MTR Corporation Limited

Shatin to Central Link
Tai Wai to Hung Hom Section

Contamination Assessment Plan for Magazine Site at TKO Area 137

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Date: 22 Apr 2016

MTR Corporation Limited

Shatin to Central Link
Tai Wai to Hung Hom Section

Contamination Assessment Plan for Magazine Site at TKO Area 137

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Date: 22 APRIL 2016

MTR Corporation Limited

Shatin to Central Link – Tai Wai to Hung Hom Section

Land Contamination Assessment of Magazine Site at TKO Area 137

Contamination Assessment Plan

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1 Introduction

1.1 Project Background

1.1.1 MTR Corporation Limited (MTRC) commissioned Ove Arup & Partners Hong Kong Limited (Arup) as the Consultant for undertaking the land contamination assessment of Magazine Site at TKO Area 137 (the Site) for the Shatin to Central Link – Tai Wai to Hung Hom Section [SCL(TAW-HUH)].

1.1.2 The Site is located within Area 137, Tseung Kwan O. The temporary above-ground magazine site for the storage of explosives previously used by Kwun Tong Extension (KTE) was handed to the SCL1103 project to support the construction of the drill and blast tunnelling works for the SCL(TAW-HUH) project. The relevant handover certificates are annexed in **Appendix 1.1**.

1.1.3 After the completion of the decommissioning works of the Magazine Site, the land will be handover to the relevant government departments. Location of the Site is shown in **Figure 1.1**.

1.1.4 According to EP Condition 2.36 of the Environmental Permit of SCL(TAW-HUH) (No. EP-438/2012/J), a land contamination assessment for the temporary explosive magazine site at Area 137, Tseung Kwan O shall be carried out. A Contamination Assessment Plan shall be prepared to the Director of Environment (DEP) for approval no later than one month before the commencement of the land contamination site investigation. A Contamination Assessment Report (CAR) shall be submitted to document the findings of the land contamination assessment findings. If land contamination is confirmed, a Remedial Action Plan (RAP) shall be submitted to formulate necessary remedial measures. A Remediation Report (RR) shall also be submitted after the completion of the remediation works.

1.2 Objectives

1.2.1 The purpose of this Contamination Assessment Plan (CAP) is to provide information, guidance and instruction to characterise land contamination and identify where contaminations are or may be present during the construction and operation within the Site. The objectives of this CAP are:

- To provide an account of the landuse within the Site boundary and relevant past landuse history in relation to possible land contamination;
- To identify areas of potential contamination; and
- To identify the chemicals of concern and scoping of requirements for sampling and laboratory testing of soil and groundwater samples.

1.3 Statutory Legislation and Evaluation Criteria

1.3.1 This CAP is prepared in accordance with the following Technical Memorandum and Guidance Notes:

- Practice Guide for Investigation and Remediation of Contaminated Land, EPD, August 2011;
- Guidance Note for Contaminated Land Assessment and Remediation, EPD, August 2007; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, December 2007; and
- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO).

1.3.2 In accordance with EPD's Guidance Note for Contaminated Land Assessment and Remediation, a contamination assessment evaluation should:

- provide a clear and detailed account of the present landuse and the relevant past land history, in relation to possible land contamination;
- identify areas of potential contamination and associated impacts, risks or hazards; and
- submit a plan to evaluate the actual contamination conditions for soil and/or groundwater, if required.

1.3.3 The EPD's Guidance Note includes a summary of the general steps of a detail contamination assessment study.

1.3.4 Under the Annex 19 of the TM-EIAO, consideration shall be given to a number of potentially contaminating historical land uses, including but not limited to, oil installations, gas works, power plants, shipyards/boatyards, chemical manufacturing/processing plants, steel mills/metal workshops, car repair and dismantling workshops and dumping ground and landfill, as having the potential to cause or have caused land contamination.

1.3.5 This CAP has been prepared to set out the requirements for a baseline contamination evaluation of the Site. A Contamination Assessment Report (CAR) will be prepared following site investigation activities. If contamination is identified in the CAR, a Remediation Action Plan (RAP) should be developed to formulate appropriate remedial measures. The RAP should follow the requirements specified in EPD's Practice Guide for Investigation and Remediation of Contaminated Land. A Remediation Report (RR) should be prepared to demonstrate adequate clean-up and submitted to EPD for agreement prior to the commencement of any development works at the contaminated areas.

1.4 Structure of this Report

1.4.1

The structure of this CAP is as follows:

Section 1 gives an introduction of the project background and this CAP

Section 2 presents the findings of the site appraisal

Section 3 identifies the potential contaminated site

Section 4 proposes the sampling and testing schedule and presents the potential health risk and environmental impacts

Section 5 presents the reporting programme

2 Site Appraisal

2.1 Desktop Review

2.1.1 A desktop study has been conducted to review past and present landuse, activities and installations within the Site that may pose potential for land contamination.

2.1.2 The following sections present the findings from desktop review.

Review of Aerial Photos

2.1.3 The development history of the Site was reviewed with the aid of aerial photographs from Year 1982 to 2014. A total of six historical photographs were selected and the key findings are summarized in **Table 2.1**. These historical photographs are shown in **Appendix 2.1**.

Table 2.1: Description of Historical Landuse of the Site

Year	Site Description
1982	The Site was part of the sea (Junk Bay). Reclamation had not been carried out in 1982.
1993	No significant change was observed.
2000	Reclamation was completed and the Site was vacant.
2004	Vegetation was observed in the centre of the Site, whereas remaining parts remained as vacant.
2010	No significant change in land use was observed.
2014	The current magazine site was observed

Review of approved EIA report

2.1.4 The approved EIA report *"Agreement No. CE21/2012 (WS) – Desalination Plant at Tseung Kwan O – Feasibility Study"* (AEIAR 192/2015) (hereinafter referred to as "the approved EIA report") was reviewed. From the approved EIA report, it is found that the ground of the magazine storage was concrete paved in good condition and no chemical was observed being stored within the magazine storage. In addition, no aboveground / underground oil tank was observed nor reported. Also, no sign of leakage or spillage of explosive or detonator was observed within the magazine storage. Hence, the approved EIA report concluded that the risk of potential land contamination within the magazine storage is low.

2.1.5 In addition, the approved EIA report stated that the generator room at the southeast of the magazine site was paved with intact concrete and enclosed from surrounding by corrugated metal sheets. The generators inside the generator room were provided with secondary containments. However, oil stains were observed on the concrete paved ground inside the generator room and around the diesel oil drums which were stored inside the generator room without secondary containment.

2.1.6 Furthermore, waste chemical drums with the label "bituminous waterproofing emulsion" were observed at the side of the vehicle access road southwest of the magazine storages. No secondary containment

was observed for the waste chemical drums. According to the photo records of the approved EIA report, it is estimated that the dimension of the storage area is around 6m x 4m.

2.1.7 Based on the findings of the approved EIA Report, potential land contamination at the generator room and the vehicle access road cannot be ruled out. A site visit was conduct to examine the current site conditions (refer to **Section 2.2**).

Review of Environmental Review Report

2.1.8 According to the Environmental Review Report (ERR) submitted for the application for Variation of Environmental Permit (VEP-495/2016) in February 2016 for SCL(TAW-HUH), it was reported that the Site was occupied by the SCL(TAW-HUH) Project since December 2014. During the operation of the magazine site by the SCL(TAW-HUH) Project between December 2014 and Q2 2016, the oil drums were stored properly inside the intact concrete paved generator room with drip trays and no spillage or leakage of oil/ waste oil was observed or recoded. Moreover, there was no chemical or chemical waste stored in other areas except the generator room.

2.1.9 As such, the ERR concluded that it is not anticipated that there was potential land contamination issue caused by the SCL(TAW-HUH) Report.

2.2 Site Survey

2.2.1 A site survey was conducted on 14 March 2016 to identify the existing land use within the Site which may have potential for causing soil contamination. The findings of the site survey are described as follows and the site survey photos are presented in **Figure 2.1**. The site survey checklist is annexed in **Appendix 2.2**.

2.2.2 The findings of the site survey were largely tally with the findings of the approved EIA report and the ERR report as stated in **Section 2.1**.

2.2.3 The magazine storage was concrete paved in good condition and no chemicals were found to be stored within the magazine site (**Photo 1**).

2.2.4 Similar to the findings of the approved EIA report and the ERR report, a generator room was observed in the southeast of the magazine store. The generator room was paved with intact concrete and enclosed by corrugated metal sheets. The bottom of the corrugated metal sheets was sealed with the concrete slab with cement. Also, the area that immediately next to the generator room was concrete paved (**Photo 2**). Diesel-fired generators and oil drums with drip trays were observed inside the generator room (**Photo 3**). Although the generators and the oil drums with drip trays were placed on a concrete slab, oil stains were observed on the concrete slab (**Photo 4**).

2.2.5 A fire hydrant tank and a pump room were also observed next to the generator room. Both the fire hydrant tanks and the pumps were placed on thick concrete slab (**Photo 5** and **Photo 6**). No oil stain or other sign of potential land contamination was observed near the fire hydrant tank

and the pump room.

2.2.6 For the waste chemical drums storage on the vehicle access road that previously identified in the approved EIA report, the vehicle access road was cleared during the site visit. No waste chemical drum nor oil stain was observed during the site survey (**Photo 7**).

2.3 Geological Information

2.3.1 Based on the review of previous ground investigation (GI) reports undertaken near the vicinity of the Site, the Site is generally underlain by a layer of gravel down to 9 m below ground level (m bgl). A 2.5m-thick layer of marine deposit is found beneath of the fill layer. The alluvium and tuff layer is found underneath. **Table 2.2** summarised the underground geology.

Table 2.2: Summary of the Drillhole Record

Depth (m bgl)	Description
0 – 9	Medium to coarse gravel with concrete, wood and brick fragments.
9.0 – 11.5	Marine deposit
11.5 and below	Alluvium and tuff

2.4 Future Land-use

2.4.1 The RBRGs have developed four different post-restoration land uses, namely “Urban Residential”, “Rural Residential”, “Industrial” and “Public Parks”, to reflect actual settings which people could be exposed to contaminated soil or groundwater. Definitions of post-restoration land uses are given in EPD’s Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management.

2.4.2 According to the approved EIA report, the Site will be developed into a desalination plant. Hence, “Industrial” land use will be adopted for result comparison for this land contamination assessment.

3 Potentially Contaminated Area

3.1 Identification of Potentially Contaminated Sites

3.1.1 Identification of potentially contaminated areas with the Site has been done with reference to EPD's *Practice Guide for Investigation and Remediation of Contaminated Land* and with the aid of the information collected from desktop review of selected historical aerial photos and previously approved EIA report and ERR report and from site survey.

3.1.2 From the site survey, oil stains were observed on the intact concrete slab of the generator room but not the part of the vehicle access road that previously store the waste chemical drums.

3.1.3 Also, as revealed from the approved EIA report, potential land contamination area was identified in both generator room and the part of the vehicle access road for storing waste chemical drums.

3.1.4 Based on the findings from the approved EIA report and site survey, the potential land contamination area identified could be divided into two parts according to the historical landuse nature, namely, the generator room (Area A) and the part of the vehicle access road where waste chemical drums were stored (Area B). The details are summarized in **Table 3.1** and shown in **Figure 3.1**.

3.2 Environmental Site Investigation

3.2.1 Environmental site investigation (SI) is recommended to be carried out at the two potentially contaminated sites, i.e. Area A and Area B to determine the types and quantities of contaminants that could be present in the sites. Details of the potentially contaminated areas and the number of sampling locations to be proposed in each area will be based on a hot-spot approach, i.e. sampling point will be located at or near potential sources of contamination identified.

Table 3.1: Potentially Contaminated Area

Site ID	Landuse	Approximate Area (m^2)	Potential Contamination Sources	Number of Recommended Sampling Locations	Trial Pit No.	Justification
Area A	Generator Room	66 [1]	Leakage of diesel from the generator and the oil drums	2	TP1	Potential leakage from oil drums with drip tray
					TP2	Oil stains on the concrete slab around the generators

Site ID	Landuse	Approximate Area (m^2)	Potential Contamination Sources	Number of Recommended Sampling Locations	Trial Pit No.	Justification
Area B	Waste chemicals drums storage	48 [2]	Leakage of the chemicals "bituminous waterproofing emulsion" from the waste chemical drums	2	TP3 TP4	Potential leakage from waste chemical drums

Note:
[1] The area of the generator room is provided by MTRC.
[2] The area of the waste chemicals drum storage was estimated from the approved EIA report.

4 Site Investigation

4.1 Proposed Site Investigation

4.1.1 Two potentially contaminated areas have been identified in **Section 3** based on the review of historical information and site survey. Site investigation is needed to determine the types and quantities of contaminants within the Site.

4.1.2 In view of the Area A covers 66m^2, two sampling locations are proposed to cover the identified hotspots (i.e. potential leakage from oil drums (TP1) and the oil stains around the generator (TP2)). The proposed locations are shown in **Figure 3.1**.

4.1.3 The area of the waste chemical drums storage (i.e. Area B) is estimated to be around 48m^2 based on the approved EIA report. Two sampling locations (TP3 and TP4) were also proposed to cover the potentially contaminated area. The proposed locations are shown in **Figure 3.1**.

4.1.4 According to approved EIA report, both potential contamination areas would be used as a car park of the desalination plant. As such, deep excavation is not anticipated for both contamination areas. The termination sampling depth of 3.0 meters below ground level (mbgl) is proposed for soil sampling which is considered sufficient to cover the excavation extent. Therefore, the "trial pit" sampling method is considered for sampling. Three disturbed soil samples would be collected at depths of 0.5, 1.5 and 3.0 mbgl respectively.

4.1.5 The coordinates and sampling depths of the proposed trial pits are summarized in **Table 4.1** below.

Table 4.1: Sampling Strategy for Proposed Trial Pit

Trial Pit No.	Coordinates		Targeted Potentially Contaminated Areas [1]	Sampling Strategy			
	Easting	Northing		Termination Level (mbgl) [2], [3]	Sampling Depths (mbgl) [2], [3]	Soil Sampling	Groundwater Sampling
TP1	846651	814014	Area A	3.0	0.5, 1.5 and 3.0	✓	✓
TP2	846651	814008				✓	✓
TP3	846614	813979	Area B			✓	✓
TP4	846612	813976				✓	✓

Note:

[1]. Area A refers to the generator room and Area B refer to the waste chemical drum storage.

[2]. mbgl refers to metres below ground level.

[3]. The proposed termination levels are just for reference purpose. The exact termination levels and no. of soil samples of each trial pit should be decided by the on-site Land Contamination Specialist. If sign of contamination is observed during site investigation, further samples may be collected by drilling (if required) and the sampling depths and termination depths would be advised by the on-site Land Contamination Specialist.

4.2 Sampling and Testing Strategy

General

4.2.1 Sampling and analytical programme is proposed based on EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*. The sampling work procedures should follow appropriate protocols to minimize potentials for cross-contamination between samples and different sampling locations. The sampling methods are based on techniques developed by the USEPA, which include decontamination procedures, sample collection, preparation and preservation, as well as chain-of-custody documentation.

4.2.2 During the sampling activities, observations of soil and groundwater samples should be recorded by on-site personnel as supporting information for results interpretation.

Decontamination Procedures

4.2.3 Equipment in contact with the ground should be thoroughly decontaminated between each sampling event to minimize the potential for cross contamination. The equipment should be decontaminated by steam cleaning, washed with phosphate-free detergent and rinsed with water. A clean area immediately adjacent to the sample location should be established with a clean plastic sheet where all cleaned and foil wrapped equipment should be placed.

4.2.4 During sampling and decontamination activities, disposable latex gloves should be worn to prevent the transfer of contaminants from other sources. Disposable accessories, such as latex gloves, would be discarded properly after use.

4.2.5 The drilling equipment (if required) and sampling equipment should be cleaned according to the above procedures between sampling holes.

Soil Sampling

4.2.6 Trial pit sampling would be employed to collect soil and groundwater samples in view of the shallow excavation depth. Trial pits would be constructed manually. Exact location of soil sampling should be determined on site by the on-site Land Contamination Specialist based on observation. Sampling of soil should be made at the depth of 0.5m, 1.5m and 3.0m. The maximum depth of the trial pit would be 3mbgl.

4.2.7 If any sign of contamination is observed in the soil, the on-site Land Contamination Specialist would determine if the samples at greater depth would be needed in order to assess the contamination of the samples of greater depth. If it is decided that sampling of greater depth is required, drillhole sampling would be employed to collect soil samples.

4.2.8 If drill rig is used for drillhole sampling, decontamination procedure would be carried in accordance to the principle stated in **Section 4.2.3 – 4.2.5**.

Groundwater Sampling

4.2.9 Groundwater samples would be collected at each trial pit when groundwater is encountered. The decision on whether groundwater samples would be collected in accordance with the actual geological situation rests with the on-site Land Contamination Specialist.

4.2.10 Each sample would be truly representative of the groundwater at the point from which it is taken, without dilution or contamination by water from other sources or by other materials. Groundwater level and thickness of free product layer, if present, would be measured by dip meter and interface probe respectively, before groundwater samples are taken. Moreover, prior to groundwater sampling, the groundwater would be purged (at least three times volumes of the groundwater in the trial pit) to remove fine-grained materials and to collect freshly refilled groundwater samples. After purging, one groundwater sample would then be collected at each sampling location with a Teflon bailer, WaTerra Pump or similar device. The free products, if present, would also be sampled to allow identification by the laboratory.

4.2.11 If the permeability of the surrounding strata and storage is low, dewatering by purging may dry up the hole, in which case the on-site Contamination Specialist would decide whether the requirement to purge three times the liquid volume is to be waived.

4.2.12 After the dewatering process (and allowing groundwater to percolate back into the hole if it has been purged dry), enough quantity of groundwater sample would be collected from each trial pit, and then stored in different sample containers for analysis. Immediately after collection, samples would be transferred to labelled sample containers containing the necessary preservatives (supplied by the laboratory). Samples would be stored between $2^{o}C$ – $4^{o}C$, and delivered to the laboratory within 24 hours. All samples would be collected under chain-of-custody protocols.

Analytical Parameters

4.2.13 The collected soil and groundwater samples would be analysed for the parameters based on the land use types. Testing parameters have been selected with reference to the EPD's *Practice Guide for Investigation and Remediation of Contaminated Land*. All samples should be analysed by a Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited laboratory. The sampling and testing schedule is shown in **Table 4.2** and the analytical methods are shown in **Table 4.3**. Since the diesel-fired generators and diesel-containing drums were observed in Area A and the waste chemical drums containing organic chemicals were observed in Area B. The proposed testing parameters shall include the following:

- **Metals**: Antimony, Arsenic, Barium, Cadmium, Chromium III, Chromium VI, Cobalt, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Tin and Zinc
- **Volatile Organic Compounds (VOCs)**: Acetone, Benzene, Bromodichloromethane, 2-Butanone, Chloroform, Ethylbenzene,

Methyl Tert-Butyl Ether (MTBE), Methylene Chloride, Styrene, Tetrachloroethene, Toluene, Trichloroethene and Xylenes (Total)

- **Semi-volatile Organic Compounds**: Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Bis-(2-Ethylhexyl)phthalate, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Phenol and Pyrene
- **Petroleum Carbon Ranges (PCRs)**: Carbon Ranges C6-C8, C9-C16 and C17-C35

Table 4.2: Sampling and Testing Schedule

Trial Pit No.	Potentially Contaminated Area	Sampling Type	Testing Parameters			
			Metals[1]	VOCs	SVOCs	PCRs
TP1 and TP2	Area A (Generator Room)	Soil at all sampling depths and groundwater	✓	✓	✓	✓
TP3 and TP4	Area B (Waste Chemical Drums Storage)		✓	✓	✓	✓

Note:

[1]. Only "Mercury" test is required for groundwater sample.

4.2.14 A HOKLAS accredited testing laboratory should be appointed to conduct chemical analysis for the soil and groundwater samples. All laboratory test methods should be accredited by the HOKLAS or one of its Mutual Recognition Arrangement Partners.

Table 4.3: Method of Analysis for Soil and Groundwater Samples

Parameter	Reference Analytical Method	Reporting Limit for Soil (mg/kg)	Reporting Limit for Groundwater (mg/L)
Metals			
Antimony	USEPA Method 6020	1.0	-
Arsenic		1.0	-
Barium		1.0	-
Cadmium		0.2	-
Chromium III	By Calculation	1.0	-
Chromium VI	USEPA Method 6020	1.0	-
Cobalt		1.0	-
Copper		1.0	-
Lead		1.0	-
Manganese		1.0	-
Mercury		0.05	0.0005
Molybdenum		1.0	-
Nickel		1.0	-
Tin		1.0	-
Zinc		1.0	-

Parameter	Reference Analytical Method	Reporting Limit for Soil (mg/kg)	Reporting Limit for Groundwater (mg/L)
VOCs			
Acetone	USEPA Method 8260	50	0.05
Benzene		0.2	0.005
Bromodichloromethane		0.1	0.005
2-Butanone		5	0.05
Chloroform		0.04	0.005
Ethylbenzene		0.5	0.005
Methyl tert-Butyl Ether		0.5	0.005
Methylene Chloride		0.5	0.05
Styrene		0.5	0.005
Tetrachloroethene		0.04	0.005
Toluene		0.5	0.005
Trichloroethene		0.1	0.005
Xylenes (Total)		2.0	0.02
SVOCs			
Acenaphthylene	USEPA Method 8270	0.5	0.002
Acenaphthene		0.5	0.002
Anthracene		0.5	0.002
Benzo(a)anthracene		0.5	-
Benzo(a)pyrene		0.5	-
Benzo(b)fluoranthene		1.0	0.001
Benzo(g,h,i)perylene		0.5	-
Benzo(k)fluoranthene		0.5	-
Bis-(2-Ethylhexyl)phthalate		5.0	-
Chrysene		0.5	0.001
Dibenzo(a,h)anthracene		0.5	-
Fluoranthene		0.5	0.002
Fluorene		0.5	0.002
Hexachlorobenzene		0.2	0.004
Indeno(1,2,3-cd)pyrene		0.5	-
Naphthalene		0.5	0.002
Phenanthrene		0.5	0.002
Phenol		0.5	-
Pyrene		0.5	0.002
PCRs			
C6-C8	USEPA Method 8260	5.0	0.02
C9-C16		200	0.5
C17-C35		500	0.5

Assessment Criteria

4.2.15 As mentioned in **Section 2.4**, "Industrial" would be adopted as the future landuse. Laboratory testing results from site investigation should be compared with "Industrial" RBRGs for the testing parameters stated in **Section 4.2.13**. The RBRGs for soil and soil saturation limits as well as groundwater and groundwater solubility limits for "Industrial" landuse are shown in **Appendix 4.1**.

Storage of Surplus Soil Samples

4.2.16 Landfill disposal may be a practical option if the scale of contamination is localized and the quantity of soil expected to require cleanup is small. Additional tests in terms of Toxicity Characteristic Leaching Procedure (TCLP) would be required to meet the criteria for disposal to landfills. Hence, surplus soil samples obtained during the site investigation would be stored for subsequent TCLP tests if identified necessary.

4.2.17 The allowable storage time for mercury in soil samples is 8 days while the storage time for the rest of the parameters in **Table 4.4** in soil samples could be up to 6 months. Soil samples, if stored beyond the allowable storage time, are not considered representative of the actual site conditions.

4.2.18 Nevertheless, as mentioned in **Section 4.6**, feasible measures should be implemented to minimize the amount of contaminated soils, if any, to be excavated from the site and to avoid disposal of contaminated soils, Any contaminated soils would be handled, treated and re-used on site as far as possible, and the landfill disposal would be treated as last resort for handling of contaminated soils.

4.2.19 Landfill disposal criteria for contaminated soil is shown in **Table 4.4**.

Table 4.4: Landfill disposal criteria for contaminated soil

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

Parameter	TCLP Limit (mg/L)	Referenced Analytical Method	Reporting Limit (mg/L)
Vanadium	250		0.1
Selenium	1		0.02
Barium	1000		0.1

Ref:
EPD's Practice guide for Investigation and Remediation of Contaminated Land

Quality Assurance and Quality Control (QA/QC)

4.2.20 A proper QA/QC program should be established so that the data collected are accurate and representative of actual soil (and groundwater, if encountered) conditions. At each sampling location, samples will be collected using pre-cleaned sampling equipment.

The QA/QC Programme would include the following:

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

Sample Handling, Packaging and Transport

4.2.21 The soil and groundwater sampling should be conducted by an experienced sampling technician and supervised by an on-site Land Contamination Specialist, and appropriate procedures should be adhered to. Sampling methodologies are based on the techniques developed by the USEPA. Sampling tools should be cleaned thoroughly before, in-between and after each sampling. Special care would be taken to prevent any cross contamination of samples during collection, handling and storage.

4.2.22 Sample containers should be laboratory cleansed, airtight and made of glass or other suitable materials with Teflon-lined lids so that the container does not react with sample or absorb contaminants. Care should be taken when recording and labelling the sample information on the containers. Information such as date/time, sample point codes, depths and any other relevant data should be included. Samples would be stored in an icebox (at about 2℃ - 4℃) immediately after collection and labelled, until they are transported to the laboratory for analysis. All samples should be delivered to the laboratory within 24 hours.

4.3 Potential Health Risk and Environmental Impacts

Potential Impact on Receptors

4.3.1 The potential impacts to the Project from contaminated soil and groundwater are judged by the following risks associated:

- Health risk to site workers;
- Disposal of contaminated soils, where encountered; and

- Disposal of contaminated groundwater, where encountered.

Health Risk to Site Workers

4.3.2 Site construction workers may be exposed to contaminated soils and groundwater during earth moving operations and the laying of pipelines or underground services. The main exposure routes for site construction workers are accidental direct ingestion of contaminated materials through poor hygiene and eating or smoking on site, or through direct contact with potentially toxic or harmful contaminants in excavated soil.

5 Reporting Programme

5.1.1 Following the submission of CAP and completion of SI and lab testing works, a Contamination Assessment Report (CAR) would be prepared. The CAR would present the findings of the site investigation and evaluate the level and extent of potential contamination. The CAR would evaluate the potential environmental and human health impact based on the extent of potential contamination identified. If remediation is required, a Remediation Action Plan (RAP) will be prepared. The objectives of RAP are:

- To undertake further site investigation where required;
- To evaluate and recommend appropriate remedial measures for the contaminated materials identified in the assessment;
- To recommend good handling practices for the contaminated materials during the remediation works;
- To recommend approximate handling and disposal measures; and
- To formulate optimal and cost-effective mitigation and remedial measures for EPD's agreement.

5.1.2 A Remediation Report (RR) to demonstrate adequate clean-up would be prepared prior to the commencement of any construction works within the Site.

Figures

FAT TONG O

JOSS HOUSE BAY
(TAI MIU WAN)

TATHONG CHANNEL

TIT CHAM CHAU

KWUN TSAI

LEGEND :

PROJECT BOUNDARY

0 25 50 75 100 125
METRES

REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE			

DRAWN	VL
DESIGNED	VL
CHECKED	JC
APPROVED	ST
DATE	03/2016

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR
ARUP Ove Arup & Partners Hong Kong Limited

CADD REF.

TITLE
SITE LOCATION PLAN

SCALE 1 : 5000 (A3)

DRAWING NO. Figure 1.1

REV.

PLOT DRN: C:\ProgramData\Bentley\V8i.SS3\MicroStation\WorkSpace\System\pltcfg\HP_ArupHK_A3-PDF-C_GL.plt
$MODEL$ PRINTED BY: HKGTRA04 17/03/2016 260631
FILENAME: G:\env\project\26289\drawings\TKO 131 CAP\report\Figure 1.1.dgn

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

LEGEND :

PROJECT BOUNDARY

PHOTO TAKING POINT

Photo	Description
1	The Magazine Store
2	The Generator Room
3	Generators with Drip Trays
4	Oil Drums with Drip Trays
5	Fire Hydrant Room
6	Pump Room
7	Waste Chemical Drums Storage that Identfied in the approved EIA report

REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE			

DRAWN	VL
DESIGNED	VL
CHECKED	JC
APPROVED	ST
DATE	03/2016

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

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CADD REF.

TITLE

SITE SURVEY RECORDS

SCALE 1 : 1000 (A3)

DRAWING NO. Figure 2.1

REV.

PLOT DRV: C:\ProgramData\Bentley\V8i.SS3\MicroStation\WorkSpace\System\pltcfg\HP_ArupMK_A3-PDF-C_GL.plt
$MODEL$ PRINTED BY: HKGTRAG04 8/03/2016 11:56:40
MODELNAME: G:\env\project\426289\drawings\TKO 137 CAP\Report\Figure 2.4.dgn
FILENAME:

* The photo is extracted from Figure 8A.3c of the approved EIA report of "Desalination Plant at Tseung Kwan O" (AEIAR-192/2005)

TP1

TP2

TP3

TP4

WT

PH

TS

H

H

15.4

+6.7

+5.7

+5.5

HWM

LEGEND :

- PROJECT BOUNDARY
- AREA A - GENERATOR ROOM
- AREA B - WASTE CHEMICAL DRUMS STORAGE AREA
- PROPOSED TRIAL PIT LOCATION

Sampling ID	Coordinates	
	Easting	Northing
TP1	846651	814014
TP2	846651	814008
TP3	846614	813979
TP4	846612	813976

0 2.5 5 7.5 10 12.5
METRES

REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE			

DRAWN	VL
DESIGNED	VL
CHECKED	JC
APPROVED	ST
DATE	03/2016

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

ARUP Ove Arup & Partners Hong Kong Limited

CADD REF.

TITLE

POTENTIAL LAND CONTAMINATION AREA AND PROPOSED TRIAL PIT LOCATION

SCALE 1 : 500 (A3)

DRAWING NO. Figure 3.1

REV.

PLOT DRV: C:\ProgramData\Bentley_V8i_SS3\MicroStation\WorkSpace\System\prfcfg\HP_ArupHK_A3-PDF-C_CL.plt
MODEL: $MODEL$ PRINTED BY: HKGTRA04 13/04/2016 12:03:42
FILENAME: G:\env\project\26283\drawings\TKO 131 CAP\report\Figure 3.1.dgn

Appendix 1.1

Land Handover Certificates

MTR

Land Handover Certificate

Kwun Tong Line Extension
Contract No. 1001
Yau Ma Tei to Whampoa Tunnels and Ho Man Tin Station

Works Areas 1001.W22, 1001.W23 and Adjacent Land
For Temporary Magazine Site at Tseung Kwan O Area 137, Tseung Kwan O

This is to confirm that Nishimatsu Construction Co., Ltd (the Contractor) has handed back the Works Areas 1001.W22, 1001.W23 as shown coloured pink and adjacent land as shown coloured brown on the attached drawing no. SK_515 to MTR Corporation Limited on 28 December 2014.

Attended and signed by:-

Wil (Wilson Chung)

for Land Administration Manager
MTR Corporation Limited

O. Iwata O. IWATA

for Nishimatsu Construction Co., Ltd
(the Contractor)

(SAMMY Ho)

for Construction Manager
MTR Corporation Limited

WIP May 2007

WIP Jun 2007

WIP May 2007

WIP May 2007

WIP May 2007

WIP Jun 2007

WIP May 2007

1001.W23

1001.W22

TEMPORARY MAGAZINE SITE
AT TSEUNG KWAN O AREA 137

EMERGENCY VEHICLE ACCESS
TO BE MAINTAINED BY THE
CONTRACTOR UNDER THE
SUPPLEMENTARY AGREEMENT
TO STT NO. RDS/KTE-004

鰂魚涌
FAT TONG O

P07/007

大廟灣
JOSS HOUSE BAY

KEY PLAN NOT TO SCALE

LEGEND:

- WORKS AREA BOUNDARY
- PUBLIC ROAD / FOOTPATH
- BOUNDARY OF THE SCHEME

觀仔
KWUN TSAI

鐵爹洲
TIT CHAM CHAU

0 10 20 30 40 50
METRES
1 : 1000

REV	DESCRIPTION	BY	DATE	APPROVED
A	FIRST ISSUE	WCHUNG	24DEC14	DN

DRAWN	RKO
DESIGNED	WCHUNG
CHECKED	ACHUNG
APPROVED	DN
DATE	24/DEC/2014

MTR

KWUN TONG LINE EXTENSION

ORIGINATOR
PROJECTS DIVISION | PROGRAMMING AND LAND SECTION

CADD REF. SK_515.dgn

TITLE
CONTRACT 1001
KEY PLAN OF WORKS AREA
APPENDIX 'F1'
SHEET 7 OF 10

SCALE 1 : 1000 (A1)

DRAWING NO. SK_515

REV. A

PLOT DRV: X:\CAD_Library\MicroStation\Workspace\plotdrv\PDF_Color_300dpi_080923.pltt
MODELNAME: Default PRINTED BY: RKO 24/12/2014 @25:20
FILENAME: X:\Land\KTE\K000\PLD\Sketch\SK_515.dgn

Land Handover Certificate

Shatin to Central Link
Contract No. 1103
Hin Keng to Diamond Hill Tunnels

Magazine Site at Tseung Kwan O
Works Sites 1103.W18 and 1103.W19

The subject Works Area as shown coloured pink on the attached plan no. 1103/T/000/PLD/P08/004B was handed over from MTR Corporation Limited to Vinci Construction Grands Projets (the Contractor) on 28 December 2014.

Attendees :	Claudie Keung	MTR Corporation Limited
	Henry Yu	MTR Corporation Limited
	ARROYO, FLORLITO DE JESUS	Vinci Construction Grands Projets (the Contractor)

Site Particulars:

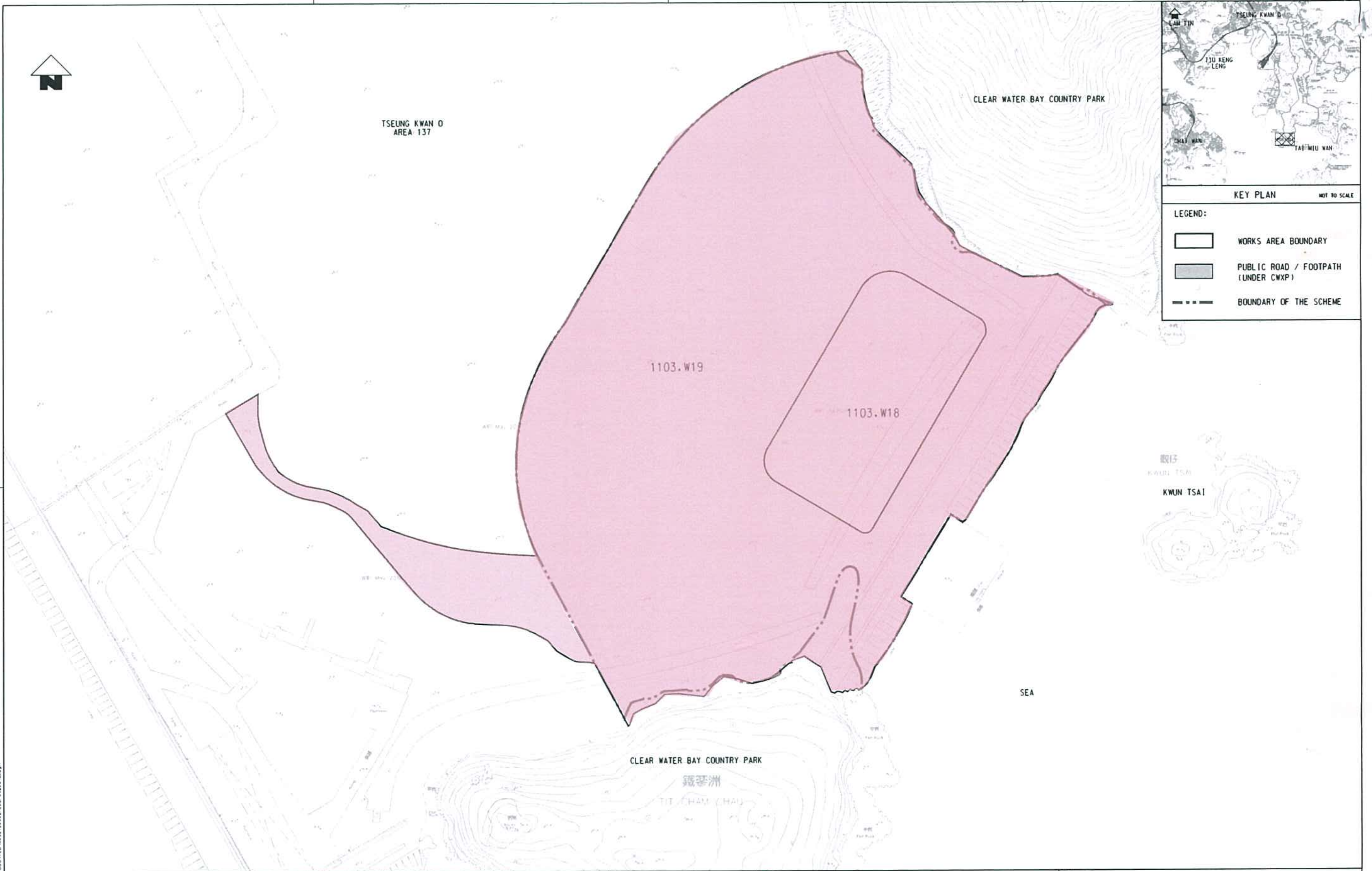
Location	:	As shown coloured pink on the attached plan no. 1103/T/000/PLD/P08/004B
Occupant	:	Vinci Construction Grands Projets (the Contractor)
Date of Possession	:	28 December 2014
Purpose	:	For Contract No. 1103
Remarks	:	Subject to Government Land Allocation – Temporary Railway Development No. 088 (Plan No. RDM1570)

Attended and signed by:-

(Claudie Keung)
for Land Administration Manager
MTR Corporation

(ARROYO, FJ)
for Vinci Construction Grands Projets
(the Contractor)

pp (Henry Yu)
for Construction Manager
MTR Corporation



REV	DESCRIPTION	BY	DATE	APPROVED
B	TENDER ADDENDUM NO.3	CK	MAY12	DN
A	FIRST ISSUE	RC	FEB12	DN

DRAWN	LWL
DESIGNED	RC
CHECKED	CHC
APPROVED	DN
DATE	06/OCT/2011

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MTR

SHATIN TO CENTRAL LINK

ORIGINATOR: PROJECTS DIVISION — LAND ADMINISTRATION SECTION

CADD REF. 1103_T_000_PLD_P08_004B.dgn

TITLE
CONTRACT 1103
KEY PLAN OF WORKS AREA
APPENDIX 'F1'
SHEET 4 OF 5

SCALE 1 : 1000 (A1) | DRAWING NO. 1103/T/000/PLD/P08/004 | REV. B

Appendix 2.1

Historical Aerial Photos

Year 1982

LEGEND :

PROJECT BOUNDARY

Year 1993

LEGEND :

PROJECT BOUNDARY

Year 2000

LEGEND :

PROJECT BOUNDARY

Year 2004

Vegetation

LEGEND :

PROJECT BOUNDARY

Year 2010

Vegetation

LEGEND :

PROJECT BOUNDARY

Year 2014

Magazine Site

Generator Room &
Pump Room

LEGEND :

PROJECT BOUNDARY

Appendix 2.2

Site Walkover Checklist

Site Walkover Checklist

1) GENERAL SITE DETAILS	
Site Owner/ Client	Vinci Construction Grand Projects
Property Address	Area 137, Tseung Kwan O
Person Conducting the Questionnaire (name & position)	Jacky Chan
Authorised Owner/ Client Representative (if applicable) (name, position & telephone)	Keith Lee, Deputy IMS Manager, Tel: 37655600

2) ACTIVITIES	
Briefly describe activities carried out on site, including types of products/chemicals/materials handled. **Obtain a flow schematic if possible.**	
Number of employees:	
- Full-time:	6
- Part-time:	0
- Temporary/Seasonal:	0
Maximum no. of people on site at any time:	4
Typical hours of operation:	00:00 - 24:00
Number of shifts:	2
Days per week:	Six days per week.
Weeks per year:	52
Scheduled plant shut-down:	N/A
Detail the main sources of energy at the site:	
Gas (Yes/No)	No
Electricity (Yes/No)	Yes
Coal (Yes/No)	No
Oil (Yes/No)	Yes
Other (Yes/No)	No

Site Walkover Checklist

3) SITE DESCRIPTION	
This section is intended to gather information on site setting and environmental receptors on, adjacent or close to the site.	
What is the total site area:	8030 m^2
What area of the site is covered by buildings (%):	Around 5%
Please list all current and previous owners/occupiers if possible.	Current Occupant: Vinci Construction Grand Projects
Is a site plan available? (Yes/No) If yes, please attach.	No
Are there any other parties on site as tenants or sub-tenants? (Yes/No) If yes, identify those parties.	No
Describe surrounding land use (residential, industrial, rural, etc.) and identify neighbouring facilities and types of industry.	
North:	Country Park
South:	Sea (Joss House Bay)
East:	Vegetation
West:	CEDD Public Fill Bank
Describe the topography of the area (flat terrain, rolling hills, mountains, by a large body of water, vegetation, etc.).	Flat terrain and by a body of water
State the size and location of the nearest residential communities.	LOHAS Park (32000 m^2, around 2700m northeast)
Are there any sensitive habitats nearby, such as nature reserves, parks, wetlands, or sites of special scientific interest?	Yes. The Clear Water Bay Country Park is located at 50m north of the Site.

Site Walkover Checklist

4) QUESTIONNAIRE WITH EXISTING/ PREVIOUS SITE OWNER OR OCCUPIER		
	Yes/No	**Notes**
1. What are the main activities/operations at the above address?	-	Storage of explosives.
2. How long have you been occupying the site?	-	1 year and 3 months
3. Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	No	
4. Prior to your occupancy, who occupied the site?	-	Occupied as magazine site for MTRC Kwun Tung Line Extension project (Contractor: Nishimatsu Construction Co., Ltd.).
5. What were the main activities/operations during their occupancy?	-	Storage of explosives.
6. Have there been any major changes in operations carried out at the site in the last 10 years?	No	
7. Have any polluting activities been carried out in the vicinity of the site in the past?	No	
8. To the best of your knowledge, has the site ever been used as a petrol filling station/car service garage?	No	
9. Are there any boreholes/wells or natural springs either on the site or in the surrounding area?	No	
10. Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please provide details.)	No	
11. Are any chemicals used in your daily operations? (If yes, please provide details.) - Where do you store these chemicals?	Yes	Diesel was used for electricity generation within the generator room. In oil drums with drip trays.
12. Material inventory lists, including quantities and locations available? (If yes, how often are these inventories updated?)	Yes	
13. Has the facility produced a separate hazardous substance inventory?	Yes	
14. Have there ever been any incidents or accidents (e.g. spills, fires, injuries, etc.) involving any of these materials? (If yes, please provide details.)	No	
15. How are materials received (e.g. rail, truck, etc.) and stored on site (e.g. drums, tanks, carboys, bays, silos, cisterns, vaults and cylinders)?	-	The explosives were transported to the Site by boat .

Site Walkover Checklist

4) QUESTIONNAIRE WITH EXISTING/ PREVIOUS SITE OWNER OR OCCUPIER (CONTINUED)		
	Yes/No	**Notes**
16. Do you have any underground storage tanks? (If yes, please provide details.)	No	
- How many underground storage tanks do you have on site?	-	
- What are the tanks constructed of?	-	
- What are the contents of these tanks?	-	
- Are the pipelines above or below ground?	-	
- If the pipelines are below ground, has any leak and integrity testing been performed?	-	
- Have there been any spills associated with these tanks?	-	
17. Are there any disused underground storage tanks?	No	
18. Do you have regular check for any spillage and monitoring of chemicals handled? (If yes, please provide details.)	No	
19. How are the wastes disposed of?	-	
20. Have you ever received any notices of violation of environmental regulations or received public complains? (If yes, please provide details.)	No	
21. Have any spills occurred on site? (If yes, please provide details)	No	
- When did the spill occur?	-	
- What were the substances spilled?	-	
- What was the quantity of material spilled?	-	
- Did you notify the relevant departments of the spill?	-	
- What were the actions taken to clean up the spill?	-	
- What were the areas affected?	-	
22. Do you have any records of major renovation of your site or re-arrangement of underground utilities, pipe work/underground tanks? (If yes, please provide details.)	No	
23. Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	N/A	
24. Are there any known contaminations on site? (If yes, please provide details.)	No	
25. Has the site ever been remediated? (If yes, please provide details.)	No	

Site Walkover Checklist

5) OBSERVATIONS		
	Yes/No	**Notes**
1. Are chemical storage areas provided with secondary containment (i.e. bund walls and floors)?	Yes	The generators and oil drums observed in the generator room was provided with drip trays. Also, the generator room was enclosed by corrugated metal sheets and the bottom of the metal sheets was sealed with the concrete slab by cement.
2. What are the conditions of the bund walls and floors?	-	The concrete slab generator room was in good condition. Also, the area that immediately next to the generator room was paved with intact concrete.
3. Are any surface water drains located near to drum storage and unloading areas?	No	
4. Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	Yes	General refuse from the site office.
5. Is there a storage site for the wastes?	No	
6. Is there an on-site landfill?	No	
7. Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please indicate location and approximate size.)	No	
8. Were any stained surfaces noted on-site during the site reconnaissance? (If yes, please provide details.)	Yes	Oil stains were observed on the concrete slab inside the generator room.
9. Are there any potential off-site sources of contamination?	No	
10. Does the site have any equipment which might contain polychlorinated biphenyls (PCBs)?	No	
11. Are there any sumps, effluent pits, interceptors or lagoons on site?	No	
12. Any noticeable odours during site walkover?	No	
13. Are any of the following chemicals used on site: fuels, lubricating oils, hydraulic fluids, cleaning solvents, used chemical solutions, acids, anti-corrosive paints, thinners, coal, ash, oily tanks and bilge sludge, metal wastes, wood preservatives, and polyurethane foam?	Yes	Diesel was used for the generators on site.

Appendix 4.1

Risk Based Remediation Goals (RBRG) Criteria

Chemicals	RBRGs for Soil & Soil Saturation Limit		RBRGs for Groundwater & Solubility Limit	
	Industrial	Soil Saturation Limit (C_{sat})	Industrial	Solubility Limit
	(mg/kg)	(mg/kg)	(mg/L)	(mg/L)
VOCs				
Acetone	10000	***	10000	***
Benzene	9.21	336	54	1750
Bromodichloromethane	2.85	1030	26.2	6740
2-Butanone	10000	***	10000	***
Chloroform	1.54	1100	11.3	7920
Ethylbenzene	8240	138	10000	169
Methyl tert-Butyl Ether	70.1	2380	1810	***
Methylene Chloride	13.9	921	224	***
Styrene	10000	497	10000	310
Tetrachloroethene	0.777	97.1	2.95	200
Toluene	10000	235	10000	526
Trichloroethene	5.68	488	14.2	1100
Xylenes (Total)	1230	150	1570	175
SVOCs				
Acenaphthene	10000	60.2	10000	4.24
Acenaphthylene	10000	19.8	10000	3.93
Anthracene	10000	2.56	10000	0.0434
Benzo(a)anthracene	91.8	--	--	--
Benzo(a)pyrene	9.18	--	--	--
Benzo(b)fluoranthene	17.8	--	7.53	0.0015
Benzo(g,h,i)perylene	10000	--	--	--
Benzo(k)fluoranthene	918	--	--	--
Bis-(2-Ethylhexyl)phthalate	91.8	--		--
Chrysene	1140	--	812	0.0016
Dibenzo(a,h)anthracene	9.18	--	--	--
Fluoranthene	10000	--	10000	0.206
Fluorene	10000	54.7	10000	1.98
Hexachlorobenzene	0.582	--	0.695	6.2
Indeno(1,2,3-cd)pyrene	91.8	--	--	--
Naphthalene	453	125	862	31
Phenanthrene	10000	28	10000	1
Phenol	10000	7260	--	--
Pyrene	10000	--	10000	0.135
Metals				
Antimony	261	--	--	--
Arsenic	196	--	--	--
Barium	10000	--	--	--
Cadmium	653	--	--	--
Chromium III	10000	--	--	--
Chromium VI	1960	--	--	--
Cobalt	10000	--	--	--
Copper	10000	--	--	--
Lead	2290	--	--	--
Manganese	10000	--	--	--
Mercury	38.4	--	6.79	--
Molybdenum	3260	--	--	--
Nickel	10000	--	--	--
Tin	10000	--	--	--
Zinc	10000	--	--	--
Petroleum Carbon Ranges				
C6 - C8	10000	1000	1150	5.23
C9 - C16	10000	3000	9980	2.8
C17 - C35	10000	5000	178	2.8
*** indicated that the C_{sat} value exceeds the 'ceiling limit' (10,000 mg/kg) therefore the RBRG applies.				