soil samples will be collected at the depth of 0.5 m from the inspection pits. Soil boring using rotary drill rigs will then be performed from 1.5 m bgl to a maximum depth of 3.0 m bgl.

Soil samples will be retrieved at approximately 1.0 m intervals for inspection of geological characteristics and for visual inspection for potential contamination (such as visual evidence of discolouration, staining, presence of non-aqueous liquid phase and abnormal odour). The soil profile with evidence of contamination (if any) will be recorded in the drilling log. The log will also include the general stratigraphic description, depth of sampling, sample notation, and level of groundwater (where encountered).

Undisturbed soil samples will be collected at depths of 1.5 m bgl and 3.0 m bgl using the U76 / U100 core. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

5.4 Soil Sampling

The sampling programme will be undertaken with strict adherence to appropriate protocols to minimise the potential for cross-contamination between sampling locations. The following will be implemented while sampling:

- A ceramic spoon shall be used to collect disturbed soil sampling, which will be cleaned between sampling;

- Where possible, a new set of sampling equipment will be used for each sampling event. If this is not possible, the equipment will be cleaned with a non-phosphate detergent between each sampling event. Larger equipment such as drilling rigs, drill rods, casings, will be steam cleaned where possible, or at a minimum pressure jet washed with water from the mains;
- The ceramic sampling spoon, sampling cores and other sampling equipment that come into direct contact with the samples will be decontaminated first with fresh water and Decon 90 detergent; rinsed with distilled water and air dried prior to the sampling and between samples;
- Clean latex gloves will be worn during sample collection and changed before each sample is collected to prevent cross contamination; and
- The thickness of any free product and groundwater if present at locations shall be measured with an interface probe.

5.5 Groundwater Sampling

Groundwater samples will be collected at remaining 16 proposed sampling locations, i.e. AEBH3, AEBH5 to AEBH9, AEBH11 to AEBH17, and AEBH19 to AEBH21. Groundwater monitoring wells will be installed in accordance with the requirements stipulated in the ERR-CAP. *Annex G* presents a schematic drawing of installed groundwater monitoring well for reference.

Prior to groundwater sampling, the depth of water table at all monitoring wells will be measured in order to delineate the local groundwater table contours at the subject site. Groundwater levels and thickness of any free product layer, if present, will be measured at each well before groundwater samples are taken. One (1) groundwater sample will be collected from each well, using a disposable Teflon bailer.

5.6 Sample Size

Prior to sampling, the laboratory responsible for chemical analysis will be consulted on the particular sample size and preservation procedures that are necessary for each chemical analysis. *Table 5.1* lists the recommended sample container types, sizes and preservation method.

Table 5.1 Summary of Sample Container Type, Sizes and Preservation Method

Test Parameters	Container Type, Size and Preservation Method
Soil	
Metals	1 x 250 ml glass jar with teflon-lined cap
VOCs / PCR's	1 x 250 ml glass jar with teflon-lined cap
SVOCs	1 x 250ml glass jar with teflon-lined cap
Free Cyanide	1 x 250ml glass jar with teflon-lined cap
Groundwater	
Metals (Mercury)	1 x 250 ml plastic (no preserve)
VOCs / PCR's	2 x 40 ml amber glass vials (hydrochloric acid)
SVOCs / PCR's	1 x 1,000ml amber glass (no preserve)
Free Cyanide	1 x 250ml plastic (Sodium Hydroxide)

5.7 Sample Handling and Laboratory Analysis

All samples will be directly collected in pre-cleaned sample bottles provided by the laboratory. Chain-of-custody documentation will be initiated immediately after samples are collected. Containers will be labelled in the field with the date, well designation, project name, time of collection and analysis to be performed. If the field work is expected to take several days, soil samples will be kept chilled with ice (at approximately 4°C) on-site and during transport. Samples will be delivered to a HOKLAS accredited laboratory for chemical analyses. All analysis will be conducted according to the test methods

accredited by HOKLAS or one of its Mutual Recognition Arrangement partners, along with laboratory internal QA/QC procedures.

5.8 QA/QC Samples

QA/QC samples will be collected to allow an assessment of the quality of data collected. The QA/QC samples are listed below.

- One (1) field duplicate sample (soil or groundwater) per twenty (20) soil and groundwater samples will be collected for full suite analysis;
- One (1) field blank will be collected for full suite analysis. The field blank will consist of laboratory supplied de-ionized water stored in the cooler boxes during sample shipment;
- One (1) equipment blank will be collected and analysed for metals to account for any potential cross-contamination due to drilling equipment. De-ionized water is poured onto decontaminated sampling equipment, and collected in appropriate sampling containers; and
- One (1) trip blank per trip will be analysed for VOCs to account for any potential cross-contamination.

5.9 Health and Safety

A site Health and Safety Plan (H&SP) will be prepared before any site work is performed at the Assessment Area. The H&SP will include:

- Instruction of works on work procedures, safe practices, emergency duties, and applicable regulations;
- Regularly scheduled meetings for the workers in which the possible hazards, problems of the job, and related safe practices are emphasised and discussed;
- Good housekeeping practices; and
- Availability of and instruction in the location, use and maintenance of personal protective equipment.

The specific safety measures to be implemented during the site work will depend on the nature and content of contamination, the site conditions and the regulations related to site safety requirements. In general, the site work will be performed with the following safety measures:

- Prohibit on-site waste disposal and all waste generated will be disposed and treated in accordance with regulation;
- Maintain proper safety devices, barriers to minimise hazards during the SI;
- Prohibit smoking and open flames;
- Develop and maintain a written emergency plan applicable to the land contamination SI;
- Maintain equipment related to drilling activities in good operating condition and have emergency and first aid equipment ready for immediate use, where applicable;
- Conduct equipment tests to ensure that equipment used for drilling is properly placed and in good operating condition, and that workers are able to respond to emergency situations;
- Require all workers employed or retained by the Contractor, or a subcontractor, to at all times wear clothing suitable for the works, weather and environmental conditions; and
- The personnel are required to wear respirator and gloves for vapour exposure protection, if necessary. Safety helmet and protective boots should be worn.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Given the requirements stipulated in Section 2 Specific Conditions of the revised EP (No: EP-441/2012/A), the updated engineering design of the partial decommissioning of WCS, and the latest decommissioning programme, ERM-Hong Kong, Limited (ERM) was commissioned by CAPCO to conduct an Updated Land Contamination Assessment for the WCS in CPPS prior to the partial decommission of the WCS

This Updated CAP details the past and present land uses of the Site in relation to potential soil and groundwater contamination. This Updated CAP will also outline the methodology for an intrusive SI of the Site to identify the nature and extent of on-site contamination (if any).

Results of the site appraisal indicated that the site condition and operation has no significant changes since 2018. Therefore, based on the grid sampling pattern adopted in the ERR-CAP, the 19 sampling locations proposed in the last approved CAP will be retained in this Updated CAP.

In order to obtain a more recent data to verify the ground condition at the Site, and provide more assurance of the coal yard decommissioning programme should remediation required, a PLCA was conducted in between 3 and 16 June 2020. Three (3) best sampling locations, AEBH4, AEBH10 and AEBH18, at the top, middle and bottom of the WCS respectively were selected among the 19 proposed sampling locations in the ERR-CAP to represent the overall ground condition of the Site.

Since the SI conducted at AEBH4, AEBH10 and AEBH18 during the PLCA-WCS was carried out in accordance with the approved ERR-CAP and EPD's RBRGs Guidance Note and Practice Guide, their sampling method and data were considered valid and representative for the land contamination assessment of this Project. As such, the proposed sampling locations will not repeat at AEBH4, ABH10 and AEBH18 and will focus on the remaining 16 proposed sampling locations. In addition, groundwater samples obtained in the 2012 LCA and 2020 PCLA-WCS were found not contaminated with respect to the RBRGs, with contaminants below their respective detection limit. The overall groundwater condition is considered consistently clean.

The SI results from 2012 LCA and 2020 PLCA-WCS both show that the geological strata of the Site is mostly formed by thin fill layer with cobbles rocks/ boulders within 0 – 1.5 m bgl and boulder sized rocks with no soil layer below 1.5 m bgl. In addition, the excavation level of the decommissioning works will be limited to 3.0 m bgl. Therefore, the borehole termination depth is proposed at 3.0 m bgl for the collection of soil samples at 0.5 m, 1.5 m and 3.0 m bgl.

Although the groundwater samples obtained in both the 2012 LCA and 2020 PLCA-WCS were considered clean and the concerned contaminants were well below their respective detection limit, it is proposed that groundwater samplings shall be collected from remaining 16 proposed sampling locations as a confirmatory sampling.

Sampling and analysis plan, sampling methods, arrangement of sample handling and storage, the QA/QC programme and a Health and Safety Plan for the sampling were proposed.

6.2 Way Forward and Recommendations for the Project

Sampling and testing works proposed in this Updated CAP will be supervised by ERM Land Contamination Specialist. Upon the receipt of laboratory testing reports, the results will be compared against the RBRGs for Industrial land use (see *Annex H*) and a CAR will be prepared and submitted to EPD for agreement. The CAR will also present the SI details and laboratory testing results of the 2020 PLCA-WCS.

If contamination is confirmed, the CAR will be accompanied by a *Remediation Action Plan* (RAP). The CAR and RAP will be a combined report for EPD's agreement. The RAP will be prepared to evaluate

the needs of a remediation, and if so, identify appropriate remediation methods suitable for the site conditions and the contaminants requiring remediation.

The contamination extent (both horizontal and vertical) will be estimated in the RAP. However, the confirmation of such contamination extent, the implementation of remediation action, and the preparation of *Remediation Report* (RR) will be conducted according to the approved RAP by the demolition contractor.

Upon completion of remediation works (if necessary), a RR will be prepared and submitted to EPD to demonstrate that the decontamination works are carried out in accordance with the approved CAR and RAP prior to commencement of any proposed construction works for subsequent developments. No excavation works will be carried out before the agreement of RR by EPD.

**ANNEX A DANGEROUS GOODS LICENSE RECORD PROVIDED BY FIRE SERVICE
DEPARTMENT**

消防處
香港九龍尖沙咀東部康莊道1號
消防總部大廈



FIRE SERVICES DEPARTMENT
FIRE SERVICES HEADQUARTERS BUILDING,
No.1 Hong Chong Road,
Tsim Sha Tsui East, Kowloon,
Hong Kong.

本處檔號 OUR REF. : (172) in FSD GR 6-5/4 R Pt. 27
來函檔號 YOUR REF. :
電子郵件 E-mail : hkfsdenq@hkfsd.gov.hk
圖文傳真 FAX NO. : 2739 5879
電話 TEL NO. : 2733 7741

17 July 2020

Environmental Resources Management
2507, 25/F, One Harbourfront,
18 Tak Fung Street, Hung Hom,
Kowloon, Hong Kong.
(Attn: Ms. Daisy WONG, Consultant)

Dear Ms. WONG,

**Land Contamination Assessment at Castle Peak Power Station
Request for Information of Dangerous Goods & Incident Records**

I refer to your emails of 22.4.2020 and 24.6.2020 regarding the captioned request and reply below in response to your questions:-

According to our record, from the year of 1990 to present moment, dangerous goods licenses have been issued by this department to the subject address, with details as shown in **Appendix A**. No incident record was found at the aforesaid location with your given conditions.

If you have further questions, please feel free to contact the undersigned.

Yours sincerely,

(KONG War-chung)
for Director of Fire Services

Castle Peak Power Station
Request for Information of Dangerous Goods & Incident Records

<u>Item</u>	<u>Type of DG</u>	<u>Quantity</u>	<u>Store Location</u>
1.	Cat. 2	60 Cylinders	Castle Peak Power Station, Tap Shek Kok, Lung Yiu Street
2.	Cat. 4	400 Litres	
3.	Cat. 5	40,000 Litres	

ANNEX B PREVIOUS GROUND INVESTIGATION RECORD



DRILLHOLE RECORD

HOLE No.
EBH 2

OUTLINE AGREEMENT 4600004073

SHEET 1 of 1

PROJECT 2-Year Outline Agreement for Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2010-2012) - GI Works for Ash Facilities

METHOD Rotary

CO-ORDINATES

PURCHASE ORDER No. **4500713197**

MACHINE & No. D112

E 809375.91
N 826410.24

DATE from 06/03/2012 to 09/03/2012

FLUSHING MEDIUM WATER

ORIENTATION **Vertical**

GROUND LEVEL + 4.70 mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples			Reduced Level	Depth (m)	Legend	Grade	Description
									No.	Type	Depth					
06/03/2012	HX	Dry at 08:00														Black and light brown, fine to coarse SAND with occasional subangular fine to medium gravel sized rock and coal fragments. (FILL)
06/03/2012 07/03/2012		Dry at 18:00		40												
	Dry at 08:00		78													
			43													
			46													
		3.10m at 18:00	98													
07/03/2012 08/03/2012		3.20m at 08:00	52													
			58													
		3.16m at 18:00	87													
08/03/2012 09/03/2012		3.50m at 08:00	47													
			67													
09/03/2012	HX 7.10	3.35m at 18:00														5.00 - 5.35m: Boulder sized strong granite.
																End of hole at 7.10m depth.

- Small disturbed sample
- Large disturbed sample
- ▨ SPT liner sample
- ▩ U76 undisturbed sample
- ▩ U100 undisturbed sample
- ▨ Mazier sample
- ▩ Piston sample
- ▲ Water sample
- Piezometer / standpipe tip
- ↓ Standard penetration test
- ⊥ Water absorption (Packer) test
- ⊥ Permeability test
- ⊥ Impression packer test
- ∇ In-situ vane shear test

LOGGED JASON LAU
DATE 10/03/2012
CHECKED KEN MA
DATE 12/03/2012

REMARKS
1. Inspection pit was dug to 0.50m depth.
2. Drain pipe well was installed at 7.00m depth.

t:\gintw\library\1july2009.gib\3159 clp drillhole



DRILLHOLE RECORD

HOLE No.
EBH 3

OUTLINE AGREEMENT 4600004073

SHEET 1 of 1

PROJECT 2-Year Outline Agreement for Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2010-2012) - GI Works for Ash Facilities

METHOD Rotary

CO-ORDINATES

PURCHASE ORDER No. **4500713197**

MACHINE & No. D112

E 809353.89
N 826381.00

DATE from 29/02/2012 to 05/03/2012

FLUSHING MEDIUM WATER

ORIENTATION **Vertical**

GROUND LEVEL + 4.75 mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples			Grade	Description	
									No.	Type	Depth			
29/02/2012	PX	08:00 Dry at											Black and light brown, fine to coarse SAND with occasional angular to subangular fine to coarse gravel sized rock and coal fragments. (FILL)	
29/02/2012		18:00 Dry at		40					A	INSPECTION PIT	0.45	4.25	0.50	
02/03/2012		08:00							T2101		0.80	3.95	0.80	Pink, COBBLE with occasional angular coarse gravel sized rock fragments. (FILL)
02/03/2012		Dry at												Brown, slightly silty fine to coarse SAND with occasional angular to subangular fine to medium gravel sized rock fragments. (FILL)
02/03/2012	PX	18:00 Dry at						200 bls	1		1.50	2.95	1.80	
03/03/2012	HX	08:00		60					T2101		1.75	2.77	1.98	Pink and brown, COBBLE with occasional angular to subangular coarse gravel sized rock fragments. (FILL)
				98					T2101		2.20	2.55	2.20	1.98 - 2.20m: Boulder sized strong granite.
				61					T2101		2.60			
				52					T2101		3.30			
03/03/2012		Dry at												
05/03/2012		18:00 3.00m at		50					T2101		3.90			
		08:00		82					T2101		4.60	0.39	4.36	4.36 - 4.60m: Boulder sized strong granite.
				38					T2101		5.00	0.15	4.60	
				16					T2101		5.50			
				44					T2101		6.30	-1.55	6.30	6.30 - 6.52m: Boulder sized strong granite.
				80					T2101		6.80	-1.77	6.52	
									T2101		7.50	-2.05	6.80	6.80 - 7.36m: Boulder sized strong granite.
05/03/2012	HX	3.35m at												
		18:00												
														End of hole at 7.50m depth.

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- Small disturbed sample
- Large disturbed sample
- ▨ SPT liner sample
- ▩ U76 undisturbed sample
- ▩ U100 undisturbed sample
- ▨ Mazier sample
- ▩ Piston sample
- ▲ Water sample
- Piezometer / standpipe tip
- ↓ Standard penetration test
- ⊥ Water absorption (Packer) test
- ⊥ Permeability test
- ⊥ Impression packer test
- ∇ In-situ vane shear test

LOGGED **JASON LAU**

DATE **06/03/2012**

CHECKED **KEN MA**

DATE **07/03/2012**

REMARKS

1. Inspection pit was dug to 0.50m depth.
2. Drain pipe well was installed at 7.00m depth.



DRILLHOLE RECORD

HOLE No.
EBH 4

OUTLINE AGREEMENT 4600004073

SHEET 1 of 1

PROJECT 2-Year Outline Agreement for Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2010-2012) - GI Works for Ash Facilities

METHOD Rotary

CO-ORDINATES

PURCHASE ORDER No. **4500713197**

MACHINE & No. D115

E 809335.89
N 826353.30

DATE from 29/02/2012 to 03/03/2012

FLUSHING MEDIUM WATER

ORIENTATION **Vertical**

GROUND LEVEL + 4.80 mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples			Grade	Description
									No.	Type	Depth		
29/02/2012	HX	08:00											Light brown, angular to subangular coarse GRAVEL sized rock fragments in sandy matrix. (FILL) Pink and grey, COBBLE sized rock fragments. (FILL) 0.60 - 0.80m: Wash boring, no sample recovered. Inferred as FILL. 2.27 - 2.39m: Boulder sized strong granite. 2.58 - 3.00m: Boulder sized strong granite. Light greyish brown, fine to coarse SAND. (FILL) Pink and brown, COBBLE with occasional subangular coarse gravel sized rock fragments. (FILL) 6.07 - 6.30m: Boulder sized strong granite. 6.30 - 6.63m: Boulder sized strong granite.
29/02/2012		at 18:00											
01/03/2012		Dry at 08:00											
01/03/2012		Dry at 18:00											
02/03/2012		Dry at 08:00											
02/03/2012		Dry at 18:00											
03/03/2012		Dry at 08:00											
03/03/2012		Dry at 18:00											
03/03/2012		Dry at 08:00											
03/03/2012		Dry at 18:00											
03/03/2012	HX 7.20	3.00m at 18:00											End of hole at 7.20m depth.

<ul style="list-style-type: none"> ● Small disturbed sample ○ Large disturbed sample ▨ SPT liner sample ▩ U76 undisturbed sample ▩ U100 undisturbed sample ▨ Mazier sample ▩ Piston sample 	<ul style="list-style-type: none"> ▲ Water sample □ Piezometer / standpipe tip ↓ Standard penetration test ⊥ Water absorption (Packer) test ⊥ Permeability test ⊥ Impression packer test ∇ In-situ vane shear test 	<p>LOGGED JASON LAU</p> <p>DATE 05/03/2012</p> <p>CHECKED KEN MA</p> <p>DATE 06/03/2012</p>	<p>REMARKS</p> <p>1. Inspection pit was dug to 0.50m depth. 2. Drain pipe well was installed at 7.00m depth.</p>
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ANNEX C SITE WALKOVER CHECKLISTS

Annex C1
Site Walkover Checklist

(Site visit on 8 May 2020)

GENERAL SITE DETAILS

SITE OWNER/CLIENT CAPCO Ltd.

PROPERTY ADDRESS West coalyard in Castle Peak Power Station (CPPS)
Tuen Mun, N.T.

PERSON CONDUCTING THE QUESTIONNAIRE

NAME Anthony Ho, Daisy Hong

POSITION Consultant from ERM

AUTHORIZED OWNER/CLIENT REPRESENTATIVE (IF APPLICABLE)

NAME Ringo Chan

POSITION _____

TELEPHONE N/A

SITE ACTIVITIES

Briefly describe activities carried out on site, including types of products/chemicals/materials handled.
Obtain a flow schematic if possible.

Number of employees: Full-time: 4 (The number will work at the site area based on request)
Part-time: 0
Temporary/Seasonal: 0
Maximum no. of people on site at any time: 4
Typical hours of operation: 8
Number of shifts: 3
Days per week: 7
Weeks per year: 52
Scheduled plant shut-down: 4

Detail the main sources of energy at the site:

Gas	Yes/ <input checked="" type="radio"/> No
Electricity	Yes/ <input checked="" type="radio"/> No
Coal	Yes/ <input checked="" type="radio"/> No
Oil	<input checked="" type="radio"/> Yes/ <input checked="" type="radio"/> No (The loader operated in the Coal yard) use the diesel oil
Other	Yes/ <input checked="" type="radio"/> No

SITE DESCRIPTION

This section is intended to gather information on site setting and environmental receptors on, adjacent or close to the site.

What is the total site area:

16000 m²

What area of the site is covered by buildings (%):

0%

Please list all current and previous owners/occupiers if possible.

Previous)

CAPCO (current &

Is a site plan available? If yes, please attach. Yes/No

Are there any other parties on site as tenants or sub-tenants? Yes/No

If yes, identify those parties: _____

Describe surrounding land use (residential, industrial, rural, etc.) and identify neighbouring facilities and types of industry.

North: Sea Bank Road West & temporary Contractor office

South: Coal Store & New Coal Plant Road

Conveyor facility to transfer coal from Pier to Coal Grinder

East: Coal Stock Road & outdoor Storage area

West: Sea Bank Road West & Wastewater Treatment Plant



Annex C1

Site Walkover Checklist

Describe the topography of the area (flat terrain, rolling hills, mountains, by a large body of water, vegetation, etc.).

Flat filled area covered by coal.

State the size and location of the nearest residential communities.

Lung Kwu Tan Village (~200,000 m²)

Are there any sensitive habitats nearby, such as nature reserves, parks, wetlands or sites of special scientific interest?

No.

Questionnaire with Existing/Previous Site Owner or Occupier

	Yes/No	Notes
1. What are the main activities/operations at the above address?		Power Generation
2. How long have you been occupying the site?		Since development of the site in 1986.
3. Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	Yes	
4. Prior to your occupancy, who occupied the site?	/	
5. What were the main activities/operations during their occupancy?	/	
6. Have there been any major changes in operations carried out at the site in the last 10 years?	No	No change related to operation
7. Have any polluting activities been carried out in the vicinity of the site in the past?	No	
8. To the best of your knowledge, has the site ever been used as a petrol filling station/car service garage?	No	
9. Are there any boreholes/wells or natural springs either on the site or in the surrounding area?	Yes	Boreholes were conducted at vicinity of the site.
10. Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please provide details.)	No	
11. Are any chemicals used in your daily operations? (If yes, please provide details.)	No	
• Where do you store these chemicals?	/	
12. Material inventory lists, including quantities and locations available? (If yes, how often are these inventories updated?)	/	
13. Has the facility produced a separate hazardous substance inventory?	/	
14. Have there ever been any incidents or accidents (e.g. spills, fires, injuries, etc.) involving any of these materials? (If yes, please provide details.)	No	

	Yes/No	Notes
15. How are materials received (e.g. rail, truck, etc.) and stored on site (e.g. drums, tanks, carboys, bags, silos, cisterns, vaults and cylinders)?	/	
16. Do you have any underground storage tanks? (If yes, please provide details.)	No	
• How many underground storage tanks do you have on site?	/	
• What are the tanks constructed of?	/	
• What are the contents of these tanks?	/	
• Are the pipelines above or below ground?	/	
• If the pipelines are below ground, has any leak and integrity testing been performed?	/	
• Have there been any spills associated with these tanks?	/	
17. Are there any disused underground storage tanks?	No	
18. Do you have regular check for any spillage and monitoring of chemicals handled? (If yes, please provide details.)	/	
19. How are the wastes disposed of?	/	No waste is generated within the Site
20. Have you ever received any notices of violation of environmental regulations or received public complaints? (If yes, please provide details.)	No	
21. Have any spills occurred on site? (If yes, please provide details.)	No	
• When did the spill occur?	/	
• What were the substances spilled?	/	
• What was the quantity of material spilled?	/	
• Did you notify the relevant departments of the spill?	/	
• What were the actions taken to clean up the spill?	/	
• What were the areas affected?	/	
22. Do you have any records of major renovation of your site or re-arrangement of underground utilities, pipe work/underground tanks (If yes, please provide details.)	No	
23. Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	No	
24. Are there any known contaminations on site? (If yes, please provide details.)	No	
25. Has the site ever been remediated? (If yes, please provide details.)	No	

Annex C1

Site Walkover Checklist

Observations

	Yes/No	Notes
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floors)?	/	
2. What are the conditions of the bund walls and floors?		The floor is covered by coal.
3. Are any surface water drains located near to drum storage and unloading areas?	Yes	
4. Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	No	
5. Is there a storage site for the wastes?	/	
6. Is there an on-site landfill?	No	
7. Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please indicate location and approximate size.)	No	
8. Were any stained surfaces noted on-site during the site reconnaissance? (If yes, please provide details.)	No	
9. Are there any potential off-site sources of contamination?	No	
10. Does the site have any equipment which might contain polychlorinated biphenyls (PCBs)?	No	
11. Are there any sumps, effluent pits, interceptors or lagoons on site?	No	
12. Any noticeable odours during site walkover?	No	
13. Are any of the following chemicals used on site: fuels, lubricating oils, hydraulic fluids, cleaning solvents, used chemical solutions, acids, anti-corrosive paints, thinners, coal, ash, oily tanks and bilge sludge, metal wastes, wood preservatives and polyurethane foam?	No	

ANNEX D SITE WALKOVER PHOTOS



Photo 1: Entrance of west coal stockyard. The area is covered with coal pile.



Photo 2: The east portion of west coal stockyard.


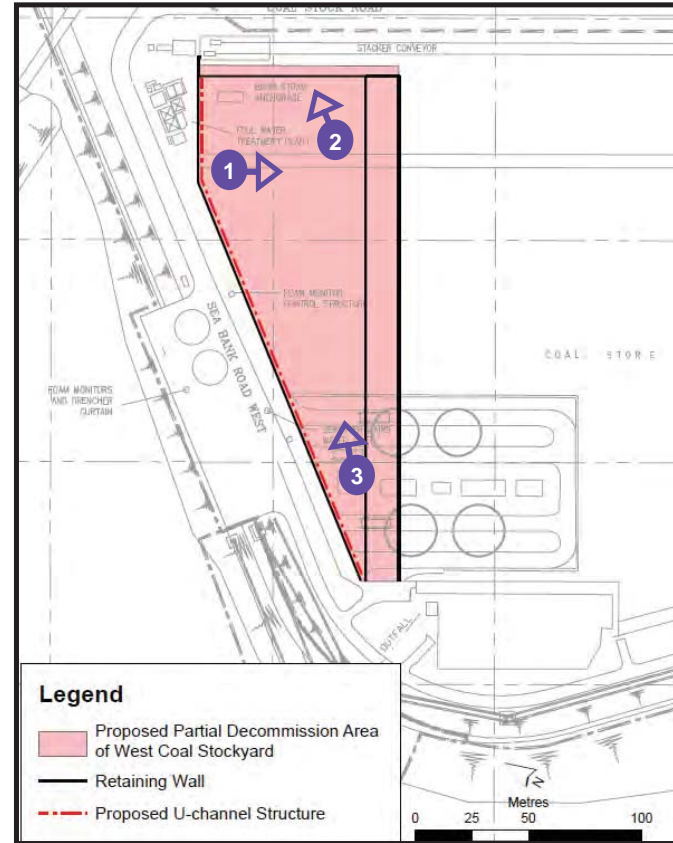

	PROJECT: Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station		TITLE: Annex D		
	ERM-Hong Kong, Limited 2507, 25/F, One Harbourfront, Tak Fung Street, Hung Hom, Kowloon Tel: (852) 2271 3000 Fax: (852) 2723 5660		Site Walkover Photos		
			DATE:	CHECKED:	PROJECT: 0553980
			DRAWN:	APPROVED:	SCALE:
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Photo 3: The west portion of west coal stockyard.



Locations and directions of Photo 1 to 3

PROJECT: Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station		TITLE: Annex D Site Walkover Photos	
ERM-Hong Kong, Limited 2507, 25/F, One Harbourfront, Tak Fung Street, Hung Hom, Kowloon Tel: (852) 2271 3000 Fax: (852) 2723 5660			
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ANNEX E REFERENCED AERIAL PHOTOGRAPHS



Year 1976 (ref: 12380):
The area and its vicinity is still part of the sea prior to reclamation work.



Year 1981 (ref: 38843):
Reclamation is completed and the CPPS was under construction. Constructions (Temporary low-rise housing structures / container offices / workshops) were found within the southern part of the works area.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station

ERM-Hong Kong, Limited
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TITLE:
Annex E
Referenced Aerial Photographs

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Year 1984 (ref: CS17522):
Part of the works area was constructed with three consecutive single - storey buildings which resembled warehouses / workshops. The West Coal Stockyard was established.



Year 1996 (ref: A42673):
The warehouses were removed. The whole works area was used as West Coal Stockyard.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT: Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station		TITLE: Annex E Referenced Aerial Photographs	
ERM-Hong Kong, Limited 2507, 25/F, One Harbourfront, Tak Fung Street, Hung Hom, Kowloon Tel: (852) 2271 3000 Fax: (852) 2723 5660			
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Year 2008 (ref: CS17522):
No significant changes were observed compared to 1996.

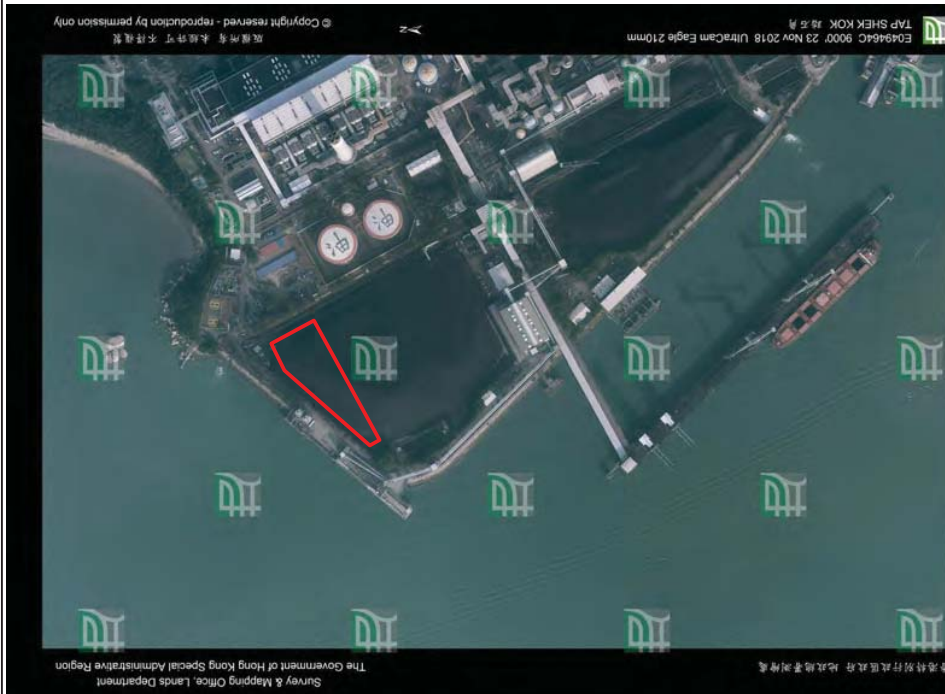


Year 2016 (ref: CS63470):
No significant changes were observed compared to 2008.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT: Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station		TITLE: Annex E Referenced Aerial Photographs	
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Year 2018 (ref: E049464C):
No significant changes were observed compared to 2016.



Year 2019 (ref: E068237C):
No significant changes were observed compared to 2018.

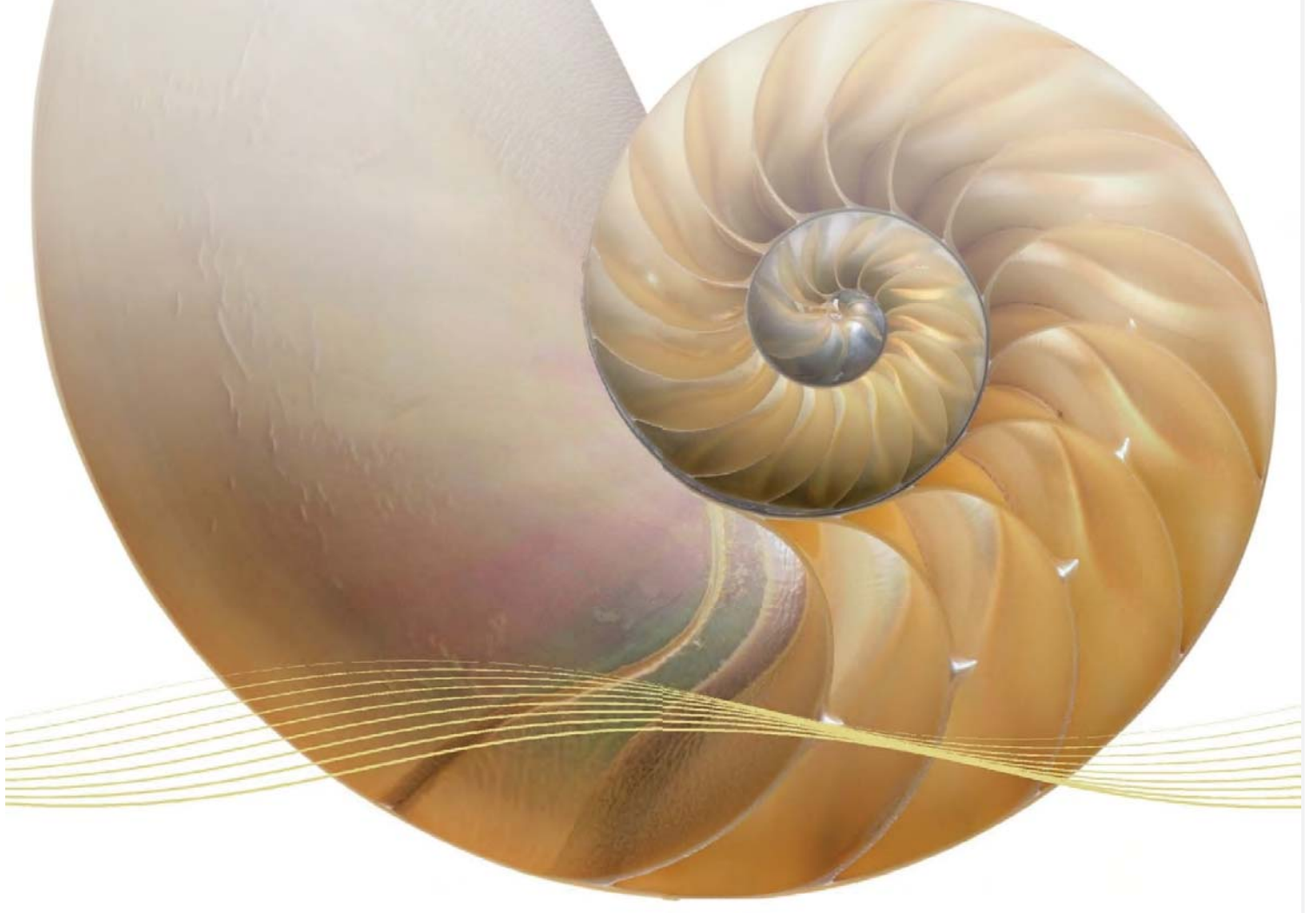
Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT: Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station		TITLE: Annex E Referenced Aerial Photographs											
ERM-Hong Kong, Limited 2507, 25/F, One Harbourfront, Tak Fung Street, Hung Hom, Kowloon Tel: (852) 2271 3000 Fax: (852) 2723 5660		<table border="1"> <tr> <td>DATE:</td> <td>CHECKED:</td> <td>PROJECT: 0553980</td> </tr> <tr> <td>DRAWN:</td> <td>APPROVED:</td> <td>SCALE:</td> </tr> <tr> <td colspan="2">DRAWING:</td> <td>SIZE: A4</td> <td>REV: 0</td> </tr> </table>		DATE:	CHECKED:	PROJECT: 0553980	DRAWN:	APPROVED:	SCALE:	DRAWING:		SIZE: A4	REV: 0
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ANNEX F DETAILS OF HISTORICAL SITE INVESTIGATION DATA

**ANNEX F1 DETAILS OF DRILLING METHOD, SAMPLING METHOD AND
DECONTAMINATION OF EQUIPMENT**



Castle Peak Power Company Limited

Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station

Specification for Site Investigation

27 April 2020

Project No.: 0553980

Document details	The document represents the <i>Specification for Site Investigation</i> for the Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station
Document title	Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station
Document subtitle	Specification for Site Investigation
Project No.	0553980
Date	27 April 2020
Version	0.0
Author	Anthony Ho, Daisy Wong
Client Name	Castle Peak Power Company Limited

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	0.0	Anthony Ho, Daisy Wong	Angus Choi	Frank Wan	27.04.2020	

Signature Page

27 April 2020

Land Contamination Assessment for West Coal Stockyard Modification Work in Castle Peak Power Station

Specification for Site Investigation



Frank Wan
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ERM
2507, 25/F One Harbourfront
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Hung Hom, Kowloon
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1. INTRODUCTION

1.1 Background

The specification states the requirements of the Preliminary Site Investigation (SI) for the West Coal Stockyard Modification Work in Castle Peak Power Station (CPPS). This text gives a general approach for the execution of the works including preparation prior to field activities such as site clearance, drilling and sampling procedures, groundwater monitoring wells installation, decontamination of equipment, borehole reinstatement, and onsite environmental, health and safety controls.

1.2 Legislative Criteria

The site investigation work for the soil and groundwater sampling at the Site shall be conducted in accordance with the requirements set out in:

- The Hong Kong Environmental Protection Department (EPD)'s Practice Guide for Investigation and Remediation of Contaminated Land; and
- The Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, for Urban Residential Use stipulated in the Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management.

2. SITE PREPARATION

2.1 Sampling Location Setting

The proposed sampling locations in accordance with the approved CAP will be set out during the site walkthrough (tentatively in early-May 2020) with representatives from CLP, CLP's drilling contractor ('the Contractor') and ERM.

As requested by CLP, only three (3) out of 19 proposed sampling locations will be conducted in the Preliminary Site Investigation (SI) stage. These sampling locations will be identified and marked out during the site walkthrough. Should locations of the boreholes or trial pit required to be adjusted due to site constraints, approval from CLP representatives will be sought.

2.2 Utility Scanning

ERM will provide coordinates of sampling locations and mark the sampling location IDs on the ground accordingly. Before commencement of site investigation works, the Contractor shall take the following subsurface clearance steps:

- Obtain underground utilities plans and as-built drawings of the subject Site from CLP;
- Identify the alignment and depth of underground utilities together with the environmental consultant and CLP representatives;
- Carry out utility detection to confirm the position of the unexposed underground utilities and mark the alignment and depth of underground utilities on the ground; and
- Provide CLP a written utility scanning report.

2.3 Mobilisation

For borehole drillings, rotary drill rig(s) shall be mobilized to the Site for the sampling exercises. The drilling rigs and sampling equipment shall be properly decontaminated prior to delivery to the Site (see *Section 1.6* for decontamination requirements).

Prior to mobilization of equipment and crew to the Site, the Contractor shall confirm with CLP the equipment and machinery laydown and work areas. The Contractor shall consider the headroom constraints (if any) at the sampling locations, laydown areas and transport routes before mobilisation. Drill rig(s) and the other equipment shall be unloaded on a solid ground to prevent toppling. The drill rig(s) shall be mobilised/re-positioned to other drilling locations/demobilized off-site using crane lorry.

3. DRILLING AND SAMPLING

CLP will supervise the drilling for environmental investigation purposes and ERM will supervise and undertake the soil and groundwater sampling from the boreholes and inspection pit.

3.1 Manual Subsurface Clearance

For safety reasons and to inspect for underground utilities, an inspection pit shall be excavated down to a minimum of 1.5m below ground level (bgl) to manually perform underground utility clearance at each of the drillhole location before drilling commences. In case of encountering any underground utilities at the inspection pit, the Contractor shall stop the excavation activity and consult CLP and ERM for further instruction of re-location.

ERM will obtain disturbed soil samples at specified depths during the digging of inspection pit.

3.2 Drilling and Sampling

The Contractor shall provide all necessary equipment for the drilling works, which will include but not limited to the following:

- Drill rigs
- Water pump
- Drilling rods
- Steel casings
- U-76 sampler / piston sampler / split spoon sampler
- Core barrel for hard material
- Barrels for equipment washing

Drilling shall be advanced continuously by dry rotary drilling method, i.e. without the use of a flushing medium, as far as practicable, from the borehole for visual inspection. Use of water as flushing medium shall only be used when rock or boulders are encountered during drilling. Diameter of boreholes must be at least 100mm. Soil will be continuously retrieved at approximately 1m intervals for inspection of geological characters and for visual inspection for potential contamination (such as visual evidence of discolouration, straining, presence of non-aqueous liquid phase and abnormal odour).

A minimum of four soil samples will be collected by ERM at specified depths, which may include two disturbed samples at 0.5m and 1.5m bbl (below bottom of concrete base), and two undisturbed samples at 3.0m and 6.0 bgl, by using U76/U100 core. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

Whenever possible, a new set of sampling equipment shall be used for each borehole. When this is not possible, the equipment shall be cleaned with a non-phosphate detergent between each sampling event.

3.3 Groundwater Monitoring Well Installation and Well Development

Based on previous drilling record at nearby boreholes, the groundwater level at the Site is around 4m bbc. Groundwater monitoring wells shall be installed at the borehole locations where groundwater is encountered. The drilled boreholes shall be converted into groundwater monitoring wells, using uPVC perforated piping with machine slotted section (1mm or less slot aperture). The well screens shall be installed to a minimum of 1m above and 2m below the groundwater level.

Diameter of well pipes shall be at least 50mm. Piping sections must be connected together by appropriate methods (threaded joins or rivets). Solvent based glues or adhesives shall not be used. Empty voids between the well pipe and the borehole may be packed with clean gravels and sand. Wells need to be secured to prevent contamination from the surface by filling bentonite and cement to the top of the void and well caps shall be used to close the pipe. A typical design of the groundwater monitoring well is shown in *Annex A*.

Monitoring well development shall be conducted by the Contractor. The monitoring wells shall be developed by bailing/pumping at least five (5) times the well volume, in order to remove standing water and allow for replenishment.

Groundwater level measurements and groundwater sampling shall be carried out by ERM after the groundwater levels in the wells have stabilised. The static groundwater levels shall be measured with an electronic groundwater level indicator in each well. These data shall be documented in the borehole logs.

3.4 Surveying and Borehole Logging Report

Strata logging for boreholes shall be undertaken by a qualified geologist provided by the Contractor. The logs shall at least include the general stratigraphic description, depth of soil sampling, sample notation and level of groundwater (if encountered). The presence of rocks/boulders/cobbles and foreign materials such as metals, wood and plastics shall also be recorded. The Contractor must conduct the level survey of each borehole, including as-built coordinate of sampling locations, level of monitoring well cap (mPD) and ground level of boreholes (mPD).

3.5 Decontamination of Equipment

Sampling equipment used during the course of the site investigation shall be thoroughly decontaminated by the Contractor, to minimize the potential for cross-contamination. All equipment must be decontaminated using a non-phosphate soap solution and water, with a distilled water rinse to clean all smaller pieces of equipment, in particular those used to sample materials such as sampling cores, hand excavation and grab samples. Larger equipment and materials must be steam cleaned using mains water, where possible, or at a minimum pressure jet washed with mains water. This cleaning procedure must be repeated after use at each borehole to avoid potential cross contamination between boreholes.

During sampling and decontamination activities, disposable latex/nitrile gloves must be worn to prevent transfer of contaminants from other sources. Any disposable equipment shall be disposed as general waste after each use.

3.6 Sampling Location Reinstatement

For sampling locations where no groundwater is encountered, upon completion of the soil sampling, the boreholes shall be backfilled with soil material extracted and the area resurfaced.

For sampling locations with groundwater encountered, the boreholes shall be installed with the groundwater monitoring wells in accordance with specifications stated in the Section 1.4.3 of this method statement.

4. SITE HEALTH AND SAFETY

4.1 Health and Safety Plan

The Contractor shall develop a Health and Safety (H&S) plan for the assignment. The H&S plan shall incorporate CLP's H&S requirements and procedures CLP as well as ERM's H&S requirements. All necessary forms or documentation required by CLP must be completed and provided on-site during the duration of site investigation works.

The H&S plan shall include:

- Instruction of works on work procedures, safe practices, emergency duties, and applicable regulations;
- Regularly scheduled meetings of the workers in which the possible hazards, problems of the job, and related safe practices are emphasized and discussed;
- Good housekeeping practices; and
- Availability of and instruction in the location, use and maintenance of personal protective equipment.

The specific safety measures to be implemented during the site work will depend on the nature and content of contamination, the site conditions and the regulations related to site safety requirements. As a pre-requisite, employee compensation insurance and third party insurance must be obtained for the workers and site work respectively. In general, the site work shall be performed with the following safety measures:

- Maintain proper safety devices, barriers to minimize hazards during performance of the work;
- Prohibit smoking and open flames and the carrying of matches and lighters;
- Develop and maintain a written emergency plan applicable to the Work and Site;
- Maintain equipment in good operating condition and have emergency and first aid equipment ready for immediate use, where applicable;
- Conduct equipment tests to ensure that equipment is properly placed and in good operating condition, and that workers are able to respond to emergency situations;
- Require all workers employed or retained at all time wear clothing suitable for existing work, weather and environmental conditions; and
- The personnel are required to wear respirator and gloves for vapour exposure protection, if necessary. Safety helmet and protective boots should be worn.

4.2 Environmental Control

Certain level of noise is expected during concrete breaking and borehole drilling. Only well-maintained plants are permitted to operate on-site and all such plants will be subject to a routine preventive maintenance service during operation. Works shall not be conducted during restricted hours, that is between 7pm and 7am or at any time on a general holiday (including Sunday and public holidays).

Soil extracted from the boreholes shall be backfilled into the borehole as far as practicable. While water is not expected during dry rotary drilling, groundwater encountered during drilling shall be treated by de-silting tank and/or oil interceptor (if free products is detected during drilling) prior to discharge.

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ANNEX F2 BOREHOLE LOGS FOR 2020 PLCA



DRILLHOLE RECORD

DRILLHOLE No.
AEBH 4

OUTLINE AGREEMENT No. 4600006651

SHEET 1 of 1

PROJECT Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2017-2019)
Environmental Sampling in West Coal Yard at CPPS

METHOD **RC**

CO-ORDINATES

PURCHASE ORDER No. 4501275597

MACHINE & No. **ZA006**

E **809500.73**
N **826478.59**

DATE from **03/06/2020** to **04/06/2020**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

REFERENCE LEVEL **+ 5.40** mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
								No.	Type					
03/06/2020	PX									5.40	0.00			
			0				105 bls	1	•	0.20	5.20	0.20		Greyish brown, spotted grey, silty fine to coarse SAND with occasional subangular to subrounded fine to coarse gravel sized rock and quartz fragments. (FILL)
								2	▨	0.50				Stiff, brown, spotted white and grey, clayey and slightly sandy SILT with occasional subangular to subrounded fine to medium gravel sized rock and quartz fragments. (FILL)
								3	▨	0.87				
							100 bls	4	▨	1.50	3.90	1.50		
			97						T2(10)	1.82	3.78	1.62		Greyish pink and orangish brown, COBBLE with occasional angular to subrounded gravel sized rock fragments. (FILL)
	PX 2.62 HX		96						T2(10)	2.62				1.88-2.21m: BOULDER sized granite.
03/06/2020		Dry at 18:00							T2(10)	3.10				
04/06/2020		Dry at 08:00	62				20 bls		T2(10)	3.60	1.80	3.60		Orangish brown, slightly sandy, angular fine to coarse gravel sized rock fragments. (FILL)
			0						T2(10)	4.20	1.20	4.20		Greyish pink and orangish brown, COBBLE with occasional angular to subrounded gravel sized rock fragments. (FILL)
			46						T2(10)	5.50				
			0				159 bls		T2(10)	6.00	-0.60	6.00		Brown, fine to coarse SAND with some angular to subangular fine to coarse gravel sized rock and quartz fragments. (FILL)
									T2(10)	6.46	-1.06	6.46		Greyish pink and orangish brown, COBBLE with occasional angular to fine to coarse gravel sized rock and quartz fragments. (FILL)
		1.80m at 18:00	94						T2(10)	7.10	-1.70	7.10		6.46-6.58m: Sandy.
04/06/2020	HX 7.10													End of borehole at 7.10m.

- Small disturbed sample
- ▨ Large disturbed sample
- ▨ SPT liner sample
- ▨ U76 undisturbed sample
- ▨ U100 undisturbed sample
- ▨ Mazier sample
- ▨ Piston sample
- ▲ Water sample
- ⬆ Standpipe tip
- ⬆ Piezometer tip
- ⬆ Standard penetration test
- ⬆ Standard penetration test (Cone)
- ⬆ Pressuremeter Test
- ⬆ Permeability test
- ⬆ Packer test
- ⬆ In-situ vane shear test
- ⬆ Televiwer test

LOGGED Y.S.CHIK
DATE 05/06/2020
CHECKED T.K.CHENG
DATE 08/06/2020

REMARKS
1. Standpipe was installed to depth at 7.10m.



DRILLHOLE RECORD

DRILLHOLE No.
AEBH10

OUTLINE AGREEMENT No. 4600006651

SHEET **1** of **1**

PROJECT Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2017-2019)
Enviromental Sampling in West Coal Yard at CPPS

METHOD **RC**

CO-ORDINATES

PURCHASE ORDER No. 4501275597

MACHINE & No. **ZA006**

E **809460.03**
N **826451.08**

DATE from **15/06/2020** to **16/06/2020**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

REFERENCE LEVEL **+ 4.50** mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Total core Recovery %	Solid core Recovery %	R.O.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
15/06/2020	6.40 PX		100						4.50	0.00			Grey and dark grey, COBBLE with occasional angular medium to coarse gravel sized concrete fragments. (FILL)
			0				200 bis	1	0.21-0.22m	0.50			0.21-0.22m: With 5mm diameter steel bar.
			81						0.50-1.00m	1.10			Greyish brown, slightly silty fine to coarse SAND with occasional angular fine to coarse gravel and cobble sized rock fragments. (FILL)
			0				120 bis	2	1.00-1.10m	1.90			Greyish pink, BOULDER sized granite with some angular coarse gravel and cobble sized rock fragments. (FILL)
			46						1.33-1.70m	2.30			1.33-1.70m: BOULDER sized granite.
			60						1.90-2.30m	2.30			Greyish brown, sandy angular fine to coarse GRAVEL and COBBLE sized rock and brick fragments. (FILL)
			92						2.30-2.62m				Greyish pink, pink and orangish brown, COBBLE with occasional angular to subangular coarse gravel sized rock fragments. (FILL)
			62						2.62-2.85m				2.62-2.85m: BOULDER sized granite.
			69						3.03-3.29m				3.03-3.29m: BOULDER sized granite.
		4.50m at 18:00							3.70-5.58m				5.58-5.85m: BOULDER sized granite.
15/06/2020 16/06/2020	6.40 PX HX	4.30m at 08:00	89						5.85-6.15m				6.15-6.40m: BOULDER sized granite.
		Dry at 18:00	83						6.40-7.00m				
16/02/2020	7.00 HX								7.00	-2.50	7.00		End of borehole at 7.00m.

- Small disturbed sample
- Large disturbed sample
- ▨ SPT liner sample
- ▩ U76 undisturbed sample
- U100 undisturbed sample
- ▨ Mazier sample
- ▨ Piston sample
- ▲ Water sample
- ⬆ Standpipe tip
- ⬆ Piezometer tip
- ⬆ Standard penetration test
- ⬆ Standard penetration test (Cone)
- ⬆ Pressuremeter Test
- ⬆ Permeability test
- ⬆ Packer test
- ⬆ In-situ vane shear test
- ⬆ Televiewer test

LOGGED Y.S.CHIK
DATE 17/06/2020
CHECKED T.K.CHENG
DATE 18/06/2020

REMARKS
1. Standpipe was installed to depth at 7.00m.



DRILLHOLE RECORD

DRILLHOLE No.
AEBH18

OUTLINE AGREEMENT No. 4600006651

SHEET 1 of 1

PROJECT Site Investigation Works for Existing / Prospective Sites of CLP Power's Premises (2017-2019)
Environmental Sampling in West Coal Yard at CPPS

METHOD **RC**

CO-ORDINATES

PURCHASE ORDER No. 4501275597

MACHINE & No. **ZA006**

E **849407.07**
N **826392.66**

DATE from **09/06/2020** to **11/06/2020**

FLUSHING MEDIUM **Water**

ORIENTATION **Vertical**

REFERENCE LEVEL **+ 5.01** mPD

Drilling Progress	Casing depth/size	Water Depth (m)	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples		Reduced Level	Depth (m)	Legend	Grade	Description
								No.	Type					
09/06/2020	PX									5.01	0.00			
			0				118 bls	1		0.50	0.50			Greyish brown, silty and clayey, fine to coarse SAND with some subangular to subrounded medium to coarse gravel sized rock fragments. (FILL)
								2		1.00				Greyish brown, slightly silty and sandy, subangular to subrounded fine to coarse GRAVEL sized rock fragments. (FILL)
		1.51m at 18:00	0				168 bls	3		1.50	1.50			Greyish brown, angular coarse GRAVEL and COBBLE sized rock fragments. (FILL)
10/06/2020		Dry at 08:00								1.71	1.71			Pink, greyish pink, orangish brown and dark grey, COBBLE with occasional angular medium to coarse gravel sized rock fragments. (FILL)
			78											2.21-2.46m: BOULDER sized granite.
			180							2.91				
			72							3.41				
			88							4.31				3.98-4.19m: BOULDER sized granite.
			0							4.81				4.31-4.81m: With cobble sized silt matrix.
		1.71m at 18:00					170 bls	4		4.81	0.20	4.81		Brown, COBBLE sized rock fragments. (FILL)
			100							5.11	-0.10	5.11		
10/06/2020		1.81m at 08:00								5.41				Greyish pink, angular medium to coarse GRAVEL and COBBLE sized rock fragments. (FILL)
			100							5.71				
			100							6.31				
	PX 6.31 HX		180							7.11	-2.10	7.11		6.80-7.11m: BOULDER sized granite.
11/06/2020	HX 7.11	2.01m at 18:00												End of borehole at 7.11m.

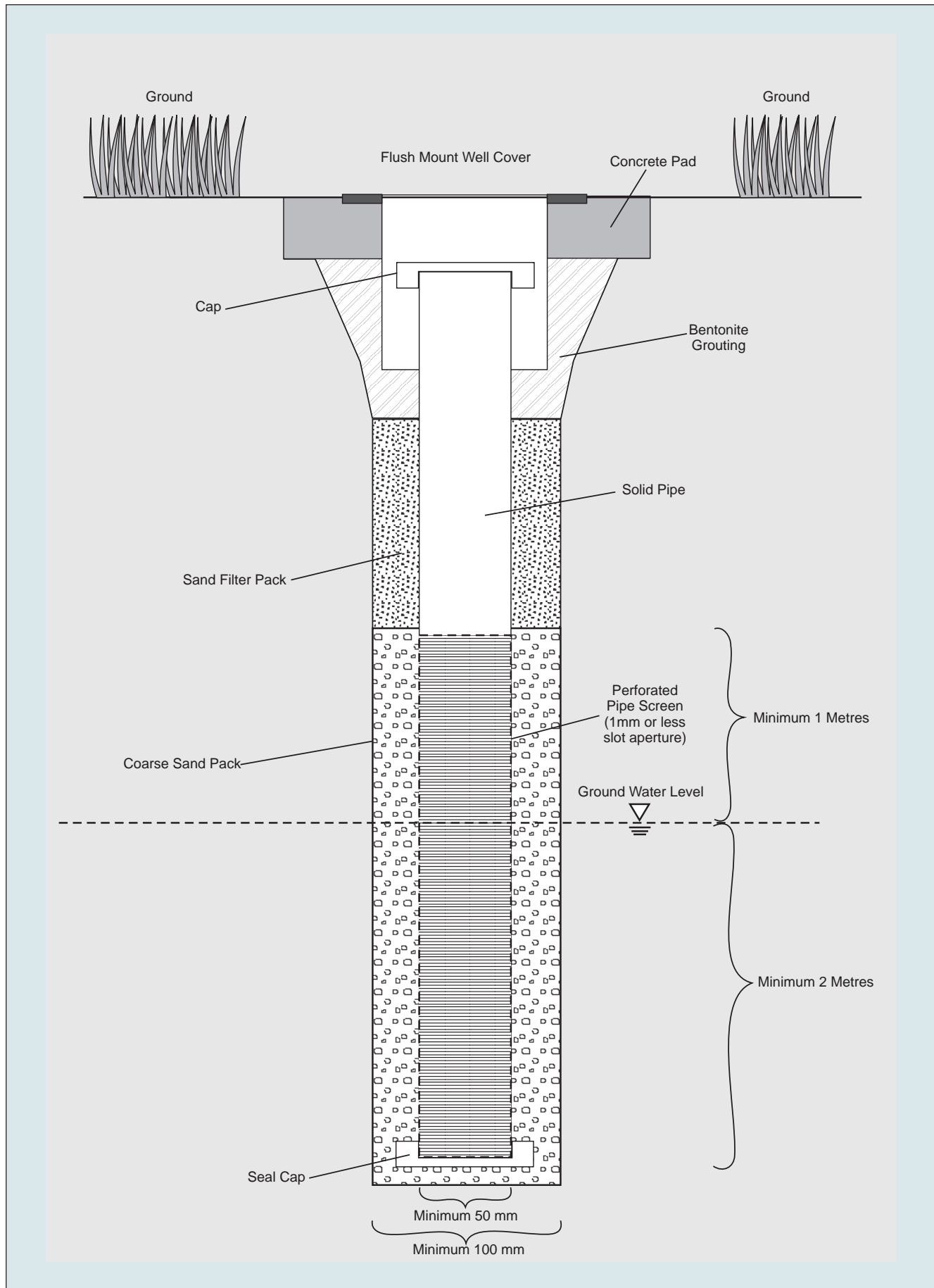
- Small disturbed sample
- Large disturbed sample
- SPT liner sample
- U76 undisturbed sample
- U100 undisturbed sample
- Mazier sample
- Piston sample
- Water sample
- Standpipe tip
- Piezometer tip
- Standard penetration test
- Standard penetration test (Cone)
- Pressuremeter Test
- Permeability test
- Packer test
- In-situ vane shear test
- Televiewer test

LOGGED Y.S.CHIK
DATE 12/06/2020
CHECKED T.K.CHENG
DATE 12/06/2020

REMARKS

1. Standpipe was installed to depth at 7.11m.

ANNEX G SCHEMATIC DRAWING OF GROUNDWATER MONITORING WELL



ANNEX H RISK-BASED REMEDIATION GOALS

**Table 2.1
Risk-Based Remediation Goals (RBRGs) for Soil & Soil Saturation Limit**

Chemical	Risk-Based Remediation Goals for Soil				Soil Saturation Limit (C _{sat}) (mg/kg)
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Parks (mg/kg)	
VOCs					
Acetone	9.59E+03	4.26E+03	1.00E+04*	1.00E+04*	***
Benzene	7.04E-01	2.79E-01	9.21E+00	4.22E+01	3.36E+02
Bromodichloromethane	3.17E-01	1.29E-01	2.85E+00	1.34E+01	1.03E+03
2-Butanone	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	***
Chloroform	1.32E-01	5.29E-02	1.54E+00	2.53E+02	1.10E+03
Ethylbenzene	7.09E+02	2.98E+02	8.24E+03	1.00E+04*	1.38E+02
Methyl tert-Butyl Ether	6.88E+00	2.80E+00	7.01E+01	5.05E+02	2.38E+03
Methylene Chloride	1.30E+00	5.29E-01	1.39E+01	1.28E+02	9.21E+02
Styrene	3.22E+03	1.54E+03	1.00E+04*	1.00E+04*	4.97E+02
Tetrachloroethene	1.01E-01	4.44E-02	7.77E-01	1.84E+00	9.71E+01
Toluene	1.44E+03	7.05E+02	1.00E+04*	1.00E+04*	2.35E+02
Trichloroethene	5.23E-01	2.11E-01	5.68E+00	6.94E+01	4.88E+02
Xylenes (Total)	9.50E+01	3.68E+01	1.23E+03	1.00E+04*	1.50E+02
SVOCs					
Acenaphthene	3.51E+03	3.28E+03	1.00E+04*	1.00E+04*	6.02E+01
Acenaphthylene	2.34E+03	1.51E+03	1.00E+04*	1.00E+04*	1.98E+01
Anthracene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	2.56E+00
Benzo(a)anthracene	1.20E+01	1.14E+01	9.18E+01	3.83E+01	
Benzo(a)pyrene	1.20E+00	1.14E+00	9.18E+00	3.83E+00	
Benzo(b)fluoranthene	9.88E+00	1.01E+01	1.78E+01	2.04E+01	
Benzo(g,h,i)perylene	1.80E+03	1.71E+03	1.00E+04*	5.74E+03	
Benzo(k)fluoranthene	1.20E+02	1.14E+02	9.18E+02	3.83E+02	
bis-(2-Ethylhexyl)phthalate	3.00E+01	2.80E+01	9.18E+01	9.42E+01	
Chrysene	8.71E+02	9.19E+02	1.14E+03	1.54E+03	
Dibenzo(a,h)anthracene	1.20E+00	1.14E+00	9.18E+00	3.83E+00	
Fluoranthene	2.40E+03	2.27E+03	1.00E+04*	7.62E+03	
Fluorene	2.38E+03	2.25E+03	1.00E+04*	7.45E+03	5.47E+01
Hexachlorobenzene	2.43E-01	2.20E-01	5.82E-01	7.13E-01	
Indeno(1,2,3-cd)pyrene	1.20E+01	1.14E+01	9.18E+01	3.83E+01	
Naphthalene	1.82E+02	8.56E+01	4.53E+02	9.14E+02	1.25E+02
Phenanthrene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	2.80E+01
Phenol	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	7.26E+03
Pyrene	1.80E+03	1.71E+03	1.00E+04*	5.72E+03	
Metals					
Antimony	2.95E+01	2.91E+01	2.61E+02	9.79E+01	
Arsenic	2.21E+01	2.18E+01	1.96E+02	7.35E+01	
Barium	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Cadmium	7.38E+01	7.28E+01	6.53E+02	2.45E+02	
Chromium III	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Chromium VI	2.21E+02	2.18E+02	1.96E+03	7.35E+02	
Cobalt	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Copper	2.95E+03	2.91E+03	1.00E+04*	9.79E+03	
Lead	2.58E+02	2.55E+02	2.29E+03	8.57E+02	
Manganese	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Mercury	1.10E+01	6.52E+00	3.84E+01	4.56E+01	
Molybdenum	3.69E+02	3.64E+02	3.26E+03	1.22E+03	
Nickel	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Tin	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Zinc	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Dioxins / PCBs					
Dioxins (I-TEQ)	1.00E-03	1.00E-03	5.00E-03	1.00E-03	
PCBs	2.36E-01	2.26E-01	7.48E-01	7.56E-01	
Petroleum Carbon Ranges					
C6 - C8	1.41E+03	5.45E+02	1.00E+04*	1.00E+04*	1.00E+03
C9 - C16	2.24E+03	1.33E+03	1.00E+04*	1.00E+04*	3.00E+03
C17 - C35	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	5.00E+03
Other Inorganic Compounds					
Cyanide, free	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Organometallics					
TBTO	2.21E+01	2.18E+01	1.96E+02	7.35E+01	

Notes:

- (1) For Dioxins, the cleanup levels in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive of 1998 have been adopted. The OSWER Directive value of 1 ppb for residential use has been applied to the scenarios of "Urban Residential", "Rural Residential", and "Public Parks", while the low end of the range of values for industrial, 5 ppb, has been applied to the scenario of "Industrial".
- (2) Soil saturation limits for petroleum carbon ranges taken from the Canada-Wide Standards for Petroleum Hydrocarbons in Soil, CCME 2000.
- (3) * indicates a 'ceiling limit' concentration.
- (4) *** indicates that the C_{sat} value exceeds the 'ceiling limit' therefore the RBRG applies.

**Table 2.2
Risk-Based Remediation Goals (RBRGs) for Groundwater and Solubility Limit**

Chemical	Risk-Based Remediation Goals for Groundwater			Solubility Limit (mg/L)
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	
VOCs				
Acetone	1.00E+04*	1.00E+04*	1.00E+04*	***
Benzene	3.86E+00	1.49E+00	5.40E+01	1.75E+03
Bromodichloromethane	2.22E+00	8.71E-01	2.62E+01	6.74E+03
2-Butanone	1.00E+04*	1.00E+04*	1.00E+04*	***
Chloroform	9.56E-01	3.82E-01	1.13E+01	7.92E+03
Ethylbenzene	1.02E+03	3.91E+02	1.00E+04*	1.69E+02
Methyl tert-Butyl Ether	1.53E+02	6.11E+01	1.81E+03	***
Methylene Chloride	1.90E+01	7.59E+00	2.24E+02	***
Styrene	3.02E+03	1.16E+03	1.00E+04*	3.10E+02
Tetrachloroethene	2.50E-01	9.96E-02	2.95E+00	2.00E+02
Toluene	5.11E+03	1.97E+03	1.00E+04*	5.26E+02
Trichloroethene	1.21E+00	4.81E-01	1.42E+01	1.10E+03
Xylenes (Total)	1.12E+02	4.33E+01	1.57E+03	1.75E+02
SVOCs				
Acenaphthene	1.00E+04*	7.09E+03	1.00E+04*	4.24E+00
Acenaphthylene	1.41E+03	5.42E+02	1.00E+04*	3.93E+00
Anthracene	1.00E+04*	1.00E+04*	1.00E+04*	4.34E-02
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene	5.39E-01	2.03E-01	7.53E+00	1.50E-03
Benzo(g,h,i)perylene				
Benzo(k)fluoranthene				
bis-(2-Ethylhexyl)phthalate				
Chrysene	5.81E+01	2.19E+01	8.12E+02	1.60E-03
Dibenzo(a,h)anthracene				
Fluoranthene	1.00E+04*	1.00E+04*	1.00E+04*	2.06E-01
Fluorene	1.00E+04*	1.00E+04*	1.00E+04*	1.98E+00
Hexachlorobenzene	5.89E-02	2.34E-02	6.95E-01	6.20E+00
Indeno(1,2,3-cd)pyrene				
Naphthalene	6.17E+01	2.37E+01	8.62E+02	3.10E+01
Phenanthrene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+00
Phenol				
Pyrene	1.00E+04*	1.00E+04*	1.00E+04*	1.35E-01
Metals				
Antimony				
Arsenic				
Barium				
Cadmium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Lead				
Manganese				
Mercury	4.86E-01	1.84E-01	6.79E+00	
Molybdenum				
Nickel				
Tin				
Zinc				
Dioxins / PCBs				
Dioxins (I-TEQ)				
PCBs	4.33E-01	1.71E-01	5.11E+00	3.10E-02
Petroleum Carbon Ranges				
C6 - C8	8.22E+01	3.17E+01	1.15E+03	5.23E+00
C9 - C16	7.14E+02	2.76E+02	9.98E+03	2.80E+00
C17 - C35	1.28E+01	4.93E+00	1.78E+02	2.80E+00
Other Inorganic Compounds				
Cyanide, free				
Organometallics				
TBTO				

Notes:

- (1) Blank indicates that RBRG could not be calculated because the toxicity or physical/chemical values were unavailable, or the condition of Henry's Law Constant > 1.00E-05 was not met for the inhalation pathway.
- (2) Water solubilities for Petroleum Carbon Range aliphatic C9-C16 and greater than C16 generally are considered to be effectively zero and therefore the aromatic solubility for C9-C16 is used.
- (3) * indicates a 'ceiling limit' concentration.
- (4) *** indicates that the solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

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