

9. Land Contamination

9.1 Introduction

The potential environmental issues associated with land contamination within the Project have been assessed and are presented in this section. Potential impacts from contaminated sites during construction phase and the need for mitigation measures have been qualitatively assessed in accordance with sections 3.1 and 3.2 of Annex 19 of the EIAO-TM as specified in Clause 3.4.9 of the EIA Study Brief (ESB-261/2013).

9.2 Environmental Legislations, Standards and Guidelines

In 2007, EPD issued two guidelines for utilising Risk-based Remediation Goals (RBRGs) developed for Hong Kong, namely, “Guidance Note for Contaminated Land Assessment and Remediation” (Guidance Note) and “Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management” (Guidance Manual). The land contamination assessment was carried out in accordance with the Guidance Manual and Guidance Note. In addition, reference was also made to the “Practice Guide for Investigation and Remediation of Contaminated Land” (Practice Guide).

9.3 Assessment Methodology

In order to identify and evaluate the potential contamination impacts associated with the Project, the following tasks have been undertaken:

- Desktop appraisal to review the current and historical land uses;
- Acquisition of information related to potential land contamination from EPD and Fire Services Department (FSD); and
- Site reconnaissance to identify the current land uses.

In addition, the following related information have been collated and reviewed:

- Historical aerial photographs of the Project;
- Records of active (current) and inactive (past) registered chemical waste producers within the Project area;
- Records of current and past dangerous goods (DG) licences within the Project area;
- Records of accidents that involved spillage / leakage of chemical waste or DG from EPD and FSD;
- Records and photographs from site visit.

Site reconnaissance survey was also undertaken to identify current land uses of the Project and to verify the findings of the desktop appraisal.

9.4 Identification of Environmental Impacts

9.4.1 Desktop Appraisal

Historical Information

Relevant historical aerial photographs taken between 1949 and 2013, where available, were collected and reviewed. The aim of this review is to evaluate potential contamination implication associated with any land use changes within the Project. The development history of Project is summarised below and a list of aerial photographs reviewed has been provided in the **Table 9.1**. Representative aerial photographs reviewed are presented in **Appendix 9.1**.

According to the 1940's and 1970's aerial photographs, the Project area was mainly in agricultural use. Mainly vegetated land and woodland were found within the Project area. Based on the aerial photographs, the Project area has not experienced significant changes over this period.

Aerial photograph taken in 1983 shows reclamation in the southern part of the Project (lower hillside and seashore) to form a new reclaimed land and site formation works for the development of Middle Kingdom and Bird Paradise were in progress. The rest of the Project area was mainly planted land and woodland. No significant change was found.

It is noted from the historical aerial photo in 1989 that construction of Middle Kingdom was completed while construction of Bird Paradise was still in progress. The Bird Paradise was completed in 1993. The rest of the Project area remained unchanged.

Based on the aerial photographs reviewed, the Project area has not undergone much change since the completion of Middle Kingdom and Bird Paradise. The Middle Kingdom and Bird Paradise were composed of Flamingo Pond, aviaries, theatres, exhibition halls and restaurant. The rest of the Project area has no significant change.

Aerial photograph taken in 2013 revealed that the Empress theatre, Marco Polo Display and Xia, Shang, Zhou to Qin Dynasty exhibition halls at Middle kingdom were demolished and became a temporary storage area for stage materials. The rest of the Project area remained unchanged.

Table 9.1: Review of Aerial Photographs

Year	Height (feet)	Photograph Reference Number
1949	8600	6187
1983	4000	49741
1989	4000	A17770
2013	3000	CW99618

Source: Survey and Mapping Office, Lands Department

Review of Relevant Information from Government Departments

EPD and FSD have been contacted for the following information:

- Records of any active (present) and inactive (past) registered chemical waste producer(s) and any reported accidents of chemical waste spillage / leakage within the Project area; and
- Records of any licensed dangerous goods (DG) store(s) and any reported accidents of spillage / leakage of DG within the Project area.

A review of the chemical waste producers (CWPs) records had been provided by EPD. Two registered CWPs were identified in the Project area. One of the CWPs is active and the other one is inactive. The licensees of CWPs in Project area have been contacted and the licensees confirmed that no chemical waste has been produced from either of the CWPs.

According to the reply from EPD, there is no record of chemical spillage / leakage within the Project area. The reply from EPD is shown in **Appendix 9.2**.

According to the reply from FSD, there is no record of DG or incidents of spillage / leakage of DG within the Project area. The reply from FSD is shown in **Appendix 9.2**.

9.4.2 Site Reconnaissance Survey

Site reconnaissance was carried out in October 2013 to identify current land uses within the Project area and to verify the findings of the desktop appraisal.

The Project area can be divided into 2 major parts, Bird Paradise and Middle Kingdom. The rest of the Project area is mainly planted area.

During site inspection, abandoned Flamingo Pond, abandoned Bird Theatre, and abandoned Aviary were observed in Bird Paradise. No dangerous goods, chemical or chemical waste storage were found. Therefore, no potentially contaminative land uses were observed in this abandoned area.

It is confirmed that the Middle Kingdom was comprised of Middle Kingdom Restaurant and a temporary storage area only. Stage materials for performance use such as stage platform, stage framing and scenery frame were found in the temporary storage area. No other potentially polluting activities were found. Therefore, no sign of land contamination was observed during the site visit in this area.

As observed on site, the rest of the Project area is mainly planted area. No sign of land contamination was observed during site reconnaissance in this area.

The photographic records taken during site reconnaissance are shown in **Appendix 9.3**.

9.5 Prediction and Evaluation of Environmental Impacts

9.5.1 Construction Phase

Based on the reviewed historical aerial photographs, the current land uses, site reconnaissance survey and the information collected from the relevant government departments. No potentially contaminated area within the Project has been identified.

The findings from the desktop appraisal and the site reconnaissance of the Project have been summarised in **Table 9.2**.

Table 9.2: Summary of Potential Land Contamination Impact

Location	Current Land Use	Historical Land Use	Potential Contamination Impact	Land	Necessity for Further Site Investigation	Photo Ref. (in Appendix 9.3)
Bird Paradise	Abandoned Flamingo Pond, abandoned Bird Theatre, abandoned Aviaries were observed. The rest of the Bird Paradise area was mainly planted land and woodland	Agricultural use, vegetated land and woodland	No contaminative land uses were identified		No	1, 2, 3
Middle Kingdom	Temporary storage area for stage materials and Middle Kingdom Restaurant	Vegetated land and woodland	No contaminative land uses were identified		No	4, 5, 6

9.5.2 Operation Phase

The planned land uses within the Project will mainly include wave pool, sandy beach, lazy river, various water slides, F&B facilities, premium zone with cabanas and car parking. No industrial activities will be taken place at the Project during operation phase. Therefore, no contaminated land issue is anticipated.

9.6 Recommendation of Mitigation Measures

As no potential land contamination issues have been identified for the Project, specific mitigation measures are virtually not necessary. Nevertheless, in any case where contaminated soil is identified after the commencement of works, a Contamination Assessment Plan (CAP) is required to be prepared for EPD's endorsement prior to the site investigation. The Contamination Assessment Report (CAR) and/ or Remediation Action Plan (RAP) should be prepared for EPD's approval after the site investigation. If land contamination is confirmed, remediation works should be carried out according to the approved RAP. A Remediation Report (RR) should also be prepared for EPD's endorsement to demonstrate that the clean-up of the contaminated land is completed. No construction work or development of site should be carried out before the approval of the RR.

The following mitigation measures are proposed for contaminated material excavation and transportation of contaminated materials (if any), in order to minimise the potentially adverse effects in the health and safety of construction workers and impacts arising from the disposal of potentially contaminated materials:

- To minimise 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 working 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 any contaminated soil for landscaping purpose should be avoided unless pre-treatment was carried out;
- Vehicles containing any 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, disposal quantities and disposal arrangements.

9.7 Evaluation of Residual Environmental Impacts

Based on the desktop appraisal and the site reconnaissance survey results for land contamination assessment of the Project, no contaminated land issue has been revealed. Hence, no land remediation action is proposed. As such, no residual impact in relation to land remediation is anticipated.

9.8 Conclusion

The land contamination assessment has been conducted by reviewing the historical and current land uses, desktop appraisal and site reconnaissance survey with respect to the potential land contamination at the Project area. Other relevant information collected from the related government departments has been reviewed.

Based on the findings of the desktop appraisal of the historical and current land uses and the site survey in the Project area, land contamination impacts associated with the construction and operation of the proposal project is not anticipated.

In case contaminated material is discovered after the commencement of works, mitigation measures for handling of contaminated materials and regular site audits are recommended to minimise the potential adverse impacts on workers' health and safety and remediation/ disposal of potentially contaminated materials.