


# Drainage Services Department

**Contract No. SPW 09/2018  
Environmental Team Baseline Surveys  
for Sha Tin Cavern Sewage Treatment  
Works**

**Supplementary Contamination  
Assessment Plan  
(Version 3.1)**

Certified By   
(Environmental Team Leader)

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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27 November 2018

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By Post and E-mail

Attention: Ms. YIP Lai Yuk, Carol (Engr/Sewerage Projects 26)

Dear Ms. Yip,

**Re: Contract No. SPW 09/2018  
Environmental Team Baseline Surveys  
for Sha Tin Cavern Sewage Treatment Works**

**Supplementary Contamination Assessment Plan  
(Condition 2.21 of EP-533/2017)**

Reference is made to the captioned Supplementary Contamination Assessment Plan (Version 3.1) certified by the ET Leader and provided to us via e-mail on 27 November 2018.

Please be informed that we have no adverse comment on the captioned submission. We write to verify the captioned submission in accordance with condition 1.9 of EP-533/2017.

Thank you very much for your attention and please do not hesitate to contact our Mr. Simon Cheung (Tel: 3465 2861) or the undersigned should you have any queries.

Yours sincerely,



YH Hui  
Independent Environmental Checker

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by E-mail  
by E-mail

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## 1 INTRODUCTION

- 1.1 To support social and economic development in Hong Kong, there is a pressing need to optimize the supply of land for various uses by sustainable and innovative approaches. One possible approach is rock cavern development. The Policy Agenda of the 2016 Policy Address has stated that works for the relocation of the Sha Tin Sewage Treatment Works (STSTW) is to commence as soon as possible to release the existing site, of a size about 28 hectares, for development purpose.
- 1.2 The Relocation of Sha Tin Sewage Treatment Works (STSTW) to Caverns (the Project) is implemented so as to release the existing site, of a size about 28 hectares, for other uses.
- 1.3 The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) Report for the Project was approved under EIAO in November 2016 (No.AEIAR-202/2016) in accordance with the EIA Study Brief (No.ESB-273/2014) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The corresponding Environmental Permit was issued (EP no.: EP-533/2017) by the Director of Environmental Protection (DEP) in March 2017.
- 1.4 According to Section 7 of the Contamination Assessment Plan (CAP) in the approved EIA Report and Section 5.1.1.1 of the EM&A Manual, further site walkover and/or detailed land contamination assessment will be required for sites that are inaccessible/ currently in operation/ yet to be constructed, which include the existing STSTW, Vehicle Detention Centre (VDC), David Camp and proposed Ah Kung Kok Shan Road surface magazine site (Magazine Site). As required in Condition 2.21 of the EP, detailed assessment of land contamination shall be carried out before the commencement of demolition/construction of the Project when access to the concerned site(s) identified in Appendix 6.01 of the approved EIA Report (Register No. AEIAR-202/2016) is available.
- 1.5 At the time of this study, the existing STSTW is still under operation while the VDC and David Camp have/will be handed over to the Lands Department. The Magazine Site is also accessible. The Technical Requirements Clause (D)(a)(ii) of the current study identified three assessment areas for further review as shown in **Figure 1** and tabulated below:

**Table 1-1 Land Contamination Assessment Locations**

Location	Proposed Use	Justification for Assessment
Custom and Excise Department (C&ED) Vehicle Detention Centre (VDC)	Temporary works area for this project	To verify the potential contamination hotspots identified in the EIA Stage: <ul style="list-style-type: none"> <li>• Temporary Storage Area of Spent Batteries (100m<sup>2</sup>)</li> <li>• Storage area of seized goods (100 m<sup>2</sup>)</li> </ul>
Evangelical Lutheran Church of Hong Kong (David Camp)	Construction of Main Portal	Inaccessible in EIA Stage

Location	Proposed Use	Justification for Assessment
Ah Kung Kok Shan Road Magazine Site (“Magazine Site”)	Storage of explosives for construction works	To verify the finding in EIA Stage

- 1.6 Cinotech Consultants Limited (Cinotech) was commissioned by the Drainage Services Department (DSD) to prepare a Supplementary Contamination Assessment Plan (SCAP) focusing on the VDC, David Camp and Magazine Site for partial fulfilment of Condition 2.21 of the EP. A separate SCAP for the existing STSTW will be submitted to completely fulfill the EP Condition when the STSTW is accessible.
- 1.7 This SCAP provides findings from site appraisal and environmental information available to propose a sampling plan for site investigation. The following guidelines/manuals will be adopted:
- Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (RBRGs Guidance Manual) (EPD, 2007)
  - Practice Guide for Investigation and Remediation of Contaminated Land (PG) (EPD, 2011)
  - Guidance Note for Contaminated Land Assessment and Remediation (GN) (EPD, 2007).

## 2 SITE APPRAISAL

### Site Locations

2.1 The three assessment areas are located in Tai Shui Hang as illustrated in **Figures 1a – 1c** and described below:

- **The C&ED VDC** is located opposite to the existing STSTW separated by the Shing Mun River Channel. It is accessible via Hang Tai Road.
- **The David Camp** is located in A Kung Kok Street, about 170m to the northeast of Ah Kung Kok Fishermen Village.
- **The Magazine Site** is located at the upper end of A Kung Kok Shan Road next to the Neighbourhood Advice-Action Council Harmony Manor.

### Review of Past Contamination Assessment Plans

2.2 The EIA Report has conducted a land contamination assessment on the VDC, David Camp and magazine site prior to July 2015 (hereafter called “EIA CAP”). Prior to the closure of the VDC, the Custom and Excise Department (C&ED) has engaged a consultant (ERM) to prepare a CAP for the VDC (hereafter called “C&ED CAP”), and the CAP was agreed by the EPD in early 2018. The findings from the two reports are summarized below:

#### *VDC*

2.3 The VDC was managed by the C&ED for storage of detained vehicles and seized goods. It was concrete-paved and in good condition. Two potential contamination hotspots were identified as mentioned in **Table 1-1**: temporary storage area of spent batteries and storage area of seized goods. The C&ED has also registered as a chemical waste producer (CWP) due to disposal of the spent batteries (**Table 2-1**). As the storage areas were well-paved, the EIA Report considered that land contamination would be localized. Soil sampling at the potential hotspots was proposed at six locations (ENV-BH53 - ENV-BH58) at the hotspots.

**Table 2-1 Chemical Waste Producers identified in the EIA Stage**

CWP & CWP No.	Year of Application	Type of Chemical Waste
<b>VDC</b>		
Commissioner of Customs and Excise (0012-756-C3760-01)	2012	Spent battery

2.4 In addition to the two contamination hotspots as proposed in the EIA CAP, the Motor Spirit Area located in the vacant area on the western end of the VDC, as shown in **Figure 2**, was also identified by ERM as another potential contamination area. The area was used to transfer detained motor spirits to tanker truck for offsite shipment, although no spillage incidents was recorded within the motor spirit transfer area, two sampling locations were proposed to ascertain that the area has not been contaminated. The C&ED CAP (**Appendix G**), proposed 8 sampling locations, of which 6 of them (BH3 - BH8) are identical to those proposed in the EIA CAP (ENV-BH53 - ENV-BH58). The

sampling points and Chemicals of Concern (CoCs) proposed in C&ED CAPs agreed by the EPD are summarised in **Table 2-2** below.

**Table 2-2 Summary of Sampling Points & CoCs proposed in Latest CAP for VDC**

Potentially Contaminated Area	Sampling Location ID in C&ED CAP <sup>(a)</sup>	Sampling Location ID in EIA CAP	Sampling Depths (m bgl)		Proposed Testing Parameters
			Soil	Groundwater	
Area 1: Temporary Storage Area of Spent Batteries	BH6	ENV-BH53	<u>Manual excavation of Inspection Pit</u> (0-1.5 m bgl): - To collect disturbed sample at 0.5 m bgl.  <u>Rotary Drilling of boreholes</u> (1.5-7.0 m bgl): - Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a maximum of 7 m below ground level or 2m below static groundwater level, whichever shallower.	At each borehole, to collect one (1) groundwater sample at static groundwater level.	Metals <sup>(b)</sup>
	BH7	ENV-BH54			
	BH8	ENV-BH55			
Area 2: Storage Area of Seized Goods	BH3	ENV-BH56	To collect undisturbed soil samples at 3.0 m and 6.0m bgl.		Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
	BH4	ENV-BH57			
	BH5	ENV-BH58			
Area 3: Motor Spirit Transfer Area	BH1	N/A	To collect undisturbed soil samples at 3.0 m and 6.0m bgl.		Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
	BH2	N/A			

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 fine 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) Heavy 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) PCR: 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.

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*David Camp*

- 2.5 The David Camp was inaccessible during the EIA Stage. It was suspected to be used for non-contaminating activities such as recreation activities, classrooms, place of worship and accommodations. While the EIA did not anticipate any land contamination issue, it recommended further inspection when access is granted.

*Magazine Site*

- 2.6 The EIA Report proposed to construct an access road from the upper end of A Kung Kok Shan Road to the future vertical ventilation shaft opening atop Nui Po Shan. The plateau adjacent to the access road will be employed as a temporary surface explosive magazine. These areas are collectively called “magazine site” in this SCAP for simplicity.
- 2.7 The magazine site was assessed as part of Nui Po Shan North. This area was undeveloped and vegetated. Therefore, no land contamination issue was expected.
- 2.8 To fill the information gap between July 2015 and 2018, this detailed SCAP assessed land contamination potential via the following methods:
- Review of aerial photos between 2016 and 2018
  - Review of C&ED CAP
  - Inquiry with the Environmental Protection Department (EPD) and Fire Services Department (FSD) on past land uses
  - Carry out site walkover and conduct interview with current/past users

**Review of Historical Land Uses**

- 2.9 Aerial photos between 2016 and 2018 of the three sites were inspected at the Map and Aerial Photograph Library of the Lands Department. Aerial photos overlaid with the boundaries of areas of concern is provided in **Appendix A1**. The land use history prior to 2016 described in the EIA CAP was extracted, as shown in **Appendix A2**, and the land use after 2015 was noted based on the observations made from the aerial photos taken from the years between 2015 and 2018. The review of the land use history of the three sites are summarised in **Table 2-3** as below:



**Table 2-3 Land Use Change**

Site	Photo No./ Reference	Observations
<b>VDC</b>		
Prior to 2016	Tables 3.2 - 3.4 of the C&ED CAP	<ul style="list-style-type: none"> <li>- Land reclamation was completed in 1985;</li> <li>- Construction of Tate's Cairn Highway Bridge between 1985-1993;</li> <li>- North-eastern end of the Site was used as an outdoor parking lot between 1995 and 2004. Remaining area was vacant;</li> <li>- The site was used as VDC since 2004.</li> <li>- Temporary storage of dry type spent batteries were found sitting on a concrete slab at south corner of the VDC.</li> </ul>
2016	E010046	<ul style="list-style-type: none"> <li>- Northeastern portion of the VDC was modified into a carpark with black-colour ground, suggesting that it was bitumen-paved;</li> <li>- Remaining portion of the VDC was placed with cars, trucks and containers.</li> </ul>
2017	E017852C	- No noticeable change
2018	E037507C	- The Site has been cleared while the concrete pavement remains
<b>David Camp</b>		
Prior to 2016	Appendix 2.02 of EIA CAP	- Aerial Photos revealed that two buildings were seen at the Site since 1974 and no change was observed after then.
2016	E010046	- No noticeable change
2017	E017852C	- No noticeable change
2018	E037507C	- No noticeable change
<b>Magazine Site</b>		
Prior to 2016	Section 2.3.1.7 of EIA CAP  Appendix 2.02 of EIA CAP	<ul style="list-style-type: none"> <li>- This area (part of Nui Po Shan North in the EIA) was not developed and covered with vegetation;</li> <li>- In the aerial photo from 1982, the A Kung Kok Shan Road and the area of the existing structures along the road are developed.</li> </ul>
2016	E010046	- Well-vegetated with minor vegetation clearance, possibility due to ground investigation work of this project
2017	E017852C	- No noticeable change
2018	E038981	- No noticeable change

2.10 The review of historical land use from previous assessment and aerial photos has indicated that no land contaminating activity at the three sites prior to 2016 and during 2016 -2018.

**Inquiry with EPD & FSD**

- 2.11 Information was requested from FSD and EPD's Regional Office (North) on the history of operation and land use of the sites. The EPD was consulted with regard to any records of chemical waste producer (CWP). The FSD was consulted with regard to any records of dangerous good producer(s). Both departments were also inquired on any reported accidents or spillage/leakage incidents within the three areas of concern. The correspondences from EPD and FSD are documented in **Appendix B. Table 2-4** below shows the summary of the response from Government Departments.

**Table 2-4 Summary of Response from Government Departments**

<b>Government Department</b>	<b>Response</b>
Environmental Protection Department Regional Office (North)	No record of reported accidents of spillage / leakage of chemicals at the concerned sites.
Fire Services Department	No record of dangerous goods license, fire incidents nor incidents of spillage / leakage of dangerous goods at the concerned sites.

- 2.12 An appointment was made with the Territory Control Office of the EPD for checking of the registry of chemical waste producers on 23 July 2018. No new chemical waste producer within the areas of concern in addition to the one identified in the EIA Stage (**Table 2-1**) was identified.
- 2.13 The site walk did not reveal any land contaminating activity. The oil stains observed in VDC are suspected to be left after cessation of VDC operation (to be explained in subsequent sections). Therefore, according to the site condition, inquiring EPD and FSD for chemical waste producer/dangerous goods registers and spillage records would be sufficient for this assessment.

**Observations from Recent Site Walkover and Interviews with Current/Past Users**

- 2.14 The David Camp and magazine site were inspected on 21 June 2018 while the VDC was inspected on 10 July 2018. An interview was also conducted with the representative of David Camp. The site walkover checklists and photographic records of the three sites are provided in **Appendices C** and **E** respectively.

*VDC*

- 2.15 The C&ED has handed over the VDC to the Lands Department in early 2018. The northeastern end of the site was rented out as car park under short term tenancy. Another carpark also partly encroached near the centre of the site. The remaining area was left vacant. The location of the carparks are shown in **Figure 2**.
- 2.16 The carparks, located in the northeastern part of the VDC as illustrated in **Figure 2**, were parked with private cars, vans and/or trucks. The ground was fully paved with bitumen and no crack was observed. No storage of chemical, oil stains, stressed vegetation or land contaminating activity was observed. Although bitumen is porous, no oil leakage or storage of contaminant was observed during the site visit. Therefore, no land contamination potential is expected.

- 2.17 The vacant portion of the VDC was cleared of cars, trucks and containers observed in the aerial photos. However, pieces of car parts such as broken windshield, car door, exhaust pipe were occasionally found in the northwestern part of the VDC site. As confirmed by C&ED with written statement as shown in **Appendix F**, the VDC only stored vehicles with no repairing or dismantling works. Also, the District Lands Office confirmed that no access to the site by third parties were made after C&ED handed over the site and before site inspection in July 2018 (**Appendix F**). Therefore, no vehicle repairing/dismantling activity was conducted during and after operation of the VDC. It is surmised that the car parts may be accidentally broken up during vehicle removal for site clearance.
- 2.18 In general, the ground of the vacant portion of the VDC was laid with soil/broken concrete mix. Part of the site was overgrown with grass. Where the ground was slightly depressed, these areas were inundated with water from the morning rain. These indicated that the ground permeability varied across the site.
- 2.19 At the contamination hotspots identified in the EIA Stage, no sign of contamination (e.g. oil stain) was seen. Nevertheless, black stains were observed in the middle of the VDC. They were confirmed as non-aqueous phase liquid when flooded with water. Each stain was smaller than 1m<sup>2</sup>. The C&ED CAP did not report any oil stain. Also, C&ED clarified that no repairing/dismantling work was performed in the VDC and the DLO confirmed that no third party can enter the VDC after handing over and before the site inspection in July 2018 (**Appendix F**). Judging from the black colour, the stains are suspected to be engine oil, which might be left during site clearance after cessation of VDC operation. As no large scale oil stain was observed, the oil stains are believed to be localized leakage. The locations of the stains are shown in **Figure 2**.
- 2.20 In short, new land contaminated area was suspected at oil stains observed in recent survey.

#### *David Camp*

- 2.21 The David Camp is currently managed by the Evangelical Lutheran Church of Hong Kong. According to the representative of the David Camp, the site is used as an occasional volunteer training centre and gardening work. The site will be handed over to the Lands Department at the end of 2018.
- 2.22 It is located at the foot of Nui Po Shan. Due to the sloping topography, the camp is layered in three levels: ground level, first platform and second platform. The ground level was a garden laid with pavers and placed with planter pots. The ground surrounding the garden was unpaved and grown with vegetation.
- 2.23 A one-storey building was constructed on each platform. The concrete floor around the buildings was intact with no crack. The SIMAR slopes at the back of the buildings were vegetated with no sign of human disturbance. The buildings were used as training room, kitchen and storage of musical equipment. No storage of chemical, oil stains, stressed vegetation or land contaminating activity was observed.

*Magazine Site*

- 2.24 The magazine site was completely natural and covered by secondary woodland, plantation woodland and shrubland. A few natural streams flowed across the magazine site. During the site walkover, the only signs of human activity were access ropes of land surveyors and boreholes. No storage of chemical, oil stains, stressed vegetation or land contaminating activity was observed.

**Overall Summary**

- 2.25 The available information from aerial photos, interview with site representative and site walkover suggest that new land contamination hotspots were identified at the VDC (engineer oil stains) while no land contamination activity was observed at the David Camp and magazine site.

### 3 SAMPLING STRATEGY

#### Proposed Sampling Locations

- 3.1 The C&ED CAP has proposed 8 sampling locations (**Table 2-2** refers). After ERM conducted the site inspection in August 2017, C&ED vacated the VDC in early 2018 and subsequently Cinotech inspected the site in July 2018. Since the site has not been utilized after site clearance, the findings in the C&ED CAP remains valid. C&ED has engaged a contractor to carry out sampling and testing works for these 8 sampling locations. The sampling strategies proposed in **Table 2-2** shall be adopted in this SCAP, however, the sampling works shall be conducted by C&ED and the results shall be reviewed in the CAR for this project.
- 3.2 Soil sampling is recommended at the potential contamination hotspots at the oil stains at the VDC observed in this study.

#### Soil Sampling

- 3.3 According to the agreed C&ED CAP, previous GI record obtained from Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD) revealed that the geological strata encountered in area of the sites were in general a fill material in a matrix of coarse sand and silty clay with gravel sized rock fragments (from 0 to 12.10m bgl). The fill material layer was underlain by alluvium in a matrix of silty sand with quartz fragments (from 12.10 to 16.10m b.g.l), and granite (16.10 to 37.40 m bgl).
- 3.4 According to the *Practice Guide for Investigation and Remediation of Contaminated Land*, simplified site investigation at the potential hotspot can be carried out for very small scale operation. The stains are suspected to be leaked engine oil left during site clearance after cessation of VDC when there is no long term vehicle storage. Therefore, no large scale contamination is expected and sampling at the hotspot is proposed. A total of 2 sampling locations (S1 & S2) are proposed as shown in **Figure 2**.

**Table 3-1 Soil Sampling Requirements**

Location	Area (m <sup>2</sup> )	No. of sampling points	ID
Oil Stain Patch 1	1	1	S1
Oil Stain Patch 2	1	1	S2

- 3.5 Refer to **Section 2** for the findings of the site appraisal for David Camp and Magazine site, since no signs of potential land contamination has been reported or found during the site visit for these two sites, soil sampling is not required for David Camp and Magazine sites.

#### Groundwater Sampling

- 3.6 According to the latest available groundwater level monitoring record (April 1999) provided by CEDD, the groundwater level measured was ranged from approximately 1.55 to 3.89 m bgl. Therefore, groundwater may be encountered at shallow depth during soil sampling.

- 3.7 Groundwater samples shall be collected when groundwater is encountered in any soil sampling locations. A competent land contamination specialist of Cinotech shall make decision on whether groundwater samples shall be collected with the actual geological situation.

### **Depth of Sampling**

- 3.8 According to the *Practice Guide for Investigation and Remediation of Contaminated Land*, three or more soil samples shall be taken at each sampling point to verify vertical distribution of contaminants.
- 3.9 With reference to EIA CAP, dry rotary drilling should be employed for soil sampling. Soil samples shall be collected at 0.5m, 1.5m, 3.0m and 6m bgl if no groundwater is encountered, or to 2m below groundwater level, whichever is shallower. The depths of sampling are shown in **Table 3-2**.
- 3.10 Trial pit to 3m bgl should be carried out for area where drilling of borehole is not possible (e.g. presence of underground utilities, limitation of headroom space, etc.). Disturbed soil samples shall be collected at 0.5m, 1.5m and 3.0m below the prevailing ground level with stainless steel hand tools at each trial pit sampling location to obtain the vertical contamination profile.

### **Sampling and Testing Plan**

- 3.11 As mentioned in **Section 2.19**, the oil stains are suspected to be engine oil. With reference to Table 2.3 of EPD's *Practice Guide for Investigation and Remediation of Contaminated Land (PG)*, potential contaminants associated with release of oils and fuels and lubricants from vehicles (similar to motor vehicle service centre) are as follows:
- Metals: antimony, arsenic, barium, cadmium, chromium (III), chromium (VI), cobalt, copper, lead, manganese, mercury, molybdenum, nickel, tin and zinc;
  - Petroleum Carbon Ranges (PCRs): carbon ranges C<sub>6</sub> – C<sub>8</sub>, C<sub>9</sub> – C<sub>16</sub> and C<sub>17</sub> – C<sub>35</sub>;
  - Volatile Organic Compounds (VOCs): acetone, bromodichloromethane, 2-butanone, chloroform, methyl tert-butyl ether (MTBE), methylene chloride, styrene, tetrachloroethene (TCE), trichloroethene, benzene, toluene, ethylbenzene and xylenes;
  - Polycyclic Aromatic Hydrocarbons (PAHs): acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene.

- 3.12 The proposed sampling points and corresponding testing parameters for oil stains are summarised in the **Table 3-2** below:

**Table 3-2 Proposed Sampling and Testing Parameters for Oil Stains**

Sampling ID	Contamination land type	S / GW*	Depth	Proposed Testing Parameters					
			(m below concrete slab/iron sheets)	PCRs	VOCs	SVOCs	PCBs	Metals	PAH
S1 to S2	motor vehicle service centre	S	0.5	Y	Y	/	/	Y	Y
		S	1.5	Y	Y	/	/	Y	Y
		S	3.0	Y	Y	/	/	Y	Y
		S	GW level or 6m*	Y	Y	/	/	Y	Y
		GW	If present	Y	Y	/	/	Y	Y

Remarks:

- a) S – Soil, GW – Groundwater  
b) Details of the testing parameters are shown in **Table 4-1**.  
c) \* whichever is shallower

### **Sampling Methodology**

- 3.13 As mentioned in **Sections 3.9** and **3.10**, soil samples shall be collected using borehole drilling or trial pit depending on the site condition. All soil sampling work shall be supervised by a land contamination specialist of Cinotech.

#### **Trial Pit Excavation**

- 3.14 The hard surface of each exploratory borehole shall be excavated and removed by hand digging or using a mechanical device to allow visual inspection of the ground conditions. The trial pit area will be closed to 1.5m x 1.5m. For safety purposes, available utility service plans will be investigated and utility scanning will be executed prior to any ground disturbance to ensure the clearance of underground utilities at all proposed trial pit locations.
- 3.15 The sampler shall be lowered to the base of the borehole and hand driven into the undisturbed soil. The sampler shall then be removed from the borehole and disassembled exposing the soil-filled sleeves. The sample sleeves shall be separated and observed for possible staining. The exposed soil on each end of the sample sleeves shall be quickly covered with Teflon™ sheeting, fitted with tightly fitting plastic end caps, and sealed with Parafilm™ (an adhesive-free laboratory film). Under no circumstances shall tape with an adhesive be used on sample end caps due to the possible introduction of volatiles and phthalate compounds.
- 3.16 Although glass sample jars are generally acceptable for collection of soil samples for most analyses, glass jars are not acceptable for analysis of samples for volatile constituents. This includes VOCs and the volatile fraction associated with TPH analyses. Sample collection in stainless-steel sleeves is therefore specified for all drive samples. Samples shall be labelled and handled in accordance with **Sections 3.34** and **3.35** respectively.



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- 3.17 A portion of the soil from the sampler bit shall be placed in a plastic zip-lock bag sealed. The contents of the bag should then be manually mixed, and the bag allowed to sit in the open, preferable in the sunlight, to allow volatilisation of any VOCs in the soil. The headspace in the zip-lock bag will be measured for the VOC concentration by a calibrated photo- or flame-ionization (PID or FID) instrument and the measurement readings shall be recorded, including the sample ID (e.g. location & depth) and observations on the sampled soil. The VOC measurement results and findings shall be presented in the Contamination Assessment Report (CAR).
- 3.18 If a boring is to be piloted using a backhoe or similar excavating device rather than piloting with a hand auger, soil samples shall be collected from the sidewalls of the excavation using the slide hammer by driving the steel core sampler into a side wall of the excavation at the appropriate depth.
- 3.19 Additional samples shall be collected for laboratory analysis whenever there are suspected signs of contamination. The location and depth of the additional samples will be determined by the on-site land contamination specialist subject to the actual site condition and engineering constraints.
- 3.20 Prior to each sampling event, the soil sampling equipment shall be decontaminated either by steam cleaning or by washing in a lab-grade detergent, doubled rinsed with potable water, and final rinsed with deionised water (see **Section 3.37** below).
- 3.21 The excavated materials will be placed away from the edge next to the trial pit to prevent collapse. Once sampling is completed, the trial pits will be backfilled instantaneously in reverse order to which they were excavated.

#### Borehole (Dry) Drilling

- 3.22 Borehole drilling is the most common method to examine and determine the presence of potential soil and groundwater contamination. Borehole by means of dry rotary drilling method without the use of flushing medium will be adopted in order to avoid potential cross contamination.
- 3.23 Utility scanning will be inspected prior to any ground disturbance to ensure the clearance of underground utilities at all proposed borehole locations. Moreover, an inspection pit will be excavated down to about 1.5m bgl to manually perform underground utility clearance prior to any ground disturbance at all proposed borehole locations.
- 3.24 All drilling equipment that may potentially come in contact with soil samples shall be decontaminated in accordance with the procedures outlined in **Section 3.37** prior to mobilizing the drilling rig to the borehole location.
- 3.25 Borehole shall be advanced to the desired sampling depth without the addition of drilling mud and water. The drill rods and drill bit shall be removed from the borehole when the desired depth is reached. Samples shall then be collected using a cleaned sampler fitted with stainless-steel liner sleeves. The sampler shall be attached to drive rods and driven with the aid of the drill-rig hammer.
- 3.26 After the sampler has been driven to desired depth, it shall be carefully removed from the borehole, detached from the drive rods, and placed on a work table. The expose ends

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of the sampler shall be quickly covered with Teflon™ sheeting and plastic caps, and wrapped with Parafilm™ tape. Each sample ring shall be labelled and handled using the procedures discussed in **Section 3.34**.

- 3.27 A portion of the soil from the sampler bit shall be placed in a plastic zip-lock bag sealed. The contents of the bag should then be manually mixed, and the bag allowed to sit in the open, preferable in the sunlight, to allow volatilisation of any VOCs in the soil. The headspace in the zip-lock bag will be measured for the VOC concentration by a calibrated photo- or flame-ionization (PID or FID) instrument and the measurement readings shall be recorded, including the sample ID (e.g. location & depth) and observations on the sampled soil. The VOC measurement results and findings shall be presented in the CAR.
- 3.28 The drill bit and rods shall then be lowered back into the borehole, and drilling shall recommence until the next target sampling depth is reached. The sampling procedures shall then be repeated until the total target depth of the boring has been reached.
- 3.29 Prior to each sampling event, the soil sampling equipment shall be decontaminated either by steam cleaning or by washing in a lab-grade detergent, doubled rinsed with potable water, and final rinsed with deionised water (see **Section 3.37** below).
- 3.30 Undistributed soil samples will be collected using U76 / U100 sampler at sampling depth from 1.5m bgl and onwards. Additional samples shall be collected for laboratory analysis whenever there are suspected signs of contamination. The location and depth of the additional samples will be determined by the on-site land contamination specialist subject to the actual site condition and engineering constraints.
- 3.31 Once sampling is completed, the borehole shall be backfilled with bentonite / cement grout. Surface restoration is required unless water monitoring well is required to be installed.
- 3.32 Soil sampling methods and techniques including decontamination procedures, sample collection, preparation, preservation and chain-of-custody documentation are developed by United States Environmental Protection Agency (USEPA).
- 3.33 If groundwater is not encountered, the soil sample shall be collected at 0.5m, 1.5m, 3.0m and 6m bgl. If groundwater is encountered, the soil sample shall be collected at 0.5m, 1.5m, 3.0m and at groundwater level.

#### Sample Size and Handling Procedures

- 3.34 Soil samples must be individually labelled and described on site prior to sending to a HOKLAS accredited laboratory for analysis. Description shall include, but not be limited to the following:
- i) sampling location where the soil sample collected;
  - ii) sample identification number;
  - iii) soil sampling depth (with respect to lowest level of concrete slab);
  - iv) estimated physical characteristics (clay, silt, sand, gravel, stone, cobble, colour, odour, moisture);
  - v) level of groundwater table (if any);

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- vi) colour photograph; and
  - vii) any other relevant information.
- 3.35 Before sampling commences, the laboratory will be consulted on the particular sample size and preservation procedures which are required for each chemical analysis. The samples must be stored in an insulated box with refrigeration between 2 to 4°C (but not frozen) immediately after being placed in an appropriate pre-washed glass bottles or sampling containers (provided by the laboratory) without being agitated. Headspace should also be minimised when volatile parameters are to be determined. It must be ensured that samples containers and the box are tightly closed and the lid of glass jar should be covered with Teflon liner.
- 3.36 A land contamination specialist of Cinotech shall be on site to oversee all soil sampling and determine the appropriate depth at each sampling point with respect to the actual site conditions. He/she is required to supervise soil and field reporting as stated in Section 3.3.1 and Section 3.6 of Practice Guide (e.g. soil profiling, sign of contamination, groundwater level, presence of non-aqueous phase liquid).

### **Decontamination**

- 3.37 All equipment employed for sample handling and storage must be decontaminated before and after collection of each sample to minimize the potential of cross-contamination between sampling locations and depths. The following is the standard procedure for cleaning drilling equipment and sampling equipment on site:
- i) Clean with steam or lab-grade detergent (using brush if necessary) to remove particulate matter and surface films.
  - ii) Rinse thoroughly with tap water (for drilling equipment) or distilled water (for sampling equipment) and then with deionised water.
  - iii) After field cleaning, the equipment shall be handled by personnel wearing disposable latex gloves to avoid the transfer of contaminants from other sources. If the equipment is not to be used immediately it should be covered with clean plastic sheeting or wrapped in aluminium foil to avoid re-contamination. Also, provisions should be made to handle any decontamination fluids.
  - iv) The drilling equipment and sampling equipment shall be cleaned according to the above procedures between sampling holes.
- 3.38 The samples should be scooped directly from the sampling tool into the sample containers using a stainless steel scoop. If a gloved hand comes into contact with the sample, then new gloves should be used for each sample.

### **Groundwater Sampling**

- 3.39 At each proposed sampling point, one groundwater sample shall be collected if groundwater is encountered at the sampling location. A groundwater monitoring well should be installed at the drill hole of each required sampling point. The design of the well should be made with reference to the PG, as shown in **Appendix D**, and approved by the land contamination specialist.

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- 3.40 Upon completion of installation of monitoring wells and prior to purging and sampling, groundwater levels should be measured and recorded. Prior to sampling, the wells should be purged with approximately five times the well volume at each sampling event to remove silt and drilling fluid residue from the wells. Samples should be taken by using a Teflon bailer within 24 hours of the wells being purged.
- 3.41 Field measurement of pH and temperature shall also be carried out prior to sampling to ensure that the well has been adequately purged and that the groundwater in the well was stabilised and has reached equilibrium. The presence of any free product floating on the top of the groundwater and the thickness should be recorded. The floating layer should be removed/recovered and analysed by the laboratory.
- 3.42 Following the dewatering process (and allowing groundwater to permeate back into the hole if it has been purged dry), sufficient quantity of groundwater sample would be collected from each station and stored in individual containers for analysis.
- 3.43 Before sampling commences, the laboratory will be consulted on the particular sample size and preservation procedures which are required for each chemical analysis. Between samples, all equipment used for sample handling and storage shall be thoroughly decontaminated with laboratory-grade detergent. Samples shall be stored in appropriate pre-washed containers (provided by laboratory) and put in an insulated box between 2 – 4°C (but not frozen) immediately. Headspace should also be minimised. It must be ensured that the sample containers and the box are tightly closed.

#### **Quality Control and Quality Assurance (QA/QC)**

- 3.44 A chain of custody system shall be operated as part of the QA/QC procedure. The laboratory accredited QA/QC procedures shall be followed as below:

**Table 3-3 QA/QC Requirements**

Samples taken under QA/QC procedures	Sampling Frequency	Testing Parameters
Duplicate samples	1 for every 20 samples	All parameters that are tested for the proposed soil and groundwater samples at the proposed sampling points <sup>1</sup>
Equipment blank	1 for every 20 samples	All parameters that are tested for the proposed soil and groundwater samples at the proposed sampling points <sup>1</sup>
Field Blank	1 for every 20 samples	All parameters that are tested for the proposed soil and groundwater samples at the proposed sampling points <sup>1</sup>
Trip Blank	1 for every trip with samples that require the analysis of VOCs	All VOCs parameters that are tested for the proposed soil and groundwater samples at the proposed sampling points <sup>1</sup>

Remarks:

1) Refer to **Table 3-2** for the proposed testing parameters at the proposed sampling points and **Table 4-1** for the laboratory analysis schedule.

**Overall Sampling Strategy**

3.45 In total, 10 soil/groundwater sampling locations are proposed as illustrated in **Figure 2**. The sampling requirements are summarized below:

**Table 3-4 Overall Sampling Points & CoCs for VDC**

Potentially Contaminated Area	Sampling Location ID <sup>(a)</sup>	Sampling Location ID in EIA CAP	Sampling Depths (m bgl)		Proposed Testing Parameters
			Soil	Groundwater	
Area 1: Temporary Storage Area of Spent Batteries	BH6	ENV-BH53	<u>Manual excavation of Inspection Pit</u> (0-1.5 m bgl): - To collect disturbed sample at 0.5 m bgl.	At each borehole, to collect one (1) groundwater sample at static groundwater level.	Metals <sup>(b)</sup>
	BH7	ENV-BH54			
	BH8	ENV-BH55			
Area 2: Storage Area of Seized Goods	BH3	ENV-BH56	- Rotary Drilling of boreholes (1.5-7.0 m bgl): - Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a		Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
	BH4	ENV-BH57			

Potentially Contaminated Area	Sampling Location ID <sup>(a)</sup>	Sampling Location ID in EIA CAP	Sampling Depths (m bgl)		Proposed Testing Parameters
			Soil	Groundwater	
	BH5	ENV-BH58	maximum of 7 m below ground level or 2m below static groundwater level, whichever shallower. - To collect undisturbed soil samples at 3.0 m and 6.0m bgl.		Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
Area 3: Motor Spirit Transfer Area	BH1	N/A			
	BH2	N/A			
Area 4: Oil Stains	S1	N/A	<u>Manual excavation of Inspection Pit</u> (0-1.5 m bgl): - To collect disturbed sample at 0.5 m bgl.	At each borehole, to collect one (1) groundwater sample at static groundwater level.	Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , PAH <sup>(f)</sup>
	S2	N/A	<u>Rotary Drilling of boreholes</u> (1.5-6.0 m bgl): - Continuous drilling and retrieving of soil materials for visual inspection at 1.5m, 3.0m and 6m bgl if no groundwater is encountered, or to 2m below groundwater level, whichever is shallower. - To collect undisturbed soil samples at 1.5m, 3.0 m and 6.0m bgl.		

## 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 fine 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) Heavy 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) PCR: 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,

Potentially Contaminated Area	Sampling Location ID <sup>(a)</sup>	Sampling Location ID in EIA CAP	Sampling Depths (m bgl)		Proposed Testing Parameters
			Soil	Groundwater	
					Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene and Pyrene. (f) PAHs : <u>For soil</u> : acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene <u>For groundwater</u> : acenaphthene, acenaphthylene, anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene



#### 4 LABORATORY ANALYSIS

- 4.1 Since the future land uses of these sites have not been determined at this stage, the most stringent set of RBRGs is recommended as the land contamination assessment criteria shall be adopted, that is the lowest limit level for each testing parameter, as listed in Table 2.1 of EPD's *Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management*. The key chemicals of concern are metals, VOCs, PCBs and PAHs.
- 4.2 The soil and groundwater samples shall be sent to the HOKLAS accredited laboratory for analysis. All laboratory test methods must be accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or one of its Mutual Recognition Arrangement partners. The schedule for laboratory analysis is listed in **Table 4-1**.
- 4.3 Toxicity Characteristics Leaching Procedure (TCLP) test will also be implemented for all soil samples if exceedance of land contamination standards is confirmed. In situ remediation, recycling and reuse of remediated materials should be explored first if soil contamination is found. Ex situ remedial measures could then be considered and off-site disposal of contaminated materials to landfills should be adopted only when there is no other feasible option for management/treatment of such materials. The landfill disposal criteria for contaminated soil are shown in **Table 4-2**.

**Table 4-1 Laboratory Analysis Schedule**

Parameter	Referenced Analytical Method	Reporting Limit for Soil (mg/kg)	Reporting Limit for GW (mg/L)	RBRGs for Soil Limit (mg/kg)	RBRGs for GW Limit (mg/L)	Soil Saturation Limit (C <sub>sat</sub> ) (mg/kg)	Solubility Limit (mg/L)
<b>Metals</b>							
Antimony	USEPA Method 6020	1	-	29.1	N/A	-	-
Arsenic		1	-	21.8	N/A	-	-
Barium		1	-	10000*	N/A	-	-
Cadmium		0.2	-	72.8	N/A	-	-
Chromium (III)	By Calculation#	1	-	10000*	N/A	-	-
Chromium (VI)	USEPA Method 3060 APHA Method 3500 Cr:D	1	-	218	N/A	-	-
Cobalt	USEPA Method 6020	1	-	1460	N/A	-	-
Copper		1	-	2910	N/A	-	-
Lead		1	-	255	N/A	-	-
Manganese		1	-	10000*	N/A	-	-
Mercury	APHA Method 3112B	0.2	0.0005	6.52	0.184	-	-
Molybdenum	USEPA Method 6020	1	-	364	N/A	-	-
Nickel		1	-	1460	N/A	-	-
Tin		1	-	10000*	N/A	-	-
Zinc		1	-	10000*	N/A	-	-

Parameter	Referenced Analytical Method	Reporting Limit for Soil (mg/kg)	Reporting Limit for GW (mg/L)	RBRGs for Soil Limit (mg/kg)	RBRGs for GW Limit (mg/L)	Soil Saturation Limit (C <sub>sat</sub> ) (mg/kg)	Solubility Limit (mg/L)
<b>VOCs</b>							
Acetone	USEPA Method 8260	50	0.5	4260	10000*	**	***
Benzene		0.2	0.005	0.279	1.49	336	1750
Bromodichloromethane		0.1	0.005	0.129	0.871	1030	6740
2-Butanone		5	0.05	10000*	10000*	**	***
Chloroform		0.04	0.005	0.0529	0.382	1100	7920
Ethylbenzene		0.5	0.005	298	391	138	169
Methyl tert-Butyl Ether		0.5	0.005	2.8	61.1	2380	***
Methylene Chloride		0.5	0.05	0.529	7.59	921	***
Styrene		0.5	0.005	1540	1160	497	310
Tetrachloroethene		0.04	0.005	0.0444	0.0996	97.1	200
Toluene		0.5	0.005	705	1970	235	526
Trichloroethene		0.1	0.005	0.211	0.481	488	1100
Xylenes		2	0.02	36.8	43.3	150	175
<b>PCRs</b>							
C6 – C8	USEPA Method 8260/8015	5	0.02	545	31.7	1000	5.23
C9 – C16		200	0.5	1330	276	3000	2.8
C17 – C35		500	0.5	10000*	4.93	5000	2.8
<b>PAH</b>							
Acenaphthene	USEPA Method 8270	0.5	0.002	3280	7090	60.2	4.24
Acenaphthylene		0.5	0.002	1510	542	19.8	3.93
Anthracene		0.5	0.002	10000*	10000*	2.56	0.0434
Benzo(a)anthracene		0.5	-	11.4	-	-	-
Benzo(a)pyrene		0.5	-	1.14	-	-	-
Benzo(b)fluoranthene		0.5	0.001	9.88	0.203	-	0.0015
Benzo(g,h,i)perylene		0.5	-	1710	-	-	-
Benzo(k)fluoranthene		0.5	-	114	-	-	-
Chrysene		0.5	0.001	871	21.9	-	0.0016
Dibenzo(a,h)anthracene		0.5	-	1.14	-	-	-
Fluoranthene		0.5	0.002	2270	10000*	-	0.206
Fluorene		0.5	0.002	2250	10000*	54.7	1.98
Indeno(1,2,3-cd)pyrene		0.5	-	11.4	-	-	-
Naphthalene		0.5	0.002	85.6	23.7	125	31
Phenanthrene		0.5	0.002	10000*	10000*	28	1
Pyrene		0.5	0.002	1710	10000*	-	0.135

a) USEPA – Environmental Protection Agency of the United States

b) APHA – American Public Health Association: Standard Methods for the Examination of Water and Wastewater

# Chromium III = Total Chromium – Chromium VI

\* “Ceiling limit” concentration

\*\* Soil saturation limit value exceeds the “ceiling limit” therefore the RBRG applies.

\*\*\* Solubility limit value exceeds the “ceiling limit” therefore the RBRG applies.

**Table 4-2 Landfill disposal criteria for contaminated soil**

Parameter	TCLP Limit (ppm)	Referenced Analytical Method	Reporting Limit (mg/L)
Cadmium	10	USEPA Method 1311 and 6020	0.01
Chromium	50		0.1
Copper	250		0.1
Nickel	250		0.1
Lead	50		0.1
Zinc	250		0.1
Mercury	1		0.002
Tin	250		0.1
Silver	50		0.1
Antimony	150		0.1
Arsenic	50		0.1
Beryllium	10		0.1
Thallium	50		0.01
Vanadium	250		0.1
Selenium	1		0.02
Barium	1000		0.1

## 5 HEALTH AND SAFETY

5.1 The following measures should be implemented to reduce potential impacts on workers during site investigation works. These measures will also mitigate against transferring contamination to groundwater, to surface water courses or to the air.

- A written emergency plan applicable to the site investigation, scheduled meetings and instructions shall be developed and regularly reviewed to ensure safety practices are emphasised and discussed. Evacuation route, storage location of safety equipment and medical equipment shall be explained in the plan.
- Safety devices and barriers shall be maintained properly to minimize risk during the site investigation.
- Site workers should wear gloves, masks, safety boots, eye protection and other protective clothing where exposure to vapours or contaminated soil may be encountered.
- Sampling and first aid equipment shall be maintained in good operating condition for immediate use.
- Contaminated materials should be moved with bulk earthmovers to prevent human contact.
- The use of handling equipment shall be maximized to reduce the potential contacts between excavated contaminated materials and workers.
- Excavation machineries and vehicles shall be washed prior to leaving the Site.
- Adequate washing facilities should be provided and smoking, eating and open flames should be prohibited in the area.
- Contaminated soils, which have been stockpiled or are being transported, should be covered with tarpaulin.
- Leakage of pollutants or leaching from excavated soil should be prevented by storing on an impermeable surface.
- Abnormality should be reported to the Resident Engineer immediately.

## 6 CONCLUSION

- 6.1 This SCAP assessed the land contamination potential at the VDC, David Camp and Magazine Site for partial fulfilment of Condition 2.21 of the EP. A separate SCAP for the existing STSTW will be submitted to completely fulfill the EP Condition when the STSTW is accessible.
- 6.2 In this study, site appraisal for the VDC, David Camp and Magazine Site was conducted to identify any land contamination potential through site inspection, review of the aerial photos and interview with current user. Also, information on the land contamination issues prior to 2016 was obtained from EIA CAP. The agreed C&ED CAP was reviewed to understand the site condition between 2016 and cessation of the VDC in early 2018. Based on the past CAPs and the current study, no land contaminating activity was observed at the David Camp and Magazine Site. However, potential land contamination hotspots were identified at the VDC.
- 6.3 A total of 8 sampling locations have been proposed in the latest agreed C&ED CAP and have been adopted in this SCAP. The sampling works for these 8 sampling locations shall be conducted by C&ED as proposed in the C&ED CAP and the results shall be reviewed and assessed in the CAR for this SCAP. During the site visit, 2 small oil patches were found near the center of the VDC site. Therefore, 2 additional sampling locations have been supplemented in this sampling strategy. The sampling works for these 2 sampling locations shall be conducted by DSD according to the sampling strategy as stated in **Section 3**.
- 6.4 No construction works or development shall be carried out within the subject Site prior to the approval of the Remediation Report (if necessary).
- 6.5 A Contamination Assessment Report (CAR) should be compiled following the site investigation. The CAR should present the methodology used during the soil boring and sampling work, details of field observations and interpretation of laboratory testing results for soil and groundwater contamination. It will incorporate the investigation results and observation from all sampling locations (including those studied by C&ED).
- 6.6 If land contamination is confirmed, a Remediation Action Plan (RAP) should be drawn up to formulate necessary remedial measures. The sequential CAR and RAP should be endorsed by EPD before implementation of any remediation work. Upon completion of the necessary remediation works, a Remediation Report (RR) should be submitted to the EPD to demonstrate that the contaminated soil/groundwater has been cleaned and their quality satisfies with the adopted RBRG criteria.

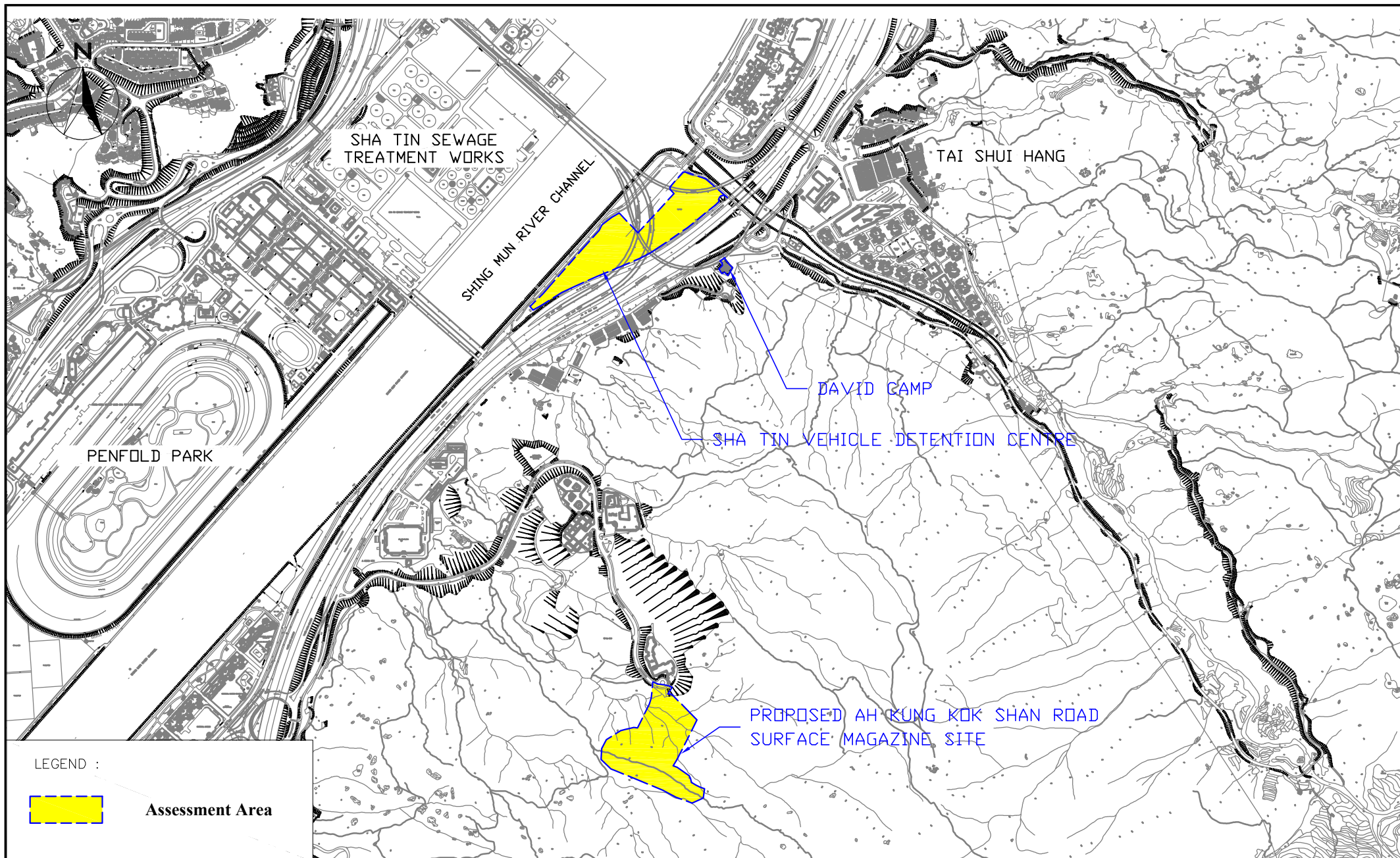
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## FIGURES

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 Assessment Area

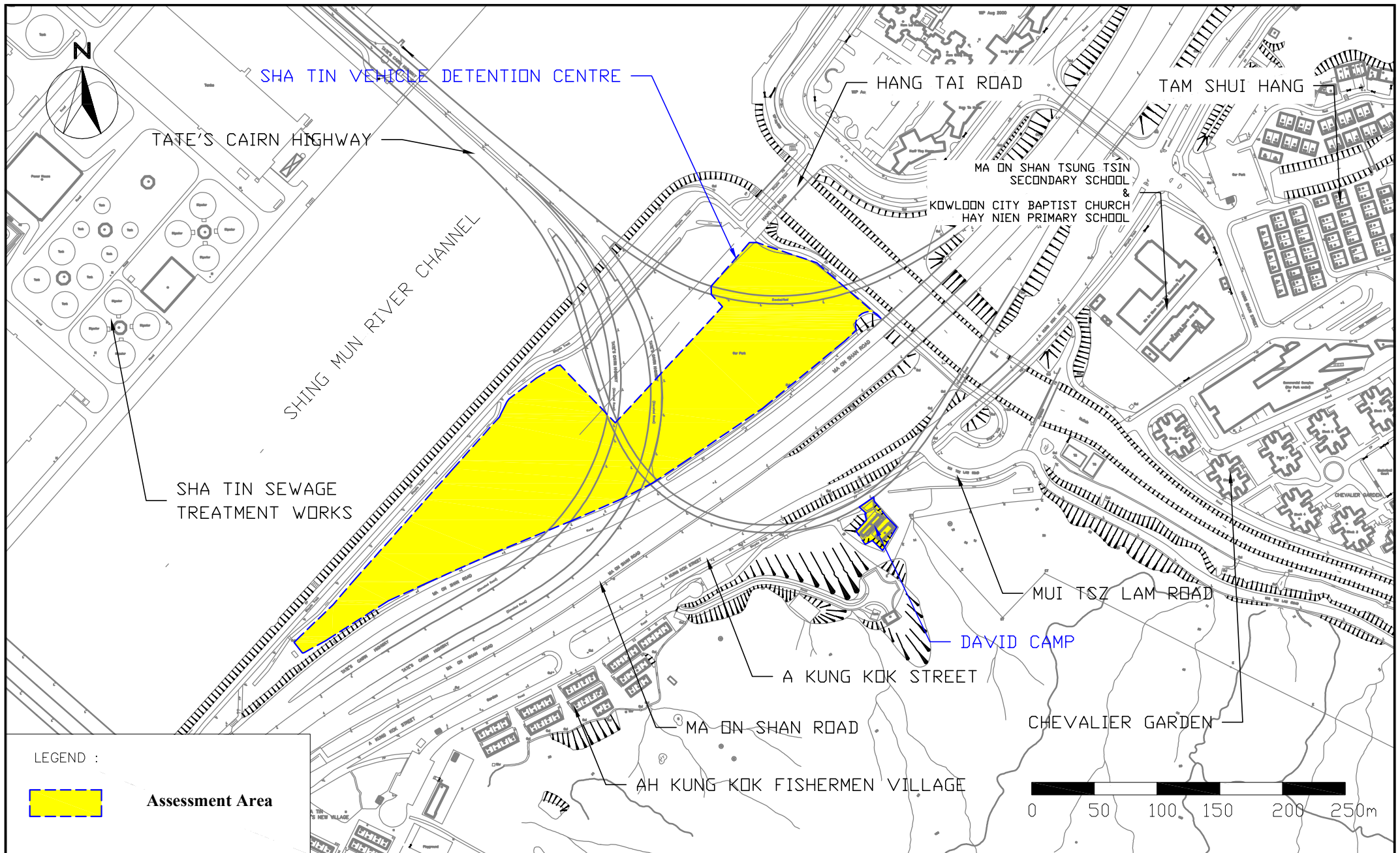
**CINOTECH**  
Cinotech Consultants Limited

Contract No. SPW 09/2018  
Environmental Team Baseline Surveys for Sha Tin Cavern  
Sewage Treatment Works

**Land Contamination Assessment Area**

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JOB No.	IA18064	FIGURE NO.	1a	REV —



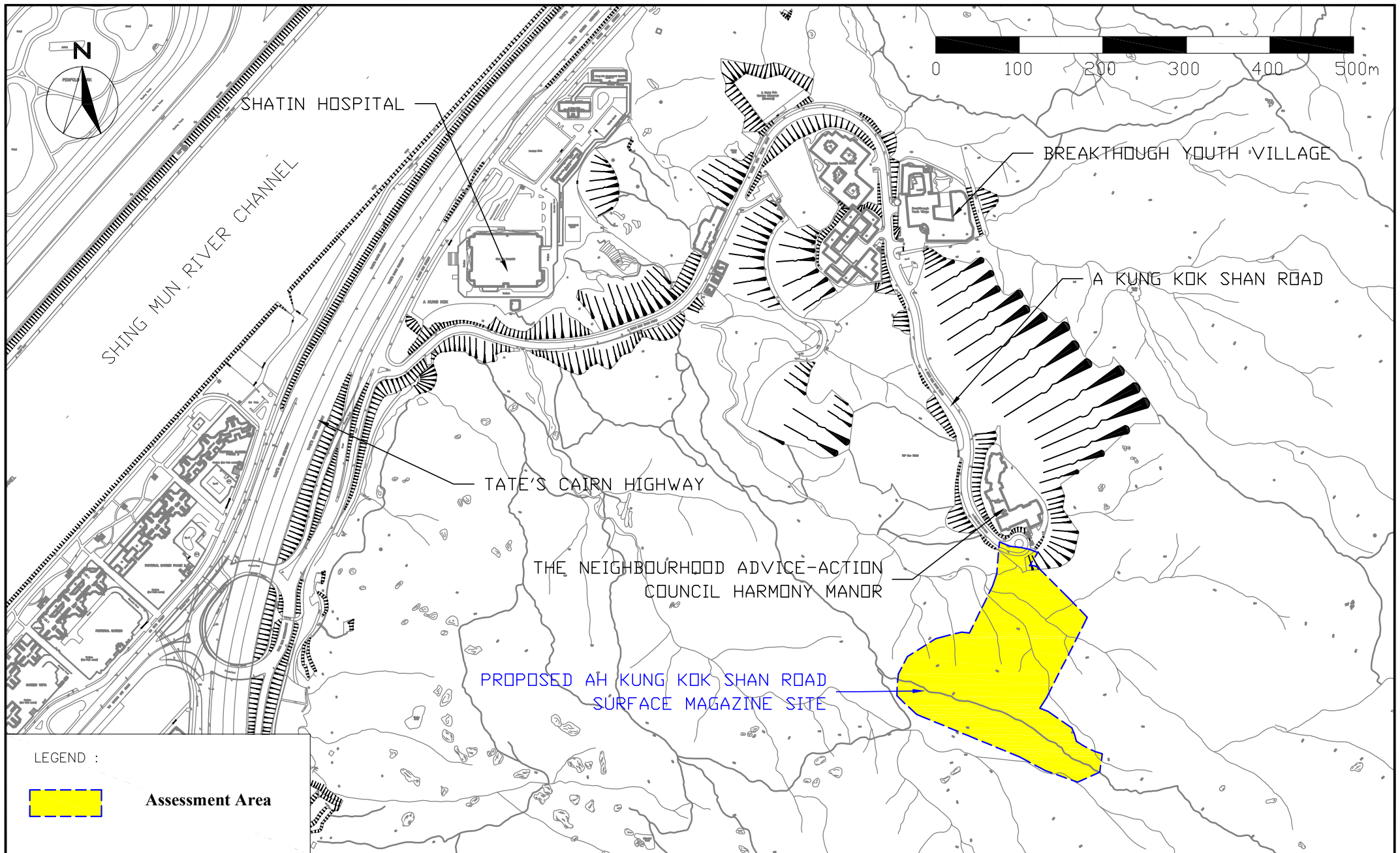


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Assessment Area

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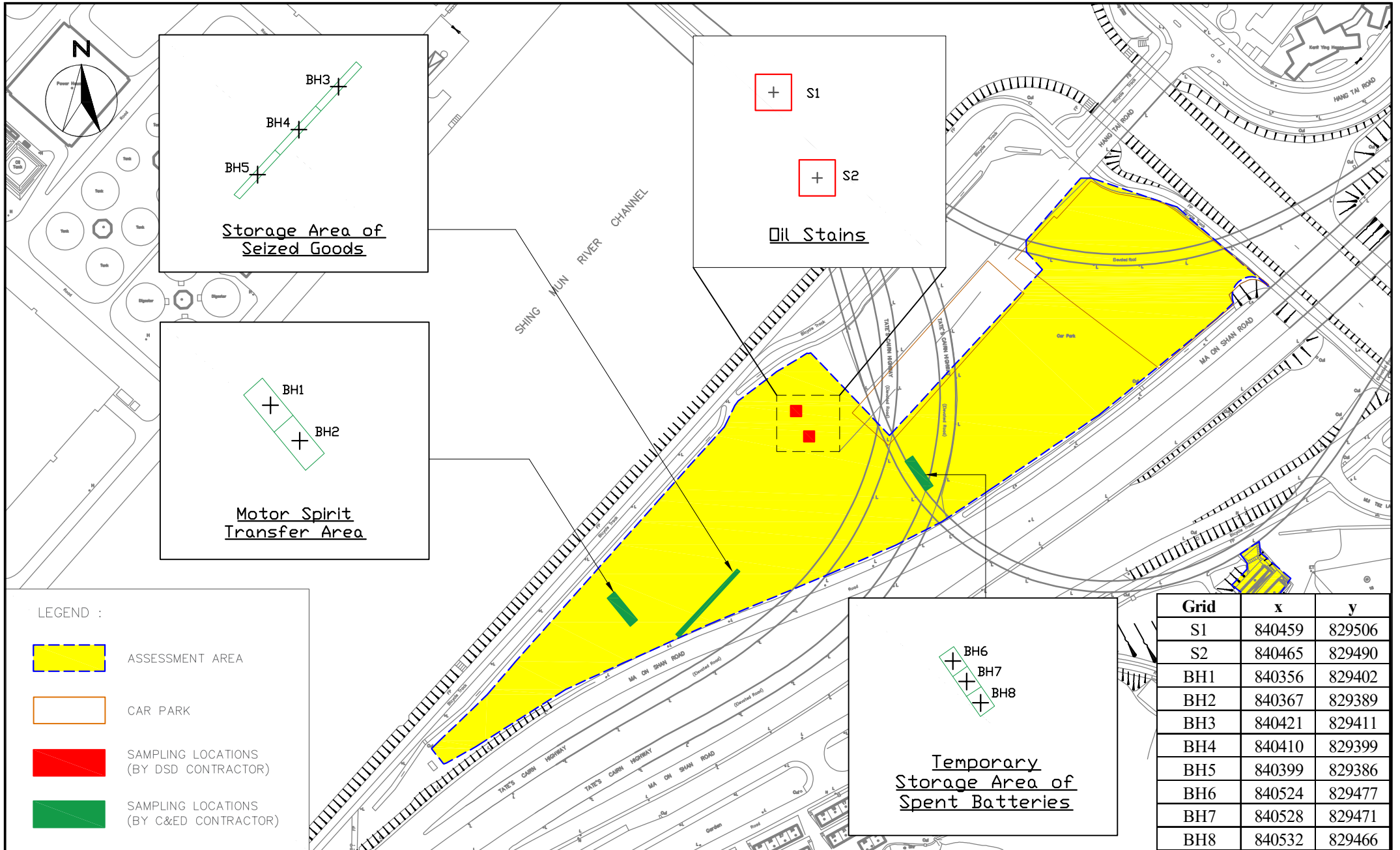


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Assessment Area

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		REV	-



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**APPENDIX A1**  
**AERIAL PHOTO RECORD (2016 – 2018)**

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**APPENDIX A1**  
**AERIAL PHOTO RECORD (2016 – 2018)**

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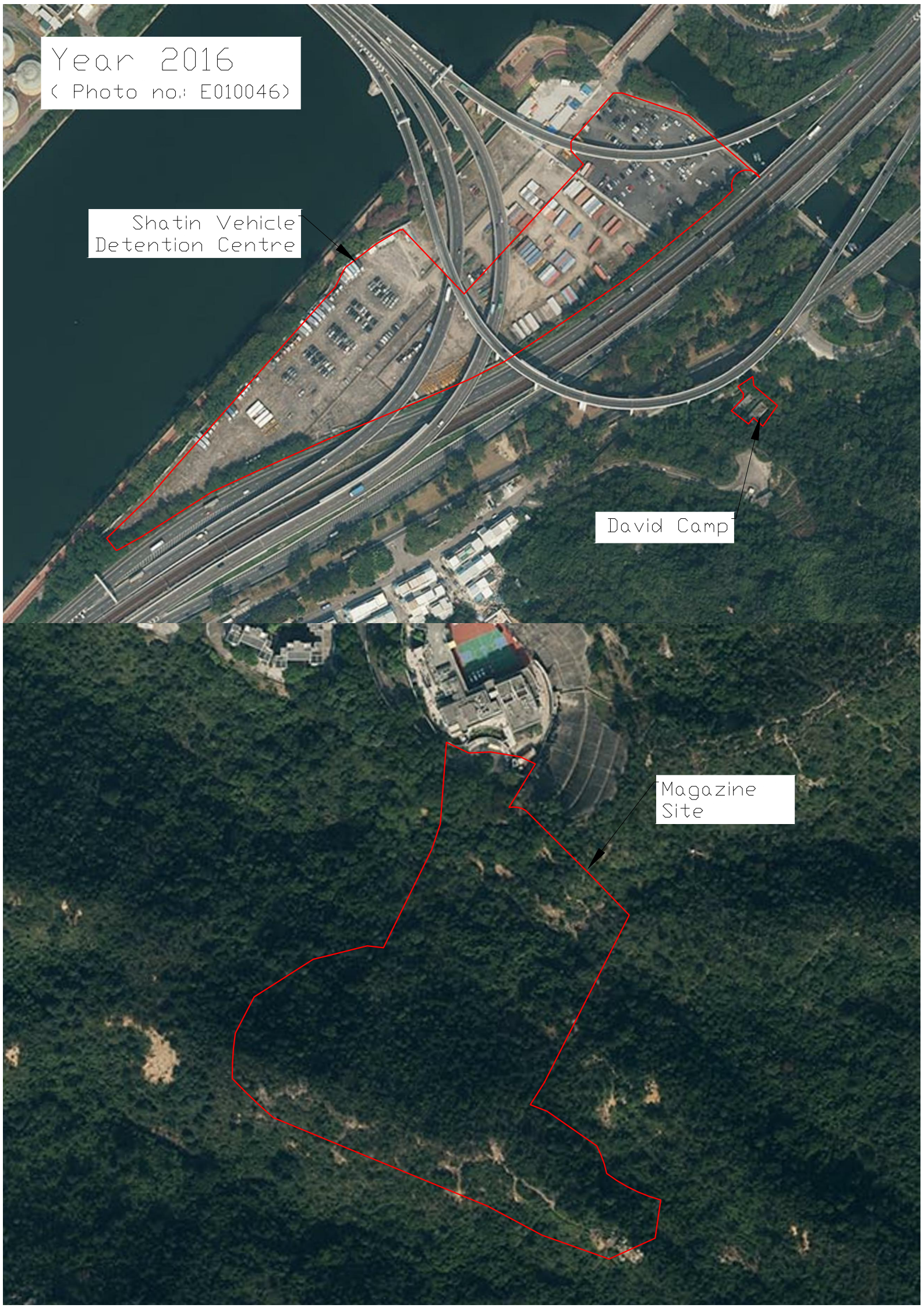


Year 2016  
( Photo no.: E010046 )

Shatin Vehicle  
Detention Centre

David Camp

Magazine  
Site





Year 2017  
(Photo no.: E017852C)

Shatin Vehicle  
Detention Centre

David Camp

Magazine  
Site





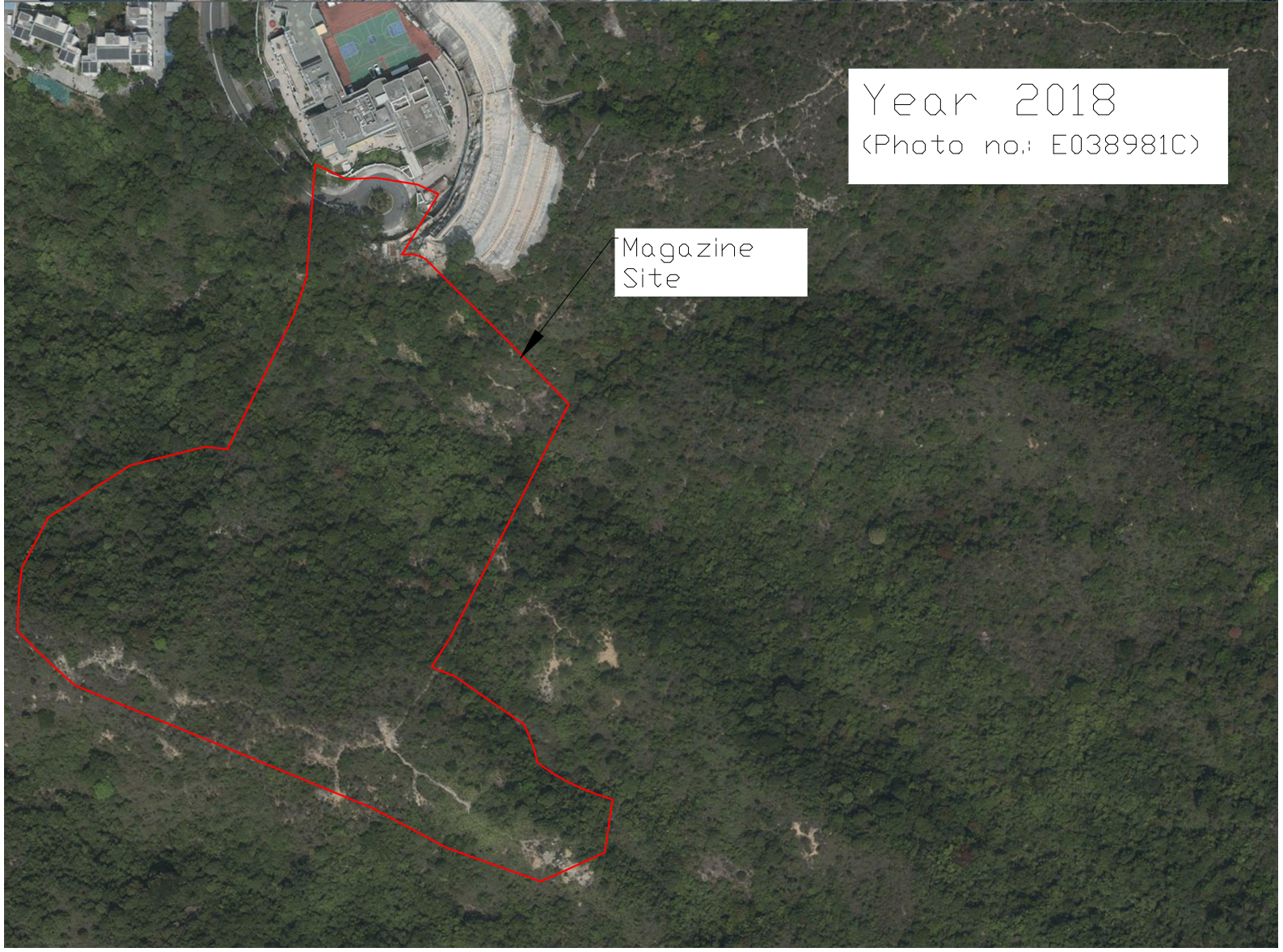
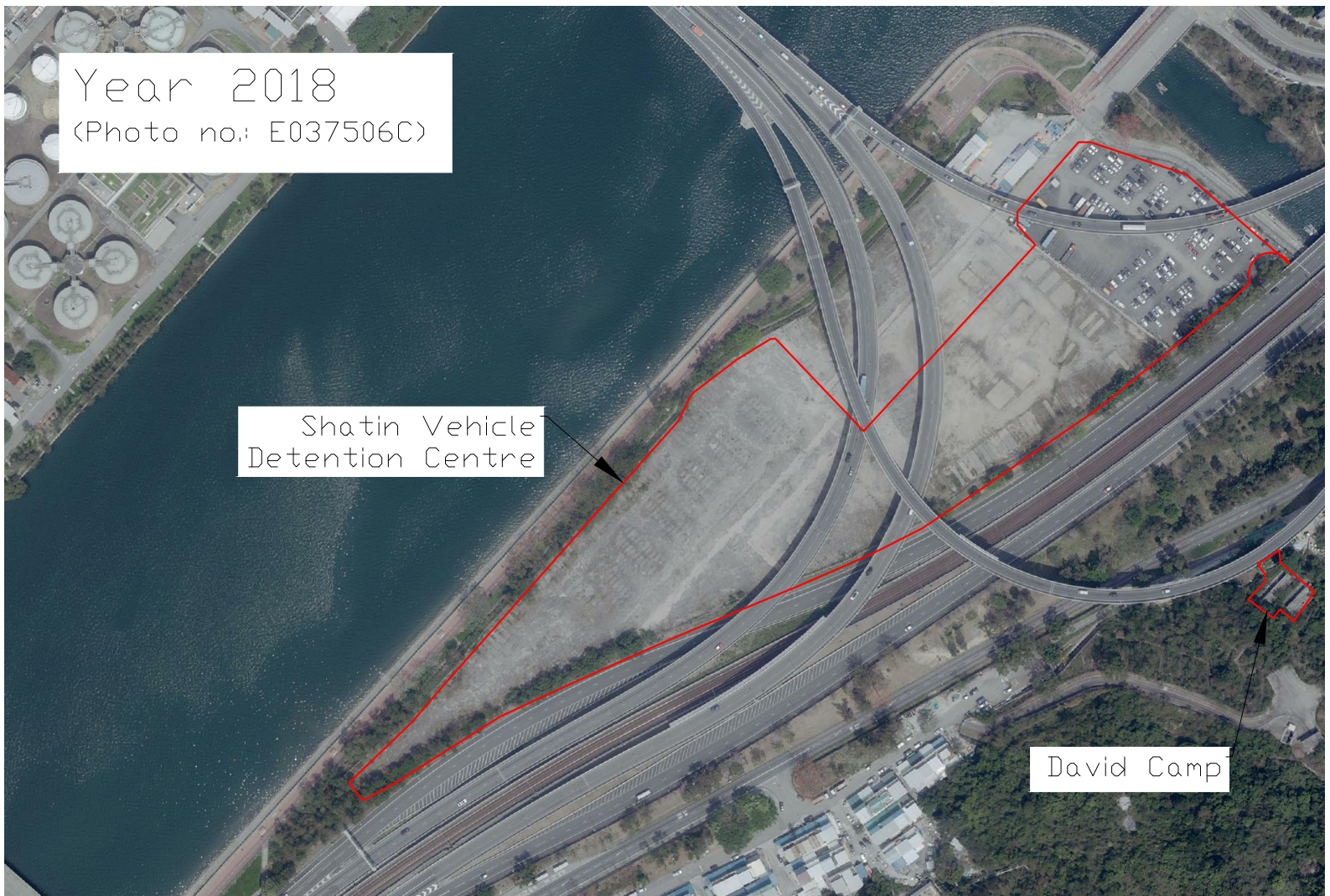
Year 2018  
(Photo no.: E037506C)

Shatin Vehicle  
Detention Centre

David Camp

Year 2018  
(Photo no.: E038981C)

Magazine  
Site





# David Camp

Year 2016

(Photo no.: E010046)



Year 2017

(Photo no.: E017852C)



Year 2018

(Photo no.: E037506C)



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**APPENDIX A2  
EXTRACT FROM EIA ON PAST LAND  
USE (PRIOR TO 2016)**

---

samples. A total of 35 soil samples (including 2 duplicate samples) and 9 groundwater samples were collected from 13 sampling locations and analyzed for semi volatile organic compounds (SVOCs) and petroleum carbon ranges (PCR). The as-built sampling locations and the preliminary laboratory results extracted from the Feasibility Study are shown in **Appendix 2.01**.

2.2.1.5 The preliminary results of the sample analyzed indicate no exceedance in the risk-based remediation goals (RBRBs) for soil and groundwater under the Urban Residential Land Use Scenario. No contaminants under the investigation were detected in the testing.

### 2.3 Review of Historical Land Uses

#### General

2.3.1.1 A comprehensive review of aerial photographs has been undertaken under this Assignment to confirm the findings from the Feasibility Study. The aim of the review is to evaluate the likelihood of potential contamination associated with past land uses within the CSTW Site. The development history of the CSTW Site is summarised below and the list of aerial photographs reviewed is shown in **Table 2.1**. Selected aerial photos are provided in **Appendix 2.02**.

**Table 2.1 Aerial Photographs Reviewed**

Year	Height (Feet)	Photograph Reference Number
1963	7000	0237
1963(2)	3900	63_5313
1974	12500	8246
1979	10000	28624
1981	2200	37599
1982	10000	44629
1983	4000	48577
1985	5000	CN973
1989	4000	A16196
1991	4000	A27102
1993	4000	A34676
1994	9000	CN6447
1995	2500	CN10812
2004	4000	CW62791
2009	6000	CS25120
2014	2000	CW109254
2015	8000	CW111916

2.3.1.2 Based on the review of the aerial photographs, both the existing STSTW and Vehicle Detention Centre sites are reclaimed land. The earliest available aerial photograph taken in 1963 indicated that the areas of the 2 sites were part of Sha Tin Hoi.

#### Existing STSTW

2.3.1.3 The reclamation works in the area was first noted in 1974 and completed around 1981. The construction of STSTW began around 1979 and the Stage I construction was nearly completed in 1982 with the main facilities constructed. The STSTW Stage II and III extension works were noted from 1983 until completion in 2004. No significant changes at the study area were noted after the construction of the UV disinfection chamber within the Site in 2009.

#### Existing Vehicle Detention Centre (VDC) and Its Surrounding Areas

Existing VDC

2.3.1.4 Reclamation of the VDC and Area A was completed in 1985. The area of the existing VDC remained vacant until structures were observed from 1989 to 1993. The actual uses of these structures were likely for nearby construction works as according to the topographic maps dated June 1989 and July 1992, the areas were labeled as "Construction in Progress" and "Work in Progress". The whole area was vacant again after 1993 and then became a car park in 1995 until 2004 when the footprint of the VDC was noted. No change in land uses were observed since then.

#### Area A

2.3.1.5 A Kung Kok Street was first observed in 1982. The landscape area (between Ma On Shan Road and A Kung Kok Road) was remained vacant after reclamation in 1985 and was observed covered with vegetation in 2009.

2.3.1.6 Similar to VDC, the remaining area of Area A appeared to be a construction site from 1989 until 1993 when the area turned vacant. Cycling tracks and footpaths at northeast of VDC were observed in 1995 and the vacant area adjacent to VDC were observed in 1993. No major changes in land use were noted since then.

#### Nui Po Shan North

2.3.1.7 The Nui Po Shan North has generally not been developed, with most of the area covered with vegetation, from 1963 until the latest aerial available in 2015. There are two developments noted in the aerial photographs: a construction site office in 1994 along Mui Tsz Lam Road and the THEES portal in 1993 located just south of A Kung Kok Street. No significant change was observed for both developments since then.

#### Summary of Historical Land Uses

2.3.1.8 Based on the historical land uses review, the main area of land contamination concern is the existing STSTW. For part of existing VDC within the Project boundary and THEES portal, site reconnaissance were conducted to confirm the presence of any on-site contaminating activities for these types of land uses.

### 2.4 Site Reconnaissance

2.4.1.1 Site walkovers were conducted on 7 and 14 November 2014 and 28 January, 17 and 24 July 2015 to investigate any contaminative issues associated with current land uses and activities within the CSTW Site. Questionnaires, if possible, were conducted with available site representatives.

#### Existing STSTW

2.4.1.2 Site walkover was conducted on 7 November 2014 and 28 January 2015. The completed Site Walkover Checklists and photographic records are annexed in **Appendix 2.03a**.

2.4.1.3 Based on the site observations and confirmation from the review of aerial photographs, a large portion of the site was covered by vegetation with less than half of the area occupied by facilities and buildings.

2.4.1.4 Except for the vegetated areas, all facilities/buildings and access roads within the site were paved with intact concrete and no oil stains or stressed vegetations were observed. The site condition is considered orderly and well managed.

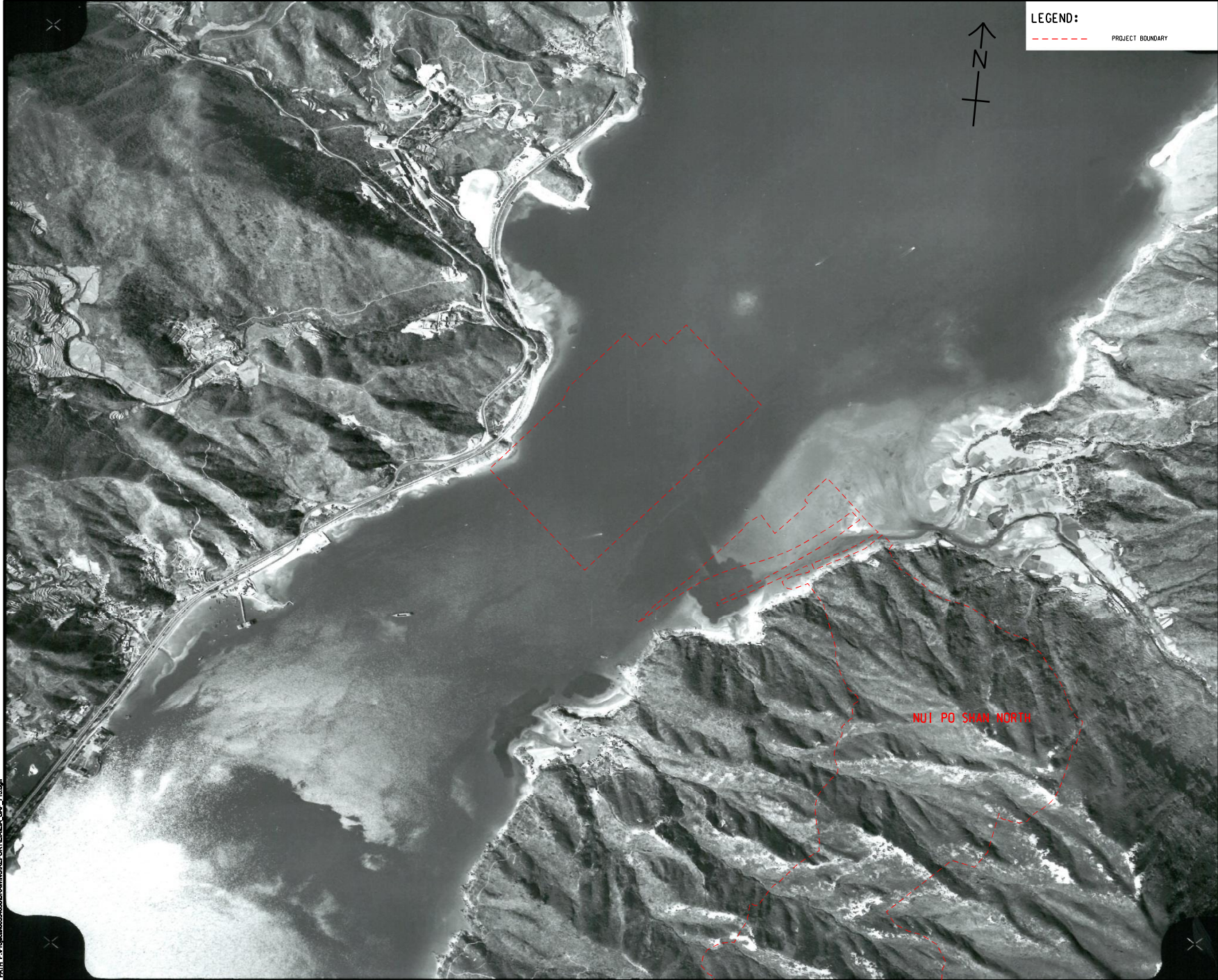
2.4.1.5 Based on the site condition and nature of sewage treatment operations, widespread contamination is not envisaged across the site. The potential land contamination concerns are likely restricted to facilities / buildings that handle hazardous chemicals or chemical wastes. The facilities / buildings with potential for handling hazardous substances were identified during the site walkover and discussed in **Table 2.4**. Locations of these potential hotspots areas are shown in **Figure 60334056/CAP/2.01**. A total of 27



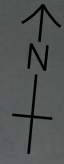




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**LEGEND:**  
 - - - - - PROJECT BOUNDARY



**AECOM**

**PROJECT**  
 RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS: CAVERNS AND SEWAGE TREATMENT WORKS - INVESTIGATION, DESIGN AND CONSTRUCTION

**CLIENT**  
 Drainage Services Department

**CONSULTANT**  
 AECOM Asia Company Ltd.  
 www.aecom.com

**SUB-CONSULTANTS**

**ISSUE/REVISION**

NO.	DATE	DESCRIPTION	CHK.

**STATUS**

**SCALE**  
 N.T.S.      **DIMENSION UNIT**  
 METRES

**KEY PLAN**

NUI PO SHAN NORTH

**PROJECT NO.** 60334056      **CONTRACT NO.** CE 30/2014 (DS)

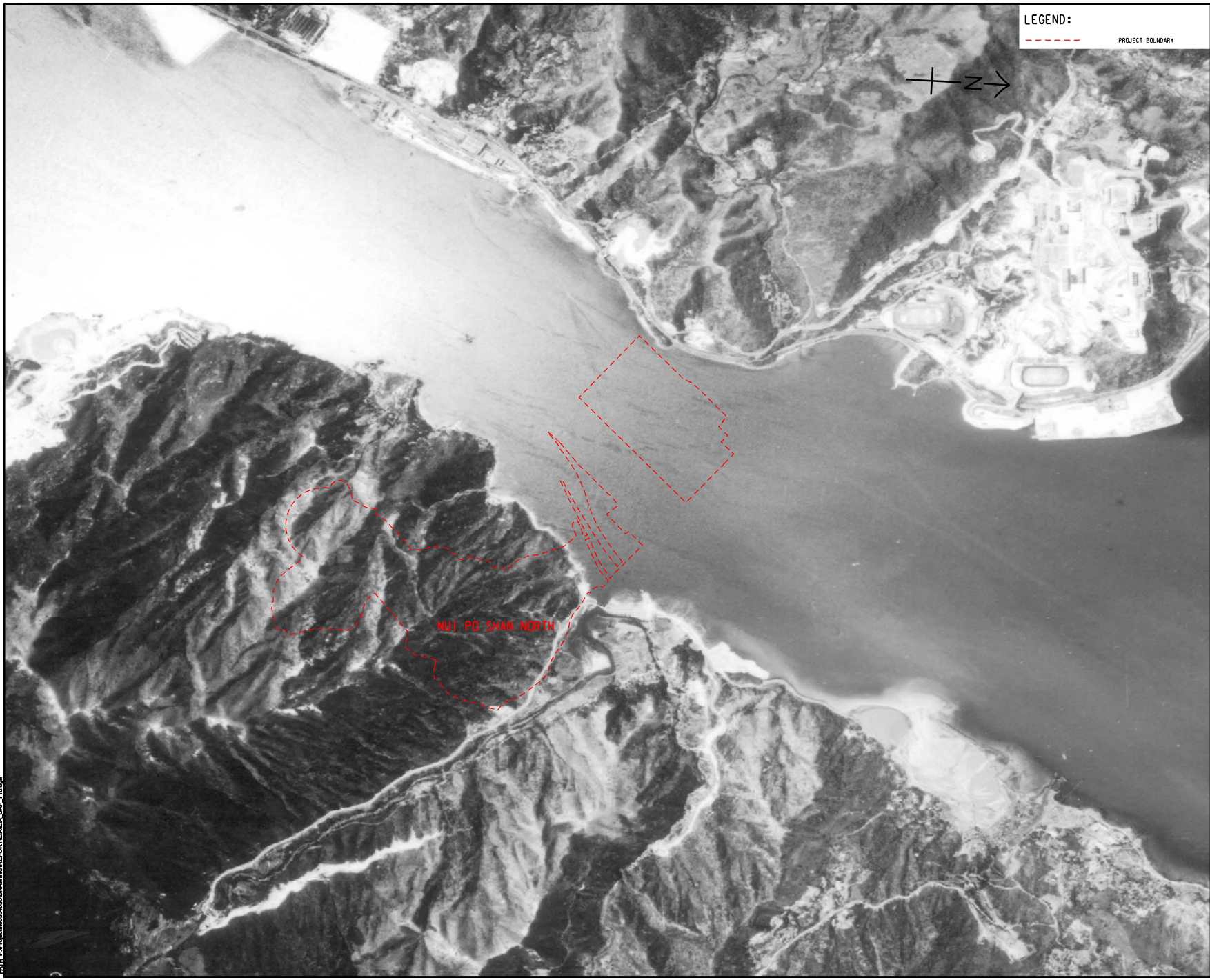
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**KEY PLAN**

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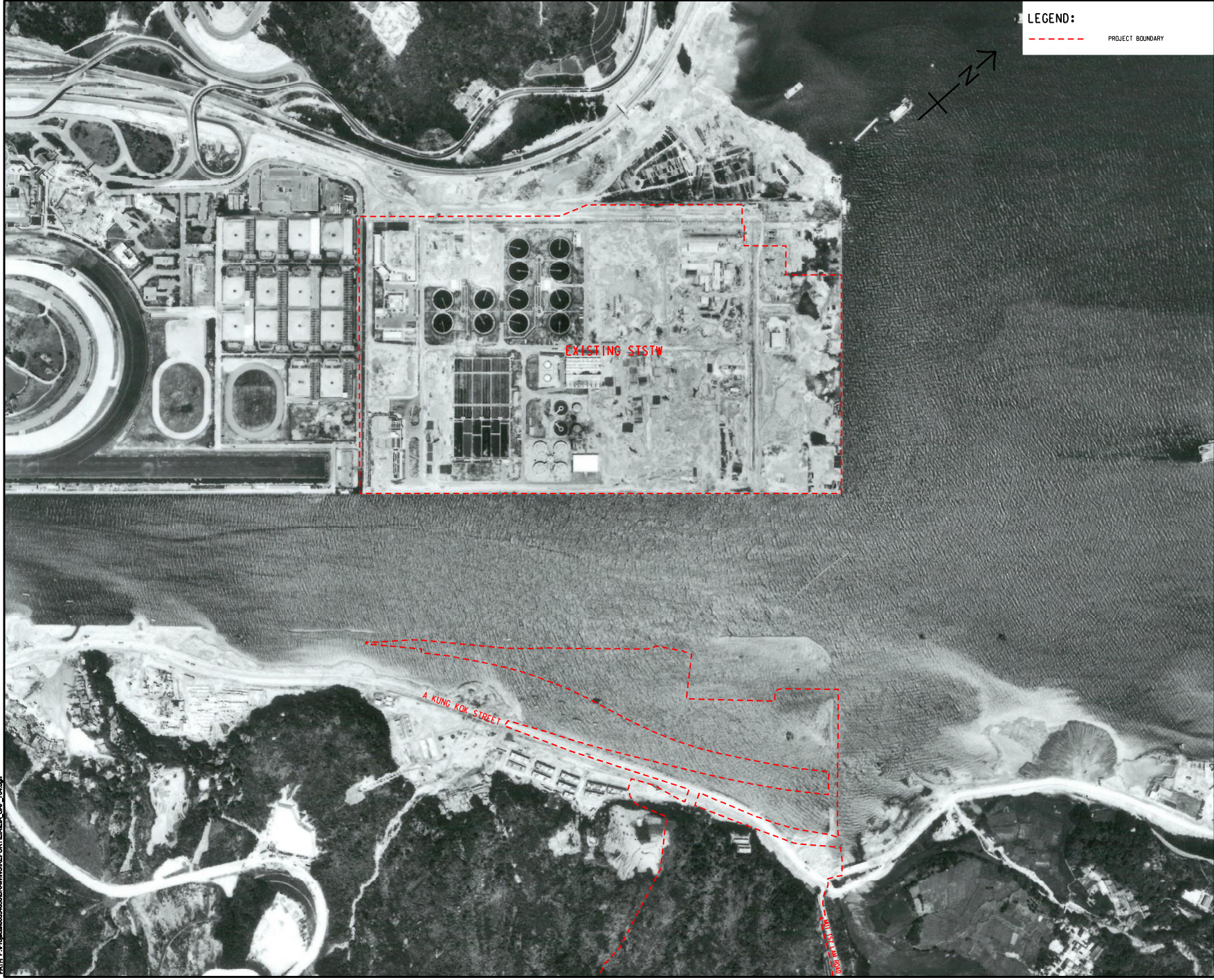
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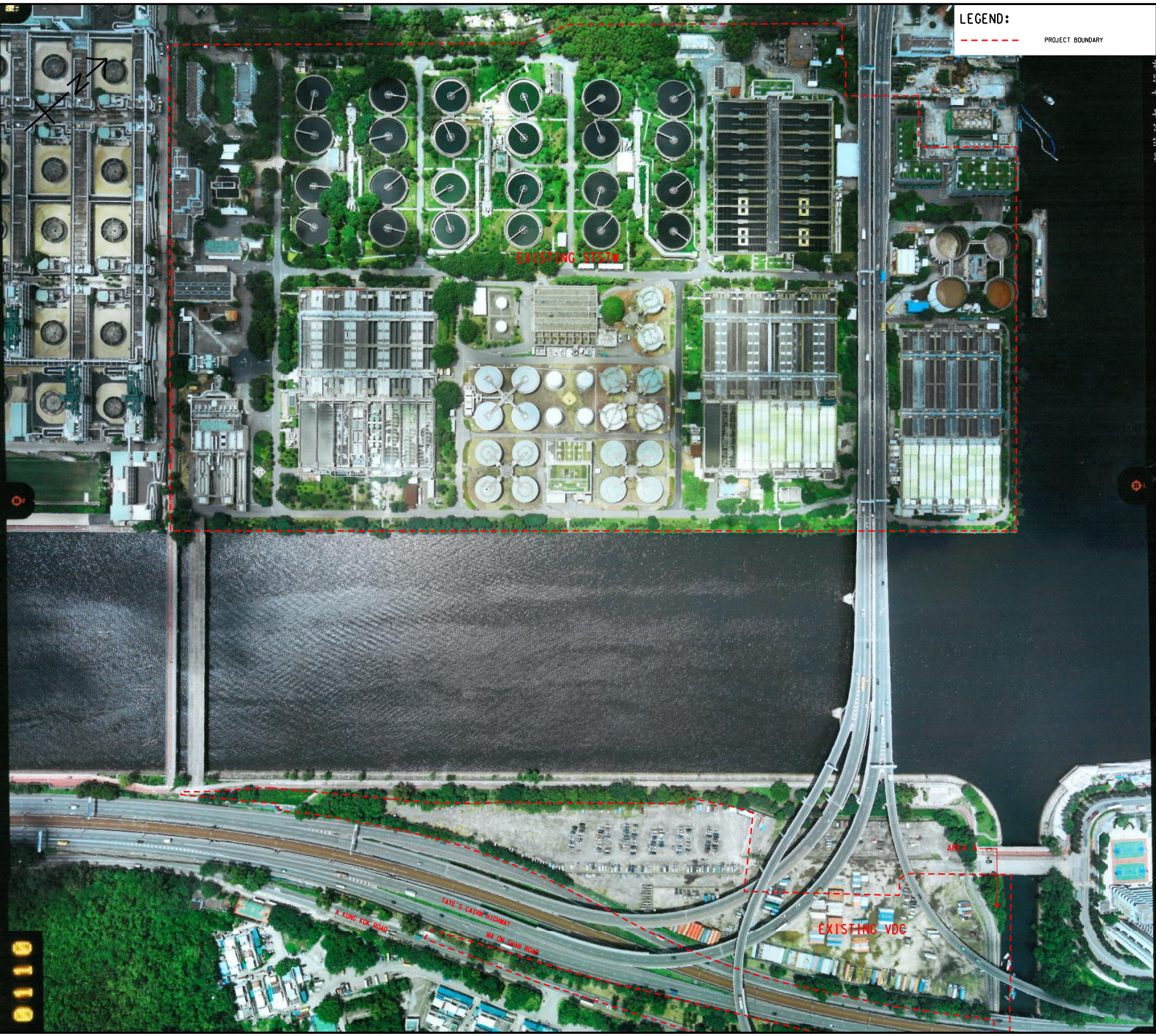
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香港特別行政區政府 地政總署測繪處

Survey & Mapping Office, Lands Department  
 The Government of Hong Kong Special Administrative Region



**LEGEND:**  
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**AECOM**

**PROJECT**  
 RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS: CAVERNS AND SEWAGE TREATMENT WORKS - INVESTIGATION, DESIGN AND CONSTRUCTION

**CLIENT**  
 Drainage Services Department

**CONSULTANT**  
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**PROJECT NO.**  
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**CONTRACT NO.**  
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**SHEET TITLE**  
 AERIAL PHOTOGRAPH (2014)

**SHEET NUMBER**  
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**APPENDIX B  
CORRESPONDENCES FROM THE EPD  
AND FSD**

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Our Ref: CCL/IA18064/bc180626

Environmental Protection Department  
Environmental Compliance Division  
Regional Office (North)  
Shatin  
10th floor, Shatin Government Offices,  
No.1 Sheung Wo Che Road, Sha Tin, New Territories

By Mail & E-mail  
26 June 2018

Attn.: Dr. NG Wai Yin, Jackie

Dear Dr. Ng,

**Contract No. SPW 09/2018 Environmental Team Baseline Surveys  
for Sha Tin Cavern Sewage Treatment Works  
- Enquiry on Record of Land Contamination**

The Sha Tin Sewage Treatment Works is proposed to be relocated to cavern to release the existing site for other uses. We, Cinotech Consultants Ltd., were engaged by the Drainage Services Department as the Environmental Team of the captioned contract. According to the Environmental Permit (EP no.: EP-533/2017), a Land Contamination Assessment shall be carried out before the commencement of demolition/construction of the Project. The areas of concern are marked in **Figure 5**.

I am writing to enquire if there is any past record of registered chemical waste producers and reported accidents of chemical leakage or spillage within or in the vicinity of the proposed works.

Your reply by 6 July 2018 will be much appreciated. If you need any further clarification, please contact our Ms. Betty Choi at 2151 2072 or the undersigned at 2151 2083.

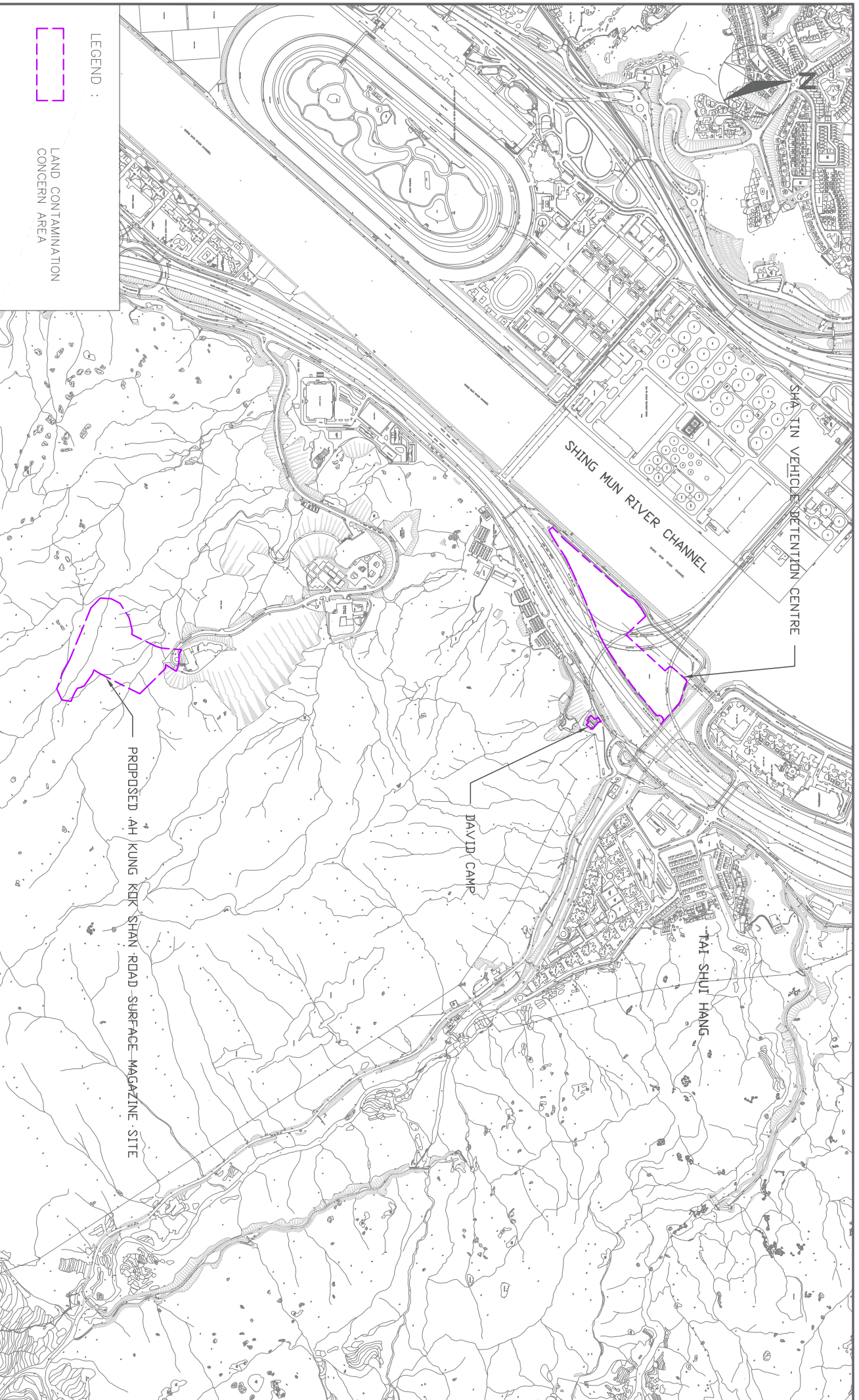
Yours faithfully,



Ivy Tam  
Environmental Team Leader

Encl. Figure 5 – Land Contamination Concern Area Plan

c.c. DSD Mr. TY Kieh Sheng, Raymond (by e-mail)  
AECOM Mr. Gary KWAN (by e-mail)



LEGEND :  
  
 LAND CONTAMINATION CONCERN AREA

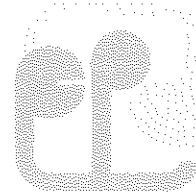
Contract No. SPW 09/2018  
 Environmental Team Baseline Surveys for Sha Tin Cavern  
 Sewage Treatment Works

LAND CONTAMINATION CONCERN AREA PLAN

SCALE	1:300 A4	DATE	5/2018
CHECK	IT	DRAWN	V/W
JOB No.	18096	FIGURE NO.	5
		REV	-

本署檔案  
OUR REF: ( ) in EP540/P5/1  
來函檔案  
CCL/IA18064/bc180626  
YOUR REF:  
電話  
TEL. NO.: 2158 5744  
圖文傳真  
FAX NO.: 2650 6033  
網址  
HOME PAGE: <http://www.epd.gov.hk/>

**Environmental Protection Department**  
**Environmental Compliance Division**  
**Regional Office (North)**  
10/F., Shatin Government Offices,  
1 Sheung Wo Che Road,  
Sha Tin, New Territories,  
Hong Kong.



環境保護署  
環保法規管理科  
區域辦事處(北)  
香港新界沙田  
上禾輦路一號  
沙田政府合署 10樓

CINOTECH Consultants Limited  
Room 1710, Technology Park,  
18 On Lai Street, Shatin, N.T.  
(Attn: Ms. Ivy TAM, Environmental Team Leader)

**BY MAIL**

4 July 2018

Dear Ms. TAM,

**Land Contamination Assessment for Shatin Cavern Sewage Treatment works**  
**Request for Information of Chemical Spillage Accident**

I refer to your letter dated 26 June 2018 on the captioned.

Regarding your enquiries in the above letter, this Regional Office has no record of reported accidents of spillage / leakage of chemicals at the concerned site. You may need to check with other parties / departments for such information as appropriate.

A registry of chemical waste producers is available in the Territory Control Office of this department. Please contact Mr. Eric FUNG, Senior Environmental Protection Inspector at 2835 1027 for making an appointment to view the records.

Should you have any enquiry, you may contact my colleague Mr. IP at 2158 5764

Yours faithfully,

( NG Wai-yin, Jackie )  
Regional Office / North  
for Director of Environmental Protection



Our Ref: CCL/IA18064/bc180704

Fire Services Department  
Fire Services Headquarters Command  
Management Group (MG)  
9th Floor, Fire Services Headquarters Building  
1 Hong Chong Road, Tsim Sha Tsui East, Kowloon

By Mail & Fax  
04 July 2018

Attn.: Mr. KONG Wai Chung

Dear Sir,

**Contract No. SPW 09/2018 Environmental Team Baseline Surveys  
for Sha Tin Cavern Sewage Treatment Works  
- Enquiry on Record of Land Contamination**

In response to the query raised in your letter (your ref.: (77) in FSD GR 6-5/4 R Pt. 19), I am writing to provide more details on the locations of the area of concerns mentioned in our letter dated 26 June 2018.

All three sites are located in Tai Shui Hang, Shatin. As some of them do not have detailed address in terms of building name, street name and/or number, the following will describe their locations with respect to nearby roads and landmarks. Zoom-in views of the sites can be found in Figures 1a – 1c.

Location 1: Sha Tin Vehicle Detention Centre (VDC)

The VDC is located opposite to the existing Sha Tin Sewage Treatment Works separated by the Shing Mun River Channel. It is accessible via Hang Tai Road. It was managed by the Custom and Excise Department before handing over to the Lands Department in early 2018.

Address: 39 Hang Tai Road, Tai Shui Hang, Shatin, N.T.

Location 2: David Camp

The David Camp is located in A Kung Kok Street, about 170m to the northeast of Ah Kung Kok Fishermen Village. It is currently managed by the Evangelical Lutheran Church of Hong Kong.

Location 3: Proposed Ah Kung Kok Shan Road Surface Magazine Site


The magazine site is located at the upper end of A Kung Kok Shan Road next to the Neighbourhood Advice-Action Council Harmony Manor.

I am writing to enquire if there is any past record of dangerous goods license and reported accidents of dangerous goods leakage or spillage within or in the vicinity of the above sites.

The appointment letter of the captioned project issued by the Drainage Services Department is attached for your reference.

Your reply by 9 July 2018 will be much appreciated. If you need any further clarification, please contact our Ms. Betty Choi at 2151 2072 or the undersigned at 2151 2083.

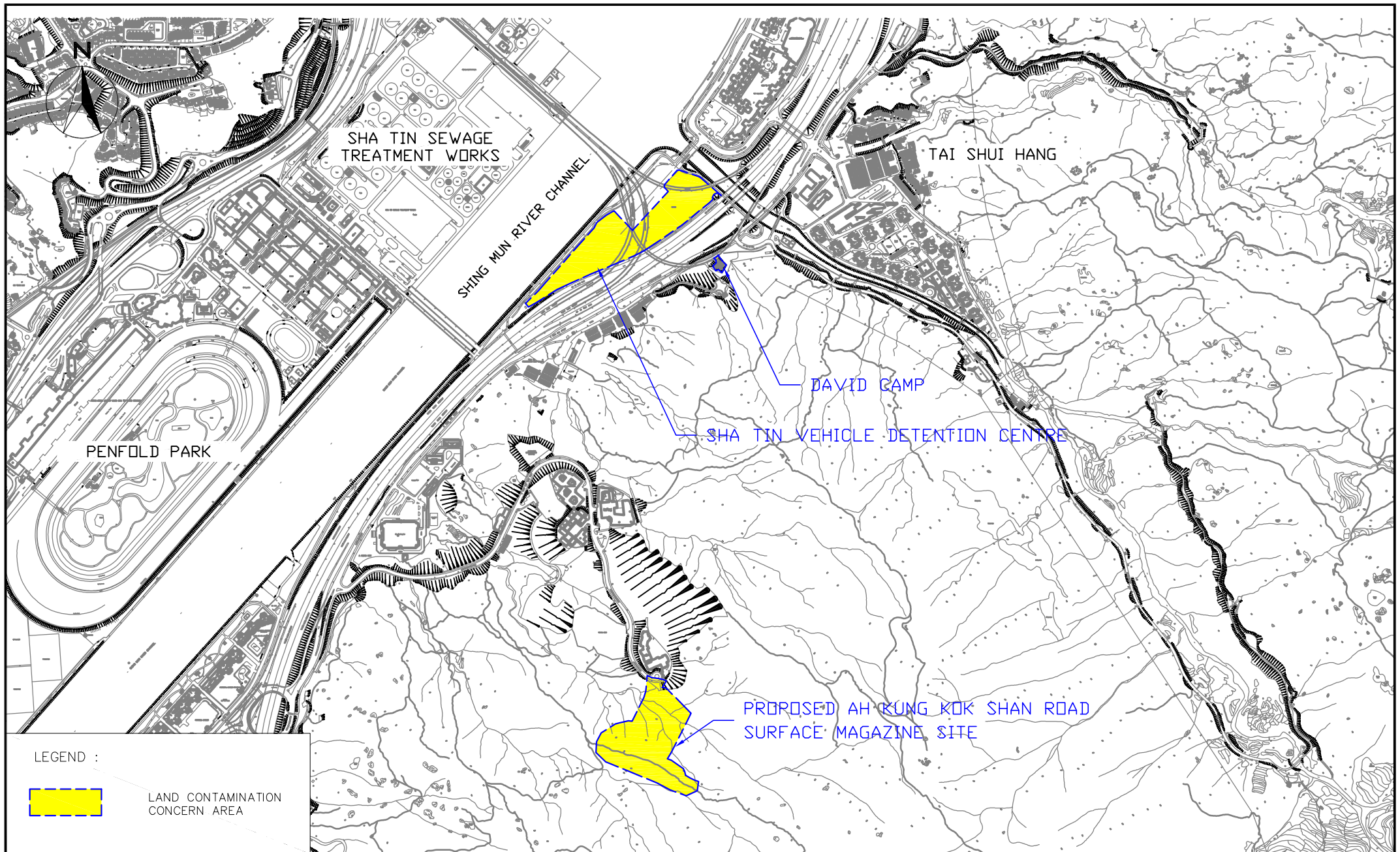
Yours faithfully,



Ivy Tam  
Environmental Team Leader

Encl.            Figures 1a – 1c – Land Contamination Concern Area Plan

c.c.	DSD	Mr. TY Kieh Sheng, Raymond	(by e-mail)
	AECOM	Mr. Gary KWAN	(by e-mail)



LEGEND :



LAND CONTAMINATION  
CONCERN AREA

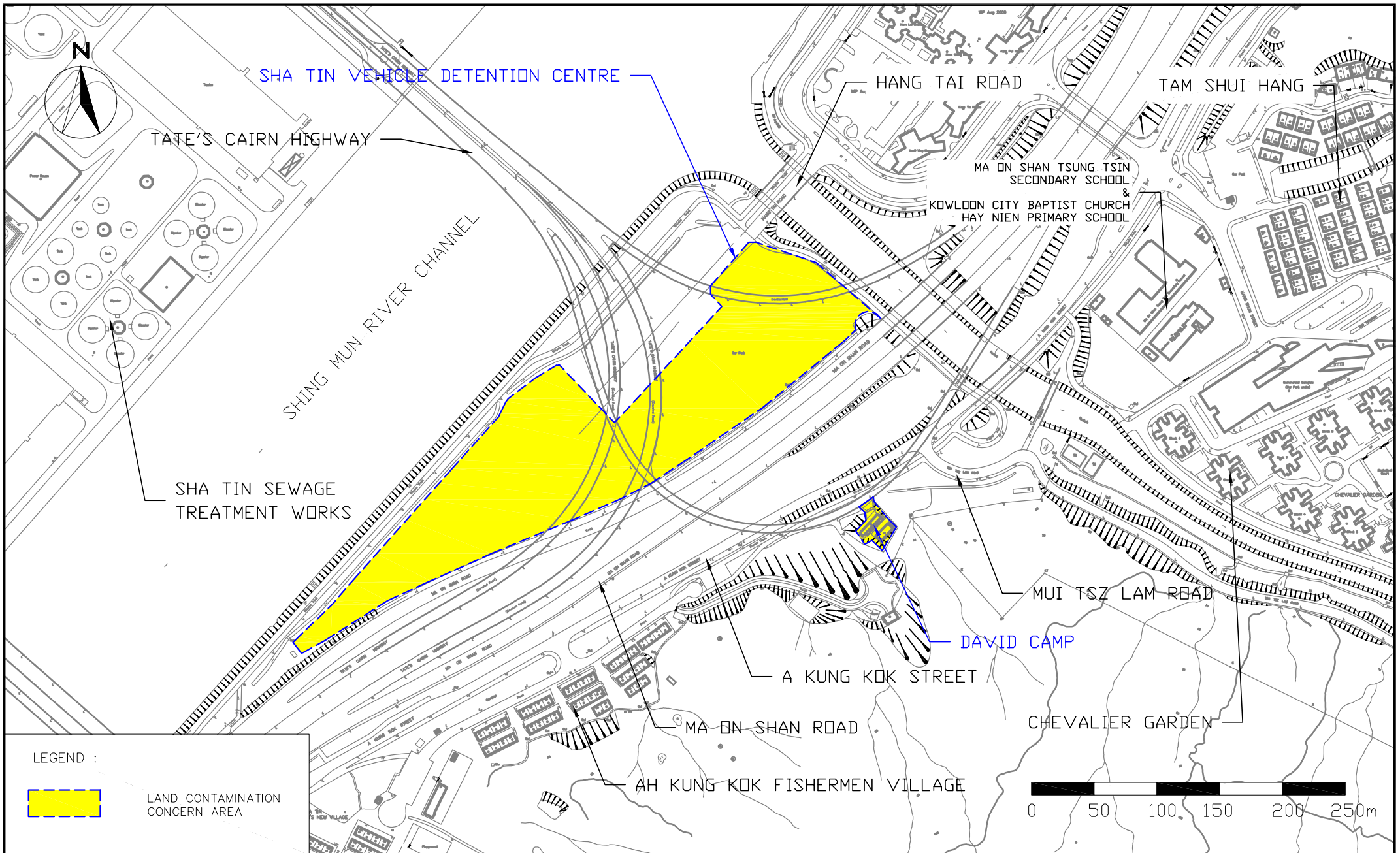
**CINOTECH**  
Cinotech Consultants Limited

Contract No. SPW 09/2018  
Environmental Team Baseline Surveys for Sha Tin Cavern  
Sewage Treatment Works

LAND CONTAMINATION CONCERN AREA PLAN

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JOB No.	IA18064	FIGURE NO.	1a	REV —





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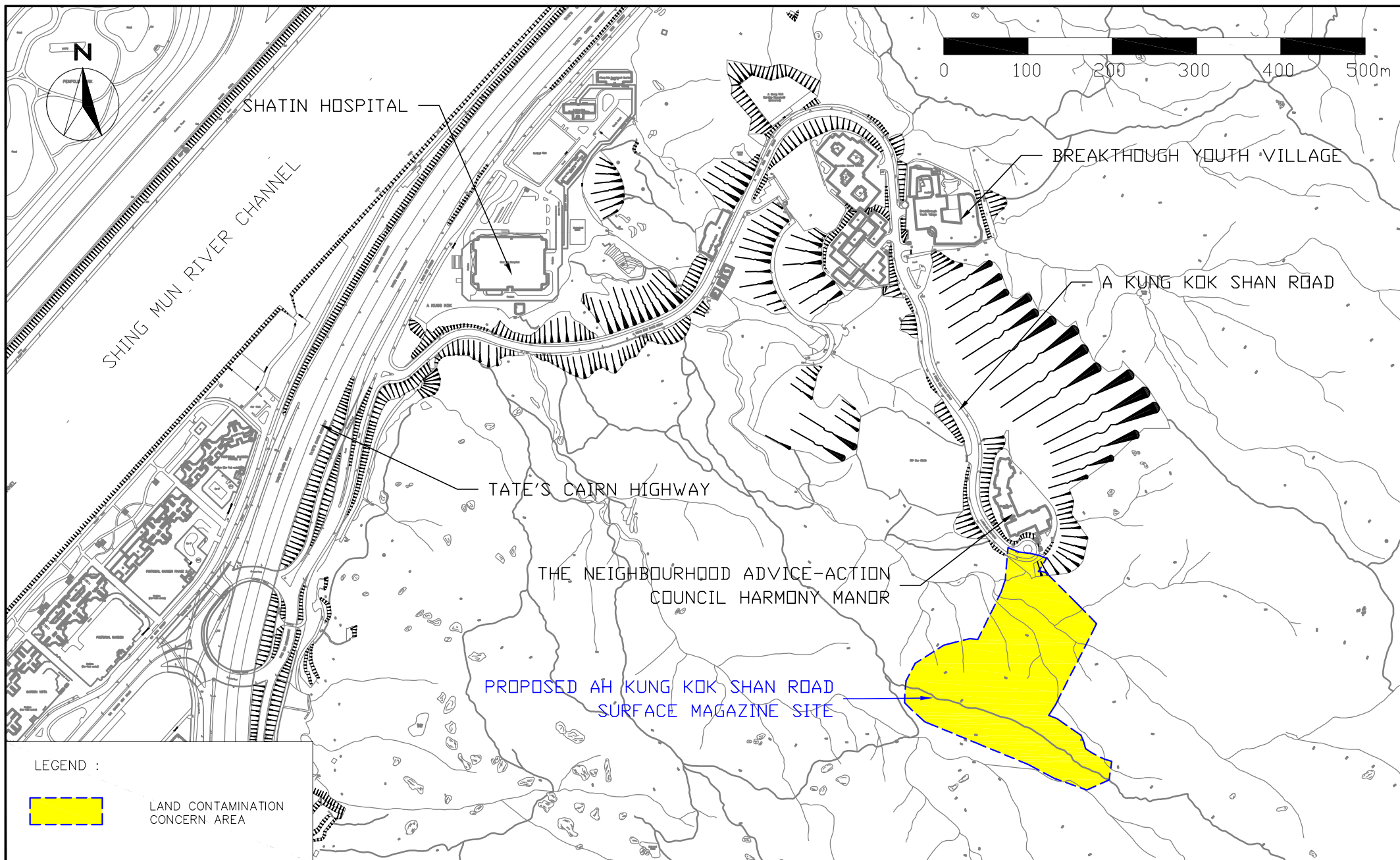
LAND CONTAMINATION CONCERN AREA

**CINOTECH**  
Cinotech Consultants Limited

Contract No. SPW 09/2018  
Environmental Team Baseline Surveys for Sha Tin Cavern  
Sewage Treatment Works

LAND CONTAMINATION CONCERN AREA PLAN

SCALE	1:10000@A4	DATE	JUL 2018	
CHECK	IT	DRAWN	BC	
JOB No.	IA18064	FIGURE NO.	1b	REV
				-



LEGEND :



LAND CONTAMINATION  
CONCERN AREA

SCALE	1:15000@A4	DATE	JUL 2018	
CHECK	IT	DRAWN	BC	
JOB No.	IA18064	FIGURE NO.	1c	REV -



**Drainage Services Department**

**Sewerage Projects Division**

44<sup>th</sup> floor, Revenue Tower, 5 Gloucester Road,

Wan Chai, Hong Kong

渠務署

污水工程部

香港灣仔告士打道 5 號

稅務大樓 44 樓

來函檔號 Your Ref:  
本署檔號 Our Ref: (007UM4) in SPR 8/4399DS/SPW0918  
電話 Telephone: (852) 2594 7451  
圖文傳真 Fax: (852) 2519 3615

**By Hand – w/ Encl. and  
Fax (3107 1388) – w/o Encl.  
Restricted (Tender)**

8 June 2018

CINOTECH Consultants Limited  
Rm 1710, Technology Park,  
18 On Lai Street  
Shatin, N.T., Hong Kong  
(Attn: Dr. Priscilla Choy)

Dear Sirs,

**Contract No. SPW 09/2018  
Environmental Team Baseline Surveys  
for Sha Tin Cavern Sewage Treatment Works**

**Letter of Acceptance**

I am pleased to inform you that your tender submitted on 31 May 2018 to undertake the above Contract in the sum of [REDACTED] is accepted.

One set of the contract document together with correspondence are enclosed for your reference.

The date of commencement of the Services in accordance with Clause 4.1 of the Conditions of Contract would be 11 June 2018.

Yours faithfully,

(TY Kieh-sheng, Raymond) *L*  
for Chief Engineer/Sewerage Projects  
Drainage Services Department

Encl.





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**APPENDIX C**  
**SITE WALKOVER CHECKLIST**

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## Site Walkover Checklist (1. VDC)

### GENERAL SITE DETAILS

Site Owner / Client: Lands Department, Skye Parking, 啟富停車場

Property Address: 39 Hang Tai Road, Tai Shui Hang, Shatin, N.T.

(Ex-Vehicle Detention Centre)

### *Person Conducting the Questionnaire*

Name: N/A

Position: N/A

### *Authorized Owner/Client Representative (If Applicable)*

Name: N/A

Position: N/A

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: 2

Part-time: -

Temporary/Seasonal: N/A

Maximum no. of people on site at any time: 2

Typical hours of operation: 24

Number of shifts: 2

Days per week: 7

Weeks per year: 52

Scheduled plant shut-down: N/A

Detail the main sources of energy at the site:

Gas	Yes / No
Electricity	Yes / <del>No</del>
Coal	Yes / No
Oil	Yes / No
Other	Yes / 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: 3.7 ha

What area of the site is covered by buildings (%): 0%

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

Current occupiers are Skye Parking, 啟富停車場 and unoccupied area is managed by Lands Department. Previous occupier is Custom & Excise Department.

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: Skye Parking, 啟富停車場

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

North: Cycle track, 沙田體育會單車公園, Waterfront

South: Ma On Shan Road

East: Ma On Shan Road

West: Cycle track, 沙田體育會單車公園, Waterfront

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

The site is located on flat land. It is surrounded by the sea and a stream to the north and west.



State the size and location of the nearest residential communities.

The nearest residential community is “Kam Ying House”, which is located about 100m to the north of the site. The size is around 630m<sup>2</sup>.

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

The site is surrounded by the sea and a stream to the north and west.

### **QUESTIONNAIRE WITH EXISTING/PREVIOUS SITE OWNER OR OCCUPIER**

		<b>Yes/No</b>	<b>Notes</b>
1	What are the main activities/operations at the above address?	-	-
2	How long have you been occupying the site?	-	-
3	Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	-	-
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?	-	-
7	Have any polluting activities been carried out in the vicinity of the site in the past?	-	-
8	To the best of your knowledge, has the site ever been used as a petrol filling station/car service garage?	-	-
9	Are there any boreholes/wells or natural springs either on the site or in the surrounding area?	-	-
10	Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please provide details.)	-	-
11	Are any chemicals used in your daily operations? (If yes, please provide details.)	-	-
	<ul style="list-style-type: none"><li>Where do you store these chemicals?</li></ul>	-	-

		Yes/No	Notes
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.)	-	-
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.)	-	-
	<ul style="list-style-type: none"> <li>How many underground storage tanks do you have on site?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the tanks constructed of?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the contents of these tanks?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Are the pipelines above or below ground?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>If the pipelines are below ground, has any leak and integrity testing been performed?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Have there been any spills associated with these tanks?</li> </ul>	-	-
17	Are there any disused underground storage tanks?	-	-
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?	-	-
20	Have you ever received any notices of violation of environmental regulations or received public complaints? (If yes, please provide details.)	-	-
21	Have any spills occurred on site? (If yes, please provide details.)	-	-
	<ul style="list-style-type: none"> <li>When did the spill occur?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the substances spilled?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What was the quantity of material spilled?</li> </ul>	-	-

		Yes/No	Notes
	<ul style="list-style-type: none"> <li>• Did you notify the relevant departments of the spill?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>• What were the actions taken to clean up the spill?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>• What were the areas affected?</li> </ul>	-	-
22	Do you have any records of major renovation of your site or rearrangement of underground utilities, pipe work/underground tanks (If yes, please provide details.)	-	-
23	Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	-	-
24	Are there any known contaminations on site? (If yes, please provide details.)	-	-
25	Has the site ever been remediated? (If yes, please provide details.)	-	-

## OBSERVATIONS

	Yes/No	Notes
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floor)?	N/A	No chemical stored onsite.
2. What are the conditions of the bund walls and floors?	N/A	-
3. Are any surface water drains located near to drum storage and unloading areas?	N/A	No drum storage or unloading area.
4. Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	Yes	Pieces of car parts such as broken windshield, car door, exhaust pipe and general refuse
5. Is there a storage site for the waste?	No	-
6. Is there an on-site landfill?	No	-
7. Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please provide details.)	No	-



	Yes/No	Notes
8. Were any stained surfaces noted on-site during the site reconnaissance? (If yes, please provide details.)	Yes	Black stains were observed in the middle of the VDC. They were confirmed as non-aqueous phase liquid when flooded with water. Each stain was smaller than 0.3m in diameter.
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, efficient 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 fluid, 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	-

## Site Walkover Checklist (2. David Camp)

### GENERAL SITE DETAILS

Site Owner / Client: Evangelical Lutheran Church of Hong Kong (David Camp)

Property Address: A Kung Kok Street, Tai Shui Hang, Sha Tin

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#### *Person Conducting the Questionnaire*

Name: Betty Choi

Position: Senior Environmental Consultant

#### *Authorized Owner/Client Representative (If Applicable)*

Name: Venus Hung

Position: Assistant Administrative Officer

Telephone: 3124 7633

### 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: Depending on activities involved

Part-time: Ditto

Temporary/Seasonal: Ditto

Maximum no. of people on site at any time: 25

Typical hours of operation: 8

Number of shifts: N/A

Days per week: Variable

Weeks per year: Variable

Scheduled plant shut-down: N/A

Detail the main sources of energy at the site:

Gas	<del>Yes</del> / No
Electricity	Yes / <del>No</del>
Coal	<del>Yes</del> / No
Oil	<del>Yes</del> / No
Other	<del>Yes</del> / 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: 707m<sup>2</sup>

What area of the site is covered by buildings (%): 24%

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

Previous occupier is suspected to be Water Supplies Department hostel

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: N/A

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

North: Cycle track, roadside landscape area and elevated highway

South: Woodland

East: Woodland

West: Woodland

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

The site is located near the foot of a hill (Nui Po Shan) which is upward sloping towards the east. Building structures were constructed on two platforms. The site is surrounded by woodland except the entrance that faces a cycle track.



State the size and location of the nearest residential communities.

The nearest residential community is “Ah Kung Kok Fishermen Village”, which is located about 170m to southwest of the site. The size is around 6,300m<sup>2</sup>.

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

The site is surrounded by Green Belt.

### **QUESTIONNAIRE WITH EXISTING/PREVIOUS SITE OWNER OR OCCUPIER**

		<b>Yes/No</b>	<b>Notes</b>
1	What are the main activities/operations at the above address?	-	Volunteer training, gardening
2	How long have you been occupying the site?	-	Since 2000, about 18 years
3	Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	No	-
4	Prior to your occupancy, who occupied the site?	-	Water Supplies Department
5	What were the main activities/operations during their occupancy?	-	Possibly hostel
6	Have there been any major changes in operations carried out at the site in the last 10 years?	No	-
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?	No	-
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?	-	-

		Yes/No	Notes
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?	No	-
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.)	-	-
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	-
	<ul style="list-style-type: none"> <li>How many underground storage tanks do you have on site?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the tanks constructed of?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the contents of these tanks?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Are the pipelines above or below ground?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>If the pipelines are below ground, has any leak and integrity testing been performed?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Have there been any spills associated with these tanks?</li> </ul>	-	-
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?	-	-
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	-
	<ul style="list-style-type: none"> <li>When did the spill occur?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the substances spilled?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What was the quantity of material spilled?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Did you notify the relevant departments of the spill?</li> </ul>	-	-

		Yes/No	Notes
	<ul style="list-style-type: none"> <li>What were the actions taken to clean up the spill?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the areas affected?</li> </ul>	-	-
22	Do you have any records of major renovation of your site or rearrangement of underground utilities, pipe work/underground tanks (If yes, please provide details.)	Yes	Building renovation in 2010
23	Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	-	-
24	Are there any known contaminations on site? (If yes, please provide details.)	-	-
25	Has the site ever been remediated? (If yes, please provide details.)	-	-

## OBSERVATIONS

	Yes/No	Notes
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floor)?	N/A	No chemical stored onsite.
2. What are the conditions of the bund walls and floors?	N/A	-
3. Are any surface water drains located near to drum storage and unloading areas?	N/A	No drum storage or unloading area.
4. Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	Yes	General refuse
5. Is there a storage site for the waste?	Yes	Rubbish bins
6. Is there an on-site landfill?	No	-
7. Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please provide details.)	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	-



	<b>Yes/No</b>	<b>Notes</b>
11. Are there any sumps, efficient 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 fluid, 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	-

## Site Walkover Checklist (3. Magazine Site)

### GENERAL SITE DETAILS

Site Owner / Client: Lands Department (Government)

Property Address: Nui Po Shan (Proposed magazine site at the upper end of  
A Kung Kok Shan Road next to the Neighbourhood  
Advice-Action Council Harmony Manor

#### *Person Conducting the Questionnaire*

Name: N/A

Position: N/A

#### *Authorized Owner/Client Representative (If Applicable)*

Name: N/A

Position: N/A

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: N/A

Part-time: N/A

Temporary/Seasonal: N/A

Maximum no. of people on site at any time: N/A

Typical hours of operation: N/A

Number of shifts: N/A

Days per week: N/A

Weeks per year: N/A

Scheduled plant shut-down: N/A

Detail the main sources of energy at the site:

Gas	Yes / No
Electricity	Yes / No
Coal	Yes / No
Oil	Yes / No
Other	Yes / 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: 3.5 ha

What area of the site is covered by buildings (%): 0%

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

Not occupied, owned by the Government.

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: N/A

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

North: Residential (Neighbourhood Advice-Action Council Harmony Manor)

South: Woodland

East: Woodland

West: Woodland

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

The site is located on a hill (Nui Po Shan). It is upward sloping towards the plateau, which will be used as the magazine site. Natural streams run across the site.



State the size and location of the nearest residential communities.

The nearest residential community is “Neighbourhood Advice-Action Council Harmony Manor”, which is located about 14m to north of the site. The size is around 2,400m<sup>2</sup>.

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

The site is surrounded by woodland and fed by natural streams. It is located in Green Belt.

**QUESTIONNAIRE WITH EXISTING/PREVIOUS SITE OWNER OR OCCUPIER**

		Yes/No	Notes
1	What are the main activities/operations at the above address?	-	-
2	How long have you been occupying the site?	-	-
3	Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	-	-
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?	-	-
7	Have any polluting activities been carried out in the vicinity of the site in the past?	-	-
8	To the best of your knowledge, has the site ever been used as a petrol filling station/car service garage?	-	-
9	Are there any boreholes/wells or natural springs either on the site or in the surrounding area?	-	-
10	Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please provide details.)	-	-
11	Are any chemicals used in your daily operations? (If yes, please provide details.)	-	-
	• Where do you store these chemicals?	-	-
12	Material inventory lists, including quantities and locations available? (If yes, how often are these inventories updated?)	-	-

		Yes/No	Notes
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.)	-	-
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.)	-	-
	<ul style="list-style-type: none"> <li>How many underground storage tanks do you have on site?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the tanks constructed of?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What are the contents of these tanks?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Are the pipelines above or below ground?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>If the pipelines are below ground, has any leak and integrity testing been performed?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Have there been any spills associated with these tanks?</li> </ul>	-	-
17	Are there any disused underground storage tanks?	-	-
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?	-	-
20	Have you ever received any notices of violation of environmental regulations or received public complaints? (If yes, please provide details.)	-	-
21	Have any spills occurred on site? (If yes, please provide details.)	-	-
	<ul style="list-style-type: none"> <li>When did the spill occur?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the substances spilled?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What was the quantity of material spilled?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>Did you notify the relevant departments of the spill?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the actions taken to clean up the spill?</li> </ul>	-	-
	<ul style="list-style-type: none"> <li>What were the areas affected?</li> </ul>	-	-

		Yes/No	Notes
22	Do you have any records of major renovation of your site or rearrangement of underground utilities, pipe work/underground tanks (If yes, please provide details.)	-	-
23	Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	-	-
24	Are there any known contaminations on site? (If yes, please provide details.)	-	-
25	Has the site ever been remediated? (If yes, please provide details.)	-	-

## OBSERVATIONS

	Yes/No	Notes
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floor)?	N/A	No chemical stored onsite.
2. What are the conditions of the bund walls and floors?	N/A	-
3. Are any surface water drains located near to drum storage and unloading areas?	N/A	No drum storage or unloading area.
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 waste?	No	-
6. Is there an on-site landfill?	No	-
7. Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please provide details.)	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, efficient pits, interceptors or lagoons on site?	No	-
12. Any noticeable odours during site walkover?	No	-



	<b>Yes/No</b>	<b>Notes</b>
13. Are any of the following chemicals used on site: fuels, lubricating oils, hydraulic fluid, 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	-

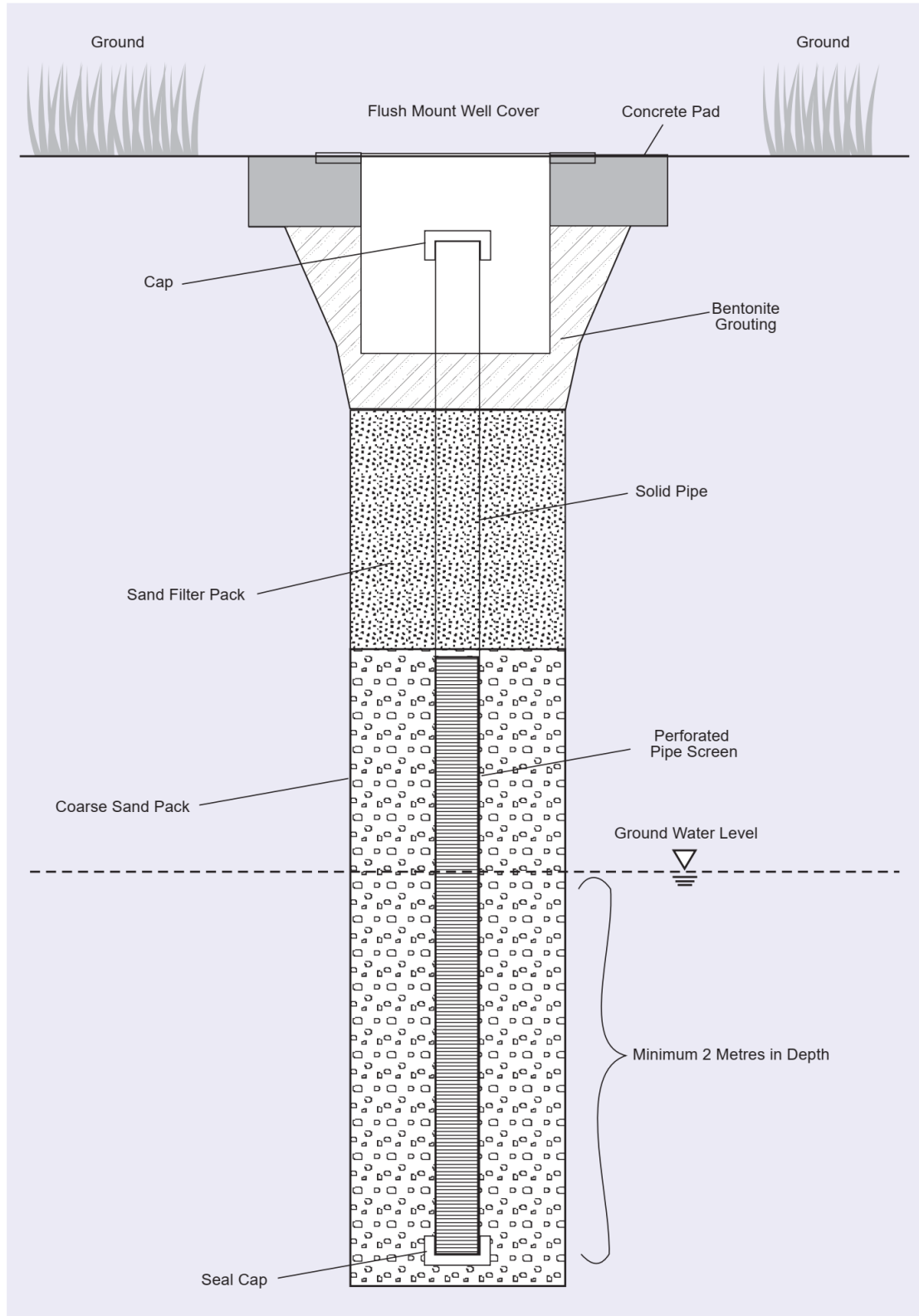
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**APPENDIX D  
SCHEMATIC DRAWING OF  
GROUNDWATER MONITORING WELL**

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## Appendix D

### Schematic Drawing of Groundwater Monitoring Well





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**APPENDIX E  
REPRESENTATIVE PHOTOS OF  
CURRENT LAND USE**

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Carpark in northeastern part of VDC



Carpark near center of VDC



General view in eastern part of VDC



General view in western part of VDC

**Appendix E Representative Photos of Current Land Use (Vehicle Detention Centre, Taken in July 2018)**





Temporary storage of spent batteries identified in EIA Stage



Storage area of siezed goods identified in EIA Stage



Engineer oil stain observed in recent walkover



Non-aqueous phase liquid in oil stain

**Appendix E Representative Photos of Current Land Use (Vehicle Detention Centre, Taken in July 2018)**





Broken Car Door



Broken Windshield



Broken Exhaust Pipe



Broken Ignitor

**Appendix E Representative Photos of Current Land Use (Vehicle Detention Centre, Taken in July 2018)**





Ground Level



Ground Level



First Platform (Front of building)



First Platform (Back of building)

**Appendix E Representative Photos of Current Land Use (David Camp, Taken in June 2018)**





Second Platform (Front of building)



Second Platform (Back of building)



Second Platform (Covered Area)

**Appendix E Representative Photos of Current Land Use (David Camp, Taken in June 2018)**





Secondary Woodland



Plantation Woodland



Shrubland



Natural Stream

**Appendix E Representative Photos of Current Land Use (Proposed Magazine Site, Taken in June 2018)**



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**APPENDIX F  
WRITTEN STATEMENTS FROM C&ED  
& DLO**

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Betty Choi <betty.choi@cinotech.com.hk>

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## Shatin Cavern - Enquiry on Activity in Shatin Vehicle Detention Centre

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**gary\_cc\_wong@customs.gov.hk** <gary\_cc\_wong@customs.gov.hk>

2018年11月8日 下午7:47

收件者: Betty Choi <betty.choi@cinotech.com.hk>

副本: carolyip@dsd.gov.hk, "Kwan, Chun To Gary" <gary.kwan@aecom.com>, ivy <ivy.tam@cinotech.com.hk>, Choy Priscilla <priscilla.choy@cinotech.com.hk>

Dear Betty,

The site of former Shatin Vehicle Detention Centre ("STVDC") has been returned to Lands Department in January 2018. During the site allocation for operation of STVDC, as far as I know, there was no vehicle repairing and dismantling activity.

Regards,

Gary WONG  
Supplies Officer (Seizure Management)  
Supplies Section  
Customs and Excise Department  
Tel: 3759 3941 Fax: 2854 3987

---

From: Betty Choi <betty.choi@cinotech.com.hk>

To: gary\_cc\_wong@customs.gov.hk,

Cc: carolyip@dsd.gov.hk, ivy <ivy.tam@cinotech.com.hk>, Choy Priscilla <priscilla.choy@cinotech.com.hk>, "Kwan, Chun To Gary" <gary.kwan@aecom.com>

Date: 08/11/2018 17:01

Subject: Shatin Cavern - Enquiry on Activity in Shatin Vehicle Detention Centre

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Dear Mr. Wong,

We found some car parts in the western end of the Shatin Vehicle Detention Centre (VDC) during the site inspection in June 2018 (see photo record in the attachment). May I know if the VDC has any vehicle repairing or dismantling activity during its operation? Thank you.

Best Regards,  
Betty Choi

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Cinotech Consultants Ltd.  
Direct Line: (852) 2151 2072

Disclaimers:

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 **App E1 - Photo record (VDC).pdf**  
964K





Betty Choi <betty.choi@cinotech.com.hk>

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## Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

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**Betty Choi** <betty.choi@cinotech.com.hk>

2018年11月19日 下午4:15

收件者: essts@landsd.gov.hk

副本: carolyip@dss.gov.hk, ivy <ivy.tam@cinotech.com.hk>, Choy Priscilla <priscilla.choy@cinotech.com.hk>

Dear Ms. Chan,

I am writing to inquire if the Shatin Vehicle Detention Centre (VDC) was allocated to any user after handing over by the Custom & Excise Department in early 2018. We know that eastern side of the VDC became carparks. Was the rest of the site accessible by other parties? Please find a figure showing the location of the VDC and the carparks in the attachment.

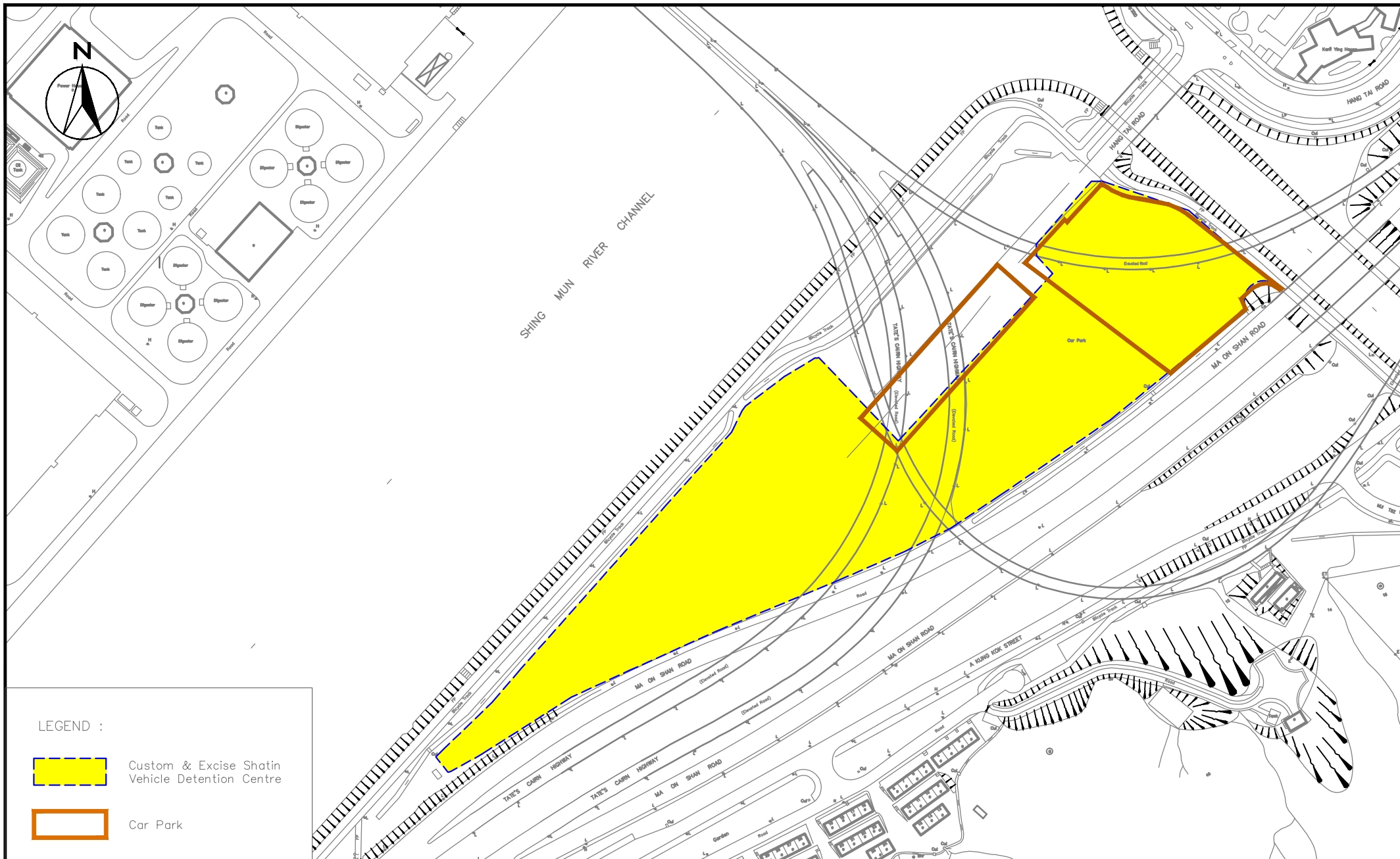
If you need other information, please don't hesitate to contact me. Thank you.

Best Regards,  
Betty Choi



-----  
Cinotech Consultants Ltd.  
Direct Line: (852) 2151 2072

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 **Location of VDC.pdf**  
333K



LEGEND :

-  Custom & Excise Shatin Vehicle Detention Centre
-  Car Park

SCALE	1:2800@A4	DATE	NOV 2018
CHECK	IT	DRAWN	BC
JOB No.	IA18064	FIGURE NO.	1
		REV	—



Betty Choi <betty.choi@cinotech.com.hk>

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## Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

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essts@landsd.gov.hk <essts@landsd.gov.hk>

2018年11月19日 下午4:28

收件者: Betty Choi <betty.choi@cinotech.com.hk>

副本: lestes@landsd.gov.hk

Dear Betty

As spoken (Choi/Chan), the rest of the site as shown coloured yellow hatched red on the plan was not accessible by other parties except Customs & Excise Department where approval has been given for them to carry out contamination assessment works up to 17.12.2018.

Regards

Yolanda Chan  
for District Lands Officer, Sha Tin  
Tel: 2158 4847

---

From: Betty Choi <betty.choi@cinotech.com.hk>

To: essts@landsd.gov.hk,

Cc: carolyip@dtd.gov.hk, ivy <ivy.tam@cinotech.com.hk>, Choy Priscilla <priscilla.choy@cinotech.com.hk>

Date: 2018/11/19 下午 04:16

Subject: Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

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### 2 個附件



**Location of VDC.pdf**

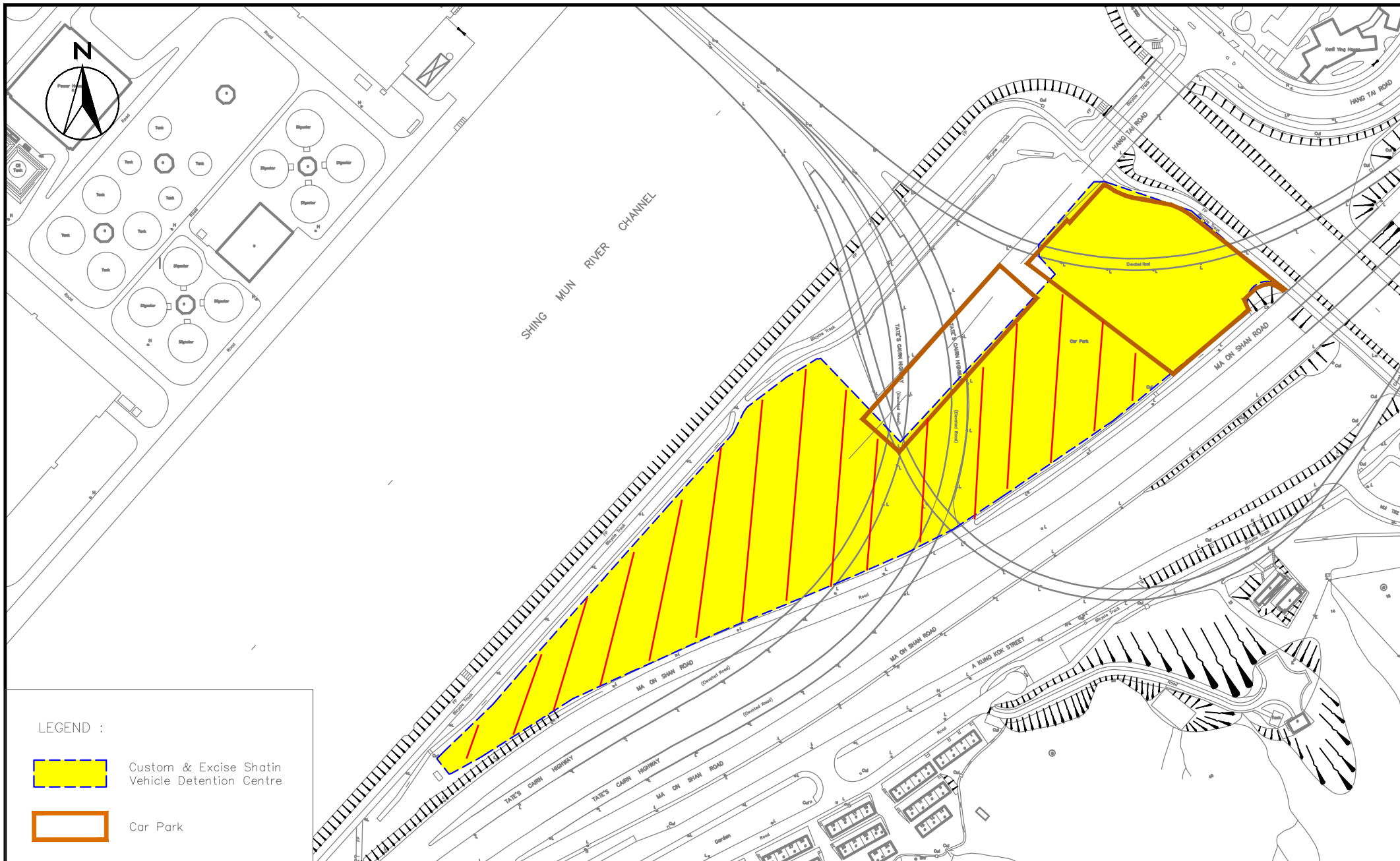
333K



**Location Plan.pdf**

334K





LEGEND :

- Custom & Excise Shatin Vehicle Detention Centre
- Car Park

SCALE	1:2800@A4	DATE	NOV 2018
CHECK	IT	DRAWN	BC
JOB No.	IA18064	FIGURE NO.	1
		REV	—



Betty Choi <betty.choi@cinotech.com.hk>

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## Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

---

**Betty Choi** <betty.choi@cinotech.com.hk>

2018年11月19日 下午5:01

收件者: essts@landsd.gov.hk

副本: lestes@landsd.gov.hk

Dear Ms. Chan,

Noted with thanks. May I know if C&ED was accessible to the site after handing over in early 2018 to July 2018?

Best Regards,  
Betty Choi

-----  
Cinotech Consultants Ltd.  
Direct Line: (852) 2151 2072

<essts@landsd.gov.hk> 於 2018年11月19日 週一 下午4:29寫道：

[隱藏引用文字]



Betty Choi <betty.choi@cinotech.com.hk>

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## Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

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essts@landsd.gov.hk <essts@landsd.gov.hk>

2018年11月19日 下午5:08

收件者: Betty Choi <betty.choi@cinotech.com.hk>

副本: lestes@landsd.gov.hk

Dear Betty

No. The allocation to C&ED commenced on 22.10.2018.

Regards

Yolanda Chan  
for District Lands Officer, Sha Tin  
Tel: 2158 4847

From: Betty Choi <betty.choi@cinotech.com.hk>

To: essts@landsd.gov.hk,

Cc: lestes@landsd.gov.hk

Date: 2018/11/19 下午 05:02

Subject: Re: Shatin Cavern - Enquiry on Land Use after Handing Over of VDC

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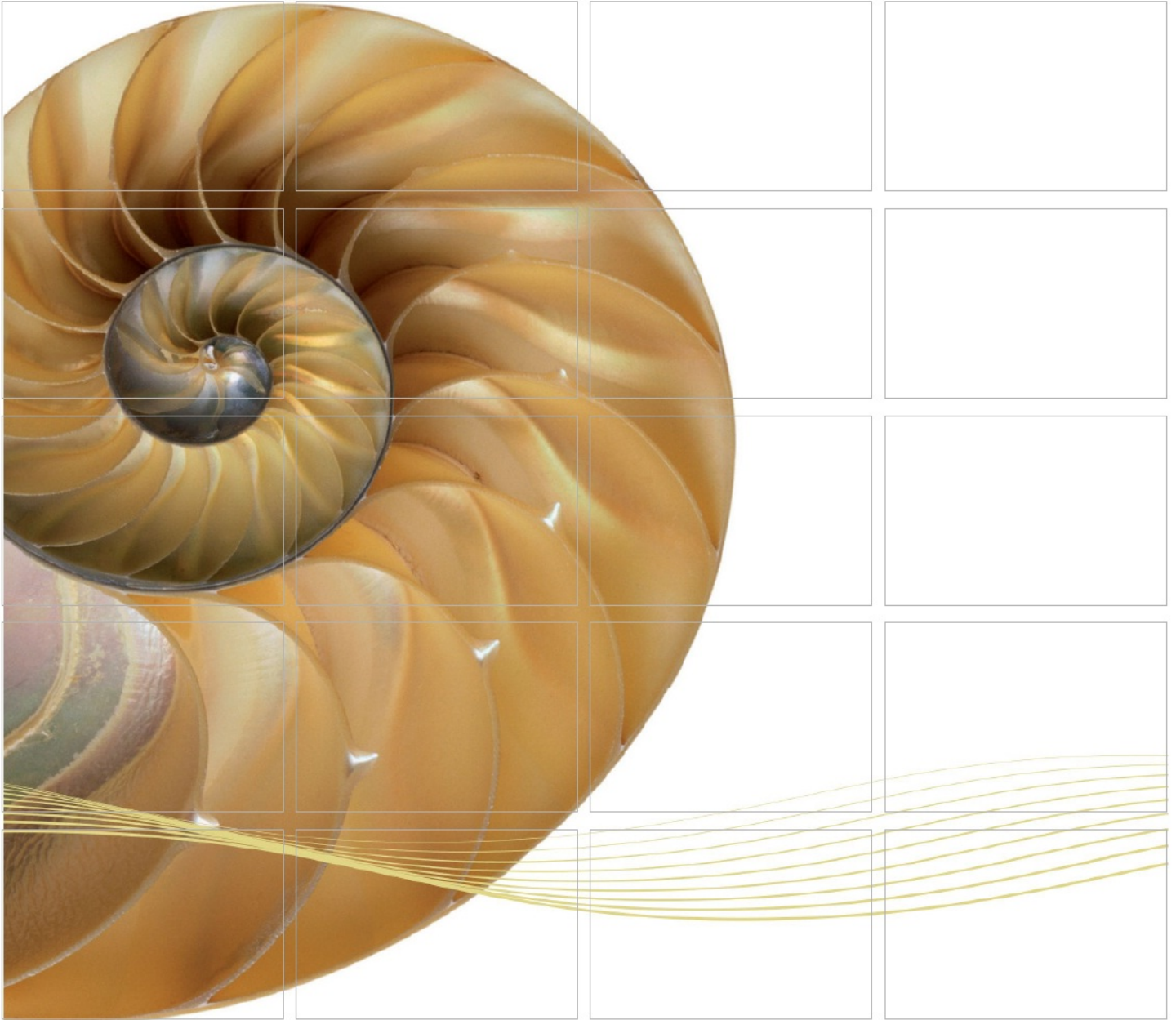
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**APPENDIX G  
C&ED CAP REPORT**

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Customs and Excise Department

## Contamination Assessment Plan

*Land Contamination Assessment for Shatin  
Vehicle Detention Centre*

*39 Hang Tai Road, Tai Shui Hang, Shatin*

January 2018

### **Environmental Resources Management**

16/F, Berkshire House  
25 Westlands Road  
Quarry Bay, Hong Kong  
Telephone 2271 3000  
Facsimile 2723 5660

[www.erm.com](http://www.erm.com)

Customs and Excise Department

## Contamination Assessment Plan

*39 Hang Tai Road, Tai Shui Hang, Shatin*

January 2018

Reference 0422666

For and on behalf of  
Environmental Resources Management

Approved by: Dr. Robin Kennish

Signed:



Position: Managing Director

Date: 11 January 2018

This report has been prepared by ERM-Hong Kong, Limited with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.





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# 1 INTRODUCTION

## 1.1 BACKGROUND

The Customs and Excise Department (C&ED) is required to vacate the existing Shatin Vehicle Detention Centre (VDC) at 39 Hang Tai Road, Tai Shui Hang, Shatin (hereinafter referred to as “the Site”) for the relocation programme of the current Site to Stonecutters Island and site handover to Lands Department (LandsD). The site has been used for storing detained vehicles and containers.

ERM-Hong Kong, Limited was commissioned by C&ED to conduct a Land Contamination Assessment for the site of VDC prior to the Site hand-over to LandsD as per the requirements stipulated in the land lease conditions for TGLA no. TST-277 (hereinafter referred to as “the Project”). As part of the assessment, a Contamination Assessment Plan (CAP) is prepared for submission to LandsD.

## 1.2 OBJECTIVES OF THE CAP

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

## 1.3 STRUCTURE OF THIS CAP

This section introduces the background of the Project, while subsequent sections are structured according to the assessment methodology for contaminated sites.

- *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, etc;
- *Section 4* proposes the sampling plan to assess the potential contamination in the Site;
- *Section 5* proposes the proposed sampling method;
- *Section 6* presents the conclusion and recommendations.

This CAP is also supplemented by the following annexes:

*Annex A Site Location Plan and Site Layout Plan*

- Annex B Selected Site Photographs and Site Walkover Checklist*
- Annex C Previous EIA Sampling Location Plan*
- Annex D Referenced Aerial Photographs*
- Annex E Chemical Waste Producer Registration and Motor Spirit Transfer Record from C&ED, and Letter from FSD on Dangerous Goods License Record*
- Annex F Previous Site Investigation Record*
- Annex G Potentially Contaminated Areas and Sampling Location Plan*
- Annex H Schematic Drawing of Groundwater Monitoring Well*
- Annex I Risk-Based Remediation Goals*

## 2 STATUTORY REQUIREMENTS AND EVALUATION CRITERIA

### 2.1 STATUTORY FRAMEWORK

The following key guiding documents are to be referenced for 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 the 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 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 Site is located in an urban area surrounded by mainly residential buildings and public parks. As no future land use for the Site is provided during the time of preparing this CAP, the most stringent RBRGs of each parameter, will be adopted in this Project.



### 3 *SITE APPRAISAL*

The site appraisal comprises site walkover, review of historical aerial photographs and maps and review of previous SI conducted at the Site.

#### 3.1 *SURROUNDING LAND USE OF THE SITE*

The Site is located at 39 Hang Tai Road, Tai Shui Hang, Shatin, New Territories. Surrounding land uses of the neighbouring environment are summarised as follow:

North: Immediate to the north is an outdoor parking lot and a cycling park. Further north is Hang Tai Road.

East: Immediate to the east is Ma On Shan Road. Further east is a greenfield area occupied by trees and shrubs adjacent to A Kung Kok Road.

South: Immediate to the south is the junction of Ma On Shan Road and Tate's Cairn Highway. Further south is A Kung Kok Road and A Kung Kok Fishermen Village.

West: Immediate to the west is a public cycling track. Further west is Shing Mun River.

A map showing the location of the Site is presented in *Annex A*.

#### 3.2 *SITE SETTING AND WALKOVER FINDINGS*

The size of the Site is approximately 38,000 m<sup>2</sup>. The Site is an outdoor parking area for detained vehicles and containers for C&ED. It includes vehicle detention area at the centre to western portion, container detention area at the north to north east portion and miscellaneous seized goods storage area at the south portion. The detention areas are separated by metal fencing. The rest of the Site is occupied by the main road. According to interview with site management, there has been no change in site layout since the operation began in 2004. The site layout plan is provided as *Annex A*. Site walkover with site management interview was conducted on 30 August 2017 to observe the Site conditions and to interview with C&ED staff. "Standard Form 3.1 - Current Use" in accordance with the RBRGs Guidance Manual is included as *Table 3.1. Annex B* presents the selected photographs of the Site and the Site Walkover Checklist.

#### 3.3 *REVIEW OF HISTORICAL CONTAMINATION ASSESSMENT PLAN FROM PREVIOUS ENVIRONMENTAL IMPACT ASSESSMENT*

The approved Environmental Impact Assessment (EIA) for Shatin Cavern Sewage Treatment Works (AIEAR-202/2016) (hereinafter referred to as "2016

EIA”) has been prepared by AECOM in August 2016. The Shatin VDC was regarded as part of the study areas in this EIA. *Section 6 Land Contamination* of the approved 2016 EIA report and the approved CAP have identified the potential land contamination concerns in Shatin VDC, i.e. temporary storage area for spent batteries and storage area for seized goods. According to the approved CAP, the seized goods were only empty containers. Apart from the pest control used on-site, no chemicals were observed stored or handled on site. There were no past records and apparent chemical leakage. The sampling locations and the corresponding Chemical of Concerns (CoCs) are presented in *Table 3.1*. *Annex C* is the previous sampling location figure.

**Table 3.1** *Previous Sampling Locations and corresponding COCs*

Concerned Area	Summary of 2016 EIA Site Appraisal	Sampling Locations	COCs
Area 1: Temporary Storage Area of Spent Batteries	<ul style="list-style-type: none"> <li>This area is paved with additional layer of concrete above the concrete ground.</li> <li>No stain and stressed vegetation are observed and no past records of leakage of battery solution.</li> </ul>	ENV-BH53 ENV-BH54 ENV-BH55	Metals
Area 2: Storage Area of Seized Goods	<ul style="list-style-type: none"> <li>Only empty containers were stored in the area.</li> <li>This area is concrete paved.</li> <li>No stain and stressed vegetation are observed and no past records of leakage of chemicals.</li> </ul>	ENV-BH56 ENV-BH57 ENV-BH58	Metals, PCRs, VOCs, SVOCs, PCBs

Notes:  
Metals: For soil: Antimony, Arsenic, Barium, Cadmium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Tin, Zinc, Mercury, Chromium (III) and Chromium (VI);  
For groundwater: Mercury  
PCRs: Petroleum Carbon Range C6 – C8, C9 – C16 and C17 – C35  
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)  
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, Dibenzo(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.  
PCBs: Polychlorinated Biphenyls

During the site interview and walkover on 30 August 2017, site management confirmed that there was no change in land use and site layout of the site since the agreement of the CAP in August 2016 and there was no change at the Concerned Areas 1 and 2 as per the conditions in the approved CAP of 2016 EIA. As such, the approved CAP of 2016 EIA is considered still valid as the site condition remains unchanged after 2016.

### 3.4 HISTORICAL SITE ACTIVITIES

#### 3.4.1 *Detained Motor Spirit Transfer*

According to information provided by C&ED, fifteen (15) events of motor spirit transfer were carried out at the Motor Spirit Transfer area under the supervision of Fire Service Department (FSD) between 2008 and 2015. Detained motor spirits were transferred to tanker truck for offsite shipment. Empty containers generated from the motor spirit transfer were temporarily stored at the Area 2: Storage Area of Seized Goods. The Motor Spirit Transfer Area (Area 3) is located at the vacant area on the western end of the vehicle detention area. The C&ED confirmed there was no spillage incidents occurred during the motor spirit transfer. All motor spirits were handled carefully during the process. The approximate locations are shown in *Annex G*. Email response from C&ED confirming no record of spillage incidents within the Site is provided in *Annex E*.

#### 3.4.2 *Spent Vehicle Batteries Storage and Disposal*

According to information provided by C&ED, the Site address has been registered as a Chemical Waste Producer for “Spent Battery” on 9 October 2012. It is reported that the spent vehicle batteries were previously stored at the southern portion of the container detention area, i.e. Area 1: Temporary Storage Area of Spent Batteries. According to C&ED’s record provided, 6,532 nos of vehicle batteries were disposed in November 2012.

### 3.5 REVIEW OF PAST LAND USE

A review of past land use of the Site was conducted by reviewing the selected aerial photographs in the years of 1983, 1985, 1990, 1995, 2009 and 2013. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. A summary of historical land uses at the Site is provided in *Table 3.2*. Key changes of site setting observed within these areas is summarised in *Table 3.3* using the ‘Standard Form 3.1 – Past Use’ in accordance with the RBRGs Guidance Manual. The referenced aerial photographs are attached in *Annex D*.

**Table 3.2** *Summary of Historical Site Land Uses*

Date Began / Period	Site Land Use / Activities
1983	Reclamation of Tai Shi Hang Area. The Site was part of the opening of Shing Mum River
1985	Reclamation of the Tai Shui Hang area has been complete. Construction for the Tate’s Cairn Highway Bridge was in the early stages with no infrastructures erected.
1990	Tate’s Cairn Highway Bridge was under construction. The areas for the proposed work were partly vacant and partly occupied by material storage.
1995	Construction of Tate’s Cairn Highway Bridge was completed. The north eastern end of the Shatin VDC area was occupied by containers and vehicles.



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Date Began / Period	Site Land Use / Activities
2009	Overview of the C&ED Shatin VDC which the operation was commenced in 2004.
2013	Overview of the C&ED Shatin VDC. No significant changes have been made to the land use since commencement of operation.

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**Table 3.3**      *Standard Form 3.1 Summary of On-Site Land Use – Current Use*

Area	Type of Existing Facility/Business	On-site Property Land Use	Date Began/Period	Description of Site Walkover Findings	Owner or Occupier	Approximate Size of On-site Property (m <sup>2</sup> )	Off-site Property Affected?
Shatin Vehicle Detention Area	Detained Property Storage	Government & Institution	2004	<p>The vehicle detention area provides storage for various types of vehicles including five-seater to eight-seater cars, container tractors and trucks. The one-storey container site office is located at the northern end of the vehicle detention area. The remaining areas are access roads. The area was observed in general good condition. No signs of oil stains and odour were noted during the site visit.</p> <p>The container detention area provides storage for 20 feet sized containers. The southern portion of the container detention area is covered with concrete slab. No signs of abnormal stain and stress vegetation were observed.</p> <p>The miscellaneous seized goods area was vacant during the site visit. No signs of abnormal stain and stress vegetation were noted.</p>	C&ED	38,000	No

**Table 3.4 Standard Form 3.1 Summary of On-Site Land Use - Past Use**

Area	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 <sup>2</sup> )	Off-site Property Affected?
Shatin Vehicle Detention Area	Detained Property Storage	Government & Institution	Early 1980s	The Site was part of the Shing Mun River opening in early 1980s. Based on review of historical aerial photographs dated 1983, the reclamation works was underway. Reclamation for the land parcel where the Site is located at was completed in 1985.	NIL	NIL	No
			Early 1990s	Based on review of historical aerial photographs dated 1985, the Tate's Cairn Highway Bridge across Shing Mun River was under construction. Construction works within the Site were observed from 1989 to 1993.	NIL	NIL	No
			Late 1990s	The north-eastern end of the Site was part of an outdoor parking lot. The rest of the Site was a vacant land from 1995 to 2004.	Unknown	NIL	No
			2004 to present	Based on review of aerial photographs and information provided by C&ED, the VDC operation commence in 2004. No changes in land uses were observed since then.	C&ED	~ 38,000 m <sup>2</sup>	No
Shatin Vehicle Detention Area	Detained Property Storage	Government & Institution	2008 to 2015	<p>According to information provided by C&amp;ED, fifteen (15) motor spirit transfers were previously carried out between 2008 and 2015 under FSD's supervision on the vacant area at the immediate south of vehicle detention area.</p> <p>Further review of historical aerial photographs dated 2009 and 2013, only the northern part of the motor spirit detention area was occupied. According to interview with Site management, no spillage and leakage occurred. No information regarding the stored volume was available.</p>	C&ED	Area 3: Motor Spirit Transfer Area: ~ 160 m <sup>2</sup>	No



Area	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 <sup>2</sup> )	Off-site Property Affected?
			2012	<p>C&amp;ED waste disposal record showed that 6,532 nos of spent dry type vehicle batteries were disposed in November 2012. It is reported that the dry type spent batteries were temporarily stored above a concrete slabbed area at the south corner of the Container Detention Area for a short period of time. The Spent Vehicle Batteries Area was considered as a potential land contamination concern in the approved CAP of 2016 EIA.</p> <p>According to Section 6 Land Contamination of the approved CAP from 2016 EIA, the Storage Area for Seized Goods was identified as a potential land contamination concern. According to information provided by C&amp;ED, the seized goods were empty containers only. Apart from the pest control used on-site, no chemicals were observed stored or handled on site. There were no past records and apparent chemical leakage</p>	C&ED	<p>Area 1: Spent Vehicle Batteries Storage Area: ~ 160 m<sup>2</sup></p> <p>Area 2: Storage Area of Seized Goods: ~ 150 m<sup>2</sup></p>	No

### 3.6

#### ***REVIEW OF HISTORICAL SPILLAGE AND LEAKAGE RECORD***

Enquiries were made to C&ED on Chemical Waste Producer Record and the Fire Services Department (FSD) on historical spillage and leakage records at the Site respectively.

According to the information provided by C&ED, the Site has been registered as a Chemical Waste Producer on 9 October 2012 for the disposal of spent vehicle batteries. Review of C&ED waste disposal record showed that 6,532 nos of spent dry-type vehicle batteries were disposed in November 2012.

An information request was sent to FSD regarding the records of any historical Dangerous Goods (DG) license records and incident records within the Site. According to the information provided by the FSD, no historical DG license records and incident records from 1990 to the present was found.

Information provided by C&ED and FSD are attached in *Annex E*.

### 3.7

#### ***(HYDRO) GEOLOGY AND UNDERGROUND SOIL PROFILE***

Previous Ground Investigation (GI) records in the vicinity of the Site were obtained from Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD). According to the drillhole record for *Investigation Study for Widening of Tate's Cairn Highway between Shek Mun and TS Interchange*, the geological strata encountered were in general a fill material in a matrix of coarse sand and silty clay with gravel sized rock fragments (from 0 to 12.10m bgl). The fill material layer was underlain by alluvium in a matrix of silty sand with quartz fragments (from 12.10 to 16.10 m bgl), and granite (16.10 to 37.40 m bgl). Copy of the previous borehole record is attached in *Annex F*.

According to the latest available groundwater level monitoring record (April 1999) provided by CEDD, the groundwater level measured was ranged from approximately 1.55 to 3.89 m bgl.

#### 4.1 PROPOSED SAMPLING LOCATIONS AND TESTING PARAMETERS

*Section 3.1 to 3.6* summarized the findings from site walkover, review of historical aerial photographs and historical land contamination assessment and leakage and spillage records, from which potential soil and groundwater contamination concerns in Area 1: Temporary Storage Area of Spent Batteries, Area 2: Storage Area of Seized Goods and Area 3: Motor Spirit Transfer Area were identified based on historical information provided by C&ED. *Section 3.7* presents the results and locations of previous GI conducted within/adjacent to the Site to demonstrate the geological profile at the Site.

Based on the interview with site management, historical records provided by C&ED, observation from the site walkover and the review of historical aerial photographs, there was no potential land contamination activity being carried out within the above-mentioned area. The general current land use of the Site include: vehicle and container storage, container site office and access roads. As confirmed by C&ED and FSD, there were no past records of oil spillage from the motor spirit transfer and chemical leakage from spent batteries storage. No potential land contaminating activities were historically conducted within the abovementioned Areas. The site management also confirmed that there is no change in the site land use, site layout and concerned areas as per the site conditions mentioned in the approved CAP of 2016 EIA. As such, the approved CAP of 2016 EIA is considered still valid. For the purpose of verifying the land condition, sampling locations are proposed at the identified concerned areas as illustrated in *Section 4.1.1 to 4.1.5* below.

##### 4.1.1 Proposed Locations for SI

Considering the information presented in *Section 3*, a SI plan for the Project is presented in this section and *Table 4.2* summarises the details of the sampling, including number of sampling locations, their sampling methods, the number of samples, and the parameters that will be analysed. The sampling locations proposed are presented in *Annex G*.

*Table 4.3* presents the laboratory analytical methods and reporting limits proposed for the SI.



**Table 4.1 Proposed Sampling and Analysis Plan**

Potentially Contaminated Area	Sampling Location ID	Proposed Coordinates (a)	Soil Sampling Depths (m bgl)	Groundwater Sampling Depths (m bgl)	Proposed Testing Parameters
Area 1: Temporary Storage Area of Spent Batteries	BH6	E: 840524.25 N: 829476.91	Manual excavation of Inspection Pit (0-1.5 m bgl): - To collect disturbed sample at 0.5 m bgl.  Rotary Drilling of boreholes (1.5-7.0 m bgl): - Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a maximum of 7 m below ground level or 2m below static groundwater level, whichever shallower.	At each borehole, to collect one (1) groundwater sample at static groundwater level.	Metals <sup>(b)</sup>
	BH7	E: 840528.13 N: 829471.27			
	BH8	E: 840532.01 N: 829465.62			
Area 2: Storage Area of Seized Goods	BH3	E:840421.19 N:829410.84	To collect undisturbed soil samples at 3.0 m and 6.0m bgl.		Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
	BH4	E:840409.93 N:829398.63			
	BH5	E: 840398.68 N: 829386.43			
Area 3: Motor Spirit Transfer Area	BH1	E: 840356.08 N:829401.87			Metals <sup>(b)</sup> , PCR <sup>(c)</sup> , VOCs <sup>(d)</sup> , SVOCs <sup>(e)</sup>
	BH2	E: 840366.78 N:829388.66			

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 fine 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) Heavy 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) PCR: 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.

**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)
<b>Metals <sup>(b)</sup></b>				
Lead	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Antimony	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Arsenic	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Barium	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Cadmium	USEPA 6020	0.2	USEPA 6020	Not to be tested <sup>(a)</sup>
Cobalt	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Copper	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Manganese	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Molybdenum	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Nickel	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Tin	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Zinc	USEPA 6020	1	USEPA 6020	Not to be tested <sup>(a)</sup>
Chromium III	By Calculation	1	By Calculation	Not to be tested <sup>(a)</sup>
Chromium VI	USEPA3060	1	APHA3500 Cr:D	Not to be tested <sup>(a)</sup>
Mercury	APHA3500Cr:D	0.05	APHA3112B	0.5
<b>Petroleum Carbon Ranges <sup>(b)</sup></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
<b>VOCs <sup>(b)</sup></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
<b>SVOCs <sup>(b)</sup></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 <sup>(a)</sup>
Benzo(a)pyrene	USEPA 8270	0.5	USEPA 8270	Not to be tested <sup>(a)</sup>
Benzo(b)fluoranthene	USEPA 8270	0.5	USEPA 8270	1
Benzo(k)fluoranthene	USEPA 8270	0.5	USEPA 8270	Not to be tested <sup>(a)</sup>
Benzo(g,h,i)perylene	USEPA 8270	0.5	USEPA 8270	Not to be tested <sup>(a)</sup>
Bis-(2-Ethylhexyl)phthalate	USEPA 8270	5	USEPA 8270	Not to be tested <sup>(a)</sup>
Chrysene	USEPA 8270	0.5	USEPA 8270	1

Test Parameter	Soil		Groundwater	
	Reference Method	Reporting Limit (mg/kg)	Reference Method	Reporting Limit (µg/L)
Dibenzo(a,h)anthracene	USEPA 8270	0.5	USEPA 8270	Not to be tested <sup>(a)</sup>
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 <sup>(a)</sup>
Naphthalene	USEPA 8270	0.5	USEPA 8270	2
Phenanthrene	USEPA 8270	0.5	USEPA 8270	2
Pyrene	USEPA 8270	0.5	USEPA 8270	2

**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.



**5.1 OVERVIEW**

Borehole drilling has been 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 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 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. Water can only be used as a flushing medium 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 clearance of underground structures prior to ground disturbance. In addition, an inspection pit will be excavated down to about 1.5m bgl to manually 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 bgl from the excavation pits. Soil boring using rotary drill rigs will then be performed from 1.5 m bgl to a maximum depth of 7.0 m bgl or 2m below static groundwater level, whichever shallower.

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 3.0 m and 6.0 m bgl using the U100 core. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

Should there be site constraints, such as insufficient headroom for drilling rig, trial pit excavation method instead of borehole drilling will be adopted. The trial pit area shall be approximately 1.5m by 1.5m with a depth of 1.5m. The excavation shall proceed by hand digging in a series of shallow cuts, typically between 0.2 and 0.3m thickness. This will allow visual examination of the ground conditions, logging of the soil strata and the collection of soil samples.

For safety reasons, available utility service plans shall be checked and the surrounding area for visible covers/service runs. Utility scanning shall be performed at the proposed trial pit location to ensure clearance of underground structures prior to ground disturbance. Disturbed soil samples will be collected at the depth of 0.5m and 1.5m bgl from the trial pits. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

The excavated materials shall be positioned away from the immediate edge of the trial pit to avoid collapse. Upon completion, trial pits will be backfilled immediately in reverse order to which they were excavated.

### 5.3

#### *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 then 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;
- The presence of volatile organic compounds (VOCs) from the samples shall be screened by using a Photo-ionisation Detection (PID) meter. Where PID readings over 20 ppm are recorded or where significant visual or olfactory evidence of contamination is present, further laboratory analysis may be necessary; and
- The thickness of any free product and groundwater if present at locations shall be measured with an interface probe.

## 5.4 GROUNDWATER SAMPLING

Groundwater samples will be collected if groundwater is encountered in the boreholes. Groundwater monitoring wells shall be installed in accordance with the instructions given by the land contamination specialist. *Annex H* presents a schematic drawing of groundwater monitoring well for reference.

After the installation of the monitoring wells, 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. Well developments (approximately five well volumes) will be carried out to remove silt and drilling fluid residing from the wells. The wells will then be allowed to stand for a day to permit groundwater conditions to stabilise.

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.

## 5.5 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
<b>Soil</b>	
Metals	1 x 250ml glass jar with teflon-lined cap
VOCs / PCR	1 x 250ml glass jar with teflon-lined cap
SVOCs	1 x 250ml glass jar with teflon-lined cap
<b>Groundwater</b>	
Metals (Mercury)	1 x 250ml plastic (no preserve)
VOCs / PCR	2 x 40ml amber glass vials (hydrochloric acid)
PCR / SVOCs	1 x 1,000ml amber glass (no preserve)

## 5.6 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 Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited laboratory or an equivalent laboratory approved by the Engineer, 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 Quality Assurance/Quality Control (QA/QC) procedures.

## 5.7 QUALITY ASSURANCE/QUALITY CONTROL 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 soil duplicate sample/one groundwater duplicate sample 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 per each set of drilling tools and rig will be collected and analysed for heavy 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.

## 5.8 SAMPLING QUANTITY SUMMARY

Based on the proposed sampling plan, the sampling quantity for soil, groundwater and QA/QC analysis is summarised in *Table 5.2*.

**Table 5.2 Sampling Quantity Summary**

Sampling Location/ Type	Sampling Depth (m bgl)	Estimated no. of Samples <sup>(a)</sup>
<b>Soil and Groundwater</b>		
Area 1: Temporary Storage Area of Spent Batteries	BH6	Disturbed sampling at 0.5m bgl
	BH7	Undisturbed sampling at 3.0m and 6.0m bgl
		One groundwater sample at static groundwater level
BH8		Three (3) soil + one(1) water samples
Area 2: Storage Area of Seized Goods	BH3	
	BH4	
		Three (3) soil + one(1) water samples
		Three (3) soil + one(1) water samples

Sampling Location / Type	Sampling Depth (m bgl)		Estimated no. of Samples <sup>(a)</sup>
	BH5		Three (3) soil + one(1) water samples
Area 3: Motor Spirit Transfer Area	BH1		Three (3) soil + one(1) water samples
	BH2		Three (3) soil + one(1) water samples
<b>QA/QC</b>			
Duplicate	NA	Disturbed sampling at 0.5m at proposed sampling locations	One(1) per twenty (20) soil and groundwater samples
Field Blank	NA	NA	One(1) per twenty (20) soil and groundwater samples
Equipment blank	NA	NA	One (1) per each set of drilling tools and rig
Trip Blank	NA	NA	One(1) per trip
<b>Notes:</b>			
(a) The estimated no. of samples of are for reference only and the exact no of soil and groundwater samples of each borehole should be decided by on-site Land Contamination Specialist.			

## 5.9

### *HEALTH AND SAFETY*

A site health and safety plan will be prepared before any site work is performed at the Site. The health and safety plan will 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 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:

- Dispose of the chemical wastes from the sump pits within the Site by licenced chemical waste collector(s);
- 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 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 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.

ERM was commissioned by C&ED to conduct a Land Contamination Assessment of the Site for the relocation programme to Stonecutters Island and site handover to Lands Department (LandsD) as per the requirements stipulated in the land lease conditions for TGLA no. TST - 277. The site has been used as a storage area for detained vehicles and containers. As part of the assessment, a CAP is prepared for submission to LandsD.

Based on the findings from site walkover and interview with site management, review of historical aerial photographs, historical land contamination assessment and leakage and spillage records, Area 1: Temporary Storage Area of Spent Batteries, Area 2: Storage Area of Seized Goods and Area 3: Motor Spirit Transfer Area were identified as potential soil and groundwater contamination concerned areas. As confirmed by C&ED and FSD, there were no past records of oil spillage from the motor spirit transfer and chemical leakage from spent batteries storage. No potential land contaminating activities were historically conducted within the abovementioned areas. For the purpose of verifying the land condition, sampling locations are proposed at the identified concerned areas.

A total of eight (8) boreholes are proposed within the Site. Sampling and testing work will be supervised by ERM field staff. Upon the receipt of laboratory testing reports, the result will be compared against the most stringent set of RBRGs of each parameter (*Annex I*) and a Contamination Assessment Report (CAR) shall be prepared and submitted to LandsD for approval. If contamination is confirmed, the CAR will be accompanied by a Remediation Action Plan (RAP), which will be submitted to LandsD for agreement. The RAP will examine the proposed remedial options and relevant issues of soil treatment versus disposal, proposed future land uses of potential risks based upon the soil, contamination type and concentrations and any further site investigation required during the execution of the remediation work. A Remediation Report (RR) will be prepared and submitted to demonstrate that the clean-up is completed and adequate. The abovementioned submissions and remediation works (if necessary) will be completed in accordance with the prevailing guidelines as listed in Section 2.1 prior to the redevelopment of the Site.

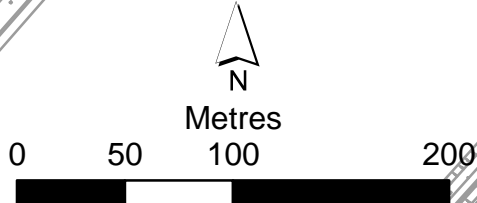
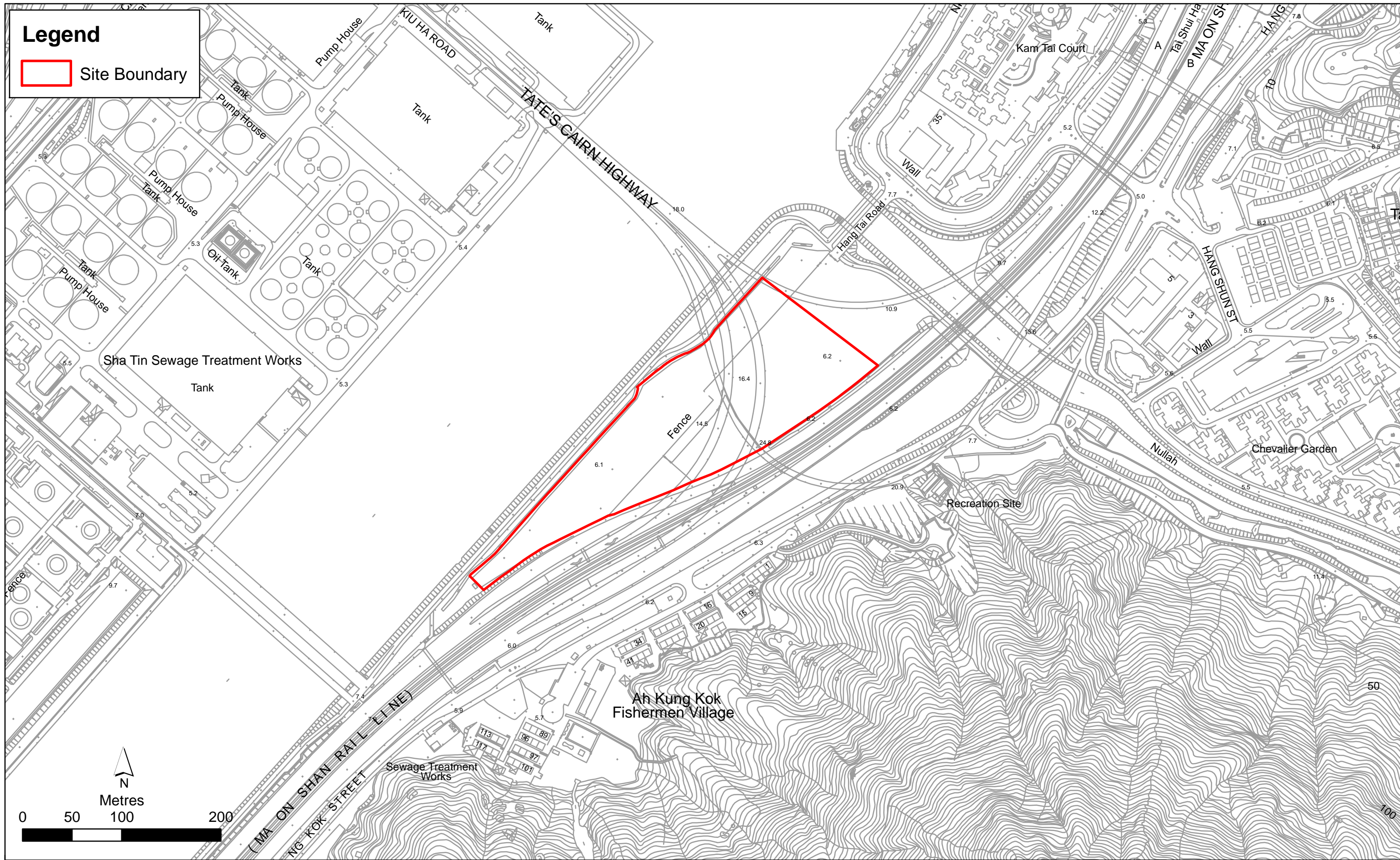


Annex A

## Site Location Plan and Site Layout Map

**Legend**

 Site Boundary



Annex A1

**Site Location Map**

File: T:\GIS\CONTRACT\0422666\mxd\0422666\_Site\_Location.mxd  
Date: 13/9/2017

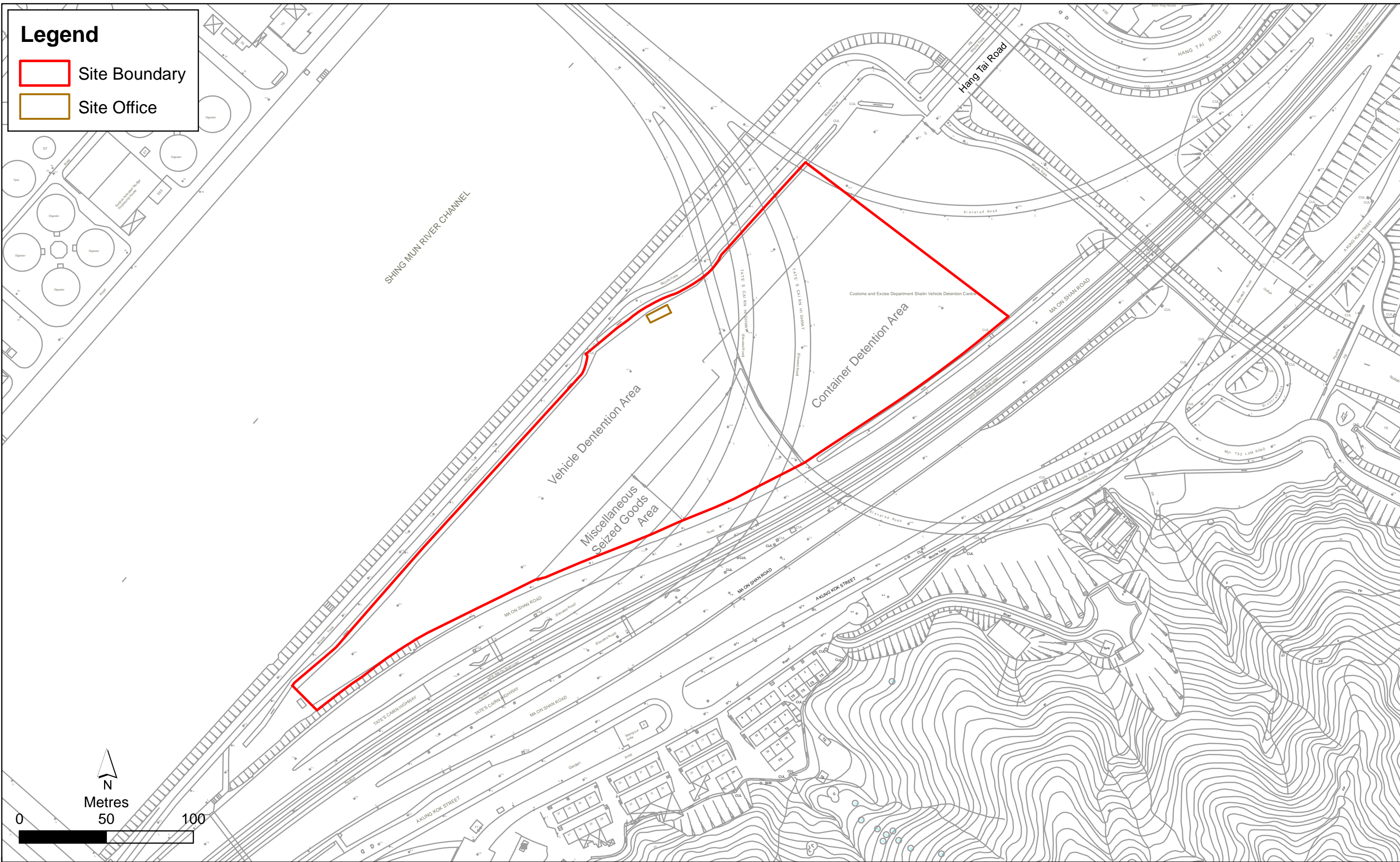
**Environmental  
Resources  
Management**





# Legend

-  Site Boundary
-  Site Office



Annex A2

## Site Layout Plan

File: T:\GIS\CONTRACT\0422666\mxd\0422666\_Site\_Layout\_Plan\_Simple.mxd  
Date: 8/12/2017

**Environmental  
Resources  
Management**



Annex B

## Selected Site Photographs and Site Walkover Checklist





Photo 1: Vehicle Detention Area occupied by small to mid size cars



Photo 2: Vehicle Detention Area occupied by large trucks



Photo 3: Motor Spirit Transfer Area at the southern end of Vehicle Detention Area..



Photo 4: Motor Spirit Transfer Area at the southern end of Vehicle Detention



Photo 5: Southern end of the Vehicle Detention Area



Photo 6: Empty Container Storage Area in Miscellaneous Seized Goods Area


<b>PROJECT:</b> C&ED Shatin VDC Land Contamination Assessment		<b>TITLE:</b> Annex B	
<b>ERM-Hong Kong, Limited</b> 16/F Berkshire House 25 Westlands Road Quarry Bay, HK Tel: (852) 2271 3000 Fax: (852) 2723 5660			
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<b>DRAWING:</b>		<b>SIZE:</b>	<b>REV:</b>
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Photo 7: Spent Vehicle Batteries Storage Area at the south of Container Detention Area



Photo 8: Vacant area of Southern Container Detention Area



Photo 9: Container Detention Area occupied by 20 feet long containers



Photo 10: Main Road and Container Detention Area



Photo 11: Main Road



Photo 12: Vacant area at the northern portion of Vehicle Detention Area

**PROJECT:**  
C&ED Shatin VDC Land Contamination Assessment

**ERM-Hong Kong, Limited**  
16/F Berkshire House  
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**TITLE:**  
Annex B

Selected Site Photographs

**DATE:**                      **CHECKED:**                      **PROJECT:** 0422666

**DRAWN:**                      **APPROVED:**                      **SCALE:**

**DRAWING:**                      **SIZE:**                      **REV:**

A4

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# Annex C1

Site Walkover Checklist (Site visit and interview on 30 August 2017)

## GENERAL SITE DETAILS

SITE OWNER/CLIENT Custom and Excise Department (C&ED)

PROPERTY ADDRESS 39 Hang Tai Road, Tai Shui Hang,  
Shatin

## PERSON CONDUCTING THE QUESTIONNAIRE

NAME Anthony Ho

POSITION Assistant Consultant, ERM

## AUTHORIZED OWNER/CLIENT REPRESENTATIVE (IF APPLICABLE)

NAME	<u>Mr. Gary Wong</u>	<u>Mr. Liu Kwok Kwong</u>	<u>Mr. Lam Chung Wai</u>
------	----------------------	---------------------------	--------------------------

POSITION	<u>Supplies Officer, C&amp;ED</u>	<u>Supplies Supervisor I</u>	<u>Supplies Supervisor II</u>
----------	-----------------------------------	------------------------------	-------------------------------

TELEPHONE	<u>3759 3941</u>	<u>2625 5122</u>	<u>2625 5122</u>
-----------	------------------	------------------	------------------

## 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

Part-time: -

Temporary/Seasonal: -

Maximum no. of people on site at any time: 4

Typical hours of operation: 24 hours

Number of shifts: 2

Days per week: 7

Weeks per year: 52

Scheduled plant shut-down: -



Detail the main sources of energy at the site:

Gas	Yes/ <input checked="" type="radio"/> No
Electricity	<input checked="" type="radio"/> Yes/No
Coal	Yes/ <input checked="" type="radio"/> No
Oil	Yes/ <input checked="" type="radio"/> No
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: 38,000 m<sup>2</sup>

What area of the site is covered by buildings (%): 0%

Please list all current and previous owners/occupiers if possible. C & ED (current and previous)

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: Outdoor Parking Lot, Cycling Park (carpark, recreational)

South: Vehicle Roads, A Kwai Kok Fisherman Village. (Streets and residential)

East: Vehicle Road, Greenfield Area with mostly trees and shrubs. (streets, rural)

West: Public Cycling Park (recreational)



# 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 Turfmac paved area

State the size and location of the nearest residential communities.

Kam Tai Court at the northeast of the site (~ 50,000m<sup>2</sup>)

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?		"Vehicles and Containers Storage"
2. How long have you been occupying the site?		"2004. Site management staff Mr. Lin and Mr. Lam confirmed that there was no change in land use and site layout since 2004."
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?	No	
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	
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	"On the site, at Spout Batters Storage Area and Miscellaneous Seized Goods area."
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?)	NA	
13. Has the facility produced a separate hazardous substance inventory?	NA	
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.)	NA	

	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)?	NA	
16. Do you have any underground storage tanks? (If yes, please provide details.)	No	
<ul style="list-style-type: none"> <li>• How many underground storage tanks do you have on site?</li> <li>• What are the tanks constructed of?</li> <li>• What are the contents of these tanks?</li> <li>• Are the pipelines above or below ground?</li> <li>• If the pipelines are below ground, has any leak and integrity testing been performed?</li> <li>• Have there been any spills associated with these tanks?</li> </ul>		
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.)	No	
19. How are the wastes disposed of?		"Daily waste are disposed at municipal refuse bins."
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	
<ul style="list-style-type: none"> <li>• When did the spill occur?</li> <li>• What were the substances spilled?</li> <li>• What was the quantity of material spilled?</li> <li>• Did you notify the relevant departments of the spill?</li> <li>• What were the actions taken to clean up the spill?</li> <li>• What were the areas affected?</li> </ul>		
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 underground tanks within the site.
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

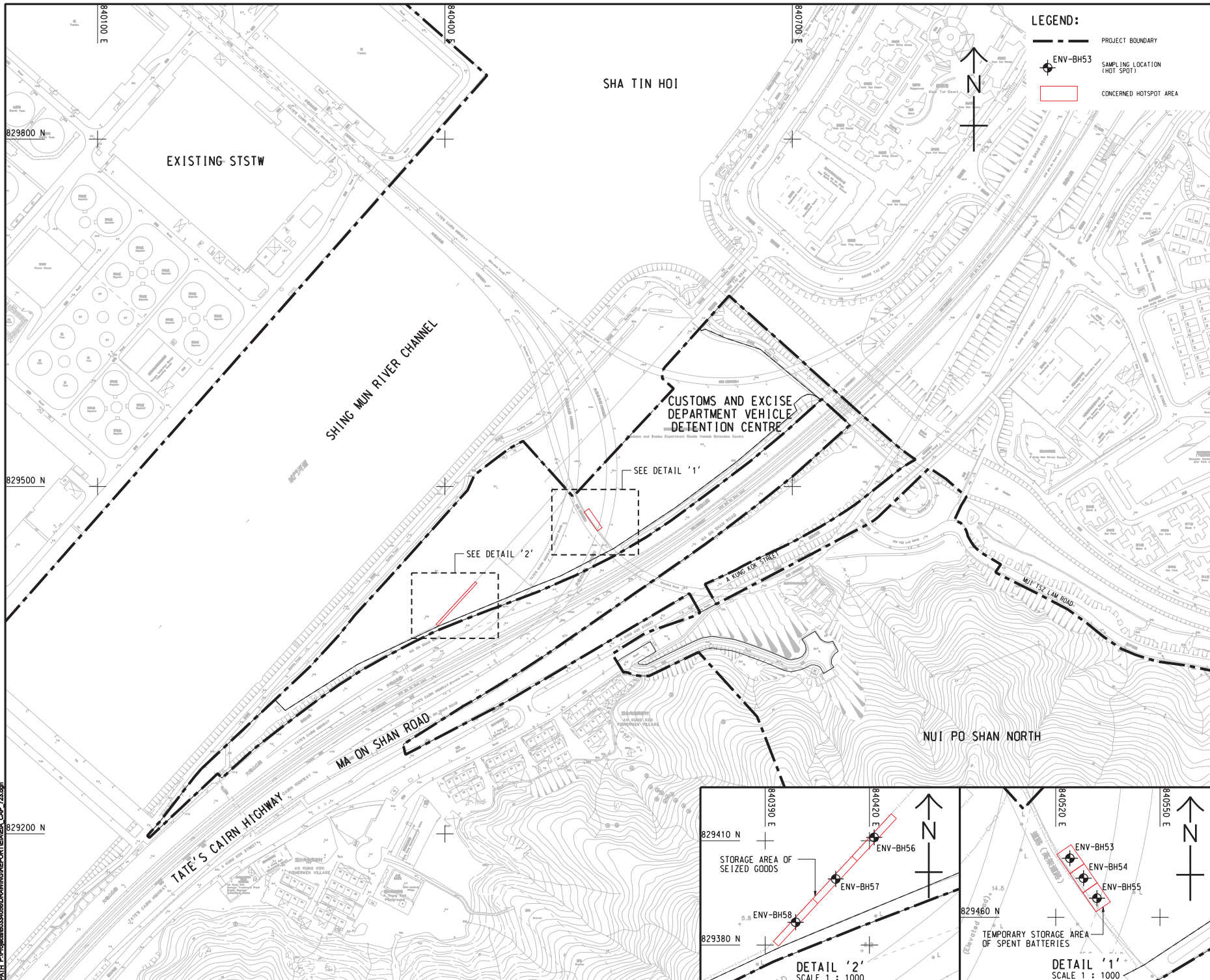
	Yes/No	Notes
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floors)?	NA	"No chemicals has been stored onsite"
2. What are the conditions of the bund walls and floors?	NA	
3. Are any surface water drains located near to drum storage and unloading areas?	NA	
4. Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	→	"Spent batteries were <del>previously</del> stored at the southern part of Contamin Retention Area."
5. Is there a storage site for the wastes?	Same as above.	
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 →	"Dirt and water stains were observed on the concrete slab at the south of container detection area."
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 →	"Site management reported that no transformers have been installed at the site or used historically."
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 C

## Previous EIA Sampling Location Plan



ISO A1 84mm x 61mm  
 Approved:  
 Checked:  
 Designer:  
 Project Management Initials:  
 2016/4/20  
 P:\4 File by PRECIV  
 PATH: P:\4 File by PRECIV\DRAWING\REPORT\ENEA\_CAP\_723.dwg



**LEGEND:**

- PROJECT BOUNDARY
- ENV-BH53
- SAMPLING LOCATION (HOT SPOT)
- CONCERNED HOTSPOT AREA



**AECOM**

**PROJECT NO.**  
60334056

**RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS: CAVERNS AND SEWAGE TREATMENT WORKS - INVESTIGATION, DESIGN AND CONSTRUCTION**

**CLIENT**  
 渠務署  
Drainage Services Department

**CONSULTANT**  
AECOM Asia Company Ltd.  
www.aecom.com

**SUB-CONSULTANTS**  
PZS2012/24

**ISSUE/REVISION**

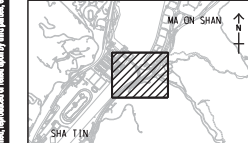
NO.	DATE	DESCRIPTION	CHK.

**STATUS**  
ISSUED

**SCALE**  
A3 1: 3000

**DIMENSION UNIT**  
METRES

**KEY PLAN** A3 1: 10000

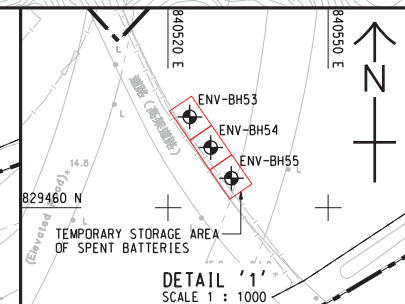
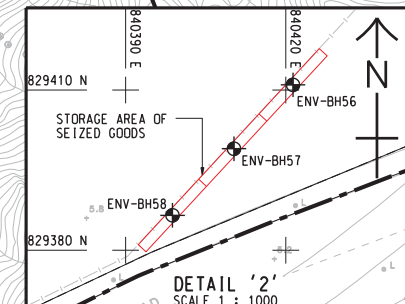


**PROJECT NO.**  
60334056

**CONTRACT NO.**  
CE 30/2014 (DS)

**SHEET TITLE**  
GENERAL SITE LAYOUT OF EXISTING VEHICLE DETENTION CENTRE AND PROPOSED SAMPLING LOACTIONS

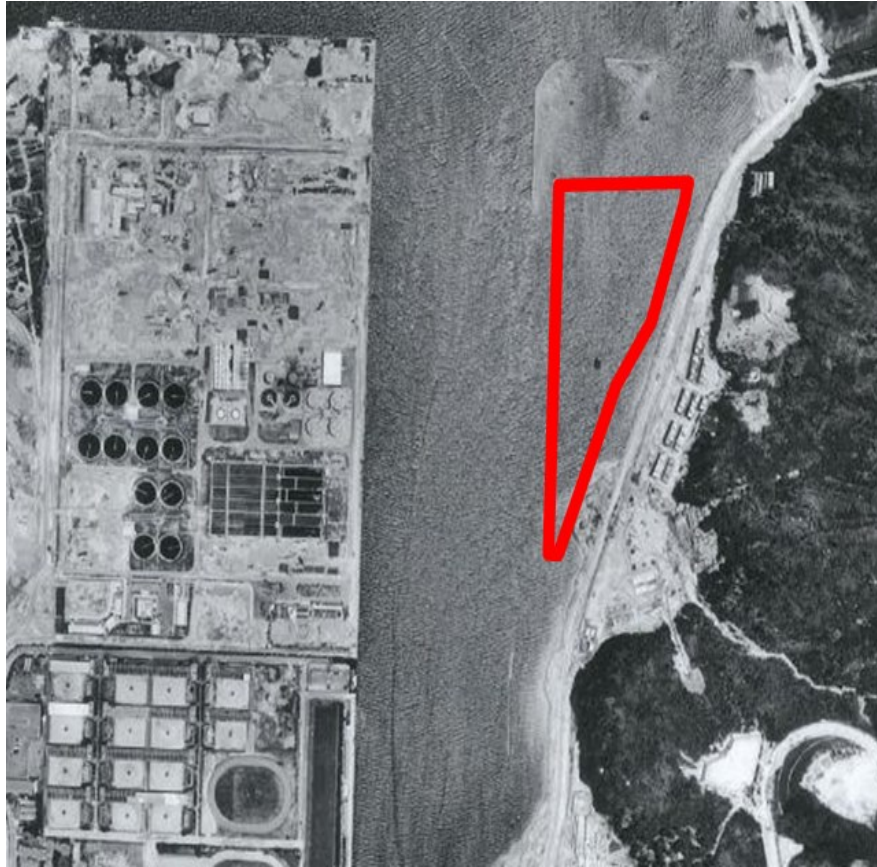
**SHEET NUMBER**  
60334056/CAP.2.03



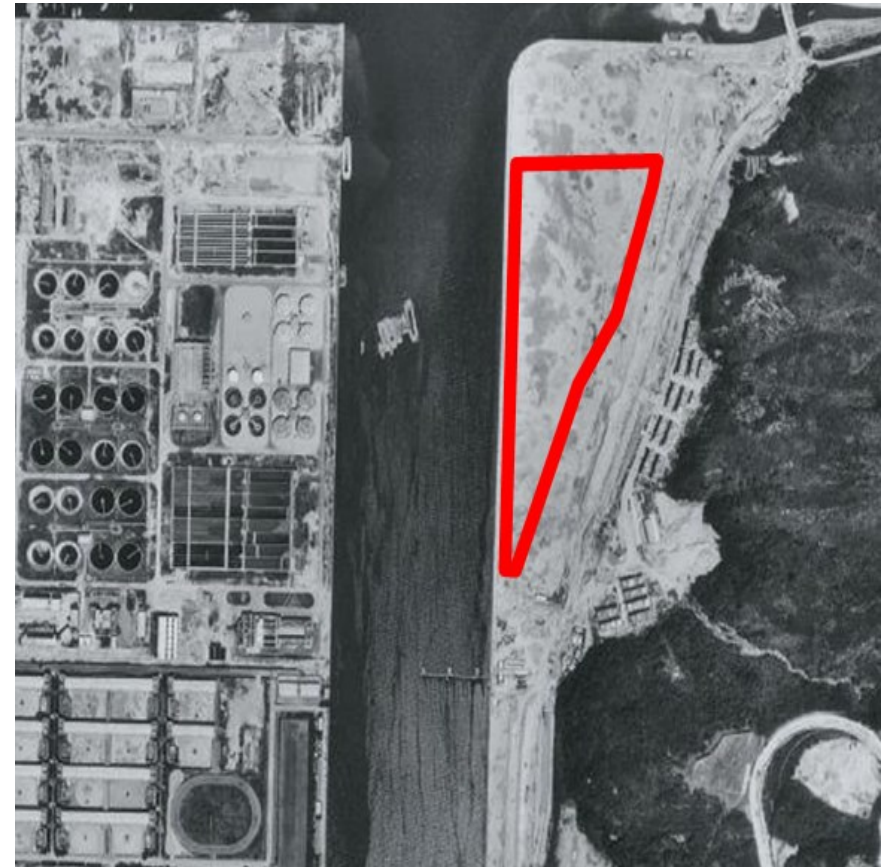
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Annex D

## Referenced Aerial Photographs




Year 1983 (ref: 48577, height: 10,000ft) – Reclamation of Tai Shui Hang Area prior to reclamation.



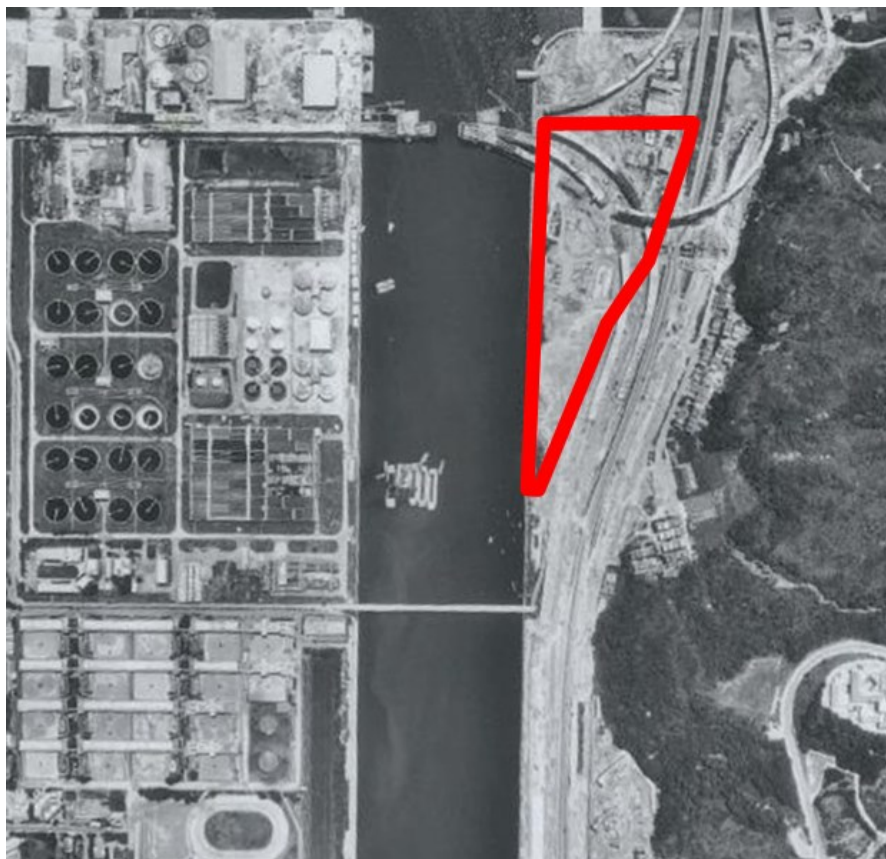
Year 1985 (ref: A02413, height: 4,000ft) – Reclamation of the Tai Shui Hang area has been complete. Construction for the Tate's Cairn Highway Bridge was in the early stages with no infrastructures erected.

Approximate Area of C&ED Shatin VDC

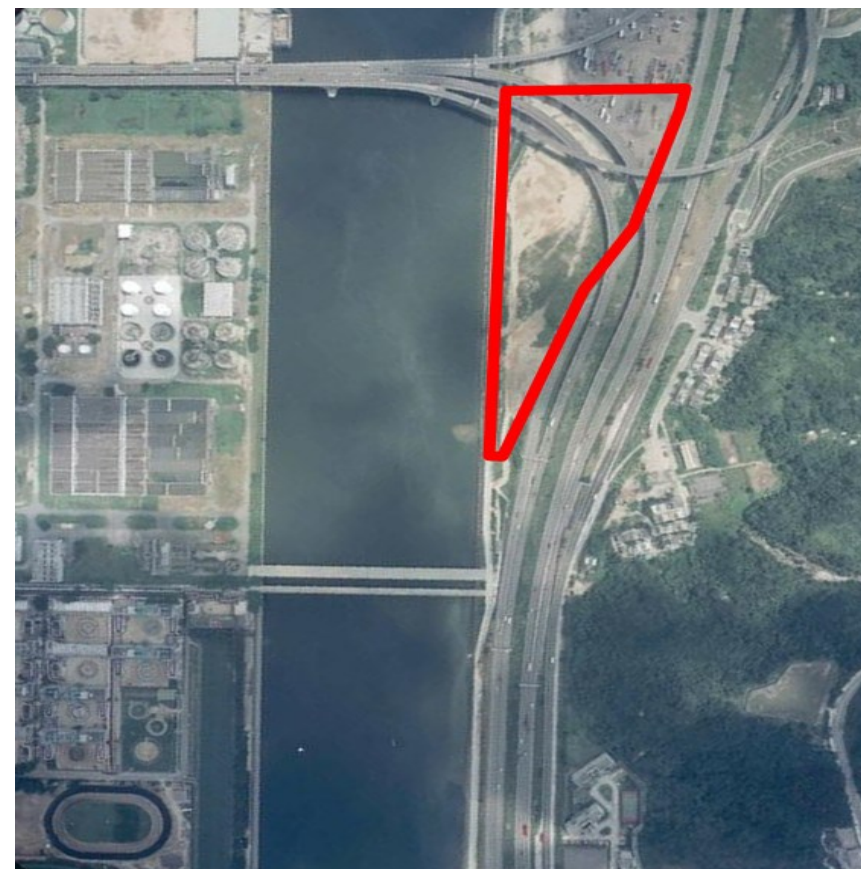
Source - GEO INFO, Lands Department, HKSARG

<b>PROJECT:</b> C&ED Shatin VDC Land Contamination Assessment		<b>TITLE:</b> Annex D Referenced Aerial Photographs	
<b>ERM-Hong Kong, Limited</b> 16/F Berkshire House 25 Westlands Road Quarry Bay, HK Tel: (852) 2271 3000 Fax: (852) 2723 5660			
<b>DATE:</b>	<b>CHECKED:</b>	<b>PROJECT:</b> 0308057	
<b>DRAWN:</b>	<b>APPROVED:</b>	<b>SCALE:</b>	
<b>DRAWING:</b>		<b>SIZE:</b> A4	<b>REV:</b> 0
<small>© ERM This print is confidential and is supplied on the understanding that it will be used only as a record to identify or inspect parts, concepts or designs and that it is not disclosed to other persons or to be used for construction purposes without permission.</small>			





Year 1990 (ref: A21212, height: 4,000) – Tate's Cairn Highway Bridge was under construction. The areas for the proposed work were partly vacant and partly occupied by material storage.



Year 1995 (ref: CN 10812, height: 2,500ft) – Construction of Tate's Cairn Highway Bridge was completed. The north eastern end of the Shatin VDC area was occupied by containers and vehicles.

**Approximate Area of C&ED Shatin VDC**

Source - GEO INFO, Lands Department, HKSARG

**PROJECT:**  
C&ED Shatin VDC Land Contamination Assessment

**ERM-Hong Kong, Limited**  
16/F Berkshire House  
25 Westlands Road  
Quarry Bay, HK  
Tel: (852) 2271 3000  
Fax: (852) 2723 5660



**TITLE:**  
Annex D  
Referenced Aerial Photographs

**DATE:**      **CHECKED:**      **PROJECT:** 0308057

**DRAWN:**      **APPROVED:**      **SCALE:**

**DRAWING:**      **SIZE:**      **REV:**

A4

0

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Year 2009(ref: CS25119, height: 6,000) – Overview of the C&ED Shatin VDC which the operation was commenced in 2004.



Year 2013 (ref: CW103602, height: 2,000ft) – Overview of the C&ED Shatin VDC. No significant changes have been made to the land use since commencement of operation.

**Approximate Area of C&ED Shatin VDC**

Source - GEO INFO, Lands Department, HKSARG

<b>PROJECT:</b> C&ED Shatin VDC Land Contamination Assessment		<b>TITLE:</b> Annex D	
<b>ERM-Hong Kong, Limited</b> 16/F Berkshire House 25 Westlands Road Quarry Bay, HK Tel: (852) 2271 3000 Fax: (852) 2723 5660			
		<b>Referenced Aerial Photographs</b>	
<b>DATE:</b>	<b>CHECKED:</b>	<b>PROJECT: 0308057</b>	
<b>DRAWN:</b>	<b>APPROVED:</b>	<b>SCALE:</b>	
<b>DRAWING:</b>		<b>SIZE:</b>	<b>REV:</b>
		A4	0

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Annex E

**Chemical Waste Producer Registration and  
Motor Spirit Transfer Record from C&ED, and  
Letter from FSD on Dangerous Goods License  
Record**



**Environmental Protection Department**

**環 境 保 護 署**

**Waste Disposal Ordinance (Chapter 354)**

香港法例第354章廢物處置條例

**Waste Disposal ( Chemical Waste ) ( General ) Regulation**

廢物處置(化學廢物)(一般)規例

**Registration of Waste Producer**

廢物產生者登記證

To: 致 廢物產生者	<b>Waste Producer</b>	<b>Full Name (English)</b> 全 名 (英 文)	Commissioner of Customs and Excise
		<b>(Chinese)</b> (中 文)	海關關長
		<b>I.D. Card No. (if any)</b> 身份證號碼:(如有者)	---
		<b>Business Reg. Cert. No. (if any)</b> 商業登記證號碼:(如有者)	---
	<b>Address for Correspondence</b> 通訊地址: Supplies Section, 29/F., Customs Headquarters Building, 222 Java Road, North Point, H.K.		
	<b>Tel. No.</b> 電 話:	3759 3941	<b>Fax No.</b> 圖文傳真:
			2854 3987

With reference to your application dated 05 / 10 / 2012 for registration as a Waste Producer under the Waste Disposal (Chemical Waste) (General) Regulation, the Waste Producer Number, WPN 0|0|1|2-7|5|6-C|3|7|6|0-0|1 is assigned to you in respect of the location or premises listed below:—

前於 2012年 10月 05日 根據廢物處置(化學廢物)(一般)規例而來信,申請登記為廢物產生者,茲特配予廢物產生者編號第 0|0|1|2-7|5|6-C|3|7|6|0-0|1 號,予下開地點或樓宇: —

Location or Premises where the waste is produced 產生廢物的地點或樓宇	<b>Name of Establishment</b> 機 構 名 稱 :	Customs and Excise Department
	<b>Business Reg. Cert. No. (if any)</b> 商 業 登 記 證 號 碼:(如有者)	---
	<b>Nature of Business</b> 業 務 性 質 :	--
	<b>Major chemical waste types</b> 主 要 化 學 廢 物 種 類 :	Spent battery
	<b>Address</b> 地 址:	39 Hang Tai Road, Tai Shui Hang, Shatin, N.T.
	<b>Tel. No.</b> 電 話 :	2647 1895
		2707 4026
<b>Contact Person (Full Name)</b> 聯 絡 人:(全 名)	Mr. LAI Mau-yee	<b>(Capacity)</b> (職 位)
		Supplies Supervisor I



  
**(CHENG Hing-wai, Henry)**  
 for Director of Environmental Protection  
 環境保護署署長 (鄭慶偉 代行)

**Date**  
 日期 9 / 10 / 2012

**WARNING :** Any registered waste producer who fails to inform the Director of Environmental Protection of any change in his registration particulars commits an offence and is liable on conviction to a fine of \$10,000.  
**警 告 :** 任何已登記的廢物產生者,若其登記資料有任何改變而不知會環境保護署署長,即屬違法,被定罪者最高罰款港幣10,000元。

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. : (229) in FSD GR 6-5/4 R Pt. 16  
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

26 September 2017

Environmental Resources Management  
16/F, DCH Commercial Centre,  
25 Westlands Road,  
Quarry Bay, Hong Kong.  
**(Attn: Mr. Anthony HO, Assistant Consultant)**

Dear Mr. HO,

**Custom and Excise Department Shatin Vehicle Detention Centre  
at Hang Tai Road, Shatin  
Request for Information of Dangerous Goods & Incident Records**

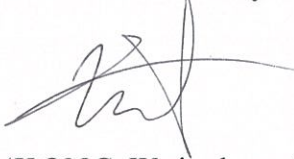
I refer to your email of 31.8.2017 regarding the captioned request and reply below in response to your questions:-

Please be advised that neither records of dangerous goods license, fire incidents nor incidents of spillage / leakage of dangerous goods were found in connection with the given conditions of your request at the subject location.

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

Yours sincerely,

Receipt Chop	
To:	ATH
Received by:	
Date:	-6 OCT 2017
Login Ref.:	119-222
GMS No:	
Action taken:	

  
(KONG Wai-chung)  
for Director of Fire Services



## Anthony Ho

---

**From:** gary\_cc\_wong@customs.gov.hk  
**Sent:** Friday, December 15, 2017 9:28 AM  
**To:** Anthony Ho  
**Cc:** Angus Choi  
**Subject:** Spillage Incident of Motor Spirit Transfer in Shatin Vehicle Detention Centre

Dear Anthony,

Regarding the following transfers of motor spirit (from metal drums to dangerous goods vehicle) carried out in the Shatin Vehicle Detention Centre, there is no record of any spillage incident.

Dates of Transfer of Motor Spirit
13/10/2008
27/10/2008
24/11/2008
23/02/2009
17/08/2009
23/11/2009
21/12/2009
1/2/2010
30/8/2010
18/4/2011
9/1/2012
6/8/2012
25/2/2013
24/2/2014
15/6/2015

Regards,

Gary WONG  
Supplies Officer (Seizure Management)  
Supplies Section  
Customs and Excise Department  
Tel: 3759 3941 Fax: 2854 3987

Disclaimers:

---

This e-mail message (together with any attachments) is for the designated recipient only. It may contain information that is privileged for the designated recipient. If you are not the intended recipient, you are hereby notified that any use retention, disclosure, copying, printing, forwarding or dissemination of the message is strictly prohibited. If you have received the message in error, please erase all copies of the message (including attachments) from your system and notify the sender immediately.

Annex F

## Previous Site Investigation Record



**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **BH2**  
 SHEET **1** of **4**

**DRILLHOLE RECORD**

CONTRACT NO. **GE/98/13**

PROJECT **Agreement No. CE 73/97, Investigation Study for Widening of Tate's Cairn Highway between Shek Mun Interchange and T6 Interchange, Ground Investigation**

METHOD **Rotary** CO-ORDINATES **E 840083.86** Works Order No. **GE/98/13.3**

MACHINE & No. **LONGYEAR, DR95** N **829135.56** DATE from **17/04/1999** to **21/04/1999**

FLUSHING MEDIUM **Water** ORIENTATION **Vertical** GROUND LEVEL **6.55 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description		
17/04/1999	PX							1		0.00	[Cross-hatched pattern]		Brown (7.5YR 5/4), silty fine to coarse SAND with some angular fine to medium gravel sized rock fragments. (FILL)		
							2		0.50						
							3		1.00						
							4		1.50						
17/04/1999 19/04/1999		Dry at 18:00 Dry at 08:00	86					5	4.15	2.40			Greyish pink (7.5YR 7/2) and brown, sandy angular COBBLE with some angular medium to coarse gravel sized rock fragments. (FILL)		
			84					6		3.00					
	PX 4.00 HX		80					7		3.50			Firm, brown (7.5YR 5/4) dappled dark grey, sandy SILT/CLAY with occasional angular fine gravel sized rock fragments. (FILL)		
								8	2.55	4.00					
			83				2.2 1.3, 3.2 N=9	9		4.45					
								10		5.00					
			85				2.1 2.2, 2.2 N=7	11		6.10			Light grey (7/N), sandy angular COBBLE sized concrete and rock fragments. (FILL)		
								12		6.55					
			54				2.2 3.2, 2.3 N=10	13		7.00					
		1.05m at 18:00	33					14	-2.40	8.95					
19/04/1999										8.60					
										9.60					
										10.00					
										3.45					

- SMALL DISTURBED SAMPLE
- LARGE DISTURBED SAMPLE
- SPT LINER SAMPLE
- U78 UNDISTURBED SAMPLE
- U100 UNDISTURBED SAMPLE
- MAZIER SAMPLE
- PISTON SAMPLE
- WATER SAMPLE
- PIEZOMETER TIP
- STANDPIPE
- STANDARD PENETRATION TEST
- PERMEABILITY TEST
- IMPRESSION PACKER TEST
- IN-SITU VANE SHEAR TEST
- PACKER TEST

LOGGED **K.M. To K.M. To**  
 DATE **22/04/1999**  
 CHECKED **Tom Lo**  
 DATE **23/03/1999**

REMARKS





**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **BH2**

SHEET **2** of **4**

**DRILLHOLE RECORD**

CONTRACT NO. **GE/98/13**

PROJECT **Agreement No. CE 73/97, Investigation Study for Widening of Tate's Cairn Highway between Shek Mun Interchange and T6 Interchange, Ground Investigation**

METHOD	Rotary	CO-ORDINATES	Works Order No.
MACHINE & No.	LONGYEAR, DR95	E 840083.86 N 829135.56	GE/98/13.3
FLUSHING MEDIUM	Water	ORIENTATION	DATE from 17/04/1999 to 21/04/1999
		Vertical	GROUND LEVEL 6.55 mPD

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
2004/1999	HX	3.07m 08:00						15		10.00			Stiff, reddish brown (5YR 5/4), sandy SILT/CLAY with occasional angular fine to coarse gravel sized rock fragments. (FILL)
			60					16		10.45			
			85					17		11.00			Very stiff, yellowish brown (10YR 5/6), sandy SILT/CLAY with occasional angular fine gravel sized quartz fragments. (ALLUVIUM)
								18	-5.55	12.10			
			90					19					Medium dense, yellowish red (5YR 5/8), silty/clayey fine to coarse SAND with some angular fine gravel sized quartz fragments. (ALLUVIUM)
								20		13.20			
			100					21		13.65			Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								22	-7.55	14.10			
								23					Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								24		15.20			
								25		15.65			Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								26		16.10			
			100					27	-9.55	17.20			Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								28		17.65			
								29		18.10			Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								30		19.20			
								31		19.65			Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								32					
								33					Extremely weak, reddish yellow (7.5YR 7/6) mottled white, completely decomposed, medium grained GRANITE. (Firm to very stiff, sandy SILT)
								34					

- 1 SMALL DISTURBED SAMPLE
- 2 LARGE DISTURBED SAMPLE
- 3 SPT LINER SAMPLE
- 4 U76 UNDISTURBED SAMPLE
- 5 U100 UNDISTURBED SAMPLE
- 6 MAZIER SAMPLE
- 7 PISTON SAMPLE
- 8 WATER SAMPLE
- 9 PIEZOMETER TIP
- 10 STANDPIPE
- 11 STANDARD PENETRATION TEST
- 12 PERMEABILITY TEST
- 13 IMPRESSION PACKER TEST
- 14 IN-SITU VANE SHEAR TEST
- 15 PACKER TEST

LOGGED **K.M. To K.M. To**

DATE **22/04/1999**

CHECKED **Tom Lo**

DATE **23/03/1999**

REMARKS

JCRIC





**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **BH2**  
 SHEET **3** of **4**

**DRILLHOLE RECORD**

CONTRACT NO. **GE/98/13**

PROJECT **Agreement No. CE 73/97, Investigation Study for Widening of Tate's Cairn Highway between Shek Mun Interchange and T6 Interchange, Ground Investigation**

METHOD	<b>Rotary</b>	CO-ORDINATES	Works Order No.	<b>GE/98/13.3</b>	
MACHINE & No.	<b>LONGYEAR, DR95</b>	<b>E 840083.86</b> <b>N 829135.56</b>	DATE from	<b>17/04/1999 to 21/04/1999</b>	
FLUSHING MEDIUM	<b>Water</b>	ORIENTATION	<b>Vertical</b>	GROUND LEVEL	<b>6.55 mPD</b>

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
	HX		100					35		20.00 20.10			See sheet 2 of 4 for details.
							3.3 8, 12, 13, 16 N=48	36 37		21.20 21.65			
			100					39		22.10			
							7.8 13, 17, 21, 29 N=80	40 41		23.20 23.65			
	HX 23.70		100	85	72	8.0		42	-17.15	23.70		III	Moderately strong, pinkish brown, moderately decomposed, medium grained GRANITE with some small voids along core of maximum size 5mm x 7mm. Joints are closely to medium spaced, rough planar and stepped, extremely narrow to very narrow, stained by iron and manganese oxide, dipping at 10° to 20°, 30° to 40° and 40° to 50°.
			99	89	65					24.90			
		1.55m at 18:00				NI			-19.66	26.21		IV/III	Weak to moderately weak, pinkish brown, highly to moderately decomposed, medium grained GRANITE.
20/04/1999 21/04/1999		3.89m at 08:00				NR			-20.30	26.85		V/IV	Joints are closely spaced, locally very closely spaced, rough planar and stepped, very narrow to narrow, stained by iron and manganese oxide, dipping at 30° to 40° and 50° to 60°.
						4.7			-20.65	27.20		IV/III	From 26.85m to 27.20m : No core recovered, assumed to be completely to highly decomposed granite.
			83	38	13	>20				27.97		IV	From 28.05m to 28.28m : Weak and highly decomposed.
						NR			-21.73	28.28		V/IV	From 28.28m to 28.58m : No core recovered, assumed to be completely to highly decomposed granite.
			50	17	17	16.2			-22.03	28.58		IV/III	From 28.77m to 29.05m : Weak and highly decomposed.
						NI			-22.50	29.05		IV	From 29.05m to 29.55m : No core recovered, assumed to be completely to highly decomposed granite.
						NR			-23.00	29.55		V/IV	
			83	63	29	3.9				29.77		IV/III	

1 SMALL DISTURBED SAMPLE	△ WATER SAMPLE	LOGGED	<u>K.M. To K.M. To</u>
↓ LARGE DISTURBED SAMPLE	▲ PIEZOMETER TIP	DATE	<u>22/04/1999</u>
□ SPT LINER SAMPLE	○ STANDPIPE	CHECKED	<u>Tom Lo</u>
▨ U78 UNDISTURBED SAMPLE	⊥ STANDARD PENETRATION TEST	DATE	<u>23/03/1999</u>
▩ U100 UNDISTURBED SAMPLE	⊥ PERMEABILITY TEST		
▧ MAZIER SAMPLE	⊥ IMPRESSION PACKER TEST		
▨ PISTON SAMPLE	⊥ IN-SITU VANE SHEAR TEST		
	⊥ PACKER TEST		

REMARKS





**GEOTECHNICS & CONCRETE ENGG. (H.K.) LTD.**  
**GROUND INVESTIGATION DEPARTMENT**

HOLE NO. **BH2**  
 SHEET **4** of **4**

**DRILLHOLE RECORD**

CONTRACT NO. **GE/98/13**

PROJECT **Agreement No. CE 73/97, Investigation Study for Widening of Tate's Cairn Highway between Shek Mun Interchange and T6 Interchange, Ground Investigation**

METHOD **Rotary** CO-ORDINATES **E 840083.86** Works Order No. **GE/98/13.3**

MACHINE & No. **LONGYEAR, DR95** N **829135.56** DATE from **17/04/1999** to **21/04/1999**

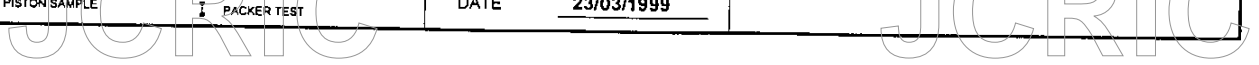
FLUSHING MEDIUM **Water** ORIENTATION **Vertical** GROUND LEVEL **6.55 mPD**

Drilling Progress	Casing size	Water level (m) & Time	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Description
						NR			-23.51	30.06		V/IV	From 30.06m to 30.39m : No core recovered, assumed to be completely to highly decomposed granite.
					9.8				-23.84	30.39		IV/III	
			81	33	12	NR			-24.25	30.67		V/IV	From 30.80m to 31.00m : No core recovered, assumed to be completely to highly decomposed granite.
					>20				-24.45	31.00		IV/III	
					12.9				-24.90	31.45		III/II	Moderately strong to strong, greyish pink, locally pinkish brown, moderately to slightly decomposed, medium grained GRANITE. Joints are closely to medium spaced, rough planar and stepped, occasionally rough undulating, extremely narrow to very narrow, stained by iron and manganese oxide, chlorite infilled, dipping at 10° to 20°, 20° to 30° and 30° to 40°, occasionally 60° to 70°.
			100	100	60					31.70			
			100	96	80	3.5				32.30			
					9.7					33.70			
			100	93	67					35.10			
					7.9					36.40			
		2.48m at 18:00	100	98	92	2.9				37.40			Hole completed at 37.40m.
		21/04/1999			88	52			-30.85	37.40			

- 1 SMALL DISTURBED SAMPLE
- 2 LARGE DISTURBED SAMPLE
- 3 SPT LINER SAMPLE
- 4 U76 UNDISTURBED SAMPLE
- 5 U100 UNDISTURBED SAMPLE
- 6 MAZIER SAMPLE
- 7 PISTON SAMPLE
- 8 WATER SAMPLE
- 9 PIEZOMETER TIP
- 10 STANDPIPE
- 11 STANDARD PENETRATION TEST
- 12 PERMEABILITY TEST
- 13 IMPRESSION PACKER TEST
- 14 IN-SITU VANE SHEAR TEST
- 15 PACKER TEST

LOGGED **K.M. To K.M. To**  
 DATE **22/04/1999**  
 CHECKED **Tom Lo**  
 DATE **23/03/1999**

REMARKS





CIVIL ENGINEERING DEPARTMENT GEOTECHNICAL ENGINEERING OFFICE  
GROUND INVESTIGATION - HOUSCOM (Term Contract)  
GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

CONTRACT NO. GE/98/13

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

DEPTH: 0.00 m. TO 9.60

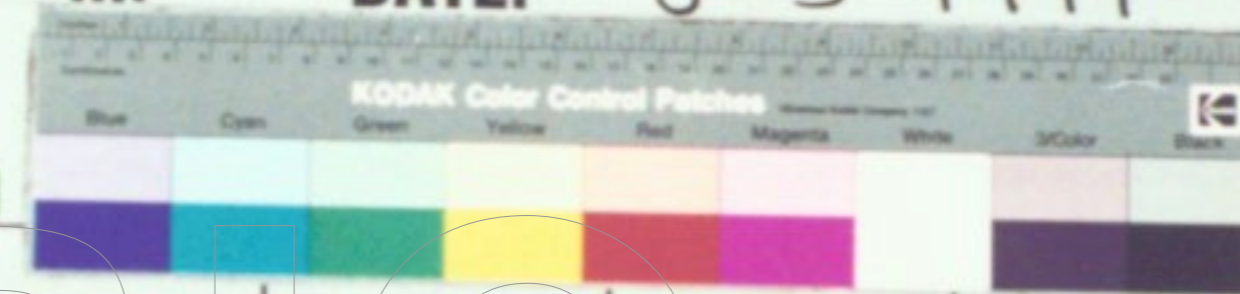
m. DATE: 8-5-1999

BOX 1 OF 6

0m

0.5m

1m





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CONTRACT NO. GE/98/13

GROUND INVESTIGATION - HOUSCOM (Term Contract)

GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

DEPTH: 9.60 m. TO 25.53 m.

DATE: 8-5-1999

BOX 2 OF 6



9.60 m

10.00

23.70 m

24.90

(25.53)



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GROUND INVESTIGATION - HOUSCOM (Term Contract)  
GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

CONTRACT NO. GE/98/13

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

DEPTH: 25.53 m. TO 29.55

m. DATE: 8-5-1999

BOX 3 OF 6

0m

0.5m



1m





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CONTRACT NO. GE/98/13

GROUND INVESTIGATION - HOUSCOM (Term Contract)

GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

DEPTH: 29.55 m. TO 32.30 m.

DATE: 8-5-1999

BOX 4 OF 6

0m

0.5m

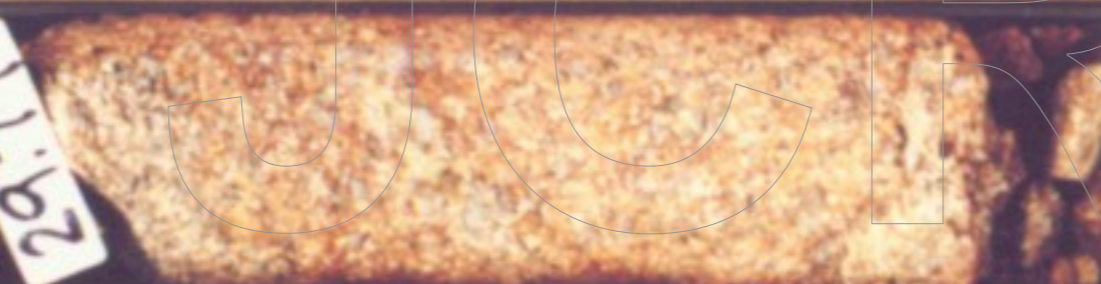
1m



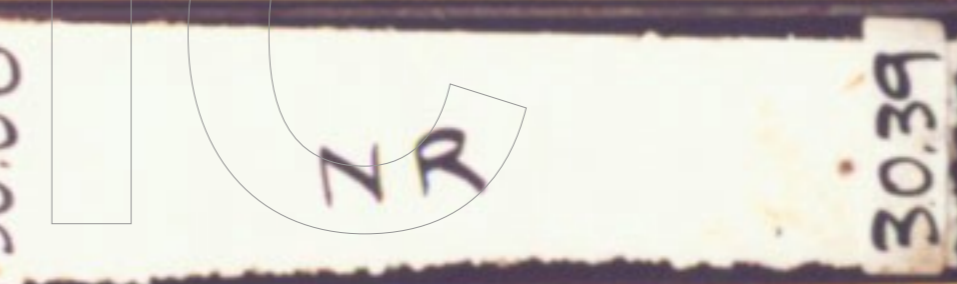
(29.55)



29.77



30.06



30.39



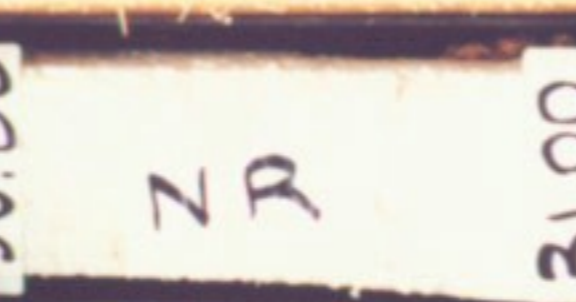
ZR



30.67



30.80



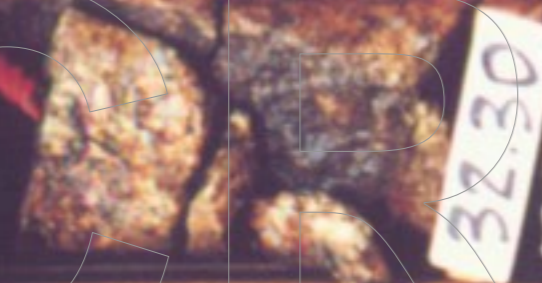
31.00



ZR



31.70



32.30





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GROUND INVESTIGATION - HOUSCOM (Term Contract)  
GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

CONTRACT NO. GE/98/13

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

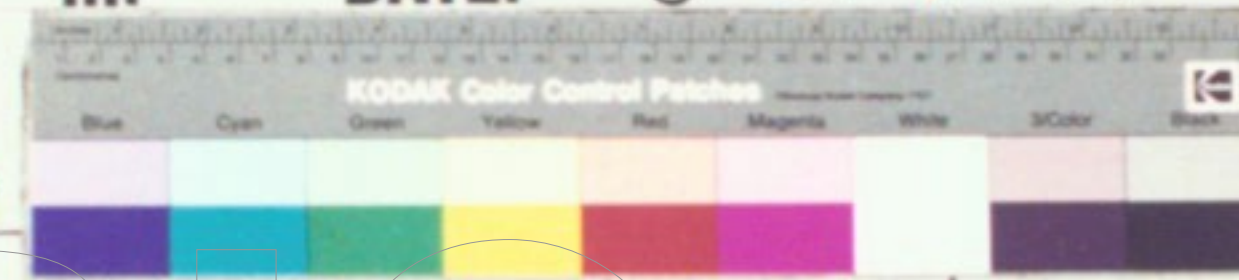
DEPTH: 32.30 m. TO 35.59 m.

DATE: 8-5-1999

BOX 5 OF 6

0m

0.5m



1m

32.30



33.70



35.10



(35.59)



CIVIL ENGINEERING DEPARTMENT GEOTECHNICAL ENGINEERING OFFICE  
GROUND INVESTIGATION - HOUSCOM (Term Contract)  
GEOTECHNICS & CONCRETE ENGG. (HK) LTD.

CONTRACT NO. GE/98/13

SITE: Investigation Study for Widening of Tate's Cairn HWY between Shek Mun & T6 Interchanges

WORKS ORDER NO.: GE/98/13.3

HOLE NO: BH 2

DEPTH: 35.59 m. TO 37.40 m.

DATE: 8-5-1999

BOX 6 OF 6

0m

0.5m

1m



(35.59)



36.40



37.40  
END









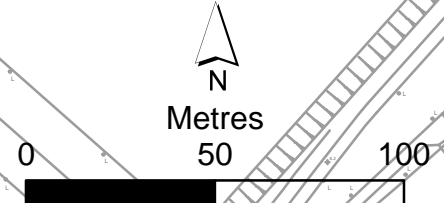
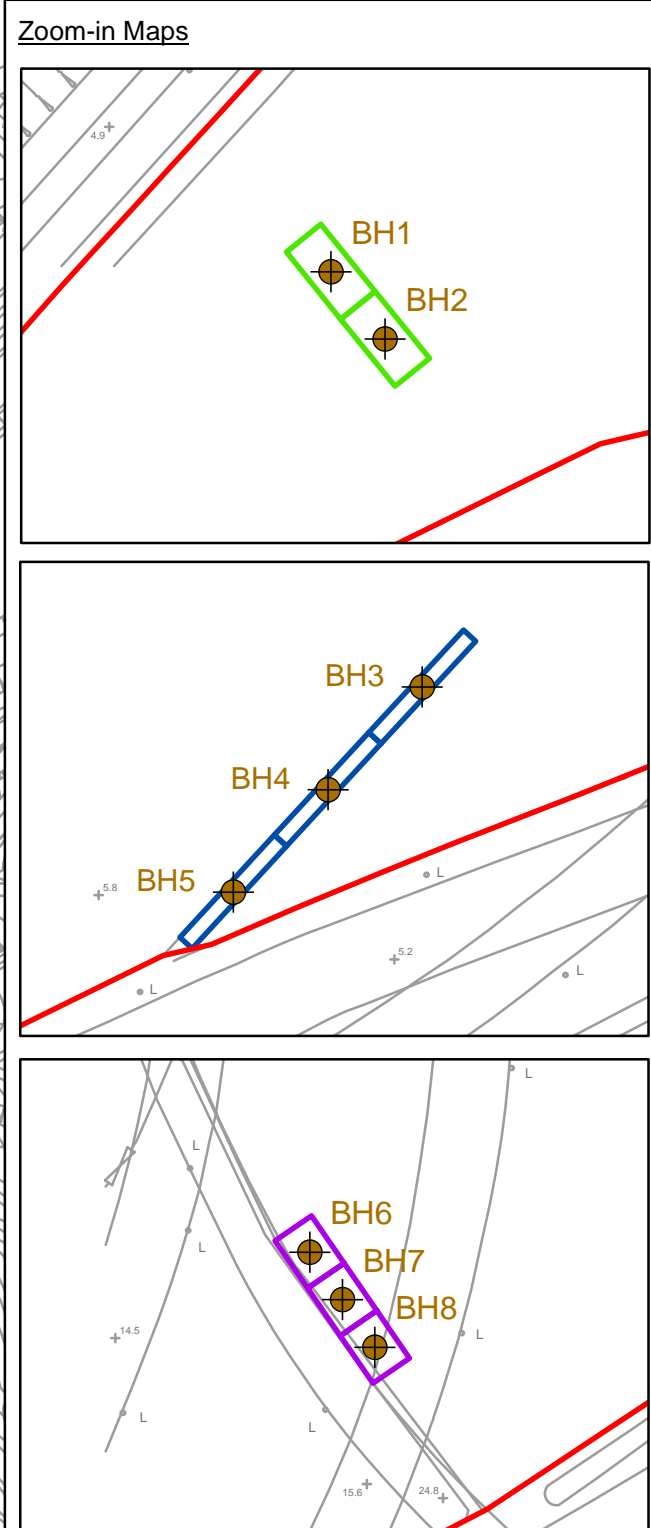
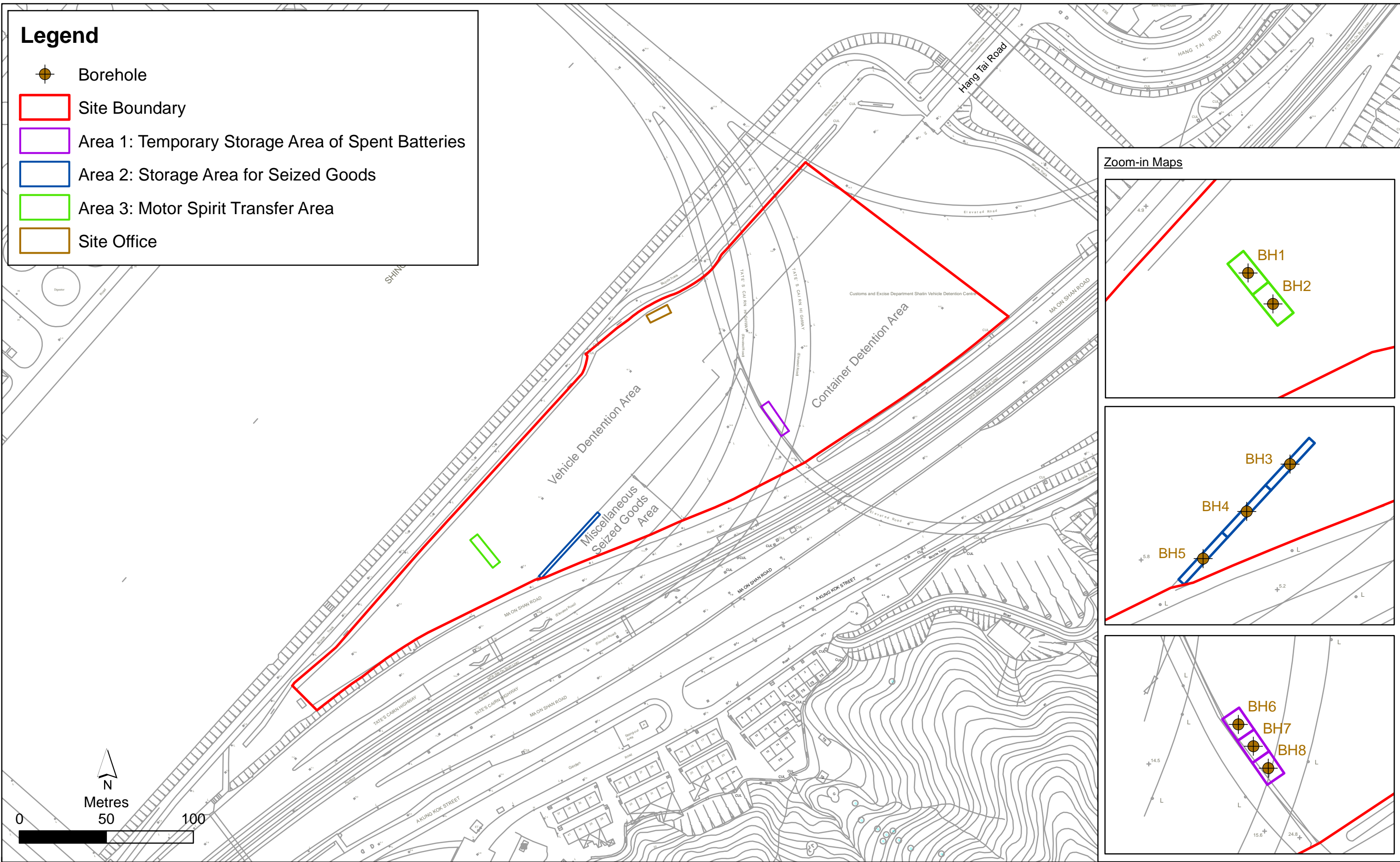


Annex G

## Potentially Contaminated Areas and Sampling Locations Plan

# Legend

-  Borehole
-  Site Boundary
-  Area 1: Temporary Storage Area of Spent Batteries
-  Area 2: Storage Area for Seized Goods
-  Area 3: Motor Spirit Transfer Area
-  Site Office



Annex G

## Potentially Contaminated Areas and Sampling Location Plan

File: T:\GIS\CONTRACT\0422666\mxd\0422666\_Potential\_Contaminated\_Area\_nofill.mxd  
Date: 8/12/2017

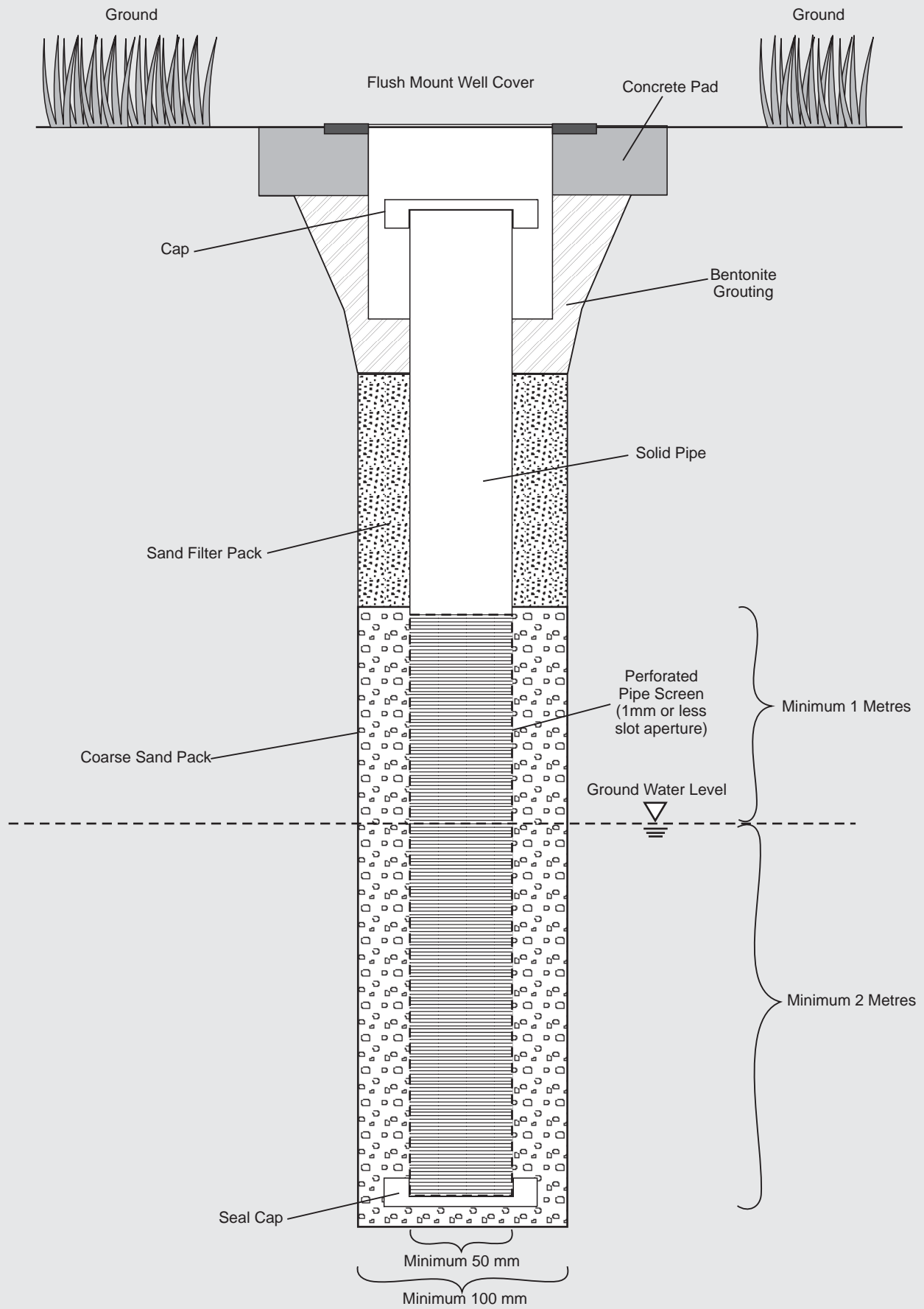
**Environmental  
Resources  
Management**





Annex H

## Schematic Drawing of Groundwater Monitoring Well



Annex I

## 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 <sub>sat</sub> ) (mg/kg)
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Parks (mg/kg)	
<b>VOCs</b>					
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
<b>SVOCs</b>					
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	
<b>Metals</b>					
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*	
<b>Dioxins / PCBs</b>					
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	
<b>Petroleum Carbon Ranges</b>					
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
<b>Other Inorganic Compounds</b>					
Cyanide, free	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
<b>Organometallics</b>					
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<sub>sat</sub> 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)	
<b>VOCs</b>				
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
<b>SVOCs</b>				
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
<b>Metals</b>				
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				
<b>Dioxins / PCBs</b>				
Dioxins (I-TEQ)				
PCBs	4.33E-01	1.71E-01	5.11E+00	3.10E-02
<b>Petroleum Carbon Ranges</b>				
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
<b>Other Inorganic Compounds</b>				
Cyanide, free				
<b>Organometallics</b>				
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.