

### 20. LAND CONTAMINATION

#### 20.1 Introduction

This section reviews the findings of the desktop investigations and site visits undertaken to determine the potential land contamination issues associated with the construction and operation of the proposed EAR and the associated modification of existing roads junctions. It also, where appropriate, previews areas which may require further assessment in subsequent stages of the project development.

#### 20.2 Assessment Methodology

##### 20.2.1 Objective

The objective of the current study is to identify and screen any concerns with respect to land contamination, namely potential soil and groundwater contamination, along the proposed Eastern Access Road.

The following methodology has been adopted in this study:

- preliminary review of the current and historical land uses, and a brief site visit, to evaluate the likely level of potential for any soil and ground contamination;
- description of the likely nature of any potential contamination;
- a preliminary review of potential environmental impacts or health concerns arising as a result of the development or during future use of the land as a result of exposure to potentially contaminated materials; and
- a summary of typical mitigation measures.

The EAR will involve the construction of approximately 800m of roadway. The construction of the roadbed, roadway and associated structures will require resumption of portions of land currently developed as industrial factory uses, and related excavation works. These excavation works will result in contact with the underlying soil, and hence there is the potential for impacts from potentially contaminated land in the area.

##### 20.2.2 Reference Sources

During this study reference to the following sources of information was made:

- *Hong Kong Ordinance Survey* maps 6-NE-A and 6-NE-C (1:1,000 and 1:5,000 scale) from 1982 to 1998 along the proposed alignment;
- Selected aerial photos along the alignment route from 1964 to 1999;
- Kam Tin South Development Permission Area Plan, *DPA/YL-KTS/1*, (1:1,000 scale), including the proposed alignment;

- District Planning Office, 1985 Kam Tin Layout Plan *L/YL-KT/IE* (1:1,000 scale); and
- Hong Kong Geological Survey Solid and Superficial Geology Series Map No. 6, Yuen Long.

In addition, preliminary site visits were conducted to establish the function and condition of selected properties.

Due to timing constraints, there has been no detailed correspondence with Government agencies regarding particular land uses for the alignment, such as for registration as chemical waste producers, storage of dangerous goods, etc.

## 20.3 Findings

### 20.3.1 Aerial Photographs

A list of the aerial photographs reviewed during the course of the study is presented in *Table 20.4a*.

**Table 20.4a Aerial Photographs Reviewed**

Year/Date	Photographs	Notes
1999 (9 February)	CN22413/CN22414/ CN22415	from 3,500 feet
1990 (5 October)	A22908/A22909/A22910 A22911	from 2,000 feet
1985 (23 June)	A1330/A1331/A1332	from 2,500 feet
1979 (1 October)	27391 / 27392	from 4,000 feet
1970 (no date)	2599 / 2600 /2601	No elevation listed
1964 (23 December)	4243 / 4244 / 4245	from 1,800 feet

Note: Photographs reviewed for generalised land changes, as well as development of specific properties. Note there was no photographic coverage from 1975 and 1980.

The photographs provided limited specific details about the land uses, however, the photos did show the increased usage during the more recent years of areas for vehicle and trailer storage, and what appeared to be vehicle repair or maintenance activities.

### 20.3.2 Potential Impacts

The potential impacts from contaminated soil and groundwater are identified as:

- health risks to site workers;
- disposal of contaminated sediments;
- contaminated groundwater disposal; and
- potential risks to future users of the site.

### **20.3.2.1 Health Risk to Site Workers**

Site construction workers may become exposed to contaminated soils and groundwater during earth moving operations and the construction of roadway foundations or laying of underground services, such as sewer drainage. The main exposure routes for site construction workers is direct ingestion of contaminated materials through poor hygiene and eating or smoking on site, or through direct contact with potentially toxic or harmful contaminants that may be present in soil.

### **20.3.2.2 Disposal of Contaminated Sediments**

In the event that any contaminated soil is identified during site development works or further environmental investigations at specific sites, they will require disposal as part of the construction programme. In addition, prior agreement will need to be reached with EPD to ensure that these materials are dealt with appropriately. Any contaminated sediments which are excavated will require off site disposal at an appropriate site which is licensed to accept 'contaminated' soils or disposed of as contaminated mud. The type(s) and concentration of contaminants will determine the actual disposal requirement, following agreement of the proper disposal option with the Waste Facilities Management Group of the EPD.

### **20.3.2.3 Contaminated Groundwater Disposal**

Although not expected, where any excavations take place below the water table in areas identified as being contaminated, there will be a need to dewater the operations for safety or construction purposes. Where dewatering takes place through layers of contaminated material or where any contaminated sediment is being excavated and/or dewatered, the water may become contaminated, requiring appropriate handling and disposal. Depending on the level of contamination encountered, and subject to the agreement of the EPD, groundwater will need to be disposed of in an appropriate manner to ensure compliance with the *Water Pollution Control Ordinance (WPCO)*.

### **20.3.2.4 Potential Health Risks to Future Users of the Site**

As the completed project is a roadway, the potential for impacts to occur as a result of any contaminated material which may remain *in situ* following development of the alignment is considered minimal. During the operational phase of the works, there is likely to be no interface with any remaining potentially contaminated material.

However, maintenance workers or workers who may be commissioned to perform extensions or alterations to the EAR at a later stage may potentially come into contact with contaminated materials, at which time, all of the above mentioned impacts may be applicable. However, if contaminated material is identified during a later proposed extension to the EAR, measures will be taken either to ensure this material is removed or to ensure direct contact with *in situ* materials is avoided.

### 20.3.3 Prediction of Impacts

#### 20.3.3.1 Review of Historic and Current Land Uses

A review of historical maps and selected historical aerial photos as well as information gathered in the 22 July 1999 site visit indicates that the proposed roadway alignment is to be developed on land with a variety of development uses. The presence of a number of properties were noted which are considered by the EPD to be potential land contaminating uses, notably in the vicinity of Kam Sheung Road and towards the north of the EAR site on Kam Tin Road.

These industrial usage include vehicle servicing facilities, scrap yards and factories (*Figure 20.4a*). In addition, rural villages and agricultural land have been identified along the alignment areas.

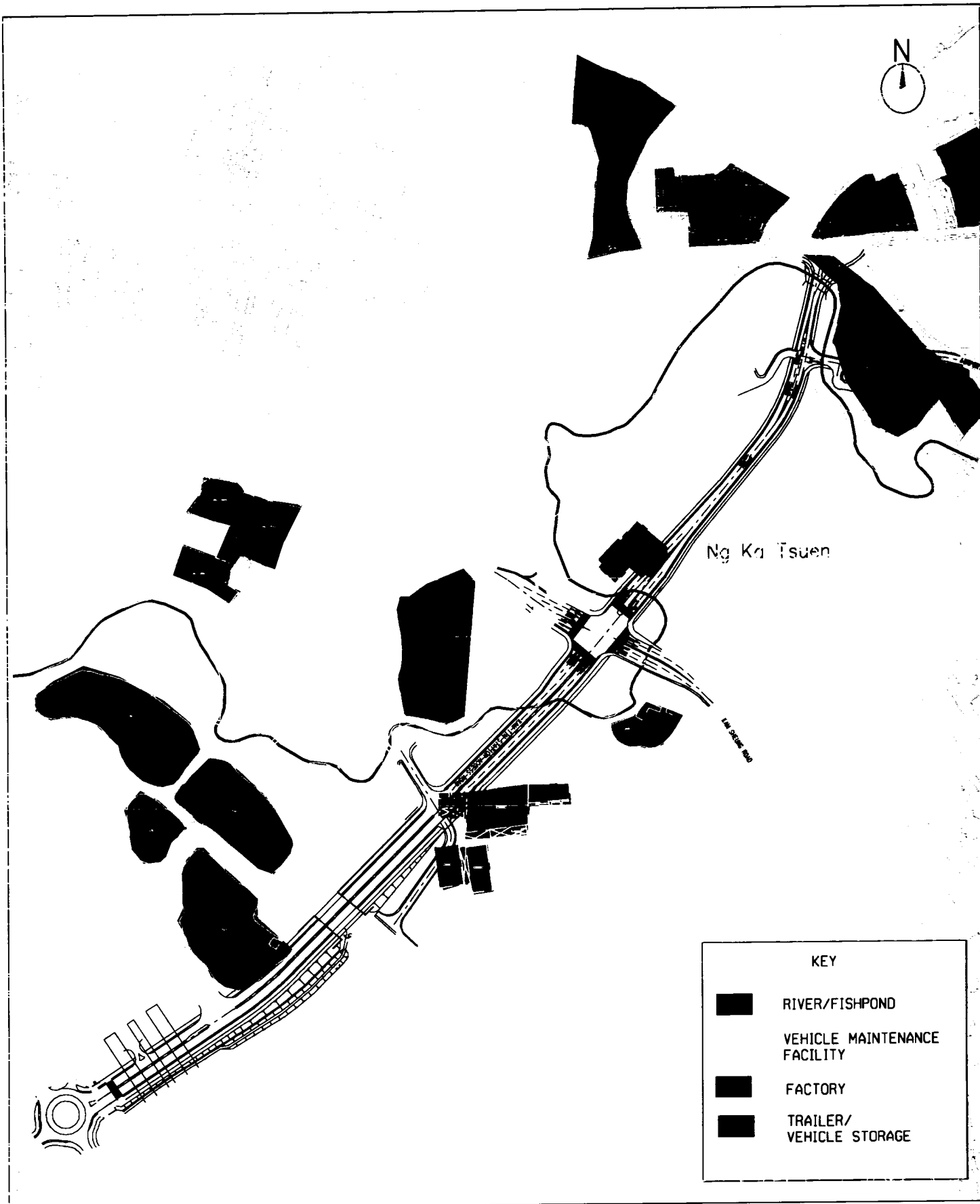
The specific landuses in and around the Study Area that have been identified as potentially contaminating sources include:

- Yui Fung Vehicle Trading Company and other car repair or maintenance facilities;
- car junk yards;
- trailer storage yards;
- a small fibre glass casting plant;
- a stone cutting facility;
- the Kwong Yu plastics factory, noted to be at least 30 years old;
- the Lim Mei Carpet Manufacturing Company and carpet storage warehouse; and
- an air conditioner/refrigerator dump/scrap site.

Of these land uses, only the fibreglass and plastics factory sites, and one vehicle maintenance facility actually lie *within* the proposed alignment works area. However, within the small fibreglass casting facility, the auditor noted a production area with storage of a large number of bags powder chemicals, and a large number of old, empty metal cans and canisters piled on what appeared to be open ground outside the production shop, apparently awaiting recycling or disposal. The contents of these canisters was not determined. At the entrance of the Kwong Yu Plastics factory, at least 160 drums (205 l) of unidentified chemical compounds were noted, stored on pallets on concrete. The remaining land uses are noted to be outside of the proposed works area (*Figure 20.4a*).

#### 20.3.4 Evaluation of Impacts

A number off potentially contaminating land uses have been identified in the vicinity of the alignment. However, as a result of the fact that there has been very little substantial industrial usage of land within the specific alignment and works area, overall contamination concerns are not considered to be significant. The main focus of potential concern relates to the presence of possible spillage of chemicals from these identified potential contaminating land uses within the



**CONTAMINATING LAND  
USES MAP OF THE PROPOSED  
EASTERN ACCESS ROAD**

SCALE: 1/4500

FIGURE 20.4a

ermhk/c1800/land.dgn



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works boundary. For example, contamination concerns would arise if leakages or spillages of chemicals occurred directly on a site, or via migration to areas where future construction works and personnel might come into contact with the soil.

Since the incidence of any specific spillages or leakages is unknown, the potential for impact to arise from any potentially contaminated soils in the vicinity of these sites is, therefore, also presently unknown. However, since the proposed study works is to be developed as a paved roadway only, the construction activities will likely consist of mechanical equipment and graders, therefore minimising the extent of any works requiring contact with soils. Thus the potential for any contamination from these land uses to cause impacts upon the construction workforce is considered minimal.

Typical contaminants associated with vehicle maintenance yards, scrap yards and car dump activities include hydrocarbons and fuels, heavy metals, possible degreasers, solvents and acids, and asbestos. Potential contaminants from fibre glass and related moulding production would include epoxy resins, polyurethane, catalysts, paints and pigments, polymerisation chemicals or other solvents such as methyl ethyl ketone (MEK). Chemical materials used in the Kwong Yu Plastic Factory or other plastic industries may include polyvinyl chloride, solvents, phthalates, esters and resins, paints and pigments, plasticisers, polymerisation chemicals and other intermediates or additives.

The potential impact from any of these facilities or industrial uses would likely arise from localised spillages or improper disposal practices relating to possible presence of chemical storage activities. These contaminants may cause negative impact to sensitive receivers, including humans, during construction works or during the operational phase, where there is potential interphase with the soils. A description of general hazardous properties of typical compounds which may have been used or stored at such sites is presented in *Table 20.4b*.

**Table 20.4b General Properties of Hazardous Substances**

Typical Material	General Hazardous Properties
Petroleum hydrocarbons (including benzene, toluene, xylenes, and ethyl benzene - BTEX)	<ul style="list-style-type: none"> <li>• Can be toxic by inhalation, ingestion and contact</li> <li>• Concentrations may be flammable</li> </ul>
Oils, oily wastes	<ul style="list-style-type: none"> <li>• Can be toxic by contact</li> <li>• Concentrations may be flammable</li> </ul>
Thinners, solvents, degreasants, and polymer chemicals	<ul style="list-style-type: none"> <li>• Toxic by contact, inhalation and ingestion</li> </ul>
Heavy Metals (including copper, chromium, lead, and zinc)	<ul style="list-style-type: none"> <li>• Can be toxic by ingestion and contact</li> <li>• Most are toxic to fish, plants, and marine plants (especially copper)</li> <li>• Specific precautions may be required in relation to monitoring and dust control in site formation works</li> </ul>
Acids (batteries)	<ul style="list-style-type: none"> <li>• Toxic and harmful by contact</li> <li>• Corrosive to metal, concrete</li> </ul>
Polycyclic Aromatic Hydrocarbons (PAHs)	<ul style="list-style-type: none"> <li>• Toxic by contact and ingestion</li> </ul>

There is currently only preliminary information available on the volumes of soil which may require excavation and disposal during the construction of the roadway alignment, and there is as yet no indication as to what percentage of this material may be contaminated, if it has been contaminated at all. Therefore the scale of any potential impacts can only be estimated at this stage.

### **20.3.5 Recommended Mitigation**

Subject to additional, detailed examination of potential land contamination concerns in subsequent phases of the study, and based upon any more information becoming available from the Highway Design Engineers, the significance of land contamination concerns may be evaluated in more detail, as appropriate.

Based upon the location of the identified land use sites in relation to the alignment, and the fact that the construction in this area is likely to include mechanical equipment, the potential for land contamination to be a major issue is not judged to be significant.

In light of the potential for contamination, a Contaminated Assessment Plan (CAP) will be prepared for specific areas of high potential or concern, such as the car dump and factory sites identified above which may impact upon the works site. This will ensure that any potentially contaminated soil or groundwater is identified at an early stage and that appropriate arrangements can be made to deal with it (*Annex I*). As identified by a CAP, Remediation Action Plans (RAP) may be developed and implemented to remove the contaminated material and its source if possible.

It should be noted that there is presently no legislation in Hong Kong that requires clean up of soil and groundwater contamination. The presence of contaminated soil becomes a waste disposal issue, based upon the limitations that arise for handling and disposing of contaminated material.

Potential exposure to contaminated materials can be minimised by implementing the generic mitigation measures outlined below:

- The use of bulk earth-moving excavator equipment will minimise the potential interface of contaminated materials with site construction workers;
- Exposure to any contaminated materials may be minimised by the wearing of appropriate clothing and personal protective equipment such as gloves (when interacting directly with contaminated material), providing adequate hygiene and washing facilities and preventing smoking and eating during such activities;
- Vehicles containing any contaminated materials should be suitably covered to limit potential dust emissions or contaminated wastewater run-off, and truck bodies and tailgates sealed to prevent any discharge during transport or during wet conditions;
- Only licensed waste hauliers should be used to collect and transport any contaminated sediments to an appropriate disposal site and procedures should be developed to ensure that illegal disposal of wastes does not occur;

- Prior agreement should be sought with the Facilities Management Group - of EPD regarding the acceptability of disposal of any contaminated soil to landfill or other suitable disposal locations. Although not officially designated, the only landfill site in Hong Kong that is likely to be able to accept contaminated material is the SENT landfill.
- The necessary waste disposal permits should be obtained, as required, from the appropriate authorities, in accordance with the *Waste Disposal Ordinance (Cap 354)*, *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)*, as required.
- Records of the quantities of any wastes generated and disposed of should be maintained.
- In accordance with good construction practice, silt traps should be used to reduce the impact to drainage caused by suspended solids (SS) arising from disturbed ground, or any construction materials such as cement and gravel. Groundwater should be disposed of in accordance with the *WPCO*.

#### 20.4 Further Actions

As stated above, the emphasis of this contaminated land study has been to identify potential sources of contamination and to prepare a Contamination Assessment Plan (CAP) for specific areas of high potential or concern. As a consequence, this sub-section highlights potential areas of work that are likely to be required during subsequent stages of the Projects development:

The Contamination Assessment Plan (CAP) should be implemented and the Contamination Assessment Report (CAR) and Remediation Action Plan (RAP), as required, should be approved before the award of the construction contract of the Eastern Access Road. This is to allow the remediation/mitigation measures recommended in the RAP to be incorporated in the construction contract.

During the subsequent stages of the Projects development, if there are separate contracts for the remediation works, such remediation works must be completed prior to the construction of the new road.

The works that are likely to be required for land contamination assessment during the subsequent stages of the Projects development are:

- Review the CAP attached in Annex I of this report; and perform a site visit to identify detailed sampling locations and test parameters;
- Submit the amended CAP for EPD's agreement;
- Perform site investigation according to the agreed CAP to ascertain the scale and level of land contamination, if any;
- Report the findings of the site investigations in a CAR, and, if land contamination is confirmed, prepare a RAP for agreement with EPD; and



- If applicable, the contaminated site shall be remediated in accordance with the approved CAR/RAP.

## 20.5 Conclusions

Contaminated land issues have not been identified as a significant concern. The only outstanding issues relate to a number of potentially contaminating landuses identified within the study area, including vehicle repair or maintenance facilities, car junk yards, trailer storage yards and two factory complexes. The main potential concern relates to the possible presence of contamination, such as chemical spillages or leakages from these land uses.

Contamination concerns would only arise if spillages or leakages of chemicals from the above sources had migrated to locations where construction works or workers might come into contact with the contaminated soil. The type and degree of any potential contamination has not yet been identified. However, as the works related to the construction of the EAR are likely to comprise the use of mechanical equipment, the likelihood of contact with any potentially contaminated soils is small or likely to be restricted to a very limited period of time, and therefore contaminated land concerns are further reduced. The use of standard good practice would be likely to be sufficient to minimise any potential concerns.

In order to more fully determine the potential for contaminated land concerns it is recommended that the Contamination Assessment Plan (CAP), outlined in *Annex I*, is developed and implemented to investigate the potential for contaminated soil and groundwater on the site.