# 8. Land Contamination

## 8.1 Introduction

The potential environmental issues associated with land contamination within the WKCD have been reviewed and are presented in this section. The review is comprised of desktop studies of previous EIAs and land contamination assessments undertaken in the WKCD area by other projects as well as earlier assessments undertaken by the Conceptual Plan Consultants for WKCD. Potential impacts from contaminated sites during construction phase and the need for mitigation measures have been qualitatively assessed in accordance with the clause 3.4.9 of the EIA Study Brief (ESB-237/2011).

In accordance with the requirement set out in Appendix E2 of the EIA Study Brief, a Contamination Assessment Plan (CAP) has been prepared for WKCD and was submitted in January 2012. The CAP is attached in **Appendix 8.1**.

## 8.2 Environmental Legislation, Standards and Guidelines

The relevant standards and guidelines on land contamination assessment and remediation include the following:

- Section 3 of Annex 19 to the EIAO-TM;
- Guidance Note for Contaminated Land Assessment and Remediation (August 2007);
- Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management (RBRGs Guidance Manual) (December 2007); and
- Practice Guide for Investigation and Remediation of Contaminated Land (August 2011).

The uses that may have the potential to cause land contamination include among others:

- Oil installations including oil depots and petrol filling stations;
- Gas works;
- Power plants;
- Shipyards/boatyards;
- Chemical manufacturing/processing plants;
- Steel mills/metal workshops;
- Car repairing and dismantling workshops; and
- Scrap yards.

## 8.3 Description of the Environmental Baseline Conditions

The WKCD site is located on the West Kowloon Reclamation south of Austin Road West and the Western Harbour Crossing Toll Plaza. The site is currently zoned as “Other Specified Uses” annotated “Arts, Cultural, Entertainment, Commercial and Other Uses” under the South West Kowloon Outline Zoning Plan, and comprises approximately 40 ha of previously undeveloped land bordering the Jordan/Tsim Sha Tsui area.

The site reserved for the WKCD development is currently occupied by local roads, temporary storage, car/coach parking facilities, a temporary promenade at the Waterfront including a temporary cycle track, and a number of existing infrastructure facilities such as ventilation buildings for the Western Harbour Crossing and the MTR railway line, sea water pumping station, etc. Parts of the WKCD site are also currently occupied by the Tsim Sha Tsui (TST) Fire Station and by the works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

## 8.4 Assessment Methodology

In order to identify the presence of any potentially contaminative land within or in the proximity of the Project area, the following tasks have been undertaken:

- Desktop study to review the current and historical land uses;
- Acquisition of information related to potential land contamination from Environmental Compliance Division of Environmental Protection Department (EPD) and Fire Services Department (FSD); and
- Site surveys to identify the existing land uses.

Relevant information were collected and reviewed as part of the desktop study, including:

- Historical aerial photographs of the Project area;
- Records of active (current) and inactive (past) registered chemical waste producers in the areas of interest from EPD;
- Records of current and past dangerous good (DG) licences in the areas of interest from FSD;
- Records of accidents that involved spillage/leakage of chemical waste or DG from EPD and FSD; and
- Previously approved studies, including previously approved EIA Reports

Site surveys were undertaken to identify current land uses in the Project area and verify the findings of the desktop study.

### 8.4.1 Desktop Study

#### 8.4.1.1 Review of Historical Aerial Photographs

Relevant historical aerial photographs taken between 1963 and 2004 and covering the Project area, where available, were collected and reviewed. The historical land uses identified from the review are summarised in **Table 8.1** below for evaluation of potential land contamination.

Table 8.1 Land Use History of Project Area

| Date | Ref. no. | Height (ft) | Land Use |
|---|---|---|---|
| 25/01/1963 | 5186 | 2,700 | open sea, bare ground, low rise buildings |
| 29/01/1976 | 13085 | 4,000 | open sea, bare ground, low rise buildings |
| 27/09/1995 | CN11223 | 3,500 | reclaimed land, construction site, low rise buildings |
| 28/09/2004 | CW59616 | 4,000 | reclaimed land, bare ground, ventilation buildings, low rise buildings |
| 25/07/2008 | CS13725 | 6,000 | reclaimed land, bare ground, ventilation buildings, parking facilities, construction site, low rise buildings |

* Please refer to Appendix A of the CAP prepared for WKCD (see **Appendix 8.1**) for the selected aerial photos

#### 8.4.1.2 Review of Previously Approved Studies/Reports

The relevant study area for this project as mentioned in the Contamination Assessment Plan (CAP) and the Contamination Assessment Report and Remediation Action Plan (CAR/RAP) of the approved Kowloon Southern Link (KSL) EIA Report (Ref. No. EIA-098/2004) were reviewed. As stated in Section 3.5.2 of the KSL CAP, there are two underground fuel oil storage tanks at Tsim Sha Tsui (TST) Fire Station, one for storage of diesel and the other for petrol. The volume of each tank is approximately 4.6$m^3$ and have been used for more than 30 years, with no record of previous spillage/leakage at the time. Information extracted from the approved CAP and CAR/RAP of KSL is provided in Appendix B of the CAP prepared for WKCD (see **Appendix 8.1)** for reference.

The CAP for KSL proposed five sampling locations, two of which are located in the immediate vicinity of the TST Fire Station (drillholes ref. KSD100/DHEPZ052 and KSD100/DHE056). As documented in Section 5 of the approved CAR/RAP for KSL, laboratory test results for samples taken from those two drillholes (as shown in Appendix B of the CAP prepared for WKCD – see **Appendix 8.1**) indicated no contamination with reference to the Dutch B levels (the standards adopted at the time of preparing the KSL EIA). However, given that the Risk Based Remediation Goals (RBRG) has been introduced by EPD for land contamination assessment since August 2007 to replace Dutch B levels, the previous site investigation results from the KSL study were checked against the RBRG criteria in order to confirm compliance under the new assessment criteria.

Based on the RBRG land use classification under the Guidance Manual, the WKCD development (which includes planned residential developments) should be classified under the more stringent "Urban Residential" land use category. **Table 8.2** shows the corresponding RBRG standards against the results from KSL.

Table 8.2: Comparison of KSL site investigation results against RBRG criteria

| Chemical Parameters (tested in KSL CAR/RAP) | Units | RBRG Limit Level for 'Urban Residential' | Maximum Concentration Detected in Drillhole KSD100/DHEPZ052 | Maximum Concentration Detected in Drillhole KSD100/DHE056 |
|---|---|---|---|---|
| **Metals** | | | | |
| Cadmium | mg/kg | 73.8 | 0.5 | 0.02 |
| Chromium | mg/kg | 221 | 13 | 0.9 |
| Copper | mg/kg | 2950 | 6.4 | 1.4 |
| Nickel | mg/kg | 1480 | 4 | 0.7 |
| Lead | mg/kg | 258 | 93 | 140 |
| Zinc | mg/kg | 10000 | 170 | 18 |
| Mercury | mg/kg | 11 | 0.5 | 0.2 |
| Arsenic | mg/kg | 22.1 | 4.3 | 1.5 |
| Barium | mg/kg | 10000 | 75 | 41 |
| Cobalt | mg/kg | 1480 | 4.1 | 5.5 |
| Molybdenum | mg/kg | 369 | 9.5 | 4.9 |
| Tin | mg/kg | 10000 | <5 | <5 |
| **TPH** | | | | |
| C6 – C9 | mg/kg | 1410(C6-8), 2240(C9) | <2 | <2 |
| C10 –C14 | mg/kg | 2240 | <50 | <50 |

| Chemical Parameters (tested in KSL CAR/RAP) | Units | RBRG Limit Level for 'Urban Residential' | Maximum Concentration Detected in Drillhole KSD100/DHEPZ052 | Maximum Concentration Detected in Drillhole KSD100/DHE056 |
|---|---|---|---|---|
| C15 – C28 | mg/kg | 2240(C15-16), 10000(C17-28) | <100 | 246 |
| C29 – C36 | mg/kg | 10000 | <100 | 167 |
| **BTEX** | | | | |
| Benzene | mg/kg | 0.704 | <0.2 | <0.2 |
| Ethylbenzene | mg/kg | 709 | <0.2 | <0.2 |
| Toluene | mg/kg | 1440 | <0.2 | <0.2 |
| Meta - & Para Xylene | mg/kg | 95 | <0.4 | <0.4 |
| Ortho Xylene | mg/kg | | <0.2 | <0.2 |
| **Others** | | | | |
| Cyanide | mg/kg | 1480 | <1 | <1 |
| Sulphate (acid soluble) | mg/kg | - | 0.96 | 0.04 |

Source: KSL EIA Report, Appendix 10-2 – Contamination Assessment Report and Remediation Action Plan

As shown in **Table 8.2**, the results from the CAR/RAP for KSL are all well within the RBRG limit levels, which reaffirms the findings of the CAR/RAP for KSL.

Aside from the TST Fire Station, the ex-government dockyard was also identified in the KSL study as a potentially contaminated site, however, it is located entirely outside the WKCD Project boundary, and as mentioned in the CAR/RAP for KSL, the contamination at the ex-government dockyard was found to be localized and was planned to be remediated under KSL project. Based on the aforementioned information, no historical land contamination is anticipated within the WKCD Project area that has been covered by the KSL EIA.

Relevant information from the West Kowloon Cut and Cover Section (WKCC) of the Express Rail Link (XRL) project including CAP and CAR of the approved XRL EIA Report were also reviewed. The study area of the WKCC partly falls within the Project area of WKCD. Site appraisal conducted for XRL has concluded that within the WKCD Project boundary, there were no adverse land contamination impacts identified. In the CAP for WKCC, sampling and testing plan was only recommended for the area of City Golf Club which is located entirely outside the WKCD Project boundary and therefore has no implication on the WKCD Project.

#### 8.4.1.3 Review of Records from Government Departments

Relevant data, including records of active and inactive registered chemical waste producers, records of current and past dangerous goods (DG) licences, and records of any accident that involved spillage/leakage of chemical waste or DG within or in the immediate vicinity of the WKCD Project area were collected from EPD and FSD. Records of registered chemical waste producers collected from EPD are presented in Appendix C of the CAP prepared for WKCD (see **Appendix 8.1**). Replies from the two Government departments in response to the information requests are presented in Appendix D of the CAP prepared for WKCD (see **Appendix 8.1**) for reference.

A review of the records from EPD revealed that while there are a number of registered chemical waste producers in the area surrounding the WKCD Project, the Project area will not encroach onto these existing

facilities. There was also no record of any accident that involved spillage/leakage of chemical waste within or in the proximity of the WKCD Project area.

Reply from FSD revealed that the only licensed DG stores in the proximity of WKCD Project area are the two underground fuel oil storage tanks (each with a capacity of 4,600 litres) located at the TST Fire Station, but no incident records of spillage/leakage of DG were identified.

### 8.4.2 Site Surveys

Site surveys were carried out from July to December 2011 to identify current land uses along the Project area and to verify the findings of the desktop appraisal. In general, the site has been used as a waterfront promenade, temporary works area for XRL, temporary open storage and parking facilities as shown in Appendix E of the CAP prepared for WKCD (see **Appendix 8.1**). The following land uses were identified:

- Local roads;
- Temporary storage/parking facilities;
- A temporary promenade at the Waterfront;
- A number of existing infrastructure facilities such as ventilation buildings for the Western Harbour Crossing and the MTR railway line, sea water pumping station, etc.
- Tsim Sha Tsui Fire Station; and
- Works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

## 8.5 Identification and Evaluation of Environmental Impact

### 8.5.1 Construction Phase

Based on the findings from the desktop study, the current land uses, including potentially contaminative uses within or in the vicinity of the Project area, have been identified as summarized in **Table 8.3**.

Table 8.3: Potential Contamination for the Project Area and its vicinity

| Areas | Current Land Use | Historical Land Use | Potential Land Contamination Impact on the Project Area | Need for Further Site Investigation |
|---|---|---|---|---|
| Tsim Sha Tsui (TST) Fire Station | Fire station | Fire station | Petroleum Carbon Ranges, Volatile organic compounds (VOC) and semi-VOC (SVOC) | Yes |
| Other land uses in West Kowloon Reclamation Area | Temporary works area, parking area, open area, ventilation buildings, waterfront promenade | Reclaimed land, open sea; (near eastern boundary) open area | No contaminative land uses were identified | No |

Although there were no records of any accidents involving spillage/leakage of chemical waste or DG within or in the proximity of the WKCD Project area, it is proposed to carry out further site investigation for the TST Fire Station location to identify any potential sources of land contamination that may be due to, but not limited to, leakage or spillage from the fuel oil tanks, pipes, or during refilling. The reason is as follows.

Based on the latest WKCD implementation programme, it is aimed to commence construction works for the critical elements of WKCD in as early as 2013 so as to commission the Phase 1 arts and cultural facilities in stages from 2014/2015 to 2020. While the existing TST Fire Station is scheduled to be relocated in phases, it will unlikely be relocated before 2020. During the period between now and 2020, the TST Fire Station will remain in operation, and leakage or spillage from the underground fuel oil tanks or pipes, or during refilling might occur. As such, further site visit and site investigation/laboratory chemical analysis are suggested to be conducted after land acquisition, so that the investigation results will be up to date. For this, the CAP prepared for WKCD has included the proposed site investigation work for the TST Fire Station area (see **Appendix 8.1**).

The site investigation should be assessed by a competent land contamination specialist, and the specialist should carry out the assessment to determine whether the location of the TST Fire Station is contaminated and to assess the extent of any contamination identified. Should any area be identified/suspected of being contaminated, soil and groundwater samples should be collected for analysis, and the sampling points should be located at or near potential sources of contamination, e.g. near the underground storage tanks or pipes. The recommended testing as described in Section 4 of the CAP (see **Appendix 8.1**) should be undertaken or referenced to identify any contamination.

The updated CAP should include proposals on the sampling and analysis and should be submitted to EPD for approval prior to the demolition work. Upon approval of the CAP, the Project Proponent should conduct a land contamination assessment and the findings should be presented in a CAR. If land contamination is confirmed with reference to the relevant RBRG levels, the Project Proponent should prepare a RAP in which further hotspots of contaminated soil that require soil remediation should be identified. Section 4 of the current CAP (see **Appendix 8.1**) has provided an outline of the proposed site investigation plan to be conducted after land acquisition at the TST Fire Station.

Other than the TST Fire Station area, the land contamination potential of the WKCD Project area is considered as low because the area is a short-history reclaimed land and has been used as open area/ temporary works area without any indication of industrial activities. Recent site inspection has identified no major change in land use and confirmed the validity of previous land contamination assessment. No major land contaminative uses were identified in the area.

### 8.5.2 Operation Phase

The planned land uses within WKCD will mainly include arts and cultural facilities, public open space, commercial establishments, retails, hotels and residential developments. There will be no industrial activities taking place at the Project area during operation phase. Therefore, no contaminated land issue is anticipated.

## 8.6 Mitigation of Adverse Environmental Impact

The potential for land contamination issues at the TST Fire Station due to its future relocation will be confirmed by site investigation after land acquisition. Where necessary, mitigation measures for minimising potential exposure to contaminated materials (if any) or remediation measures will be identified. If contaminated land is identified (e.g., during decommissioning of fuel oil storage tanks) after the commencement of works, mitigation measures are proposed in order to minimize the potentially adverse effects on the health and safety of construction workers and impacts arising from the disposal of potentially contaminated materials.

The following measures are proposed for excavation and transportation of contaminated material:

- To minimize the chance for construction workers to come into contact with any contaminated materials, bulk earth-moving excavation equipment should be employed;
- Contact with contaminated materials can be minimised by wearing appropriate clothing and personal protective equipment such as gloves and masks (especially when interacting directly with contaminated material), provision of washing facilities and prohibition of smoking and eating on site;
- Stockpiling of contaminated excavated materials on site should be avoided as far as possible;
- The use of contaminated soil for landscaping purpose should be avoided unless pre-treatment was carried out;
- Vehicles containing any contaminated excavated materials should be suitably covered to reduce dust emissions and/or release of contaminated wastewater;
- Truck bodies and tailgates should be sealed to stop any discharge;
- Only licensed waste haulers should be used to collect and transport contaminated material to treatment/disposal site and should be equipped with tracking system to avoid fly tipping;
- Speed control for trucks carrying contaminated materials should be exercised;
- Observe all relevant regulations in relation to waste handling, such as Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354) and obtain all necessary permits where required; and
- Maintain records of waste generation and disposal quantities and disposal arrangements.

## 8.7 Evaluation of Residual Impact

Based on the desktop review and available site investigation results for land contamination assessment of the Project, no major contaminated land issue has been revealed, although site investigation is suggested for the TST Fire Station area after its land acquisition. Hence, no land remediation action is proposed at this stage, and no residual impact in relation to land remediation is anticipated.

## 8.8 Environmental Monitoring and Audit

As explained above, land remediation is not expected at this stage. Therefore, environmental monitoring in relation to land remediation is not required, unless a need for land remediation is identified during the future site investigation for the TST Fire Station area.

However, during construction phase, environmental monitoring and audit (EM&A) is to be carried out in the form of regular site inspection. All related procedures and facilities for handling or storage of chemicals and chemical wastes will be audited regularly to make sure they are in order and intact and reported in the EM&A reports as such.

## 8.9 Conclusion

The land contamination assessment has been conducted by reviewing historical/current land uses, desktop review and site surveys with respect to the potential land contamination at the WKCD Project area. Other relevant information was also collected from the related Government Departments.

Based on the findings of the site surveys on the existing and historical land uses in the Project area and review of relevant records and reports, adverse land contamination impacts associated with the construction and operation of the WKCD Project is not anticipated except for demolition of the two underground fuel oil storage tanks and associated pipes at the existing TST Fire Station within the WKCD site. As the existing TST Fire Station will remain in operation until its relocation in phases, which will unlikely be started before 2020, it is proposed to carry out further site investigation after obtaining access to the Fire Station in order to obtain up-to–date site investigation findings for assessment of land contamination that may occur between now and its future relocation. The site investigation findings should be documented in a CAR and where necessary a RAP should also be prepared for submission to EPD for approval.

Mitigation measures for handling of contaminated materials, in case it is discovered after commencement of the works, and regular site audits are recommended to minimize the potential adverse impacts on workers' health and safety and disposal of any potentially contaminated materials.