# *Appendix 10.1*

## *Approved Contamination Assessment Plan (CAP) for the Hong Kong Aviation Club*

土木工程拓展署
CEDD **Civil Engineering and Development Department**
**Kowloon Development Office**

Agreement No. CE 35/2006 (CE)

# Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction

Contamination Assessment Plan (CAP)
For Hong Kong Aviation Club (Rev.2)

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Reviewed: Peter Lee 11/02/08

Approved for Issue: Igor Ho 11/02/08

**MAUNSELL CONSULTANTS ASIA LTD**

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study**
**cum Design and Construction of Advance Works**
**– Investigation, Design and Construction**

# CONTAMINATION ASSESSMENT PLAN FOR HONG KONG AVIAITON CLUB (REV.2)

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# 1 INTRODUCTION

## 1.1 Background

1.1.1 The former Kai Tak Airport started its operation since 1920s and was replaced by the new airport at Chek Lap Kok in 1998. The airport site was located at south east Kowloon and comprised of the north and south aprons and the runway areas extending into the Kowloon Bay. The former Kai Tak Airport covered a total land area of about 260 hectares.

1.1.2 The North Apron area of the former Kai Tak Airport had been assessed for land contamination under the Agreement No. CE 86/97 South East Kowloon Development at Kai Tak Airport – Design and Construction for Decontamination and Site Preparation and were cleaned up from 1998 to 2002, except the areas affected by the occupied ex-Passenger Terminal Building and Multi-Storey Car park Building, which are being cleaned up at present.

1.1.3 Land contamination issues for the South Apron area, the Narrow Strip of North Apron area and the Runway area of the former Kai Tak Airport have been assessed under the *Decommissioning of the Former Kai Tak Airport other than the North Apron EIA Study (ESB-160/2006)*.

1.1.4 As shown in **Drawing 1.1**, the area where the Hong Kong Aviation Club (HKAC) premises and an open area for car parking are situated (hereinafter called "Study Area"), is located inside the boundary of the former Kai Tak Airport but had not been included in the previous land contamination studies.

1.1.5 Following the *EIA Study Brief for Kai Tak Development (ESB-152/2006)*, this Contamination Assessment Plan (CAP) is specifically prepared to assess the presence and extent of land contamination if any associated with the historical operation of the Study Area.

## 1.2 Objectives

1.2.1 The objectives of this CAP are to (1) present the findings of the desk study and site appraisal to review past and present land use activities that may lead to land contamination, (2) identify potential hotspots of land contamination for intrusive site investigation, and (3) propose a sampling and testing strategy for the site investigation. In addition, in accordance with *Section 3.4.10.4 of the EIA Study Brief for Kai Tak Development (ESB-152/2006)*, this CAP is submitted to seek endorsement from the Environmental Protection Department (EPD).

1.2.2 On endorsement of this CAP, the land contamination investigation and assessment will be undertaken accordingly and a Contamination Assessment Report (CAR) will be prepared based on the site investigation results. Should significant contamination is identified within the Study Area, a Remediation Action Plan (RAP) will be submitted as required in *Section 3.4.10.5 of the EIA Study Brief for Kai Tak Development (ESB-152/2006)*, for formulation of necessary remedial measures.

# 2 ENVIRONMENTAL STANDARDS AND NON-STATUTORY GUIDELINES

2.1.1 Land contamination impact assessment should be conducted in accordance with the "*Guidance Note for Contaminated Land Assessment Remediation*" (the Guidance Note) and "*Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair /Dismantling Workshop*" issued by EPD. In addition, the Risk-based Remediation Goals (RBRGs) stipulated in the "*Guidance Manual for Use of Risk-based Remediation Goals for Contamination Management*" issued by EPD (the Guidance Manual) shall be adopted as the criteria for assessing soil and groundwater contamination.

# 3 LAND CONTAMINATION SITE APPRAISAL

## 3.1 General Site Context

The Study Area covered by this CAP is approximately 20,000 $m^2$ in area. It is located close to the junction of Olympic Avenue, Pak Tai Street and Sung Wong Toi Road. Surrounding environment of the Study Area is mainly used for industrial and residential purpose as shown in **Drawing 3.1**. In general, the Study Area consists of (a) the HKAC premises (HKAC site) and (b) an open area used for car parking (Car Park Area), as depicted in **Drawing 3.2**.

## 3.2 Geology and Hydrogeology

***Site Geology and Superficial Geological Deposits***

3.2.1 The subsurface geology is important as contaminants, especially those associated with petroleum hydrocarbon products such as gasoline, fuels and oils, may enter the soil and groundwater through spills or leaks and migrate through the underground medium for some distances. According to the Hong Kong Geological Survey Map (Series: HGM20) – Sheet No. 11 (1:20,000 Scale) on the solid and superficial geology, the superficial geology of the Study Area was mainly fill materials overlying marine sand. Outcrops of medium grained granite were also found in its proximity. In general, fill materials may have higher permeability and the ability of potential contaminant migration through this horizon is relatively high.

***Review of Previous Ground Investigation Reports***

3.2.2 A review of previous ground investigation (GI) reports undertaken at or in the vicinity of the Study Area (kept in the Civil Engineering and Development Department (CEDD) Geotechnical Information Library) was conducted to obtain available information about the geological and hydrogeological conditions of the Study Area. The GI reports reviewed are as follows:

- *Ground Investigation Report of PWP item No. 93 AA in Category A Additional Works to Pier by Bachy Soletanche Group Hong Kong ( (1993) (CEDD's Geotechnical Information Unit Report No.17334).*
- *Final Field Work Report of Feasibility Study for South East Kowloon Development Rising Main Alignment, Phase 4F Land Ground Investigation by Enpack Hong Kong Limited (1997) (CEDD's Geotechnical Information Unit Report No. 25964).*
- *Final Field Work Report of Feasibility Study for South East Kowloon Development Rising Main Alignment, Phase 3 Ground Investigation by Enpack Hong Kong Limited (1997) (CEDD's Geotechnical Information Unit Report No. 25957).*
- *Ground Investigation Report of Water Supply to South East Kowloon Development, Stage 1 Design and Construction by Geotechnics and Concrete Engineering (Hong Kong) Limited (1999) (CEDD's Geotechnical Information Unit Report No. 30635).*
- *Ground Investigation Report of Drainage Improvement in East Kowloon –Design and Construction by Gold Ram Engineering and Development Limited (2004). (CEDD's Geotechnical Information Unit Report No. 40819).*

3.2.3 With reference to the GI reports, the general geological sequence around the Study Area was fill, marine deposit, alluvium and medium grained granite of varying weathering grades. The immediate top layer of the fill was loose, fine to coarse sand with occasional fine to coarse gravel. The layer of concrete encountered was determined to be around 0.1m to 0.3m.

3.2.4 According to the groundwater levels recorded in some of the reviewed GI reports, the groundwater level varied from +4.0mPD near Fu Cheung Street to +2.5mPD near Sky Tower. The general groundwater flow is likely in a south–easterly direction. It was anticipated that the groundwater level was around 2m to 6m below ground at the Study Area.

## 3.3 Review of Historical Aerial Photographs

3.3.1 A review of historical aerial photographs (**Table 3.1**) covering the Study Area has been undertaken. The aim of this review is to evaluate any land use changes associated with potential contamination implication within the Study Area.

**Table 3.1 Reviewed Historical Aerial Photographs**

| Year | Photograph References | Height (ft) |
|---|---|---|
| 1959 | 0290 | 40,000 |
| 1961 | 0085 | 30,000 |
| 1972 | 1750 | 5,500 |
| 1974 | 8288 | 5,500 |
| 1978 | 24162 | 4,000 |
| 1984 | 53981 | 4,000 |
| 1990 | A23652 | 4,000 |
| 1998 | CN21282 | 4,000 |
| 2000 | CN27501 | 4,000 |
| 2004 | CW60429 | 4,000 |
| 2006 | CW72007 | 4,000 |

*Source of historical aerial photographs: Survey and Mapping Office, Lands Department.*

3.3.2 The findings of the review of historical aerial photographs are summarized as follows:

**Year 1959-2006**

- The earliest aerial photo that is relevant to the Study Area was taken in 1959, in which HKAC building was already noted. Aerial photo taken in 1974 showed two additional buildings found within the area of the HKAC site and the buildings were marked as Aero Club and Flying Club in the topographic map issued in 1975.
- According to the aerial photo taken in 1978, the western part of the HKAC site has been used as a car park. The semi-cylindrical workshop was noted at the north western part of the Flying Club in the 1994 topographic map. Based on the topographic map issued in 2003, the Aero Club and the Flying Club has been merged into one building and was named as Club House.
- As shown in the aerial photos, the Car Park Area was mainly occupied as part of the airport since 1961 and was remained as an open area after the closure of airport in 1998. The Car Park Area was then found to be occupied for car parking purpose in the 2004 aerial photo. No apparent change of the layout of the Study Area was found since then.

3.3.3 In conclusion to the above findings, the HKAC site had been constructed for more than 30 years while the Car Park Area has been occupied for car parking purpose for around 3 years. No significant changes of Study Area layout were observed since 2004.

## 3.4 Acquisition of Relevant Information from Government Departments

***Environmental Protection Department (EPD)***

3.4.1 Inquiry letter has been sent to EPD to acquire information about the registered Chemical Waste Producer(s) and records of accidents of spillage/leakage of chemical within the Study Area.

3.4.2 According to the information provided by EPD, there has been 1 registered chemical waste producer within the HKAC site. The major chemical waste concerned was the spent

lubricating oil. No spillage or leakage of chemicals has been reported in the Study Area. A copy of EPD's letter is provided in **Appendix A**.

***Fire Services Department (FSD)***

3.4.3 Inquiry letters have also been sent to FSD to acquire information about (1) the current and past registration of dangerous goods (D.G.) stored within the Study Area and (2) records of accidents of spillage/leakage of chemical and (3) the layout plans of registered D.G. storage recorded within the Study Area.

3.4.4 According to the information provided by FSD on 31 August 2007, a total of two D.G. licences were recorded for the HKAC site. The first D.G. licence was issued on 27 December 1969 and cancelled on 27 March 1972 for Category 5 D.G. storage (184 gallons of aviation fuel). The second D.G. license was issued on 22 May 1978 and cancelled on 11 January 1999 for storage of Category 5 D.G. (13,650 litres of aviation gasoline stored in an underground tank). No record of spillage / leakage has been reported within the Study Area.

3.4.5 Since no information for the location of the registered D.G. storage could be acquired from the site owner or observed during the site inspection, a further inquiry letter for the layout plans of registered D.G storage recorded within the HKAC site has been sent to FSD. Based on the drawing (Drawing No. S695C/94) showed by FSD on 8 November 2007, the location of underground tank with 13,650 litres of aviation gasoline was identified. However, no information has been provided about the location where 184 gallons of aviation fuel were stored. Copies of FSD's letters are provided in **Appendix B**.

***Building Department***

3.4.6 Inquiry letter has also been sent to Building Department (BD) to acquire the layout plan of the HKAC site.

3.4.7 2 sets of HKAC Site layout plan, dated 1966 and 1970, were received on 20 September 2007. A copy of the layout plans is provided in **Appendix C**. According to the site layout plans provided by BD, the HKAC site was mainly composed of the Far East Flying Training School in 1966 while an additional Aero Club House was found in 1970. A proposed Hong Kong Flying Club Building was also shown in the site layout plan dated 1970. During site inspections, the general layout of the HKAC site was found to be different from the layout plan provided by BD. Based on the review of aerial photo and topographic map, the club house and the Hong Kong Flying Club Building has been merged to become the Bistro. In addition, a new semi-cylindrical structure was found at the north west of the ex-Far East Flying Training School.

3.4.8 Due to the discrepancies between the layout plan provided by BD and the current site layout, the land contamination assessment would be mainly based on the site observation while the layout plan provided by BD would act as a reference of historical information review.

## 3.5 Site Inspection and Interview

3.5.1 In general, the Study Area is approximately 20,000 $m^2$ in area comprising of the HKAC site and the Car Park Area. A questionnaire has been sent to the current land user to collect background information as far as possible. Completed questionnaire from the current land user of the HKAC site was received on 30 April 2007 and is provided in **Appendix D**.

3.5.2 According to information provided in the questionnaire, the HKAC site has been established since the 1920s for membership activities and helicopter flying. As stated in the questionnaire, lubricating oils, hydraulic fluids and cleansing solvents had been used, stored or generated within the HKAC site. From the questionnaire, lubricating oils and hydraulic fluids were reported to be disposed of through a licensed chemical waste collector while cleansing solvents were recited as being discharged to foul sewer in liquid form. No spillage

and leakage of chemicals handled was reported in the questionnaire. In addition, no violation of environmental regulations and public complaints were noted.

3.5.3 In order to identify any contamination hotspots within the HKAC site, site inspection in company with HKAC site representatives was conducted on 21 September 2007. Since some areas within the HKAC site were not accessible during the first visit, three additional site inspections were undertaken on 3 October, 21 October and 5 December 2007.

3.5.4 During the site inspections, all accessible areas were inspected as far as practicable, and the HKAC site representatives were interviewed to collect information about the present and historical activities undertaken within the HKAC site. Photo-documentation was also undertaken at both the HKAC site and Car Park Area when possible and is provided in **Appendix E**. Findings of the site inspections are summarised as follows:

Hong Kong Aviation Club Site

3.5.5 The HKAC site is approximately 11,000 $m^2$ in area. According to the site personnel, the HKAC site mainly consisted of 3 main buildings, including (1) a semi-cylindrical shaped workshop, (2) the ex-Far East Flying Training School and (3) a bistro. In addition, a car park and an apron area were also found within the HKAC site. The general layout of the HKAC site is shown in **Drawing 3.2**.

*Semi-cylindrical workshop*

*3.5.6* The semi-cylindrical workshop was located on the south western portion of the HKAC site. According to the site personnel, the workshop had been used for storing modules of planes / helicopter and equipment for maintenance. During the site inspection, the workshop was found to be well paved with concrete and no apparent stains were observed. It was thus envisaged that the workshop area is unlikely to have potential land contamination issues. Hence, no site investigation was proposed in this area.

*Ex- Far East Flying Training School*

3.5.7 The ex-Far East Flying Training School was found to the east of the semi-cylindrical workshop. As reported from the HKAC site representatives, the ex-training school was comprised of a hangar, some small-scale mechanical workshops and an office. According to the site staff, the hangar was mainly used for parking and maintenance of planes / helicopters. During the site inspection, a drip tray was placed underneath the helicopter to collect any leaked fuel during maintenance. The ground of the hangar was found to be well paved with concrete with no apparent stains. Based on these inspection findings, the maintenance area of the hanger was unlikely to have potential land contamination issues and no site investigation is proposed in this area.

3.5.8 A chemical storage area was found near the gate of the hangar. As observed, several plastic containers were stored within this chemical storage area. As indicated by the site representative, aeroshell oil, bleach and lubricating oil were stored within these plastic containers. The site representative also revealed that these chemical wastes were generally collected by a licensed chemical waste collector. As observed, those plastic containers were well lidded but no secondary containment or drip tray was found underneath the containers. Based on the findings from the site inspections, it is possible that spillage of chemicals might occurred within the chemical storage area. As a result, this area is considered likely to have potential land contamination and 1 borehole is thus proposed.

*Bistro*

*3.5.9* For the Bistro located on the south-eastern portion of the HKAC site, it was mainly composed of a restaurant and a bar. Oil interceptor was observed at every sink in the kitchen during the site inspection. According to the site representatives, the oil interceptors were cleaned up every day. No signs of contamination stain were observed during the site

inspection. As there is no evidence of chemical leakages/spillages, no site investigation was proposed in this area.

*Car park*

3.5.10 A car park was found near the entrance of the HKAC site. As stated by the site representatives, the car park was reserved for members only. During the site inspections, no chemical storage area or stains were found in the car park area and hence, no site investigation was proposed in this area.

*Apron Area*

3.5.11 Apron area was found on the northern portion of the HKAC site. According to the site representative, the apron area was used for plane/helicopters parking, landing and fuelling. During the site inspections, around 11 drums of 200L containers were observed near the gate of the hangar. As reported from the site representative, these containers were used for storing AVGAS and Diesel Engine Oil. Since all the drums were found to be well lidded and placed in a designated area, sitting on thick concrete slab or wooden blocks with no apparent stains, site investigation was not proposed in this area.

3.5.12 According to the previous CAP prepared under *Agreement No. CE 42/2000(CE) South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport* which was approved on 28 June 2003, an underground fuel tank (with grass cover) was identified within the HKAC site. A fuel injection facility at about 10 metres away from the underground tank was also identified. A total of 6 sampling locations were proposed in the approved CAP for the confirmatory land contamination site investigation within the HKAC site. The layout plan of the underground tank within Hong Kong Aviation Club with the proposed sampling locations, extracted from the approved CAP prepared under *Agreement No. CE 42/2000(CE),* is provided in **Appendix F**.

3.5.13 Since the layout of the HKAC site on the layout plan extracted from the previous CAP is different from the actual layout observed during the site inspections, the site inspection conducted on 21 October 2007 could only identify the location of the fuel injection facility, including a disused filling point and a flow meter. As observed, the filling point was installed in a metallic secondary containment and the flow meter was situated in a wooden cabinet. A concrete bund surrounding both facilities was also identified during the site inspection. According to the site personnel, both filling point and flow meter were abandoned. No apparent stains were found around the bund area during the site inspection.

3.5.14 Another site investigation was carried out on 5 December after the acquisition of the drawing from FSD, showing the details of the underground fuel tank and the associated fuel pipeline. During the site visit, the underground tank was found at the south-eastern part of the HKAC site with a pump set and a tank ventilation pipe located next to it. The pump set was found to be situated in a metallic cabinet. All these facilities were surrounded by grass and no apparent stains were noted during the inspection. As reported by the site personnel, the underground tank and the pumpset were abandoned. The location of the underground tank is depicted in **Drawing 3.2.**

3.5.15 No information on the alignment of the underground fuel pipeline was obtainable during the site visits. With reference to the FSD's drawing, the fuel pipeline consisted of a filling pipe and a delivery pipe connecting the underground tank, filling point, pump set and flowmeter together. The alignment of the pipes is depicted in **Drawing 3.2.**

3.5.16 As there is a potential of chemical leakage from the underground tank and its associated fuel pipelines in the apron area, 6 sampling locations were therefore proposed. The locations were proposed based on the site observation and the rationale suggested in the previously approved CAP prepared under *Agreement No. CE 42/2000(CE)*. It should be noted that, the sampling locations are proposed along the pipelines, the alignment of the pipelines shall be identified as far as practical during the site investigation. If the

underground fuel pipelines are found to be no longer existing during the site investigation, borehole locations proposed in this CAP for the fuel pipelines are still recommended in order to assess the potential land contamination resulted from the potential historical leakage from the pipelines.

3.5.17 Together with the one borehole proposed for the chemical storage area located at the hangar. A total of 7 boreholes were proposed for the HKAC site to assess the potential extent of contamination. The locations of the proposed boreholes are illustrated in **Drawing 3.3**.

Car Park Area

3.5.18 The Car Park Area is approximately 9,000m$^2$ in area. During the site inspection conducted on 21 September 2007, it was found to be mainly used as a car park. No apparent contamination stains were observed within the site. It was a buffer area of the runway during the operation of the former Kai Tak Airport.

3.5.19 With reference to the North Apron Decommissioning EIA (AEIAR_002/1998 and EP-0074/1998) approved on 4 September 1998, a total of 3 soil gas monitoring probes and 2 soil/groundwater sampling locations were assigned within the Car Park Area during the phase 1 and phase 2 works of the Kai Tak Airport Contamination Assessment respectively (Figure 5.1 and 5.2 of the approved North Apron Decommissioning EIA report were extracted and attached in **Appendix G** for reference). Total volatile organic compounds (VOCs), methane, carbon dioxide and oxygen were measured at the installed soil gas monitoring probes for soil gas monitoring, while soil and groundwater samples were collected for chemical analysis to confirm the extent and nature of contamination. The analysis results of the soil gas monitoring and soil/groundwater sampling indicated no contamination was found in these monitoring/sampling locations.

3.5.20 As the Car Park Area is still under operation after the approval of the North Apron Decommissioning EIA Study, 3 boreholes are proposed within the Car Park Area to demonstrate that there is no contamination due to leakage/spillage since last site investigation conducted under the North Apron Decommissioning EIA. The locations of the previous soil gas monitoring probes and soil/groundwater sampling together with 3 proposed boreholes within the Car Park Area are shown in **Drawing 3.3.**

## 3.6 Potential Land Contamination Impacts

3.6.1 As discussed in the above sections, potential sources of land contamination within the Study Area would be aroused from the chemical storage area, the underground fuel storage tank, filling point and associated pipelines primarily in association with the HKAC activities. There are also land contamination concerns in the Car Park Area due to the continuous operation of car parking. Typical contaminants associated with these activities are summarized in **Table 3.2** below.

**Table 3.2 Potential Contaminants Associated with Historical/Current Land Uses**

| Uses | Potential Site Contaminants | Remarks |
|---|---|---|
| Chemical storage area | Aeroshell oil, bleach and lubricating oil | • Localized spillages |
| Underground fuel storage tank | Aviation gasoline | • Spillages during refueling/fueling process<br>• Potential tank leakage |
| Filling point | Aviation gasoline | • Spillages during refueling/fueling process |
| Underground pipelines | Aviation gasoline | • Potential pipe leakage |
| Car Park Area | Diesel, engine oil | • Localized spillages |

3.6.2 A description of general hazardous properties of typical compounds which may have been used or stored in the potential contaminated areas is presented in **Table 3.3**.

**Table 3.3 General Properties of Hazardous Substances Identified in the Potential Contaminated Areas**

| Typical Substance | General Hazardous Properties |
|---|---|
| Petroleum hydrocarbons (including benzene, toluene, ethyl benzene and xylenes –BTEX) | • Toxic by inhalation, ingestion and contact<br>• Concentration may be flammable |
| Oils, oily wastes | • Toxic by contact<br>• Concentration may be flammable |
| Metals | • Toxic by contact and ingestion<br>• Most are toxic to fish, plants and marine plants (especially copper)<br>• Specific precautions my be required in relation to monitoring and dust control in site formation works |
| Solvents | • Toxic by contact, inhalation and ingestion |
| Polycyclic aromatic hydrocarbons (PAHs) | • Toxic by contact and ingestion |

3.6.3 Based on the preliminary draft Recommended Outline Development Plan (RODP) (Version A) provided by the Civil Engineering and Development Department in October 2007, part of the Study Area would be scheduled for institution and community facilities while the remaining area could be used as a regional open space in the future. A table summarizing the past, current and future land-uses of the Study Area is provided in **Appendix H.**

# 4 SAMPLING PLAN FOR SITE INVESTIGATION

## 4.1 Sampling Locations

4.1.1 The indicative location plans of the proposed Site Investigation (SI) sampling locations are illustrated in **Drawing 3.3.** A total of 10 boreholes are proposed for the purpose of initial screening of the identified hotspots. The selection of potential chemicals of concern (COC) recommended for laboratory analysis at each proposed sampling location is referenced to the nature of historical use of each area and EPD's new Guidance Notes. As recommended in the new Guidance Notes, Petroleum carbon factions, polyaromatic hydrocarbons (PAH) and BTEX (benzene, toluene, Ethylbenzene & Xylene) would be selected for potential petroleum contamination analysis and metals were suggested for assessing the concern of general inorganic contamination. For potential land contamination concern related to chemical spillage at the chemical storage area, halogenated and non halogenated solvents would be selected in addition to those proposed for the other borehole locations for laboratory analysis. The rationales for selecting the sampling locations are summarized in **Tables 4.1**.

4.1.2 The exact sampling locations of the SI shall be determined on site and subject to fine adjustment due to site specific conditions (e.g. locations, presence of foundations, underground utilities, delivery pipes and services). The location should be agreed with both the Engineer and the land contamination specialist prior to drilling/excavation and sampling.

4.1.3 It should be noted that if serious contamination was revealed during the SI, more sampling locations or more number of samples at the specific borehole would be recommended to determine the exact extent of contamination.

**Table 4.1 Sampling and Testing Plan for the Study Area**
(Concerned Site Area: ~20,000m$^2$; Proposed 10 Sampling Locations)

| Proposed Sampling Location | Sampling Method | Sample Matrix | | Parameters to be Tested | | | | Rationale of Sampling |
|---|---|---|---|---|---|---|---|---|
| | | | | Petroleum Carbon Ranges | VOC* | SVOC** | Metals | |
| AC-01 (Underground Fuel Tank) | Borehole to 6m BBC | Soil | 1m BBC | X | X | X | | In order to assess potential land contamination impacts from any leakage /spillage from the underground fuel tank, 3 boreholes are proposed to be located at the surrounding of the tank area. |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | 5m BBC | X | X | X | | |
| | | Soil | 6m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | G.W. | If present | X | X | X$^{\#}$ | | |
| AC-02 (Underground Fuel Tank) | Borehole to 6m BBC | Soil | 1m BBC | X | X | X | | |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | 5m BBC | X | X | X | | |
| | | Soil | 6m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | G.W. | If present | X | X | X$^{\#}$ | | |
| AC-03 (Underground Fuel Tank) | Borehole to 6m BBC | Soil | 1m BBC | X | X | X | | |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | 5m BBC | X | X | X | | |
| | | Soil | 6m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | G.W. | If present | X | X | X$^{\#}$ | | |

| Proposed Sampling Location | Sampling Method | Sample Matrix | | Parameters to be Tested | | | | Rationale of Sampling |
|---|---|---|---|---|---|---|---|---|
| | | | | Petroleum Carbon Ranges | VOC* | SVOC** | Metals | |
| AC-04 (Fuel pipeline) | Borehole down to 6m | Soil | 1m BBC | X | X | X | | In order to assess potential land contamination impacts from any leakage from the underground fuel pipeline, 3 boreholes are proposed to be located along the pipeline |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | GW | If present | X | X | X# | | |
| AC-05 (Fuel pipeline) | Borehole down to 6m | Soil | 1m BBC | X | X | X | | |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | GW | If present | X | X | X# | | |
| AC-06 (Fuel pipeline) | Borehole down to 6m | Soil | 1m BBC | X | X | X | | |
| | | Soil | 2.5m BBC | X | X | X | | |
| | | Soil | 3.5m BBC | X | X | X | | |
| | | Soil | At GW Level^ | X | X | X | | |
| | | GW | If present | X | X | X# | | |
| AC-07 (Chemical Storage Area) | Borehole down to 6m | Soil | 1m BBC | X | X | X | X | In order to assess potential land contamination impacts from any leakage /spillage of the chemicals, 1 borehole was proposed in the chemical storage area. |
| | | Soil | 2.5m BBC | X | X | X | X | |
| | | Soil | 3.5m BBC | X | X | X | X | |
| | | Soil | At GW Level^ | X | X | X | X | |
| | | GW | If present | X | X | X# | X (Mercury only) | |

| Proposed Sampling Location | Sampling Method | Sample Matrix | | Parameters to be Tested | | | | Rationale of Sampling |
|---|---|---|---|---|---|---|---|---|
| | | | | Petroleum Carbon Ranges | VOC* | SVOC** | Metals | |
| AC-08 (Open Area for Car parking) | Borehole down to 6m | Soil | 1m BBC | X | X | X | X | In order to assess potential land contamination impacts from any leakage /spillage of the chemicals, 3 boreholes are proposed in the Car Park Area. |
| | | Soil | 2.5m BBC | X | X | X | X | |
| | | Soil | 3.5m BBC | X | X | X | X | |
| | | Soil | At GW Level^ | X | X | X | X | |
| | | GW | If present | X | X | X# | X (Mercury only) | |
| AC-09 (Open Area for Car parking) | Borehole down to 6m | Soil | 1m BBC | X | X | X | X | |
| | | Soil | 2.5m BBC | X | X | X | X | |
| | | Soil | 3.5m BBC | X | X | X | X | |
| | | Soil | At GW Level^ | X | X | X | X | |
| | | GW | If present | X | X | X# | X (Mercury only) | |
| AC-10 (Open Area for Car parking) | Borehole down to 6m | Soil | 1m BBC | X | X | X | X | |
| | | Soil | 2.5m BBC | X | X | X | X | |
| | | Soil | 3.5m BBC | X | X | X | X | |
| | | Soil | At GW Level^ | X | X | X | X | |
| | | GW | If present | X | X | X# | X (Mercury only) | |

Remarks:
BBC = Below Base of Existing Concrete Pavement; GW=groundwater; X = testing proposed
Details of the chemical parameters shall be referred to **Table 4.2** below.
This table shall be read in conjunction with **Drawing 3.3**.
* For proposed sampling locations AC-01 to AC-06 and AC-08 to AC-10, only BTEX would be selected as the potential COC. The parameters to be tested included *Benzene, Toluene, Ethylbenzene* and *Xylene.*
** For proposed sampling locations AC-01 to AC-06 and AC-08 to AC-10, only PAHs would be selected as the potential COC. The parameters to be tested included the whole list of COC listed under group of SVOCs in the RBRG Table except *bis-(2-Ethylhexyl)phthalate, Hexachlorobenzene* and *Phenol.*
#Since the RBRG value of *Benzo(a)anthracene Benzo(a)pyrene, Benzo(g,h,i)perylene Benzo(k)fluoranthene bis-(2-Ethylhexyl)phthalate Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene* and *Phenol* were not available, the captioned chemicals parameters would not be tested.
^ Samples will only be collected if groundwater is encountered during excavation. Analyses of the samples collected shall be determined based on the actual site condition and as instructed by both the Engineer and the land contamination specialist.

## 4.2 Soil Sampling Method and Depth of Sampling

4.2.1 All soil boring / excavation and sampling should be supervised by a qualified land contamination specialist.

4.2.2 Borehole should be undertaken by means of dry rotary drilling method i.e. without the use of flushing medium. For safety reasons, an inspection pit should be excavated down to 1.5m below ground to inspect for underground utilities at the proposed borehole location. Disturbed soil samples should be collected at the depth of 1m BBC. Soil boring using drill rigs should then be performed for depth from 1.5m to the maximum boring depth. Undisturbed U100/U76 (stainless steel) soil samples should be collected at 2.5m, 3.5m and/or 5m and 6m BBC and at the level of groundwater (if encountered).

4.2.3 At each sampling location/depth, sufficient quantity of soil sample (as specified by the laboratory) should be taken. All soil samples should be uniquely labeled. Backup samples should be retained and stored at 0 - 4 ºC in laboratory.

## 4.3 Strata Logging

4.3.1 Strata logging for boreholes should be undertaken during the course of drilling/digging and sampling by a qualified geologist. The logs should include the general stratigraphic description, depth of soil sampling, sample notation and level of groundwater (if encountered). The presence of rocks/boulders/cobbles and foreign materials such as metals, wood and plastics should also be recorded

## 4.4 Free Product and Groundwater Level Measurement

4.4.1 The thickness of any free product and ground water level if present at sampling locations should be measured with an interface probe. The free product if encountered in sufficient amount should be collected for laboratory analysis to determine the composition.

## 4.5 Groundwater Sampling

4.5.1 It is proposed to collect groundwater samples if groundwater is encountered at the sampling locations.

4.5.2 For each proposed borehole sampling location, a groundwater sampling well shall be installed into the boreholes if groundwater is encountered or agreed by the land contamination specialist. A typical design of the groundwater sampling well as shown in **Drawing 4.1** should be submitted by the land contamination specialist for the Engineer's approval prior to the commencement of sampling. After installation of the monitoring wells, the depth to water table at all monitoring wells should be measured at the same time with an interface probe in order to delineate the water table contours at the subject site. Well developments (approximately five well volumes) should be carried out to remove slit and drilling fluid reside from the wells. The wells should then be allowed to stand for a day to permit groundwater conditions to equilibrate. Groundwater level and thickness of free product layer, if present, should be measured at each well before groundwater samples are taken.

4.5.3 Prior to groundwater sampling, the monitoring wells should be purged (at least three well volumes) to remove fine-grained materials and to collect freshly refilled representative groundwater samples. Time for each groundwater purging/recharge should be recorded as well as the estimated groundwater flow.

4.5.4 After purging, one groundwater sample should then be collected at each well using Teflon bailer and decanted into appropriate sample vials or bottles in a manner that minimizes agitation and volatilization of VOCs from the samples. All samples should be uniquely labelled.

4.5.5 Immediately after collection, groundwater samples should be transferred to new, clean,

laboratory-supplied glass jars for sample storage/transport. The sampling glass jars should be of "darken" type. Groundwater samples should be placed in the glass jars with zero headspace and promptly sealed with a septum-lined cap. Immediately following collection, samples should be placed in ice chests, cooled and maintained at a temperature of about 4ºC until delivered to the analytical laboratory.

### 4.6 Sample Size and Decontamination Procedures

4.6.1 All equipment in contact with the ground should be thoroughly decontaminated between each excavation, drilling and sampling event to minimise the potential for cross contamination. The equipment (including drilling pit, digging tools and soil/groundwater samplers) should be decontaminated by steam cleaning or high-pressure hot water jet, then wasted by phosphate-free detergent and finally rinsed by distilled / deionised water

4.6.2 Prior to sampling, the laboratory responsible for analysis should be consulted on the particular sample size and preservation procedures that are necessary for each chemical analysis.

4.6.3 The sample containers should be laboratory cleaned, sealable, water-tight, made of glass or other suitable materials with aluminum or Teflon-lined lids, so that the container surface will not react with the sample or adsorb contaminants. No headspace should be allowed in the containers which contain samples to be analysed for VOCs, Petroleum Carbons Range or other volatile chemicals.

4.6.4 The containers should be marked with the sampling location codes and the depths at which the samples were taken. If the contents are hazardous, this should be clearly marked on the container and precautions taken during transport. Samples should be stored at between 0-4 ºC but never frozen. Samples should be delivered to laboratory within 24 hours of the samples being collected and analysed within the respective retention period but should not more than 10 days.

### 4.7 QA/QC Procedures

4.7.1 QA/QC samples shall be collected in the following frequency during the SI. Chain of Custody protocol shall be adopted.

- 1 equipment blank per 20 samples for full suite analysis;
- 1 field blank per 20 samples for full suite analysis; and
- 1 trip blank per trip for the analysis of volatile parameters.

4.7.2 According to the sampling plan detailed in **Table 4.1**, the total sample number would be close to 60. The minimum number of QA/QC samples which meet the frequency stated in **Section 4.7.1** will be expected as follow:

- 2 equipment blank and 2 field blank for the analysis of Petroleum Carbon Range, VOCs (BTEX only) and SVOCs (PAHs only);
- 1 equipment blank and 1 field blank for the analysis of Petroleum Carbon Range, VOCs (BTEX only) and SVOCs (PAHs only); and Metals;
- 1 equipment blank and 1 field blank for the analysis of Petroleum Carbon Range, VOCs and SVOCs; and Metals; and
- 4 trip blanks for the analysis of Petroleum Carbon Range (C6-C8) fraction and VOCs (BTEX only).

## 4.8 Health and Safety

4.8.1 The specific safety measures to be taken depend on the nature and content of contamination, the site conditions and the regulations related to site safety requirements. Workmen Compensation Insurance and third party insurance must be provided for the SI.

4.8.2 Extreme care should be exercised when toxic gases or other hazardous materials are encountered. Any abnormal conditions found shall be reported immediately to the safety officer and the land contamination specialist.

4.8.3 The SI contractor shall establish and maintain a Health and Safety Plan before commencement of the SI that will include the following:

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

4.8.4 The SI Contractor shall maintain equipment and supplies reasonably required in an emergency, including lifesaving, evacuation, rescue and medical equipment in good working order and condition at all times. The SI Contractor shall use all reasonable means to control and prevent fires and explosions, injury to personnel and damage to equipment of property. Without limiting the foregoing, the SI Contractor shall:

a. Maintain proper safety devices, barriers to minimize hazards during performance of the work;
b. Prohibit smoking and open flames and the carrying of matches and lighters;
c. Develop and maintain a written emergency plan applicable to the Work and Site;
d. Maintain equipment in good operating condition and have emergency and first aid equipment ready for immediate use, where applicable;
e. 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;
f. Require all workers employed or retained by the Contractor, or a subcontractor, to at all time wear clothing suitable for existing work, weather and environmental conditions; and
g. The personnel are required to wear respirator and gloves for vapour exposure protection, if necessary. Safety helmet and protective boots should be worn.

## 4.9 Laboratory Analysis

4.9.1 Laboratory analysis is proposed in order to screen the presence of potential contaminants that are of concern at the Study Area. **Table 4.2** summarizes the parameters, the minimum requirement of the reporting limits and reference methods for the laboratory analyses of soil and groundwater samples for this Study.

**Table 4.2 Parameters, Detection Limits and Reference Methods for Laboratory Analyses**

| Item | Parameter | Soil | | Groundwater | |
|---|---|---|---|---|---|
| | | Detection limits (mg/kg) or otherwise stated | Reference Method | Detection limits (µg/L) or otherwise stated | Reference Method |
| **VOCs** | | | | | |
| 1 | Acetone | 100^ | USEPA 8260 | 1000^ | USEPA 8260 |
| 2 | Benzene | 0.2 | | 10 | |
| 3 | Bromodichloromethane | 0.2 | | 10 | |
| 4 | 2-Butanone | 10 | | 100 | |
| 5 | Chloroform | 0.08 | | 10 | |
| 6 | Ethylbenzene | 1 | | 10 | |
| 7 | Methyl tert-Butyl Ether | 1^ | | 10^ | |
| 8 | Methylene Chloride | 1^ | | 100^ | |
| 9 | Styrene | 1 | | 10 | |
| 10 | Tetrachloroethene | 0.08 | | 10 | |
| 11 | Toluene | 1 | | 10 | |
| 12 | Trichloroethene | 0.2 | | 10 | |
| 13 | Xylenes (Total) | 4 | | 40 | |
| **SVOCs** | | | | | |
| 14 | Acenaphthene | 1 | USEPA 8270 | 4 | USEPA 8270 |
| 15 | Acenaphthylene | 1 | | 4 | |
| 16 | Anthracene | 1 | | 4 | |
| 17 | Benzo(a)anthracene | 1 | | NA | |
| 18 | Benzo(a)pyrene | 1 | | NA | |
| 19 | Benzo(b)fluoranthene | 2 | | 8 | |
| 20 | Benzo(g,h,i)perylene | 1 | | NA | |
| 21 | Benzo(k)fluoranthene | 2 | | NA | |
| 22 | bis-(2-Ethylhexyl) phthalate | 10 | | NA | |
| 23 | Chrysene | 1 | | 4 | |
| 24 | Dibenzo(a,h)anthracen | 1 | | NA | |
| 25 | Fluoranthene | 1 | | 4 | |
| 26 | Fluorene | 1 | | 4 | |
| 27 | Hexachlorobenzene | 0.2 | | 8 | |
| 28 | Indeno(1,2,3-cd)pyrene | 1 | | NA | |
| 29 | Naphthalene | 1 | | 4 | |
| 30 | Phenanthrene | 1 | | 4 | |
| 31 | Phenol | 1 | | NA | |
| 32 | Pyrene | 1 | | 4 | |

| Item | Parameter | Soil | | Groundwater | |
|---|---|---|---|---|---|
| | | Detection limits (mg/kg) or otherwise stated | Reference Method | Detection limits (µg/L) or otherwise stated | Reference Method |
| **Metals** | | | | | |
| 33 | Antimony | 2 | USEPA 6020, USEPA 7470A | NA | USEPA 6020, USEPA 7470A |
| 34 | Arsenic | 2 | | NA | |
| 35 | Barium | 2 | | NA | |
| 36 | Cadmium | 0.4 | | NA | |
| 37 | Chromium III | 2^ | | NA | |
| 38 | Chromium VI | 2 | | NA | |
| 39 | Cobalt | 2 | | NA | |
| 40 | Copper | 2 | | NA | |
| 41 | Lead | 2 | | NA | |
| 42 | Manganese | 2 | | NA | |
| 43 | Mercury | 0.4 | | 1 | |
| 44 | Molybdenum | 2 | | NA | |
| 45 | Nickel | 2 | | NA | |
| 46 | Tin | 2 | | NA | |
| 47 | Zinc | 2 | | NA | |
| **Petroleum Carbon Ranges** | | | | | |
| 48 | C6 - C8 | 10* | USEPA 8015 USEPA 8260 | 40* | USEPA 8015 USEPA 8260 |
| 49 | C9 - C16 | 400* | | 1000* | |
| 50 | C17 - C35 | 1000* | | 1000* | |

Note:
^ The HKOLAS accreditation of the testing method of the COC was not available in Hong Kong
*The laboratory testing method has been accredited with different reporting format (C-fractions). For the new report format as stated in this table, accreditation is still pending for approval.

4.9.2 For sampling and laboratory analyses, chain of custody procedure shall be included as QC/QA procedure.

4.9.3 All laboratory analyses for soil and groundwater samples will be conducted by a Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited laboratory. It should be noted that alternative methods or similar detection limits may be used subject to the laboratory availability and capability. The relevant supporting document of the laboratory to be employed for this Study should be given in the future CAR or CAR/RAP.

4.9.4 Extra soil samples shall be stored at 0-4℃ and tested for Toxicity Characteristics Leaching Procedure (TCLP) before submission of Remediation Action Plan (RAP) if excavation and landfill disposal is identified as the last resort.

4.9.5 If contamination is found and landfill disposal is identified as the last resort to remediate the contaminated soil, three impacted soil samples shall be conducted for TCLP test to determine whether they comply with the criteria for landfill disposal in accordance with the *Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops* published by the EPD.

4.9.6 The criteria are set primarily in terms of Toxicity Characteristic Leaching Procedure (TCLP)

limits shown in **Table 4.3**.

**Table 4.3 Laboratory Testing Requirements for TCLP Analysis**

| Parameter | Test Methods* | Detection limit (mg/L) | Landfill Disposal Criteria TCLP Limit (ppm) |
|---|---|---|---|
| TCLP Leachate Preparation allowed by analysis for: | | | |
| Antimony (Sb) | USEPA 1311 and 6020A | 2 | 150 |
| Arsenic (As) | | 2 | 50 |
| Barium (Ba) | | 2 | 1000 |
| Beryllium (Be) | | 1 | 10 |
| Cadmium (Cd) | | 1 | 10 |
| Chromium (Cr) | | 1 | 50 |
| Copper (Cu) | | 2 | 250 |
| Lead (Pb) | | 3 | 50 |
| Nickel (Ni) | | 1.5 | 250 |
| Selenium (Se) | | 0.1 | 1 |
| Silver (Ag) | | 2 | 50 |
| Thallium (Ti) | | 0.08 | 50 |
| Tin (Sn) | | 2.5 | 250 |
| Vanadium (V) | | 4 | 250 |
| Zinc (Zn) | | 10 | 250 |
| Mercury (Hg) | | 0.02 | 1 |

* Equivalent internationally recognized standard methods could also be used.

# 5 INTERPRETATION OF RESULTS

5.1.1 With reference to the *Guidance Note for Contaminated Land Assessment and Remediation*, interpretation of results should make reference to *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management*. The soil and groundwater samples collected for this study will be referenced to those Risk-based Remediation Goals (RBRGs) presented in Table 2.1 and Table 2.2 as stipulated in the Guidance Manual.

5.1.2 The new RBRGs are developed based on a risk assessment approach to suit the local environmental conditions and community needs in Hong Kong. Decisions on contaminated soil and groundwater remediation are based on the nature and extent of the potential risks that are posed to human receptors as a result of exposure to chemicals in the soil and/or groundwater. RBRGs are developed for four different land use scenarios reflecting the typical physical settings in Hong Kong under which people could be exposed to contaminated soil and groundwater. A description of each land use scenario is as follows:

- Urban residential – Sites located in an urban area where main activities involve habitation by individuals. The typical physical setting is a high rise residential building situated in a housing estate that has amenity facilities such as landscaped yards and children's playgrounds. The receptors are residents who stay indoors most of the time except for a short period each day, during which they are outdoors and have the chance of being in direct contact with soil at landscaping or play areas within the estate.

- Rural residential – Sites located in a rural area where the main activities involve habitation by individuals. These sites typically have village-type houses or low rise residential blocks surrounded by open space. The receptors are rural residents who stay at home and spend some time each day outdoors on activities such as gardening or light sports. The degree of contact with the soil under the rural setting is more than that under the urban setting both in terms of the intensity and frequency of contact.

- Industrial – Any site where activities involve manufacturing, chemical or petrochemical processing, storage of raw materials, transport operations, energy production or transmission, etc. Receptors include those at sites where part of the operation is carried out directly on land and the workers are more likely to be exposed to soil than those working in multi-storey factory buildings.

- Public parks – Receptors include individuals and families who frequent parks and play areas where there is contact with soil present in lawns, walkways, gardens and play areas. Parks are considered to be predominantly hard covered with limited areas of predominantly landscaped soil. Furthermore, public parks are not considered to have buildings present on them.

5.1.3 In addition to the RBRGs, screening criteria (soil saturation limits, $C_{sat}$, developed for Non-aqueous Phase Liquid [NAPL] in soil and water solubility limits for NAPL in groundwater) for the more mobile organic chemicals must be considered to determine whether a site requires further action.

5.1.4 Based on the Preliminary Draft RODP, the Study Area will be used as institution and community facilities and regional open space in the future and the corresponding RBRGs land use would be Urban Residential and Public Parks respectively. Since the RBRGs for Urban Residential are generally more stringent than that for the Public Parks, as a conservative approach, the RBRGs for Urban Residential will be adopted as the assessment criteria for this land contamination assessment. Relevant soil and groundwater RBRGs level for this land contamination study including the Soil Saturation Limit and the Solubility Limit are presented in **Table 5.1.**

**Table 5.1 Relevant RBRGs for Soil and Groundwater**

| Chemical | Soil (mg/kg) | | Groundwater (µg/L) | |
|---|---|---|---|---|
| | RBRGs for Urban Residential | Soil Saturation Limits ($C_{sat}$) | RBRGs for Urban Residential | Solubility Limits |
| **VOCs** | | | | |
| Acetone | 9590 | *** | 10000000 | *** |
| Benzene | 0.704 | 336 | 3860 | 1750000 |
| Bromodichloromethane | 0.317 | 1030 | 2220 | 6740000 |
| 2-Butanone | 10000 | *** | 10000000 | *** |
| Chloroform | 0.132 | 1100 | 956 | 7920000 |
| Ethylbenzene | 709 | 138 | 1020000 | 169000 |
| Methyl tert-Butyl Ether | 6.88 | 2380 | 153000 | *** |
| Methylene Chloride | 1.3 | 921 | 19000 | *** |
| Styrene | 3220 | 497 | 3020000 | 310000 |
| Tetrachloroethene | 0.101 | 97.1 | 250 | 200000 |
| Toluene | 1440 | 235 | 5110000 | 526000 |
| Trichloroethene | 0.523 | 488 | 1210 | 1100000 |
| Xylenes (Total) | 95 | 150 | 112000 | 175000 |
| **SVOCs** | | | | |
| Acenaphthene | 3510 | 60.2 | 10000000 | 4240 |
| Acenaphthylene | 2340 | 19.8 | 1410000 | 3930 |
| Anthracene | 10000 | 2.56 | 10000000 | 43.4 |
| Benzo(a)anthracene | 12 | NA | NA | NA |
| Benzo(a)pyrene | 1.2 | NA | NA | NA |
| Benzo(b)fluoranthene | 9.88 | NA | 539 | 1.5 |
| Benzo(g,h,i)perylene | 1800 | NA | NA | NA |
| Benzo(k)fluoranthene | 120 | NA | NA | NA |
| bis-(2-Ethylhexyl)phthalate | 30 | NA | NA | NA |
| Chrysene | 871 | NA | 58100 | 1.6 |
| Dibenzo(a,h)anthracene | 1.2 | NA | NA | NA |
| Fluoranthene | 2400 | NA | 10000000 | 206 |
| Fluorene | 2380 | 54.7 | 10000000 | 1980 |
| Hexachlorobenzene | 0.243 | NA | 58.9 | 6200 |
| Indeno(1,2,3-cd)pyrene | 12 | NA | NA | NA |
| Naphthalene | 182 | 125 | 61700 | 31000 |
| Phenanthrene | 10000 | 28 | 10000000 | 1000 |
| Phenol | 10000 | 7260 | NA | NA |
| Pyrene | 1800 | NA | 10000000 | 135 |

| Chemical | Soil (mg/kg) | | Groundwater (μg/L) | |
|---|---|---|---|---|
| | RBRGs for Urban Residential | Soil Saturation Limits ($C_{sat}$) | RBRGs for Urban Residential | Solubility Limits |
| **Metals** | | | | |
| Antimony | 29.5 | NA | NA | NA |
| Arsenic | 22.1 | NA | NA | NA |
| Barium | 10000 | NA | NA | NA |
| Cadmium | 73.8 | NA | NA | NA |
| Chromium III | 10000 | NA | NA | NA |
| Chromium VI | 221 | NA | NA | NA |
| Cobalt | 1480 | NA | NA | NA |
| Copper | 2950 | NA | NA | NA |
| Lead | 258 | NA | NA | NA |
| Manganese | 10000 | NA | NA | NA |
| Mercury | 11 | NA | 486 | NA |
| Molybdenum | 369 | NA | NA | NA |
| Nickel | 1480 | NA | NA | NA |
| Tin | 10000 | NA | NA | NA |
| Zinc | 10000 | NA | NA | NA |
| **Petroleum Carbon Ranges** | | | | |
| C6 - C8 | 1410 | 1000 | 82200 | 5230 |
| C9 - C16 | 2240 | 3000 | 714000 | 2800 |
| C17 - C35 | 10000 | 5000 | 12800 | 2800 |

Note: NA - Not Available
*** indicates that the $C_{sat}$ value/ solubility limit exceeds the 'ceiling limit' therefore the RBRG applies,

# *Drawings*


HONG KONG AVIATION CLUB

LEGEND

- STUDY AREA
- BOUNDARY OF THE FORMER KAI TAK AIRPORT (PLAN NO. KM 1965g DATED 1.11.1994) (LANDS DEPT. LETTER REF: (20) IN LND KEPD/103/13(II))
- STUDY AREA COVERED BY KAI TAK AIRPORT NORTH APRON DECOMMISSIONING EIA (EIAO REGISTER NO. AEIAR-002/1998 AND EP NO.: EP_007/1998)
- STUDY AREA COVERED BY AGREEMENT NO. CE 35/2006 (CE) THE DECOMMISSIONING OF THE FORMER KAI TAK AIRPORT OTHER THAN THE NORTH APRON
- STUDY AREA COVERED BY AGREEMENT NO. KDO 02/05 ASSESSMENT OF POSSIBLE LAND CONTAMINATION ASSOCIATED WITH DECOMMISSIONED FUEL PIPELINE AND HYDRANT SYSTEM AT SOUTH APRON OF FORMER KAI TAK AIRPORT
- STUDY AREA COVERED BY AGREEMENT NO. KDO 01/2006 SITE INVESTIGATION AND CONTAMINATION ASSESSMENT AT REMAINING AREA OF FORMER KAI TAK AIRPORT AND PROPOSED CRUISE TERMINAL

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

AGREEMENT NO. CE 35/2006 (CE)
KAI TAK DEVELOPMENT ENGINEERING STUDY CUM DESIGN AND
CONSTRUCTION OF ADVANCE WORKS-INVESTIGATION, DESIGN AND CONSTRUCTION

# SITE LOCATION PLAN

| | | | |
|---|---|---|---|
| SCALE | A3 1:12000 | DATE | FEB 08 |
| CHECK | ELYC | DRAWN | POHM |
| JOB No. | 60022503 | DRAWING No. | 1.1 |
| | | REV | 1 |

P:/60022503/DRAWINGS/DRAWING/REPORTINITIAL EIA/CAP/AVIATION/SITE LOCATION_AVIATION.DGN


CAR PARK


RESIDENTIAL BUILDING AROUND THE STUDY AREA


INDUSTRIAL AND COMMERCIAL BUILDINGS AROUND THE STUDY AREA

LEGEND

PLAN OF HONG KONG INTERNATIONAL AIRPORT
(PLAN NO. KM 1965g DATED 1.11.1994)
(LANDS DEPT. LETTER REF: (20)
IN LND KEPD/103/13(II))

STUDY AREA COVERED BY KAI TAK AIRPORT
NORTH APRON DECOMMISSIONING EIA
(EIAO REGISTER NO. AEIAR-002/1998
AND EP NO.: EP_007/1998)

STUDY AREA

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

AGREEMENT NO. CE 35/2006 (CE)
KAI TAK DEVELOPMENT ENGINEERING STUDY CUM DESIGN AND
CONSTRUCTION OF ADVANCE WORKS-INVESTIGATION, DESIGN AND CONSTRUCTION

# SURROUNDING ENVIRONMENT OF THE HONG KONG AVIATION CLUB

| | | | |
|---|---|---|---|
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| CHECK | ELYC | DRAWN | POHM |
| JOB NO. | 60022503 | DRAWING NO. | 3.1 |
| | | REV | 1 |

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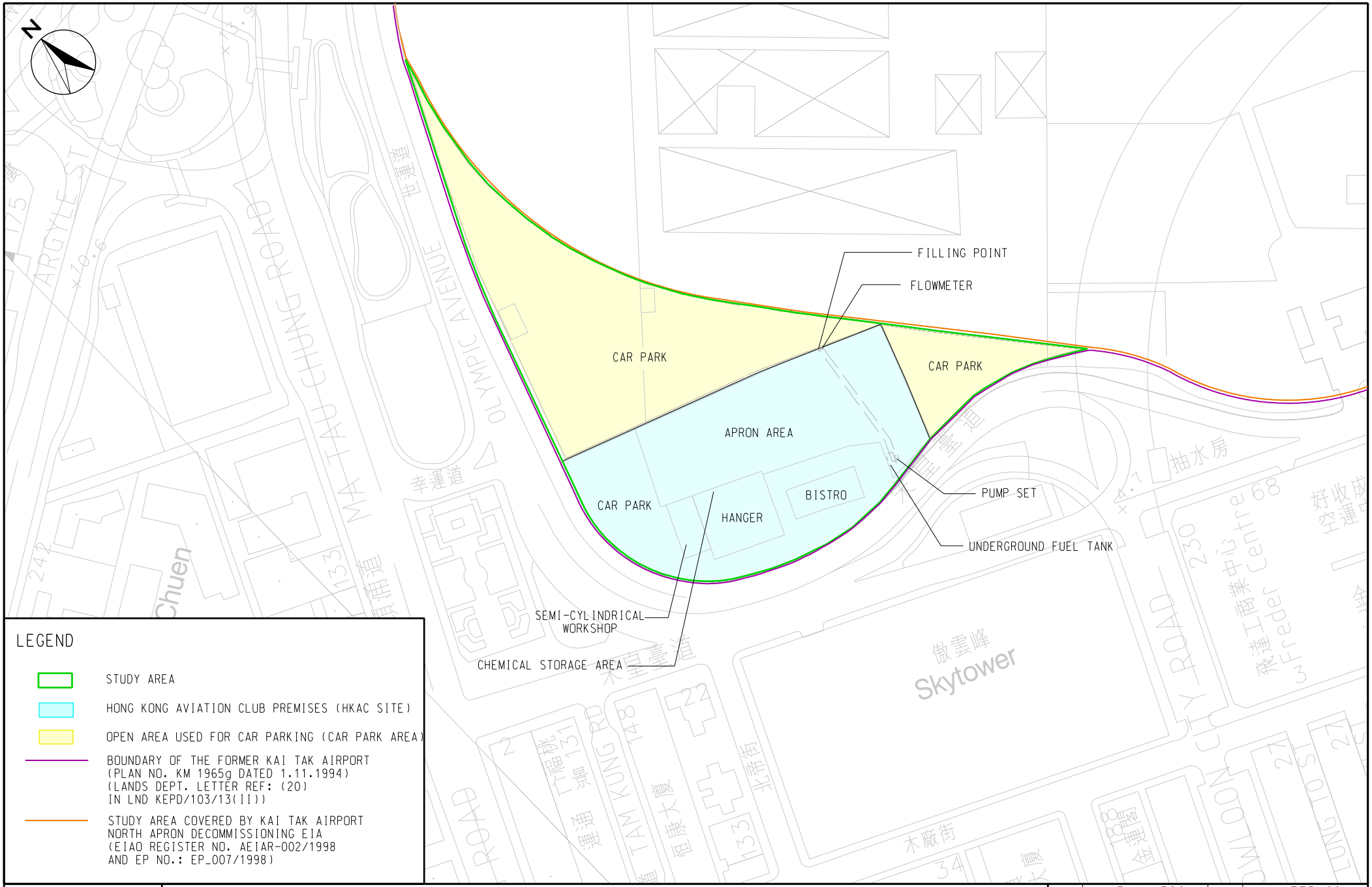


MAUNSELL AECOM
Maunsell Consultants Asia Ltd

AGREEMENT NO. CE 35/2006 (CE)
KAI TAK DEVELOPMENT ENGINEERING STUDY CUM DESIGN AND CONSTRUCTION OF ADVANCE WORKS-INVESTIGATION, DESIGN AND CONSTRUCTION

# SITE LAYOUT PLAN

| | | | |
|---|---|---|---|
| SCALE | A3 1:1500 | DATE | FEB 08 |
| CHECK | ELYC | DRAWN | POHM |
| JOB No. | 60022503 | DRAWING No. | 3.2 |
| | | REV | 1 |

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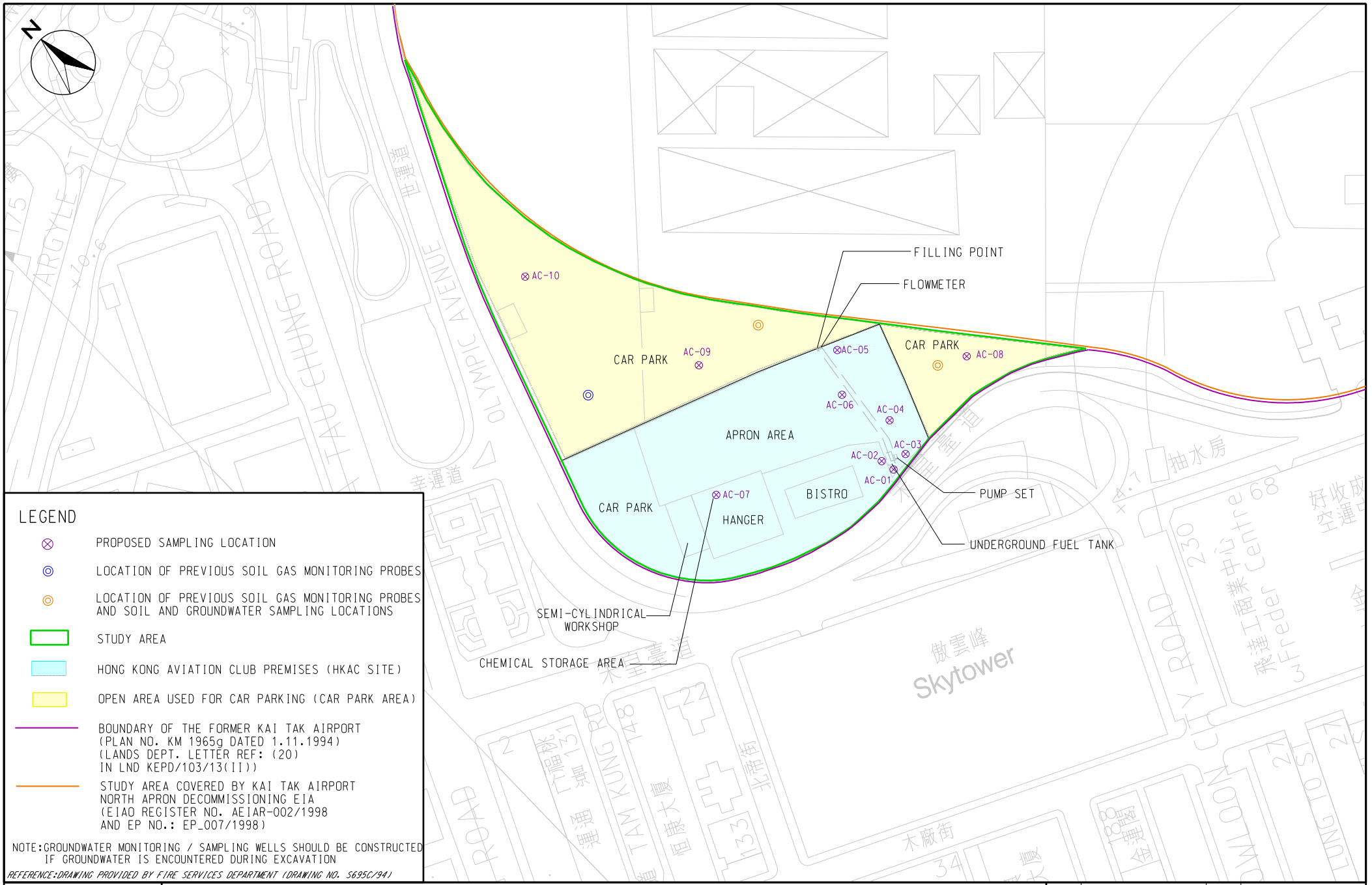



## LEGEND

- ⊗ PROPOSED SAMPLING LOCATION
- ◎ LOCATION OF PREVIOUS SOIL GAS MONITORING PROBES
- ◎ LOCATION OF PREVIOUS SOIL GAS MONITORING PROBES AND SOIL AND GROUNDWATER SAMPLING LOCATIONS
- STUDY AREA
- HONG KONG AVIATION CLUB PREMISES (HKAC SITE)
- OPEN AREA USED FOR CAR PARKING (CAR PARK AREA)
- BOUNDARY OF THE FORMER KAI TAK AIRPORT (PLAN NO. KM 1965g DATED 1.11.1994) (LANDS DEPT. LETTER REF: (20) IN LND KEPD/103/13(II))
- STUDY AREA COVERED BY KAI TAK AIRPORT NORTH APRON DECOMMISSIONING EIA (EIAO REGISTER NO. AEIAR-002/1998 AND EP NO.: EP_007/1998)

NOTE: GROUNDWATER MONITORING / SAMPLING WELLS SHOULD BE CONSTRUCTED IF GROUNDWATER IS ENCOUNTERED DURING EXCAVATION

*REFERENCE: DRAWING PROVIDED BY FIRE SERVICES DEPARTMENT (DRAWING NO. S695C/94)*

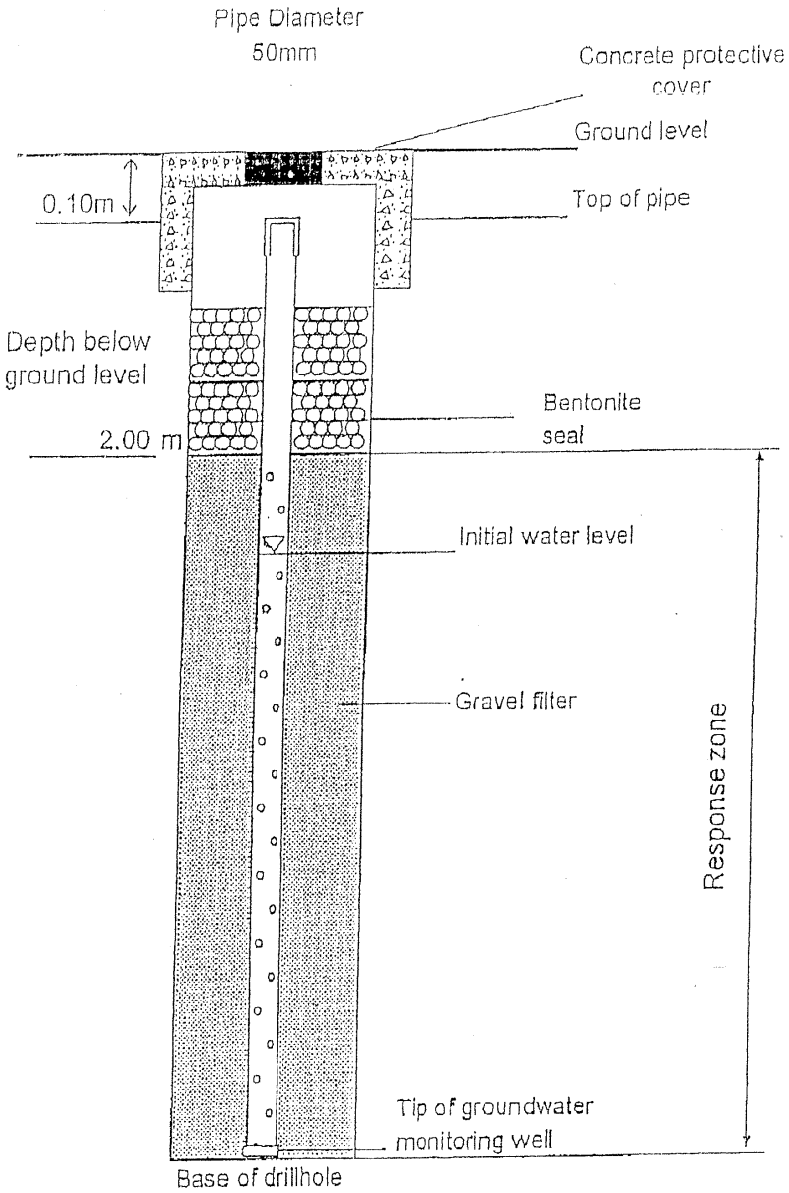
MAUNSELL AECOM
Maunsell Consultants Asia Ltd

AGREEMENT NO. CE 35/2006 (CE)
KAI TAK DEVELOPMENT ENGINEERING STUDY CUM DESIGN AND CONSTRUCTION OF ADVANCE WORKS-INVESTIGATION, DESIGN AND CONSTRUCTION

# PROPOSED SI LOCATIONS AT POTENTIAL CONTAMINATED HOTSPOTS

| | | | |
|---|---|---|---|
| SCALE | A3 1:1500 | DATE | FEB 08 |
| CHECK | ELYC | DRAWN | POHM |
| JOB No. | 60022503 | DRAWING No. | 3.3 |
| | | REV | 1 |

P:/60022503/DRAWINGS/DRAWING/KTA DECOMMISSIONING/CAP/AVIATION/HKAC_SI.DGN




MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

AGREEMENT NO. CE 35/2006 (CE)
KAI TAK DEVELOPMENT ENGINEERING STUDY CUM DESIGN AND CONSTRUCTION OF ADVANCE WORKS-INVESTIGATION, DESIGN AND CONSTRUCTION

TYPICAL GROUNDWATER SAMPLING WELL DESIGN

| | | | |
|---|---|---|---|
| SCALE | N.T.S | DATE | FEB 08 |
| CHECK | ELYC | DRAWN | POHM |
| JOB No. | 60022503 | DRAWING No. | 4.1 |
| | | REV | – |

V:/E-E1-VOL2/PROJECTS/60022503 SEK/DRAWING/MAY07/FIGURE4.1(CAP)

# *Appendix A*

***(Letter from Environmental Protection Department)***

本署檔案 OUR REF (100) in EP 650/P7/1 II
來函檔案 YOUR REF NWHF1kk:6002408/08.2-0559
電話 TEL NO : 2150 8016
圖文傳真 FAX NO : 2402 8275
網址 HOMEPAGE : http://www.epd.gov.hk/

Environmental Protection Department
Environmental Compliance Division
Regional Office (East)
8/F., Cheung Sha Wan Government Offices
303 Cheung Sha Wan Road
Kowloon

環境保護署
環保法規管理科
區域辦事處(東)
九龍長沙灣道 303 號
長沙灣政府合署 8 樓

**郵遞及傳真至 2691 2649**

31 August 2007

Maunsell Consultants Asia Limited
8/F Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Sha Tin,
New Territories.
(Attention: Mr Nelson WONG)

Maunsell Consultants Asia Ltd.
Received 04 SEP 2007
Reg. No. 1876
File No. 6002408/
TS DLO EMSC ML CW Sign
AKWL MCP SAR FSKY Off
SHRS TKH TKS YY HTS
WCKH JYL CWN PMC
Project Eng. IWLH/MWHC
Others
Reply to ENSL - Peter Lee / Mary Thank
Reply Date

Dear Sir,

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study cum Design and Construction of Advance Works Investigation, Design and Construction**

**Request for Information about Chemical Waste Producers and Chemical Spillage Accident**

I refer to your letter dated 15 August 2007 regarding the captioned.

As requested, I provide the following information abstracted from our records:-

(i) registered chemical waste producers within the study area:

| Date Registered | Name of Registered Chemical Waste Producers | Major Chemical Waste Types | Location where Waste is Produced |
|---|---|---|---|
| 6 July 1993 | Hong Kong Air Cargo Terminals Ltd. | Hydraulic oil, lubricating oil and various types of chemical waste from uncollected air cargo | Cargo Terminal Building, Hong Kong International Airport, Kowloon |
| 9 October 1996 | Hong Kong Aviation Club Limited | Spent lubricating oil | Hong Kong Aviation Club, 31 Sung Wong Toi Road, Kowloon City |
| 13 October 2005 | Electrical and Mechanical Services Department – Main Vehicle Workshop | spent batteries, spent mercury lamps, spent paint, asbestos waste, spent lubrication oil, spent acid | 3 Kai Shing Street, Kowloon Bay |
| 5 December 2006 | Electrical and Mechanical Services Department –EMA & BS Engineering | spent mercury lamps and ammonia alkaline solution | 3 Kai Shing Street, Kowloon Bay |

(ii) reported accidents of spillage/leakage of chemicals within the study areas: Nil.

Yours faithfully,

(C.P. Wai)
Environmental Protection Officer
Regional Office (East)
for Director of Environmental Protection

# *Appendix B*

***(Letters from Fire Services Department)***

消　防　處
香港九龍尖沙咀康莊道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.: (44) in FSD/PG 9/790/87 Pt. 47

號 YOUR REF.: NWHF:tkk:60022408/08.2-0742

電子郵箱 E-mail : ado_pg_1@hkfsd.gov.hk
圖文傳真 FAX: 852-2739 8775 (24 小時 HOURS)

電　話 TEL NO.: 2733 7736

Maunsell Consultants Asia Ltd.
Received 02 NOV 2007
Reg. No. 2276
File No. 60022408/
TS DLO (EMSC) ML CW
AKWL MCP SAR FSKY
SHRS TKH (TKST) YY WTS
WCKH JYL CWN PMC
Sign Off
Project Eng. IWCH
Others MPLL
Copied To MEMCL – Peter Lo
Reply Date

FAX : 2691 2649

1 November 2007

Maunsell Consultants Asia Ltd
8/F, Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road,
Sha Tin, N.T.
(Attn. : Nelson WONG,
Senior Engineer)

Dear Sir,

**Agreement No. CE35/2006 (CE)**
**Kai Tak Development Engineering Study**
**Cum Design and Construction of Advance Works**
**- Investigation, Design and Construction**

**Dangerous Goods (D.G.) Licences Storage Records at Hong Kong Aviation Club (HKAC)**

I refer to your letter of 22.10.2007.

Please be informed that the relevant dangerous goods plan/drawing of HKAC could be available at the Policy Division of Licensing and Certificate Command in this department. You may approach ADO(Pol)2 of the Division at 2733 7599 for viewing upon request.

Should you need further clarification in this matter, pleased feel free to contact the undersigned.

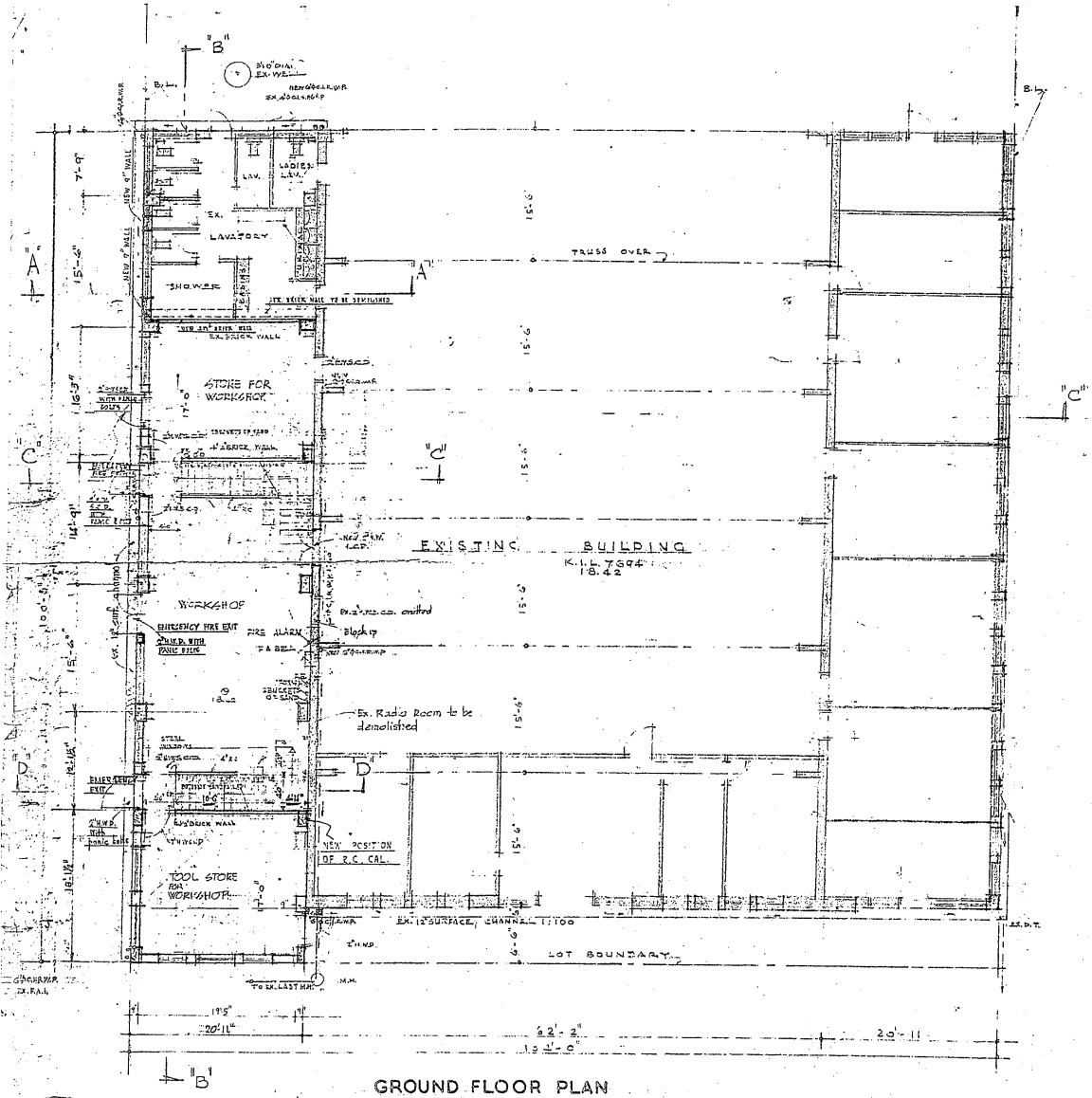
ENSR Asia (HK) Ltd.
Received 02 NOV 2007
Reg. No. 7110201
File No. 60022503
M Chan AYK (FCCM) MKO TYUT JLAM
Sign Off
Env. Consultant PLCT UNCT
Others Christina Au Yeung
Copied To
Reply Date

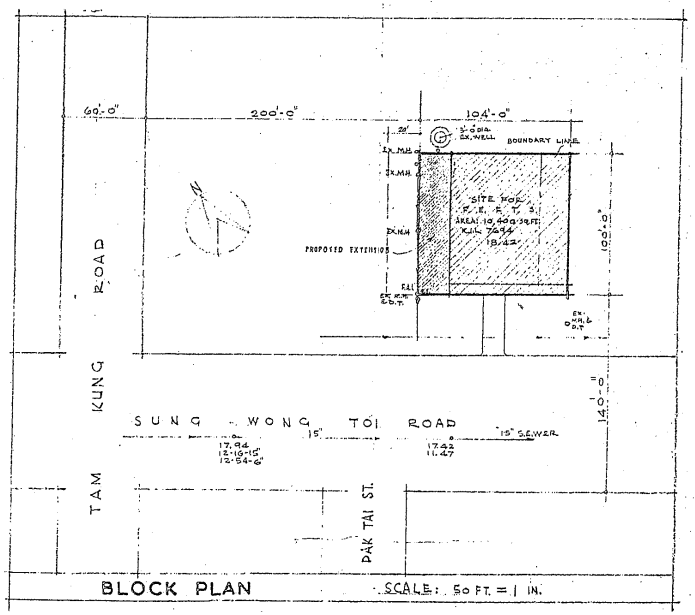
(CHIU Wai-biu)
for Director of Fire Services

Internal
c.c. SDO(Pol)
SDO(DG)

# *Appendix C*

***(As-built Drawings of Hong Kong Aviation Club)***




NOTES:
1. EXISTING BUILDING PLANS REFERRED TO B.O.O. REF. NO. 4622/58 APPROVED PLANS.
2. R.C.C. PLANS DETAILS AND CALCULATIONS TO BE SUBMITTED LATER.
3. ALL BRICK WORK TO BE BUILT IN 1:3 CEM. MORTAR.
4. CEM. CONC. FOR R.C.C. WORK TO BE OF 1:2:4 MIX.
5. ALL STAIR RISERS 9" MAX. TREADS 12" MIN.
6. MAX. AGGREGATE SIZE TO BE 3/4" DIA. FOR SLAB.
7. ALL FOUNDATIONS TO BE CARRIED DOWN TO SOLID GROUND.
8. ALL DOORS & WINDOW LINTELS TO BE THE THICKNESS OF WALL, 9" DEEP 2-1/2" ϕ M.S.S. BOTTOM.

NOTES: (FOR FIRE SERVICES)
1. NO STORAGE OF DANGEROUS GOODS WITHOUT THE AUTHORITY OF THE DIRECTOR OF FIRE SERVICES.
2. 2 X 2 GAL. A.P. EXPELLED WATER OR WATER/$CO_2$ FIRE EXTINGUISHERS.
3. WALL LININGS, ALL INTERNAL LININGS FOR ACOUSTIC, THERMAL INSULATION OR DECORATIVE PURPOSES BE OF CLASS 1 OR 2 RATE OF SURFACE FLAME SPREAD AS LAID DOWN BY B.S.S. NO. 476 OF 1953. (PART 1)
4. (a) 2 X 2 GALLON FOAM EXTINGUISHERS, (b) 4 BUCKETS OF SAND, (c) 2 X 5 LB. $CO_2$ FIRE EXTINGUISHERS TO BE PROVIDED AT POSITINS INDICATED ON PLANS.
5. IT IS CONSIDERED THAT THE STAIR-CASE INDICATED SHOULD BE RE-ROUTED SO THAT PERSONS DO NOT HAVE TO PASS THROUGH THE ENCLOSURE FROM THE OBSERVATION ROOM TO REACH THE ALTERNATIVE STAIR.
6. 2" HARDWOOD SELF-CLOSING DOORS TO BE PROVIDED AT THE POSITIONS INDICATED.
7. CLARIFY DETAIL AS INDICATED.
8. ANY WINDOWS LOOKING INTO THE EXISTING BUILDING TO BE OF WIRED GLASS IN FIXED METAL FRAMES.
9. ALL EXITS TO BE CLEARLY INDICATED BY ILLUMINATED EXIT SIGNS IN 7" ENGLISH AND CHINESE CHARACTERS.

Approved
PRO BUILDING AUTHORITY
28 SEP 1966

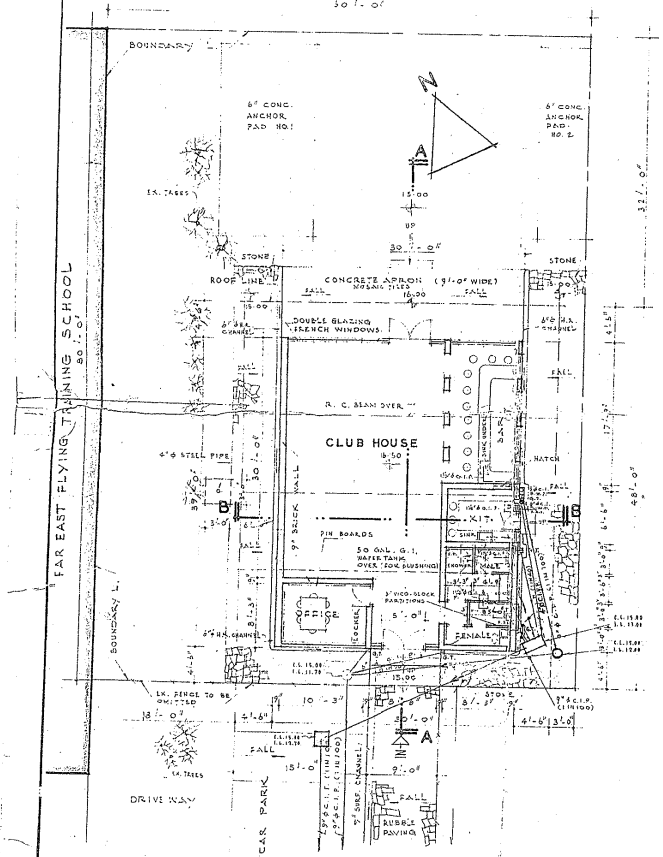
Amended
15/9/66

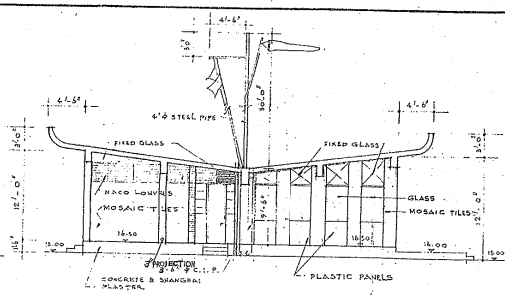
BUILDING PLAN

RECEIVED BY
17 SEP 1966
BUILDING ORDINANCE OFFICE
KOWLOON

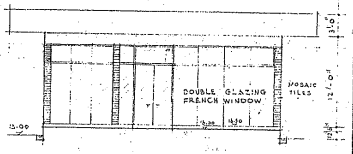
PROPOSED ALTERATIONS & ADDITIONS FOR FAR EAST FLYING TRAINING SCHOOL ON K.I.L. 7694 AT SUNG WONG TOI ROAD KOWLOON.

H. Y. Chu

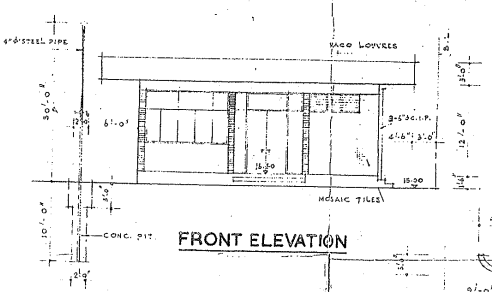


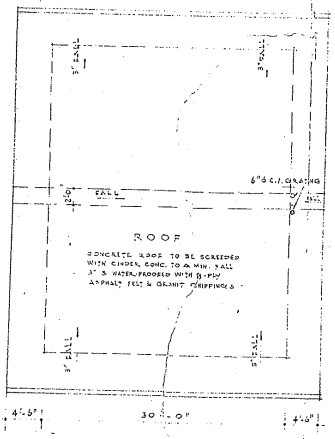

SIDE ELEVATION



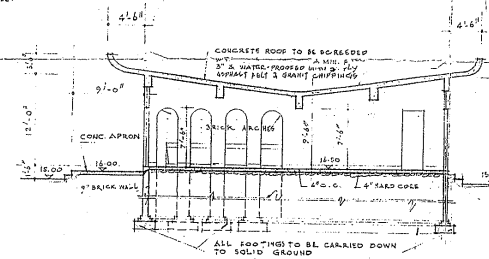

BACK ELEVATION



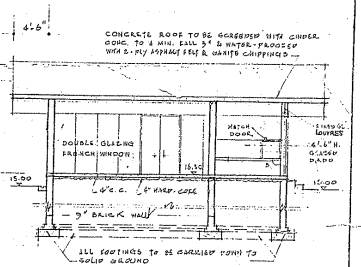

FRONT ELEVATION



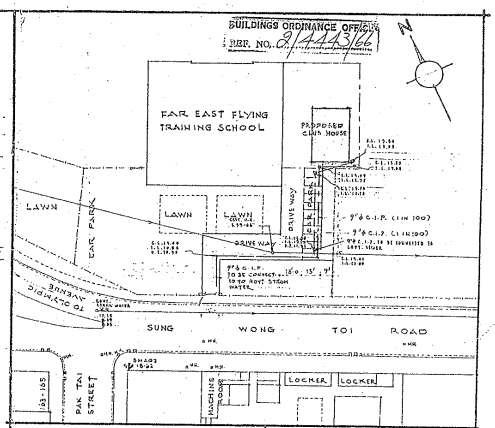

ROOF PLAN




SECTION A—A




SECTION B—B




BLOCK PLAN — SCALE :- 50 FT. TO 1 IN.

NOTE:
1. ALL BRICK WALL TO BE BUILT IN 1:3 CEMT. MORTAR.
2. ALL W.C.'S & KIT. TO HAVE 6'-0" HIGH GLAZED TILE DADO.
3. ALL R.C.C. WORKS TO BE SUBMITTED LATER.
4. ALL OPENINGS FOR DOORS AND WINDOWS TO BE R.C.C. LINTELS 12" DEEP WITH 2-½" ø M.S. ROD REINFORCEMENT FOR 9" WALL
5. SALT WATER TO BE USED FOR FLUSHING.
6. DRAINAGE PLANS TO BE SUBMITTED LATER.

RECEIVED BY
20 OCT 1965
BUILDINGS ORDINANCE OFFICE
KOWLOON
P. W. D.

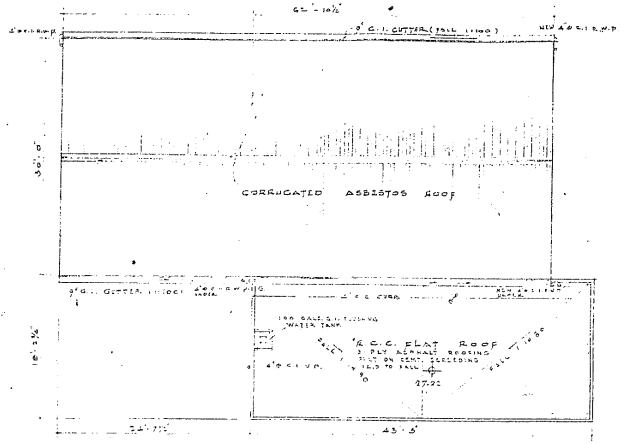
Approved
PRO BUILDING AUTHORITY
16 MAY 1966

PROPOSED CLUB HOUSE FOR AERO CLUB OF HONG KONG AT SUNG WONG TOI ROAD.

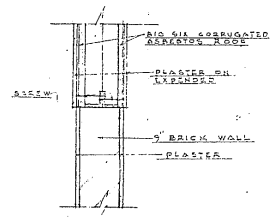
SCALE:- 1/8 IN. TO 1 FT.

ARCHITECT:- GUY W. K. CHAN
Authorised Architect

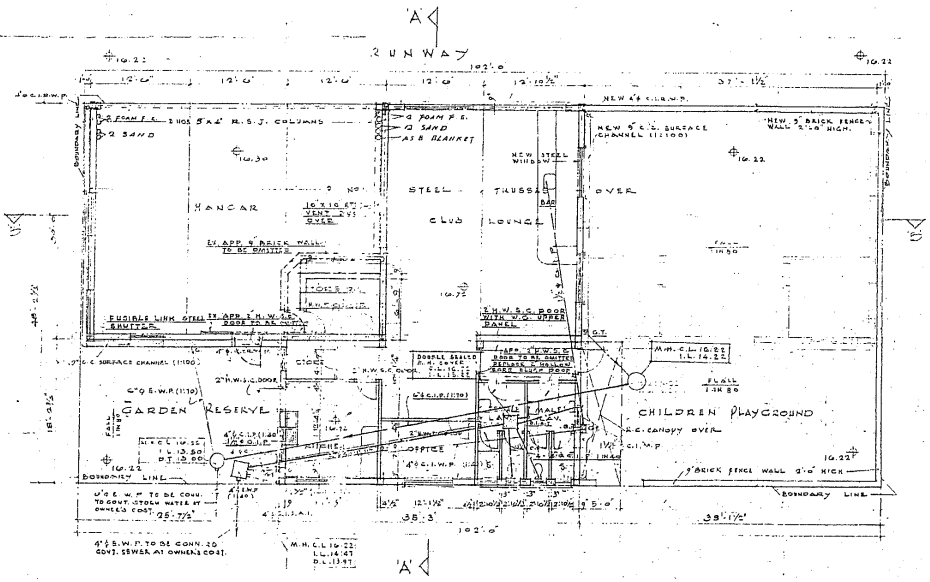
2/4333/69




ROOF PLAN



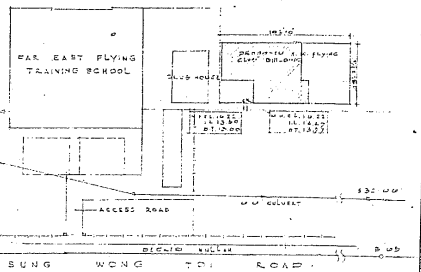

1" DETAIL AT 'A'
SCALE: 1" = 1'-0"




GROUND FLOOR PLAN

NOTE: BOLD DOTTED LINE SHOWING APPROVED WORKS TO BE OMITTED

RECORD PLAN




BLOCK PLAN SCALE: 50'-0" = 1"

LIST OF DRAWINGS

| DWG. NO. | DRAWINGS |
|---|---|
| A1 | Plans |
| A2 | Elevations & Sections |

NOTES

1. All cement concrete work to be 1:1:2 or 1:2:4 mixture
2. All brick works & 3" Vi-con. Block to be built in 1:3 cement mortar.
3. All lavatories to have min. 4'-0" high glazed tile dado.
4. Only electric gas or kerosene cookers to be used in kitchen.
5. All Steel works to be protected by cement concrete (externally).

MATERIAL INDICATIONS

- Cement concrete works
- Brick Works
- Steel works
- Mosaic or glazed tiles
- 3" Vi-con. Block
- Asbestos Works

Approved
BUILDING AUTHORITY
24 APR 1970

F.S.D. Requirements:

1. A fire service installation consisting of two hose reel points to be provided as indicated on plan. The length of the hose reels may be reduced to 60 feet.
2. A supply of water of not less than 1000 gallons to be provided to feed the hose reel installation.
3. The attached standard requirements for kerosene, diesel burners and using liquefied petroleum gas in cylinders to be complied with as applicable.
4. The hangars to be kept clean free from combustible lumber, only waste, etc..
5. No artificial lighting other than electric lamps to be used in the hangar and every item of electrical apparatus to be of totally enclosed or flame-proof type.
6. Storage of dangerous good to comply with the dangerous goods ( general ) reg: 1956
7. No store, forge or chattles to be used in the hangars.
8. " No smoking" notices in 7" english and chinese characters to be painted in conspicuous positions on the walls of the hangers.
9. The windows overlooking the Aeroclub building should be bricked up.
10. 2-9x2-gallon foam fire extinguishers, 1x2-gallon water/CO2 expelled fire extinguisher, 8 buckets of sandand 3 asbestos blankets to be provided as indicated.
11. No repair work of any nature should be carried out on the premises.
12. No petrol or oils to be stored in the hanger ( other than in the tanks and sumps of air crafts).

Raymond Kan 18/4/70

RECEIVED BY
20 APR 1970
BUILDING AUTHORITY OFFICE
KOWLOON

# Proposed Club House Of H.K. Flying Club At Kai Tak Airport

| DATE | 3/2/1970 |
|---|---|
| REVISIONS | |
| 1 | 17/6/1970 |
| 2 | 21/7/1970 |
| 3 | |
| 4 | |
| 5 | |


簡日垂建築師
RAYMOND Y. K. KAN
B. ARCH. (HELB.) A.R.A.I.A. A.R.I.B.A. M.R.A.I.
CHARTERED ARCHITECT


SCALE 1/8" = 1'0"
JOB NO. 134
DRAWING NO. A1

# *Appendix D*

***(Completed Questionnaire)***

## Questionnaire on Possible Land Contamination

Name of Company: HK AVIATION CLUB

Site Address 31 SUNG WONG TOI ROAD, KOWLOON CITY. HK.

Date: 30 APRIL 2007

Please provide the following information as fully as possible

| | | |
|---|---|---|
| 1 | What is your company's main current activities/ operations in the above address? | Membership activities and helicopter flying. |
| 2 | Area of your site? | 1·03 Hectares |
| 3 | Length of operation? | Since 1920's |
| 4 | Do you know the type of land use before you took over the site? (If yes, please vie details.) | |
| 5 | Have you ever received any notices of violation of environmental regulations or public complaints? (If yes, please give details.) | NO. |
| 6 | Do you have regular check for any spillage and monitoring of chemicals handled? (If yes please give details.) | NO. |
| 7 | Did any tank/truck spillage or leakage happen in your site?<br><br>Do you have any internal records about the type, duration and quantities? (If yes, please give details.) | NO |
| 8 | Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please give details.) | NO |
| 9 | Do you have any underground storage tank? (If yes, please give details.) | NO |
| 10 | Do you have any records of major renovation of your site or rearrangement of underground utilities, pipework/ underground tanks? (If yes, please give details.) | NO |

Maunsell Environmental Management Consultants Ltd.
Received 03 MAY 2007
File No. /C/F/Q
TS AYK TJC Sign
JLAM TYUT Off
Env. Consultant
Others
Copied To
Reply Date

Maunsell Consultants Asia Ltd.
Received 02 MAY 2007
Reg. No. 736
File No. 60022468/ 08.2
FSYB TS DLO RDT ML Sign
CSL LJE CW EKHC HYH Off
AKWL MCP SAR KYW FSKY
SHRS HCP DSSL AYK
TKH TKSI
Project Eng. IWCH
Others
Copied To
Date

Please indicate whether the following materials have been used, stored or generated on the site and indicate the method of disposal.

| Item | Materials | Possible Source | Yes/No | Method of Disposal (historical & current), if applicable (see *Note* below) |
|---|---|---|---|---|
| 1 | Fuels | Petroleum storage, LPG storage | NO | |
| 2 | Lubricating oils, hydraulic fluids | Spillage, maintenance and dismantling of equipment, scrapped tanks and pipeworks, vehicle, vehicle maintenance | Yes | (ii) |
| 3 | Cleansing solvents | Engine room and equipment maintenance | very minimal | (iii) |
| 4 | Used chemical solutions | Engine coolant, battery fluid | No | |
| 5 | Acids | Treating steel plate to remove millscale | No | |
| 6 | Asbestos | Application and removal of engine room insulation | No | |
| 7 | Transformer oil (PCB) | Scrapped electrical equipment | No | |
| 8 | Anti-corrosive paints, thinner | Application of anti-corrosive coatings | No | |
| 9 | Coal, ash, oily tank and bilge sludge | Boiler room/engine room maintenance, tank cleaning | No | |
| 10 | Finely divided metal wastes | Grinding and milling operations, especially welding joints | No | |
| 11 | Electrical wiring | Electrical installation, maintenance, scrapped electrical equipment | No | |
| 12 | Low-level radioactive waste | Scrapped instruments | No | |
| 13 | Wood preservatives | Timber treatment | No | |
| 14 | Polyurethane foam | Hull manufacture /maintenance | No | |

*Note: methods of disposal include:*

- *i) collection by a municipal solid waste collector;*
- *ii) collection by a licensed chemical waste collector;*
- *iii) disposal to foul sewer in liquid form;*
- *iv) disposal to storm drain in liquid form;*
- *v) burial at pits within the site*

# *Appendix E*

***(Photo-documentation of Site Inspection)***


Photo 1:AVGAS and Diesel Engine Oil Storage Area Located at the HKAC Apron

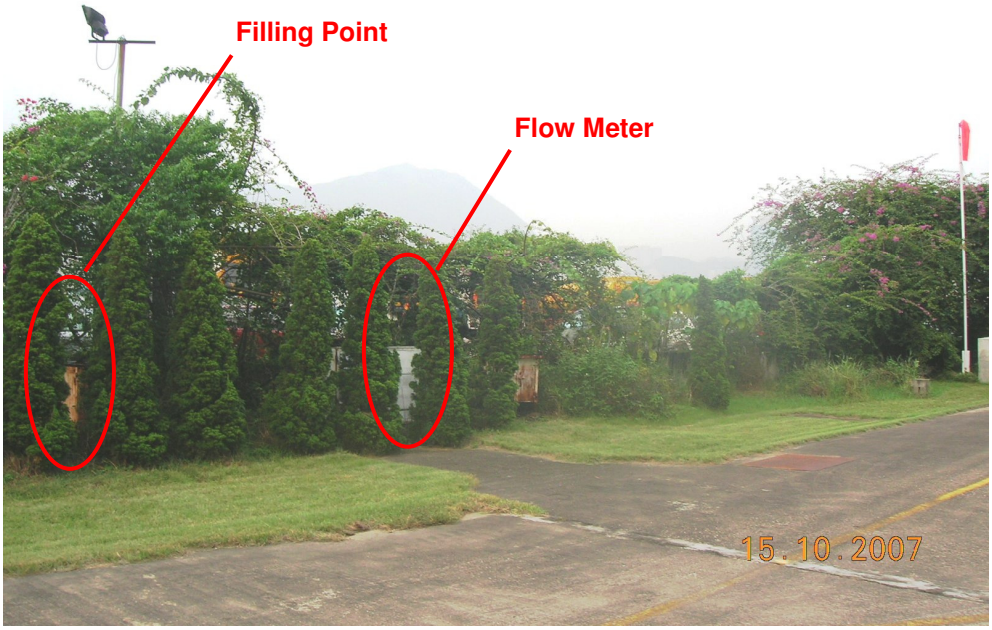



Photo 2: Location of Filling Point and Flow Meter


Photo 3: Filling Point

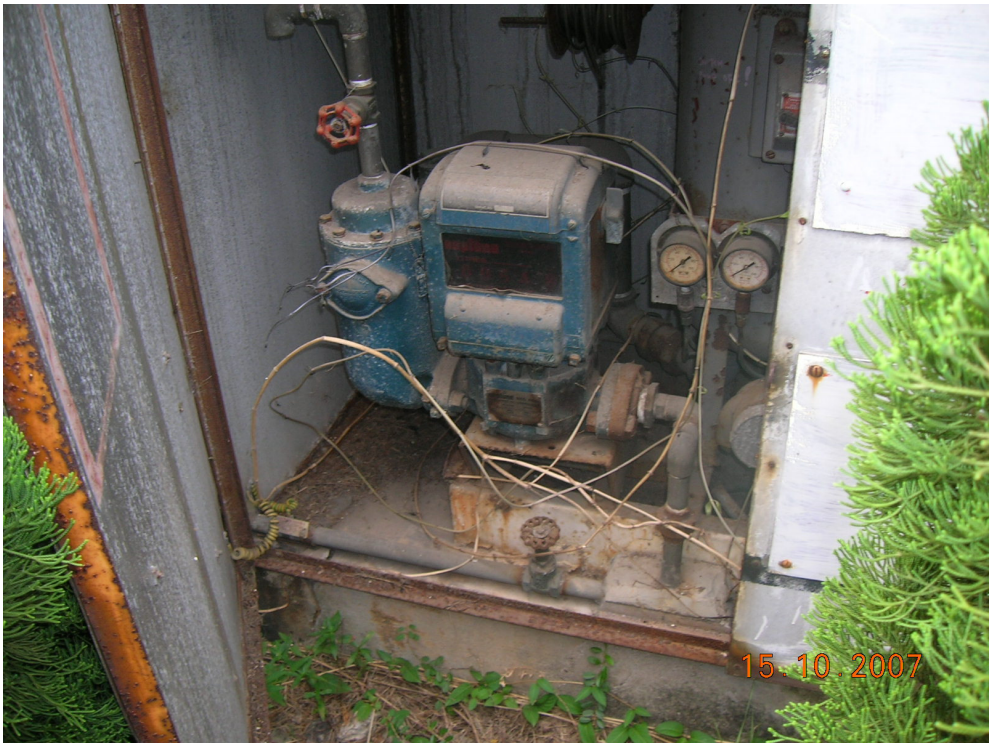



Photo 4: Flow Meter


Photo 5:Drip Tray placed under Helicopter during Maintenance


Photo 6: Chemical Storage Area Located inside Hangar


Photo 7: Modules of Plans/ Helicopter Stored inside Semi-cylindrical Workshop

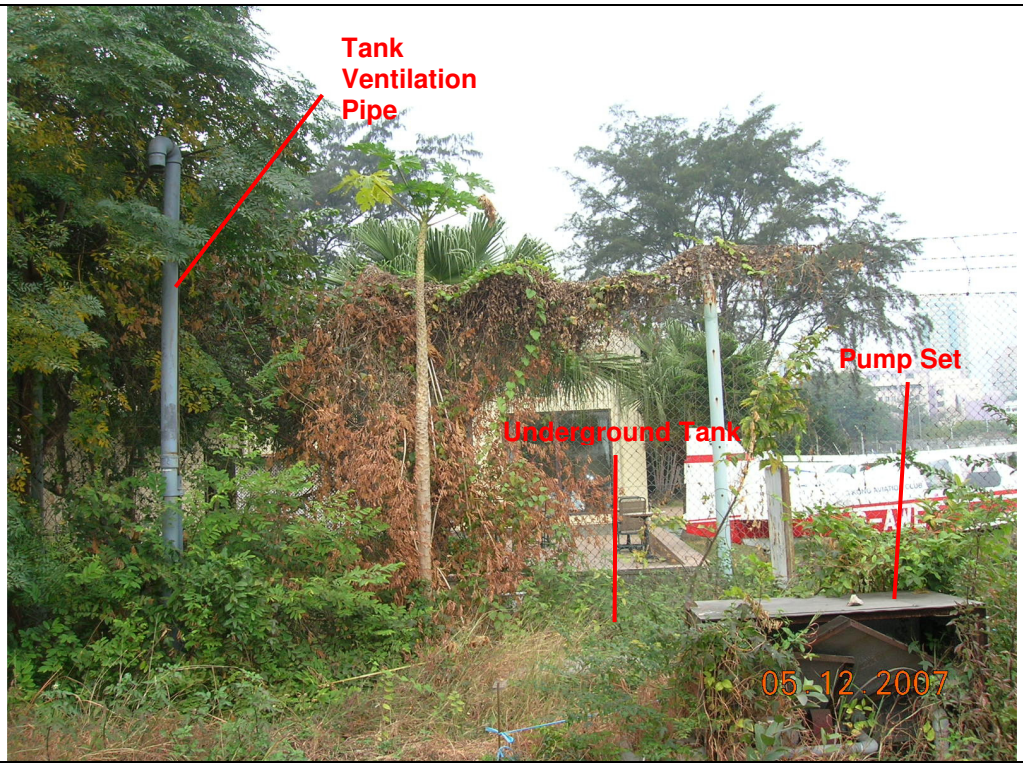



Photo 8: Location of Tank Ventilation Pipe, Underground Tank and Pump set.

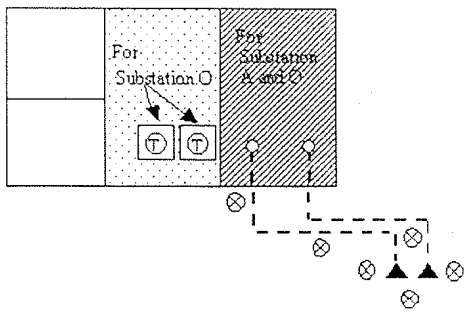

Photo 9: Pump Set


Photo 10: Underground Tank

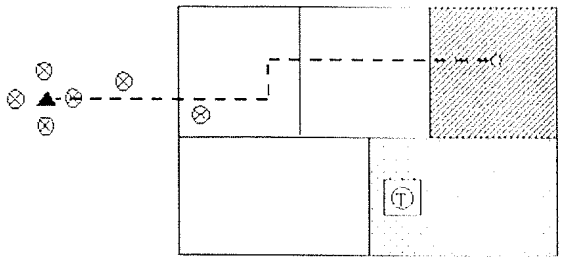
# *Appendix F*

***(Layout Plan with Proposed Sampling Points Extracted from Approved CAP under Agreement No. CE 42/2000)***

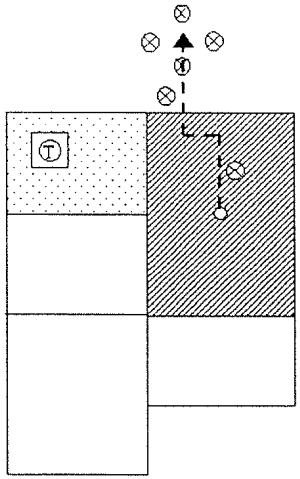
## Substation A and O



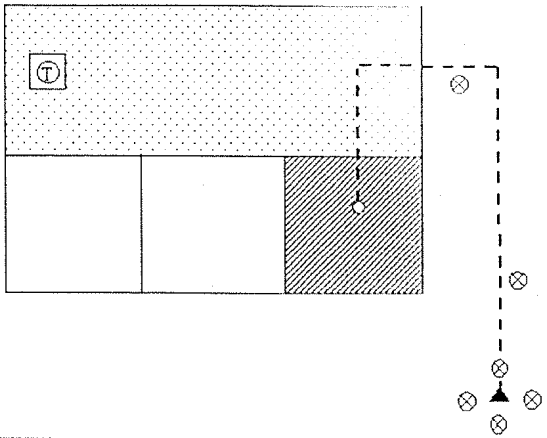

## Substation Z



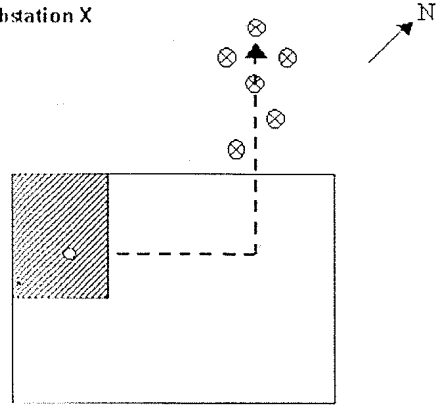

## Substation B



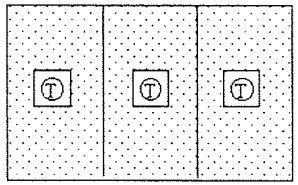

## Substation Y



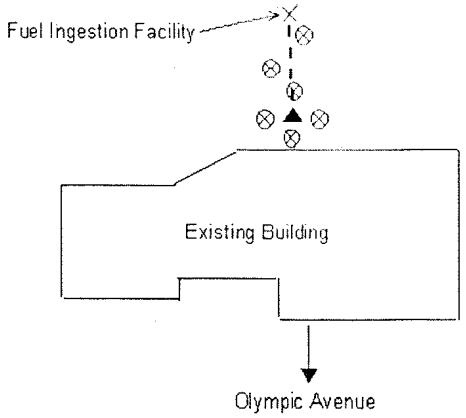

## Substation X




## Civil Airport Substation




## Underground Fuel Storage Tank within Hong Kong Aviation Club




## Legend

- Underground Fuel Tank
- Proposed Sampling Point Location for Underground Fuel Tank & Pipeline (Exact location to be determined on-site)
- Generator
- Transformer
- Proposed Sampling Point Location for Transformer (Exact location to be determined on-site)
- Schematic Alignment of Underground Fuel Pipeline (Exact Alignment to be determined on-site)
- Generator Room
- Transformer Room

| Rev | Description | By | Date |
|---|---|---|---|

Consultant: ARUP 奧雅納工程顧問 Ove Arup & Partners Hong Kong Limited

Project title:
AGREEMENT NO. CE 42/2000 (CE)
SOUTH EAST KOWLOON DEVELOPMENT
INFRASTRUCTURE AT NORTH APRON
AREA OF KAI TAK AIRPORT

Drawing title:
LAYOUT PLANS OF SUBSTATION
& PROPOSED SAMPLING POINTS
IN NAKTA (II)

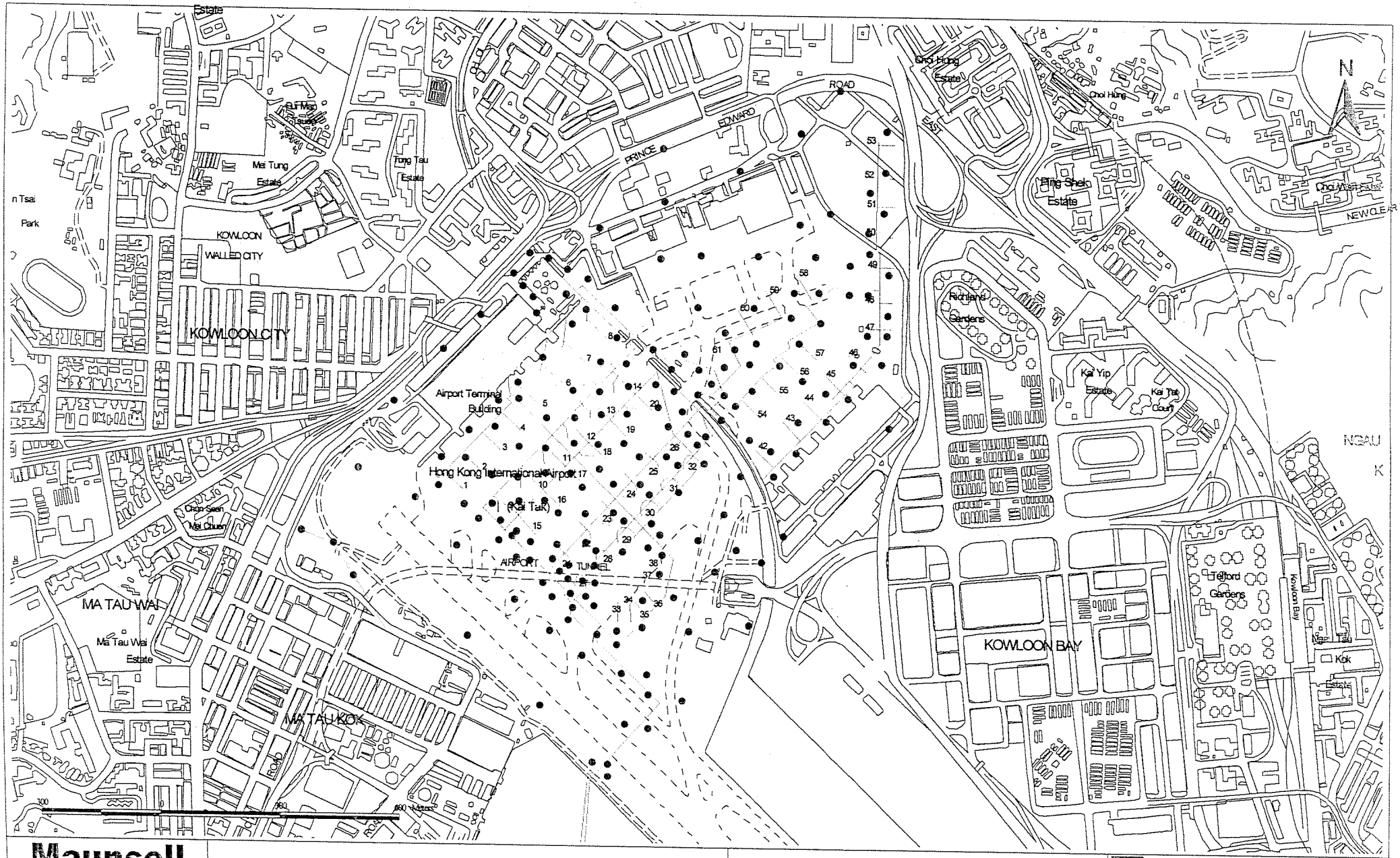
| Drawing no. | | | Rev. |
|---|---|---|---|
| 23462 /E/EIA/194 | | | |
| Drawn: AZ | Date: MAY 03 | Checked: JS | Approved: EY |
| Scale: AS SHOWN | | Status: PRELIMINARY | |



Territory Development Department, Hong Kong
九龍發展處
KOWLOON DEVELOPMENT OFFICE

# *Appendix G*

***(Relevant Information Extracted from the Approved North Apron Decommissioning EIA Report)***



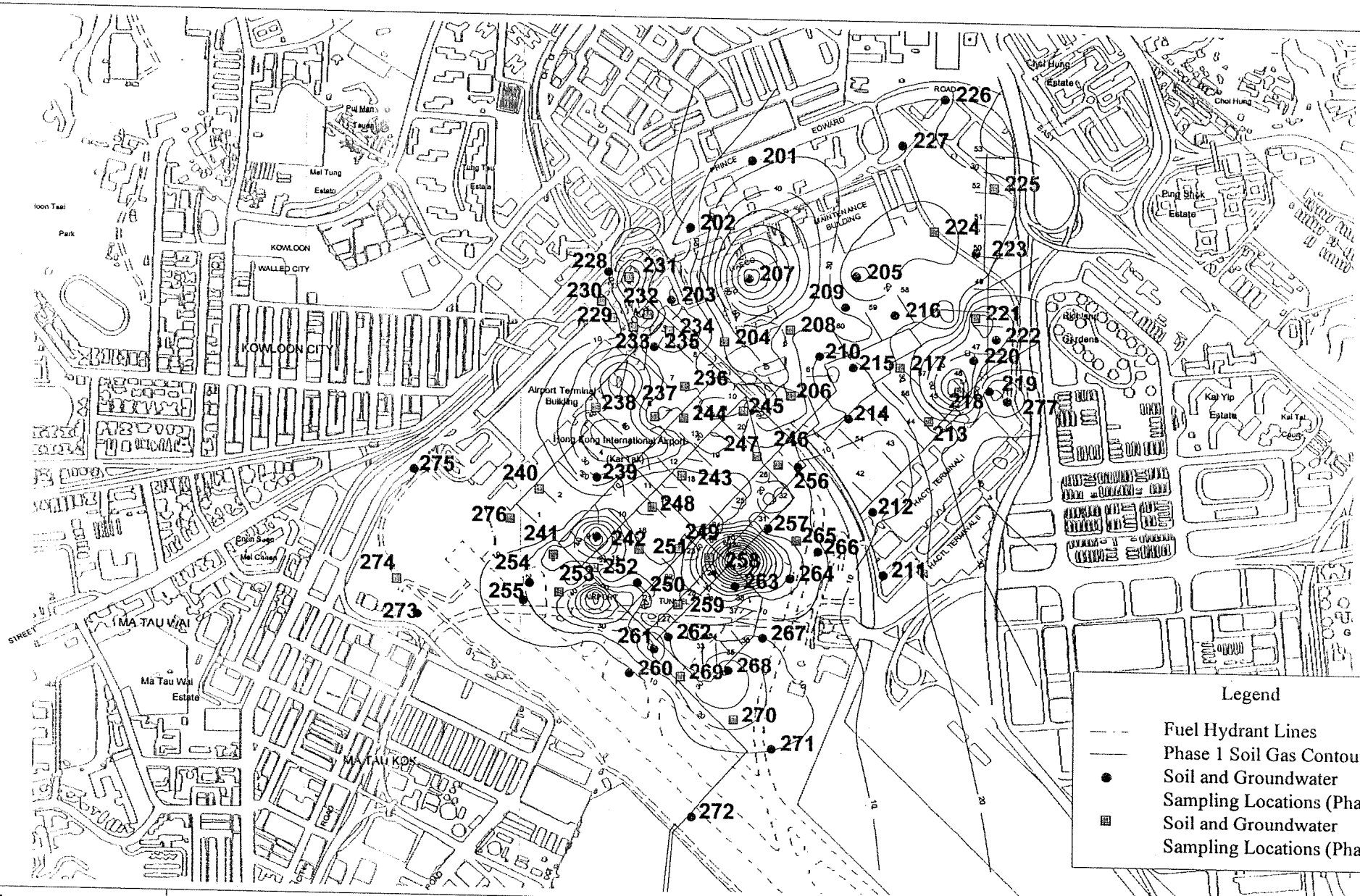

Maunsell
in association with
環科 C E S

KAI TAK AIRPORT NORTH APRON DECOMMISSIONING

TITLE
Locations of Soil Gas Monitoring Probes (Phase 1)

Territory Development Department, Hong Kong
Kowloon Development Office

| | | | |
|---|---|---|---|
| SCALE | 1 : 13000 | DATE | March 1998 |
| DESIGNED | Matthew Ko | DRAWN | Fanny Lau |
| CAD REF. | C415 | DRAWING NO. | Figure 5.1 |
| | | REV | 0 |




**Maunsell**
in association with
環科 CES

KAI TAK AIRPORT NORTH APRON DECOMMISSIONING

TITLE Phase 2 Soil and Groundwater Sampling Locations

Territory Development Department Hong Kong
Kowloon Development Office

| | | | |
|---|---|---|---|
| SCALE | 1 : 13000 | DATE | March 1998 |
| DESIGNED | Fanny Lau | DRAWN | Fanny Lau |
| CAD REF. | C415 | DRAWING No | Figure 5.2 |
| | | REV | 0 |

# *Appendix H*

***(Standard Form 3.1- Summary of On-Site Land Use Adopted from Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management)***

# Standard Form 3.1 - Summary of On-Site Land Use

**Property Name** Hong Kong Aviation Club

**Current Use**

| Type of facility/business | On-site property land use | Date began[1] | Description of business process/primary products | Owner or Occupier | Approximate size of on-site property | Off-site property affected ? ___Yes ___No |
|---|---|---|---|---|---|---|
| Hong Kong Aviation Club Premises: Recreation / Sports | Urban Residential | Since 1920's | Membership activities and helicopter flying | Owner | 1.03 Hectares | No |
| Open Area for Car Parking: Car Park | Industrial | Around 2004 | Car parking | Unknown | 0.9 Hectares | No |

**Past Use**

Are past uses different from current uses? ____Yes __X__No If Yes, complete this section.

Complete this table with each different operation, use, or status of the on-site property. Include all operations back to pre-commercial or pre-industrial time if this information is necessary to characterize the site. Specify the status of the property at each stage, including times it may have been vacant. Start with the most recent use and list in chronological order backwards through time.

| Type of facility/business | On-site property land use | Date began[2] | Date ended[3] | Description of business process/primary products | Owner or Occupier | Approximate size of on-site property (if different from current size) | Off-site property affected ? ___Yes ___No |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**Future Use**

Are future uses different from current uses? __X__Yes ____No If Yes, complete this section.

| Type of facility/business | On-site property land use[4] | Description of business process/primary products | Owner or Occupier | Approximate size of on-site property |
|---|---|---|---|---|
| Hong Kong Aviation Club Premises: Recreation / Sports | Urban Residential (No Change) | Recreation Sports | Hong Kong Aviation Club | 1.03 Hectares |
| Open Area for Car Parking: Car Park | Public Parks | Regional Open Spaces | Unkown | 0.9 Hectares |

[1] Specify the approximate year in which the current use of the on-site property began.
[2] Specify the approximate year in which the past use of the on-site property began.
[3] Specify the approximate year in which the past use of the on-site property ended.
[4] Specify all applicable land use including urban residential, rural residential, industrial or public parks

# *Appendix I*

***(Response to Comments)***

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study**
**cum Design and Construction of Advance Works**
**– Investigation, Design and Construction**

**Contamination Assessment Plan (CAP) for the Hong Kong Aviation Club (Rev.1)**

**Responses to Comments**

| Comments Received | | Date Received |
|---|---|---|
| 1. | Environmental Protection Department | 30 January 2008 |

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study**
**cum Design and Construction of Advance Works**
**– Investigation, Design and Construction**

**Contamination Assessment Plan (CAP) for Hong Kong Aviation Club (Rev.1)**

**Responses to Comments**

| No. | Comments | Responses |
|---|---|---|
| 1. | **Environmental Protection Department, memo ref. (34) in Ax (13) to EP2/K19/S3/10 Pt. 5 dated 28 January 2008**<br><br>I refer to your MUR confirming that you have instructed MCAL to prepare and submit, on behalf of CEDD, assessment methodologies and key assessment assumptions, etc. as required in the EIA study briefs for the captioned study for our agreement.<br><br>2. In this connection, we have received MCAL's letter ref. IWLH:MPLL:CSSK:60022408/08.4-1001 dated 9.1.2008 seeking our agreement to the captioned CAP (Rev.1) under Section 3.4.10.4 of the EIA Study Brief No. ESB-152/2006.<br><br>3. For avoidance of doubt, I have extracted the relevant requirements of the concerned EIA study brief clause as follows:<br><br>EIA Study Brief No. ESB-152/2006<br><br>S.3.4.10.4 - :*"During the course of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation. The CAP shall include proposals with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s)."* | |

| No. | Comments | Responses |
|---|---|---|
| | 4. In addition, you should also be aware that Section 3.4.10.2 of the EIA Study Brief No. ESB-152/2006 clearly defines that *"Assessment Area for land contamination impact shall include all areas within the boundary of the former Kai Tak International Airport as described in section 3.2.1 (of the brief)."* The Subject CAP submission is only for the Hong Kong Aviation Club area and you are reminded that CAPs for other areas within the Assessment Area shall be submitted in due course for our agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation in accordance with Section 3.4.10.4 of the EIA Study Brief No. ESB-152/2006. | |
| | 5. Please note that our comments below on the CAP are only provided for the partial fulfilment of the specific requirements for agreement stipulated in the above-mentioned EIA study brief clause and for the Hong Kong Aviation Club area only and shall not pre-empt our future decisions to the EIA report approval process for the Kai Tak Development EIA and any future related EIA studies within the Kai Tak Development EIA study area under the EIA Ordinance. Moreover, our views below shall not absolve your responsibility to fulfil requirements in other statutory legislation, including the Waste Disposal Ordinance. | |
| | 6. Subject to the above caveats, we agree that the submission identified in paragraph 2 above, with incorporation of the two textural amendments below, has partially fulfilled the specific requirement for the Hong Kong Aviation Club area stipulated in Section 3.4.10.4 of the EIA Study Brief No. ESB-152/2006 mentioned in paragraph 3 above: | |
| | (i) Provide the detection limits for both soil and groundwater samples testing in Table 4.2. | Comment Noted. The detection limits for both soil and groundwater samples testing have been provided in Table 4.2. |
| | (ii) Provide the TCLP limits for each of the parameters in Table 4.3. | Comment Noted. The TCLP limits for each of the parameters have been provided in Table 4.3. |
| | 7. Please provide two copies of the amended CAP for our record. | |

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study**
**cum Design and Construction of Advance Works**
**– Investigation, Design and Construction**

**Contamination Assessment Plan (CAP) for the Hong Kong Aviation Club**

**Responses to Comments**

| Comments Received | | Date Received |
|---|---|---|
| 1. | Environmental Protection Department | 4 December 2007 |

**Agreement No. CE 35/2006(CE)**
**Kai Tak Development Engineering Study**
**cum Design and Construction of Advance Works**
**– Investigation, Design and Construction**

**Contamination Assessment Plan (CAP) for Hong Kong Aviation Club**

**Responses to Comments**

| No. | Comments | Responses |
|---|---|---|
| 1. | **Environmental Protection Department, memo ref. ( ) in Ax (13) to EP2/K19/S3/10 Pt. 5 dated 3 December 2007**<br><br>I refer to your MUR confirming that you have instructed MCAL to prepare and submit, on behalf of CEDD, assessment methodologies and key assessment assumptions, etc. as required in the EIA study briefs for the captioned study for our agreement.<br><br>2. In this connection, we have received MCAL's letter ref. IWLH:MPLL:CSSK:60022408/08.2-0819 dated 15.11.2007 seeking our agreement to the captioned CAP under Section 3.4.10.4 of the EIA Study Brief No. ESB-152/2006.<br><br>3. For avoidance of doubt, I have reproduced the relevant requirements of the concerned EIA study brief clause as follows:<br><br>EIA Study Brief No. ESB-152/2006<br><br>S.3.4.10.4 - :*"During the course of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation. The CAP shall include proposals with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s)."* | |

| No. | Comments | Responses |
|---|---|---|
| | 4. In addition, you should also be aware that Section 3.4.10.2 of the EIA Study Brief No. ESB-152/2006 clearly defines that *"Assessment Area for land contamination impact shall include all areas within the boundary of the former Kai Tak International Airport as described in section 3.2.1 (of the brief)."* The Subject CAP submission is only for the Hong Kong Aviation Club area and you are reminded that CAPs for other areas<br><br>within the Assessment Area shall be submitted in due course for our agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation in accordance with Section 3.4.10.4 of the EIA Study Brief No. ESB-152/2006.<br><br>5. Please note that our comments below on the CAP are only provided for the partial fulfilment of the specific requirements for agreement stipulated in the above-mentioned EIA study brief clause and for the Hong Kong Aviation Club area only and shall not pre-empt our future decisions to the EIA report approval process for the Kai Tak Development EIA and any future related EIA studies within the Kai Tak Development EIA study area under the EIA Ordinance. Moreover, our views below shall not absolve your responsibility to fulfil requirements in other statutory legislation, including the Waste Disposal Ordinance.<br><br>6. Subject to the above caveats, we have the following comments, provided on an advisory basis, on your Consultant's submission: | |

| No. | Comments | Responses |
|---|---|---|
| | (a) Section 2.1.1– Please note that EPD has issued the "Guidance Note for Contaminated Assessment and Remediation" and the "Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management dated July 2007" (GM) on 15 August 2007. The "Practice Note for Professional Persons PN 3/94 on Contaminated Land Assessment and Remediation" has been superseded (with 3 months transitional period) by the GN and the Risk-based Remediation Goals (RBRGs) has replaced the outdated Dutch B levels as new contaminated land standards for Hong Kong. Only the RBRGs are applicable for assessment after the transitional period and should be used in CAP received by EPD on or after 15 November 2007. In this regard, the captioned CAP we received on 15.11.2007 should be prepared with reference to the new GN. | Comment noted. Contaminated land Assessment and the potential impacts to particular development project would be prepared with reference to the new GN, the "Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair /Dismantling Workshop" and the GM issued by Environmental Protection Department (EPD) using the Risk based Remediation Goals as the contaminated land standards. |
| | (b) Section 3..5.12 – Please indicate the date of approval of previous CAP ( the 5th line refers) in the text | Comment noted. The date of approval for the CAP prepared under Agreement No. CE 42/2000(CE) South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport has been provided. |
| | (c) Section 3.5.15 – Please show these previous borehole locations on Drawing 3.3 | To our best knowledge, no site investigations have been conducted within the Hong Kong Aviation Club area previously. The previous borehole locations were proposed base on the rationale that boreholes shall be located around the underground tank and along its associated pipelines.<br><br>Since the layout of the Hong Kong Aviation Club on the layout plan shown in the previous CAP is different from the actual layout, to avoid confusion, illustrating the proposed borehole locations suggested in the approved CAP under Agreement No. CE 42/2000(CE) on Drawing 3.3 is not recommended. |

| No. | Comments | Responses |
|---|---|---|
| | (d) Section 3.5.18 – Please indicate the date of approval of the North Apron Decommissioning EIA study area | Comment noted. The date of approval for the North Apron Decommissioning EIA study area has been provided. |
| | (e) Section 3.5.19 – Since the Hong Kong Aviation Club including Sites A and B is still under operation after the approval of North Apron Decommissioning EIA Study Report, therefore, it is suggested that similar site investigation should be proposed so as to demonstrate that there is no contamination due to leakage and/ or spillage since last site investigation conducted under the North Apron Decommissioning EIA Study. Please show the proposed sampling and monitoring locations on Drawing 3.4. | Comment noted. 3 additional boreholes have been proposed within the open area used for car parking to access the potential land contamination concern due to leakage and/ or spillage since last site investigation conducted under the North Apron Decommissioning EIA Study. The proposed boreholes locations have been illustrated in Drawing 3.3. Drawing 3.4 has been cancelled. |
| | (f) Section 4.1.1 – Please amend the text and Table 4.1 in accordance with the new GN and GM as mentioned in "Comment on Section 2.1.1" and " Comment on Section 3.5.19" | Comment noted. Section 4.1.1 and Table 4.1 has been revised according to the new GN and GM. |
| | (g) Section 4.5 – Please amend the text in accordance with the new GN and GM as mentioned in "Comment on Section 2.1.1" and "Comment on Section 3.5.19" above as appropriate. | Please note that Section 4.5 is the general groundwater sampling procedure, no amendment is required in accordance with the new GN and GM. |

| No. | Comments | Responses |
|---|---|---|
| | (h) Section 4.9 – (i) Please amend the text and associated Tables in accordance with the new GN and GM as mentioned in in "Comment on Section 2.1.1" and "Comment on Section 3.5.19" above as appropriate. (ii) Please note that, according to the Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management", all laboratory test methods must be accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS). Please confirm and state in the text that all analytical methods proposed for both soil and groundwater samples testing would fulfil the aforesaid requirements. | (i) Please note that Section 4.9 has been updated in accordance with the new GN and new GM.<br><br>(ii) In response to the comment, a questionnaire was sent to the two most widely used HOKLAS accredited laboratories for Environmental Testing in Hong Kong.<br><br>It was noted that both laboratories are not able to provide HOKLAS accredited testing method for all parameters listed in the Table in the GM. Replies from ALS and Lam are attached in **Annex 1** for reference.<br><br>In addition, a statement indicating that all soil and groundwater samples will be conducted by a HOKLAS accredited laboratory has been included in the text. |
| | (i) Section 5 – (i) Please amend the text and associated Tables in accordance with the new GN and GM as mentioned in in "Comment on Section 2.1.1" and "Comment on Section 3.5.19" above as appropriate. | Comment noted. Section 5 and Table 5.1 has been revised according to the new GN and GM. |
| | 7. In views of the comments in para. 5 above, the CAP is yet to be revised and resubmitted for our agreement. | |

# *Annex I*

***(Completed Questionnaire on HOKLAS Accredited Testing Method)***

# Completed Questionnaire on HOKLAS Accredited Testing Method provided by LAM

Relevant RBRGs for Soil and Groundwater

| Chemical | Soil (mg/kg) | | | | Groundwater (µg/L) | | | |
|---|---|---|---|---|---|---|---|---|
| | Most Stingent Set of RBRGs | Soil Saturation Limits | Testing Method Accredited? (Y/N) | Reporting Limit lower than the RBRGs? (Y/N) | Most Stingent Set of RBRGs | Solubility Limits | Testing Method Accredited? (Y/N) | Reporting Limit lower than the RBRGs? (Y/N) |
| VOCs | | | | | | | | |
| Acetone | 4260 | *** | N | Y | 10000000 | *** | N | Y |
| Benzene | 0.279 | 336 | N | Y | 1490 | 1750000 | N | Y |
| Bromodichloromethane | 0.129 | 1030 | N | N | 871 | 6740000 | N | Y |
| 2-Butanone | 10000 | *** | N | Y | 10000000 | *** | N | Y |
| Chloroform | 0.0529 | 1100 | N | N | 382 | 7920000 | N | Y |
| Ethylbenzene | 298 | 138 | N | Y | 391000 | 169000 | N | Y |
| Methyl tert-Butyl Ether | 2.8 | 2380 | N | N | 61100 | *** | N | Y |
| Methylene Chloride | 0.529 | 921 | N | N | 7590 | *** | N | Y |
| Styrene | 1540 | 497 | N | N | 1160000 | 310000 | N | Y |
| Tetrachloroethene | 0.0444 | 97.1 | N | N | 99.6 | 200000 | N | Y |
| Toluene | 705 | 235 | N | Y | 1970000 | 526000 | N | Y |
| Trichloroethene | 0.211 | 488 | N | N | 481 | 1100000 | N | Y |
| Xylenes (Total) | 36.8 | 150 | N | Y | 43300 | 175000 | N | Y |
| SVOCs | | | | | | | | |
| Acenaphthene | 3280 | 60.2 | Y | Y | 7090000 | 4240 | Y | Y |
| Acenaphthylene | 1510 | 19.8 | Y | Y | 542000 | 3930 | Y | Y |
| Anthracene | 10000 | 2.56 | Y | Y | 10000000 | 43.4 | Y | Y |
| Benzo(a)anthracene | 11.4 | NA | Y | Y | NA | NA | NA | NA |
| Benzo(a)pyrene | 1.14 | NA | Y | Y | NA | NA | NA | NA |
| Benzo(b)fluoranthene | 9.88 | NA | Y | Y | 203 | 1.5 | Y | Y |
| Benzo(g,h,i)perylene | 1710 | NA | Y | Y | NA | NA | NA | NA |
| Benzo(k)fluoranthene | 114 | NA | Y | Y | NA | NA | NA | NA |
| bis-(2-Ethylhexyl)phthalate | 28 | NA | N | Y | NA | NA | NA | NA |
| Chrysene | 871 | NA | Y | Y | 21900 | 1.6 | Y | Y |
| Dibenzo(a,h)anthracene | 1.14 | NA | Y | Y | NA | NA | NA | NA |
| Fluoranthene | 2270 | NA | Y | Y | 10000000 | 206 | Y | Y |
| Fluorene | 2250 | 54.7 | Y | Y | 10000000 | 1980 | Y | Y |
| Hexachlorobenzene | 0.22 | NA | N | Y | 23.4 | 6200 | N | Y |
| Indeno(1,2,3-cd)pyrene | 11.4 | NA | Y | Y | NA | NA | NA | NA |
| Naphthalene | 85.6 | 125 | Y | Y | 23700 | 31000 | Y | Y |
| Phenanthrene | 10000 | 28 | Y | Y | 10000000 | 1000 | Y | Y |
| Phenol | 10000 | 7260 | N | Y | NA | NA | NA | NA |
| Pyrene | 1710 | NA | Y | Y | 10000000 | 135 | Y | Y |
| Metals | | | | | | | | |
| Antimony | 29.1 | NA | N | Y | NA | NA | NA | NA |
| Arsenic | 21.8 | NA | Y | Y | NA | NA | NA | NA |
| Barium | 10000 | NA | Y | Y | NA | NA | NA | NA |
| Cadmium | 72.8 | NA | Y | Y | NA | NA | NA | NA |
| Chromium III | 10000 | NA | N | Y | NA | NA | NA | NA |
| Chromium VI | 218 | NA | N | Y | NA | NA | NA | NA |
| Cobalt | 1460 | NA | Y | Y | NA | NA | NA | NA |
| Copper | 2910 | NA | Y | Y | NA | NA | NA | NA |
| Lead | 255 | NA | Y | Y | NA | NA | NA | NA |
| Manganese | 10000 | NA | Y | Y | NA | NA | NA | NA |
| Mercury | 6.52 | NA | Y | Y | 184 | NA | Y | Y |
| Molybdenum | 364 | NA | Y | Y | NA | NA | NA | NA |
| Nickel | 1460 | NA | Y | Y | NA | NA | NA | NA |
| Tin | 10000 | NA | Y | Y | NA | NA | NA | NA |
| Zinc | 10000 | NA | Y | Y | NA | NA | NA | NA |
| Dioxins / PCBs | | | | | | | | |
| Dioxins (I-TEQ) | 0.001 | NA | Y (subcontract) | Y | NA | NA | NA | NA |
| PCBs | 0.226 | NA | Y | Y | 171 | 31 | Y | Y |
| Petroleum Carbon Ranges | | | | | | | | |
| C6 - C8 | 545 | 1000 | N | Y | 31700 | 5230 | N | Y |
| C9 - C16 | 1330 | 3000 | N | Y | 276000 | 2800 | N | Y |
| C17 - C35 | 10000 | 5000 | N | Y | 4930 | 2800 | N | Y |
| Other Inorganic Compounds | | | | | | | | |
| Cyanide, free | 1460 | NA | N | Y | NA | NA | NA | NA |
| Organometallics | | | | | | | | |
| TBTO | 21.8 | NA | N | Y | NA | NA | NA | NA |

Note: NA - Not Available

# Completed Questionnaire on HOKLAS Accredited Testing Method provided by ALS

Relevant RBRGs for Soil and Groundwater

| Chemical | Soil (mg/kg) | | | | Groundwater (µg/L) | | | |
|---|---|---|---|---|---|---|---|---|
| | Most Stingent Set of RBRGs | Soil Saturation Limits | Testing Method Accredited? (Y/N) | Reporting Limit lower than the RBRGs? (Y/N) | Most Stingent Set of RBRGs | Solubility Limits | Testing Method Accredited? (Y/N) | Reporting Limit lower than the RBRGs? (Y/N) |
| VOCs | | | | | | | | |
| Acetone | 4260 | *** | N | Y | 10000000 | *** | N | Y |
| Benzene | 0.279 | 336 | Y | Y | 1490 | 1750000 | Y | Y |
| Bromodichloromethane | 0.129 | 1030 | Y | Y | 871 | 6740000 | Y | Y |
| 2-Butanone | 10000 | *** | Y | Y | 10000000 | *** | Y | Y |
| Chloroform | 0.0529 | 1100 | Y | Y | 382 | 7920000 | Y | Y |
| Ethylbenzene | 298 | 138 | Y | Y | 391000 | 169000 | Y | Y |
| Methyl tert-Butyl Ether | 2.8 | 2380 | N | Y | 61100 | *** | N | Y |
| Methylene Chloride | 0.529 | 921 | N | N* | 7590 | *** | N | Y |
| Styrene | 1540 | 497 | Y | Y | 1160000 | 310000 | Y | Y |
| Tetrachloroethene | 0.0444 | 97.1 | Y | Y | 99.6 | 200000 | Y | Y |
| Toluene | 705 | 235 | Y | Y | 1970000 | 526000 | Y | Y |
| Trichloroethene | 0.211 | 488 | Y | Y | 481 | 1100000 | Y | Y |
| Xylenes (Total) | 36.8 | 150 | Y | Y | 43300 | 175000 | Y | Y |
| SVOCs | | | | | | | | |
| Acenaphthene | 3280 | 60.2 | Y | Y | 7090000 | 4240 | Y | Y |
| Acenaphthylene | 1510 | 19.8 | Y | Y | 542000 | 3930 | Y | Y |
| Anthracene | 10000 | 2.56 | Y | Y | 10000000 | 43.4 | Y | Y |
| Benzo(a)anthracene | 11.4 | NA | Y | Y | NA | NA | Y | Y |
| Benzo(a)pyrene | 1.14 | NA | Y | Y | NA | NA | Y | Y |
| Benzo(b)fluoranthene | 9.88 | NA | Y | Y | 203 | 1.5 | Y | Y |
| Benzo(g,h,i)perylene | 1710 | NA | Y | Y | NA | NA | | |
| Benzo(k)fluoranthene | 114 | NA | Y | Y | NA | NA | | |
| bis-(2-Ethylhexyl)phthalate | 28 | NA | Y | Y | NA | NA | | |
| Chrysene | 871 | NA | Y | Y | 21900 | 1.6 | Y | Y |
| Dibenzo(a,h)anthracene | 1.14 | NA | Y | Y | NA | NA | | |
| Fluoranthene | 2270 | NA | Y | Y | 10000000 | 206 | Y | Y |
| Fluorene | 2250 | 54.7 | Y | Y | 10000000 | 1980 | Y | Y |
| Hexachlorobenzene | 0.22 | NA | Y | Y | 23.4 | 6200 | Y | Y |
| Indeno(1,2,3-cd)pyrene | 11.4 | NA | Y | Y | NA | NA | | |
| Naphthalene | 85.6 | 125 | Y | Y | 23700 | 31000 | Y | Y |
| Phenanthrene | 10000 | 28 | Y | Y | 10000000 | 1000 | Y | Y |
| Phenol | 10000 | 7260 | Y | Y | NA | NA | | |
| Pyrene | 1710 | NA | Y | Y | 10000000 | 135 | Y | Y |
| Metals | | | | | | | | |
| Antimony | 29.1 | NA | Y | Y | NA | NA | | |
| Arsenic | 21.8 | NA | Y | Y | NA | NA | | |
| Barium | 10000 | NA | Y | Y | NA | NA | | |
| Cadmium | 72.8 | NA | Y | Y | NA | NA | | |
| Chromium III | 10000 | NA | NA | Y | NA | NA | | |
| Chromium VI | 218 | NA | Y | Y | NA | NA | | |
| Cobalt | 1460 | NA | Y | Y | NA | NA | | |
| Copper | 2910 | NA | Y | Y | NA | NA | | |
| Lead | 255 | NA | Y | Y | NA | NA | | |
| Manganese | 10000 | NA | Y | Y | NA | NA | | |
| Mercury | 6.52 | NA | Y | Y | 184 | NA | Y | Y |
| Molybdenum | 364 | NA | Y | Y | NA | NA | | |
| Nickel | 1460 | NA | Y | Y | NA | NA | | |
| Tin | 10000 | NA | Y | Y | NA | NA | | |
| Zinc | 10000 | NA | Y | Y | NA | NA | | |
| Dioxins / PCBs | | | | | | | | |
| Dioxins (I-TEQ) | 0.001 | NA | Y | Y | NA | NA | Y | Y |
| PCBs | 0.226 | NA | Y | Y | 171 | 31 | Y | Y |
| Petroleum Carbon Ranges | | | | | | | | |
| C6 - C8 | 545 | 1000 | Y* | Y | 31700 | 5230 | Y* | Y |
| C9 - C16 | 1330 | 3000 | Y* | Y | 276000 | 2800 | Y* | Y |
| C17 - C35 | 10000 | 5000 | Y* | Y | 4930 | 2800 | Y* | Y |
| Other Inorganic Compounds | | | | | | | | |
| Cyanide, free | 1460 | NA | ** | | NA | NA | Y** | Y |
| Organometallics | | | | | | | | |
| TBTO | 21.8 | NA | Y | Y | NA | NA | Y | Y |

Note: NA - Not Available

Y*- ALS is accreidted to different reporting format but is pending for extension to provide report for the new reporting format

Y**- ALS is accrdited for total cyanide testing

N* aALS can report to the level as required by subtracting the background

Prepared by ALS Technichem (HK) Pty Ltd

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