

**Agreement No. CE 52/2007 (HY)**  
**Tuen Mun – Chek Lap Kok Link – Investigation**

**EIA Report**  
**Section 13 – Land Contamination**

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## **APPENDIX**

Appendix K Preliminary Site Appraisal Checklist

## 13. LAND CONTAMINATION

### 13.1 Background

- 13.1.1.1 Contaminated land refers to the land which was polluted by hazardous substances or contaminants due to historic industrial operations at the site in the previous years. These contaminants, if present, may pose hazards or adverse effects to the future land users and the nearby environment. The preferred layout of the TM-CLKL is shown in **Figure 3.1**. The northern and southern connections are shown in **Figures 3.2a, 3.2b and 3.7**.
- 13.1.1.2 Sites previously used for petrol filling stations, boatyards and vehicle repair/dismantling workshops could be contaminated as a result of the operations carried out on the sites. Sites which may have been contaminated due to their former usage are prone to causing impacts to human receptors, e.g. site workers during the construction phase. In order to avoid or minimise the risks and hazards associated with these sites, site contamination assessment should be conducted and, remediation measures should be implemented to clean up the land if necessary, prior to any redevelopment works.
- 13.1.1.3 Contaminated land is caused by spillage, leakage or disposal of toxic chemicals to the ground. Soil at or below the ground surface and sometimes groundwater may be contaminated depending on the subsurface conditions. Contaminated land is a health concern if the public is exposed to toxic chemicals through the impacted soil or groundwater. In Hong Kong, examples of industrial or commercial activities that may potentially cause land contamination include boatyards, petrol filling stations, vehicle repair/maintenance or dismantling workshops, metal or mechanical workshops or oil installations etc.
- 13.1.1.4 The potentially polluting activities generally involve:
- underground oil or chemical storage in tanks that may leak due to corrosion; or
  - operations that may cause spillage of chemicals. Ground surface condition is also a factor affecting the severity of contamination. Spillage over bare soil results in more serious contamination than that over a capped surface.
- 13.1.1.5 Before a contaminated site is re-developed, it would be necessary to assess the level of contamination by collecting soil and groundwater samples for laboratory analyses. If contamination is above an acceptable level, defined by a set of standards, remediation would be required to render the site safe for future use.
- 13.1.1.6 In the north, the alignment makes the landfall on elevated viaducts, crossing Lung Mun Road before meeting the proposed toll plaza at grade. While the viaduct will be built on columns, it is assumed that all the land areas underneath and within the works sites would be affected by the works. As such, any contamination within the whole works area will need to be identified. The same situation occurs for the southern landing of the TM-CLKL on Lantau, where the marine elevated viaduct gradually descends to merge with the existing North Lantau Highway at grade and, again, all the land areas underneath and within the

works sites would be assumed to be potentially affected by the works.

- 13.1.1.7 Construction workers could be exposed to potentially contaminated soil due to the release of contaminants during site formation, excavation and foundation works for the construction of viaduct segments and bridge columns. Also, possible remediation works could be required. The implications of any land contamination associated with the TM-CLKL development have been assessed in this Section.

## 13.2 Environmental Legislation and Standards

- 13.2.1.1 The following legislation relevant to the land contamination issues as a result of handling, treatment and disposal of contaminated materials:

- Waste Disposal Ordinance (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C); and
- Code of Practice of the Packaging, Labelling and Storage of Chemical Waste, EPD (1992).

- 13.2.1.2 The following EPD publications provide guidance on the land contamination assessment in this Assignment:

- Guidance Note for Contaminated Land Assessment and Remediation;
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management; and
- Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops.

## 13.3 Assessment Methodology

- 13.3.1.1 The contaminated land assessment methodology comprised the following key survey tasks in order to identify and evaluate the potential of land contamination within the study area:

- (a) a desktop review to appraise the current and historical land uses within the study area in connection with land uses and potential activities leading to land contamination with the aid of aerial photographs, survey maps, geological map;
- (b) a site reconnaissance to identify any visual contamination hotspots;
- (c) definition of field sampling and laboratory testing regimes and supervise for the field and laboratory testing works based on the Risk-Based Remediation Goals (RBRGs) promulgated since August 2007 in Hong Kong, if contaminated land hotspots were identified;
- (d) interpretation and assessment of the findings of the site investigation (if required) for soil and groundwater samples following the philosophy of the RBRGs which estimate the extent of remediation required to the level of

risk under certain land uses for the protection of human health; and

- (e) recommendation of any necessary contamination remediation works for the future TM-CLKL operation based on the conclusion of the land contamination assessment.

13.3.1.2 The findings of the survey are detailed in the sections below.

## 13.4 Survey Findings

### 13.4.1 Ground Conditions

13.4.1.1 The available geotechnical information relevant to the development of the TM-CLKL project has been reviewed. The information included the available archived borehole records, geological maps, historic maps, aerial photographs, and the findings of the Final Desk Top Study Report of Ground Investigation Records under this Assignment. A summary of the reviewed information is summarised below.

#### **Topography**

13.4.1.2 The northern landfall of the Tuen Mun – Chek Lap Kok Link is targeted at the reclamation seafront (Tuen Mun Reclamation) adjacent to River Trade Terminal to form a portal area for the subsea tunnel. In these regions, the ground levels vary approximately between +4.5mPD and +6.5mPD.

13.4.1.3 The proposed subsea tunnel runs southward across the Urmston Road Channel, where the seabed level drops and varies from -11mPD to -19mPD approximately.

13.4.1.4 Beyond the Urmston Road Channel, the subsea tunnel connects the reclamation attached to the east of the proposed HKBCF to form a portal area (HKBCF Reclamation), where the seabed level varies from -19mPD to -3mPD to -19mPD approximately.

#### **Geology**

13.4.1.5 The geological condition along the proposed TMCLKL has been reviewed based on available published records, existing available ground investigation records and geophysical survey. A copy of the relevant portion of the 1:20000 geological map is reproduced as **Figure 13.1**. The geological plans and geological sections along the proposed TMCLKL are shown in **Figures 13.2-13.4** and **Figures 13.5-13.7** respectively. Discussions of the general geological condition in the study area are provided as below.

#### **Superficial Geology**

13.4.1.6 The superficial deposits at north Lantau onshore area consists of alluvium (Qa), beach deposits (Qb), debris flow deposits (Qd, Qpd) while the Tuen Mun onshore area is dominated with alluvium (Qa) and beach deposits (Qb).

- 13.4.1.7 A layer of debris flow deposits (Qd, Qpd) are mantled on the lower flanks of the hillsides, consisting sand, gravel, cobbles and boulder in silty matrix. Alluvium (Qa) is found deposited around the perennial stream courses. It mainly comprises of silt, sand and gravel. The beach deposits (Qb), dominated with sand, are found within the inlet of Tai Ho Wan and Tuen Mun onshore area.
- 13.4.1.8 The offshore superficial deposits in the vicinity of The Brothers are Hang Hau formation (QHH). It consists soft to very soft marine mud with some sand. As shown in the geological map the Channel and Transgressive Deposits (Qct) are also noted beneath the Hang Hau Formation (QHH). These deposits may include extensive sand lenses near the onshore area and offshore area of Tuen Mun, at 1-2 km north of the Brothers Islands.

### **Solid Geology**

- 13.4.1.9 The geological maps indicate at the proposed southern connection at Chek Lap Kok is dominated with the Lantau Granite. The granitic intrusion on the northern side of the fault, which forms part of the Lantau pluton and extend to the Brothers Islands, includes a number of intrusive dykes of feldsparphyric rhyolite, quartzphyric rhyolite, basalt and quartz veins. These intrusions typically form sub-vertical, narrow dykes that mostly run sub-parallel to the fault zone itself, although their exact offshore locations and extent are not well defined due to the presence of thick marine and alluvial deposits in the study area.
- 13.4.1.10 Moreover, notably different conditions are recorded in the vicinity of the Brothers Islands. In the area, outcrops of graphite bearing siltstone and other meta-sedimentary rocks forming part of the Lok Ma Chau Formation is recorded. These deposits include a number of steeply dipping (typically between 40 to 60 deg.) south-southeast striking quartzite (qz) and graphite (gr) dykes on Tai Mo To. The graphite seams were previously mined between 1952 and 1971 and many areas of the abandoned mine may remain in an unstable condition and care should be taken for any engineering works in the vicinity.
- 13.4.1.11 To the north of The Brothers, the bedrock is back to granitic nature with outcrops at onshore area of Tuen Mun, suggesting the likely presence of steeply dipping basalt and quartzphyric rhyolite dykes.
- 13.4.1.12 In addition, the proposed alignment entered the zone of designated area of Northshore Lantau, between CH.0 and CH.1550. A number of complex geological conditions are known arise in the designated area, for example, very deep weathering, presence of large fault bounded blocks of meta-sedimentary and marble deposits of the Tolo Harbour Formation, with associated karst and collapse related features. These collapse structures form unusually thick superficial deposits that comprise an assortment of debris flow deposits, laminated sediments and block breccias. The majority of these deposits are soft and unconsolidated.

### **Structural Geology**

- 13.4.1.13 The major faults anticipated in the area are summarized as the following:

- At CH.2000, the proposed alignment encountered a major fault at 45 deg. which run from the southern side of Chek Lap Kok, through the eastern part of Tai Mo To, before continuing northeast and link with the southern part of the Tai Lam Fault; and
- At CH.8000, an inferred ENE-striking fault is apparent running along the shoreline at Tuen Mun.

13.4.1.14 In addition to the above mentioned faults, which are all regional features that extend several kilometres in distance, it is anticipated that some minor faults with less pronounced effect may be encountered in the study area.

### **Ground Conditions**

13.4.1.15 A general description of these sub-surface stratifications encountered along the proposed TMCLKL is given below.

### **Marine Deposit**

13.4.1.16 A layer of Marine Deposit with thickness varied from approximately 6m to 20m was found under beneath seabed level. The material was generally described as Soft to firm, dark grey, sandy clayey Silt to sandy, silty Clay with occasional shell fragments.

### **Alluvium**

13.4.1.17 A layer of Alluvium with thickness varied from approximately 6m to 38m was found under beneath Marine Deposit. The SPT 'N' value with range from 20 to 80. The material was generally described as:

- Firm, grey, mottled yellowish brown sand silty Clay to sandy clayey Silt; and
- Medium to dense, grey to yellowish brown, silty, medium to coarse Sand with occasional sub-angular, fine to coarse gravel of moderately strong quartz.

### **Saprolitic Soils**

13.4.1.18 The saprolitic soil stratum, comprising grade V to IV material, was encountered under beneath Alluvium. The thickness of saprolite varied from approximately from 10 to 40m with SPT 'N' value with range from 35 to 100. The saprolitic soils primarily consisted of extremely weak to weak, light gray to yellowish brown, mottled yellow and olive grey completely to highly decomposed, fine to medium grained Granite (Very stiff, sandy Silt with occasional angular, coarse gravel).

### **Bedrock**

13.4.1.19 Granite was generally described as strong, pinkish grey, spotted dark green, dappled brown, slightly decomposed fine to coarse grained granite. Joints were

closely to medium spaced, locally very closely and widely spaced, rough stepped and rough planar, occasional rough undulating, extremely narrow to very narrow, iron and manganese stained, occasional kaolin chlorite coated.

### **Hydrogeology**

- 13.4.1.20 A subsea tunnel and marine viaduct form the major parts of the alignment for the TM-CLKL. The remaining part of the alignment will be formed on reclaimed land with levels slightly above the sea level. Under these conditions, it implies that the groundwater will have insignificant influence on the proposed works.

### **Groundwater Level**

- 13.4.1.21 The existing groundwater regime at the northern portal area of the subsea tunnel is heavily influenced by the close proximity of the sea. Generally the groundwater table lies at +2mPD (approximately 3m below ground level).

### **13.4.2 Land Use**

- 13.4.2.1 The proposed alignment at its southern and northern landing points, together with any work areas to be used for site offices, storage, maintenance or pre-casting for example, could potentially interface with areas of potentially contaminated land if they exist. As such, the past and current landuses of the study areas close to Tai Ho Wan for the southern viaduct and proposed work sites, in Pillar Point and Tuen Mun Area 46 for the northern viaduct, slip roads, toll plaza and works sites and at Wok Tai Wan in Tsing Yi for Works Area 23 have been reviewed to identify any interface with areas of potentially contaminated land. Locations of the northern landing (the link roads connecting Lung Mun Road and toll plaza) and southern landings (link roads connecting to the NLH) and the works areas proposed for use during the construction period of TM-CLKL are shown in **Figures 13.8-13.9, 3.8a-3.8b and 13.10-13.14**. Details of the works areas are shown in **Table 13.1**.

**Table 13.1 Location of TM-CLKL Works Areas**

<b>Works Area</b>	<b>Location</b>
<b>Lantau</b>	
WA4	The site is an Un-allocated Land at the existing reclamation for North Lantau Highway beside Cheung Tung Road in Lantau which is next to the Tai Ho Offtake and Piggling Station.
WA5	The site is under Temporary Government Land Allocation near Yam O Wan beside Cheung Tung Road in Lantau.
WA6	The site is under Temporary Government Land Allocation near Yam O Wan beside Cheung Tung Road in Lantau.
WA23	The site is under Temporary Government Land Allocation at the reclaimed land at Wok Tai Wan in Tsing Yi, which is a landfall of Tsing Ma Bridge.
<b>Tuen Mun</b>	
WA18	The site is under Short Term Tenancy at Tuen Mun Area 46 at the existing River Trade Golf at Pillar Point in Tuen Mun.



Works Area	Location
WA19	The site is under Temporary Government Land Allocation at the existing closed Pillar Point Valley Landfill at Pillar Point at Tuen Mun at Tuen Mun Area 46

**Past Land Use and Activities**

- 13.4.2.2 The northern connection at Pillar Point in Tuen Mun was developed mainly on land reclaimed at the coastal areas near Butterfly Beach. This reclamation for special industrial use has been completed since the 1980s to cater for the increasing traffic demand in association with the development in Tuen Mun. The proposed northern connection will encroach upon the coastal reclamation area which was the coastline of Pillar Point in Tuen Mun more than 20 years ago (before 1988). Also, the proposed toll plaza and its associated link roads would be located on the site of the former Pillar Point Vietnamese Refugee Camp (between 1989 and 2000) and, also, the rural, undisturbed woodlands at and adjacent to Tuen Mun Area 46, as shown in **Figure 13.15**. No apparent pollution sources were identified in the immediate vicinity of the site which would lead to significant land contamination concerns. Based on the available information, no historic potential contamination activities were anticipated and identified in that area.
- 13.4.2.3 Between the date of the earliest available aerial photographs in 1945 and the developed airport and Tung Chung New town during 1990s, the land-use at the onshore areas at North Lantau, between Tai Ho and Chek Lap Kok was primarily for agricultural terraces and cut/fill platforms with some dwellings in the low-lying valley areas. The North Lantau Highway where the southern viaduct will connect and some of the works areas are proposed is on land reclaimed after 1992, as shown in **Figure 13.16**. There are several proposed works areas along Cheung Tung Road which comprise reclaimed land including adjacent to Tai Ho Offtake and Pigging Station storage areas or have been occupied as previous contract works areas, including the site offices for Penny’s Bay Reclamation and site offices for Yam O Road watermain laying. However, there were no historic contamination hotspots identified adjacent to the proposed southern connection at north Lantau.
- 13.4.2.4 The past land uses of the main works sites for the project including the six works areas are summarised in **Table 13.2** below:

**Table 13.2 Past Land Uses of the Project Site**

Area	Past Land Use Description
Elevated viaduct at Pillar Point	The elevated viaducts would be located on the land reclaimed in 1980s at the coastal zone in Pillar Point, as shown in <b>Figure 13.15</b> . The sawmills gradually moved onto the reclamation areas in late 1980s from the coastal site near Butterfly Bay. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Toll Plaza and associated buildings	The toll plaza is proposed to be located on the site of the former Pillar Point Vietnamese Refugee Camp (operation between 1989 and 2000) and the rural, undisturbed woodlands at and adjacent to Tuen Mun Area 46 shown in <b>Figure 13.15</b> . The camp was then demolished and the land reinstated, until 2003 when the River Trade Golf started to operate.
Elevated viaduct at Tai Ho Wan	The elevated viaducts would be located on land reclaimed after 1992 for the North Lantau Highway, as shown in <b>Figure 13.16</b> . The land has remained unoccupied since it was reclaimed. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 4	The site is located on reclaimed land. According to the historic photographs shown in <b>Figure 13.17</b> , the site had not been reclaimed prior to 1992. Since that time, site formation works for the North Lantau Highway were apparent and the subsequently the site is known to have been used for site offices and as a storage area for the Penny’s Bay Reclamation project which was concrete-paved. The MTR Siu Ho Wan Depot is located more than 400m from the site which is too far to influence the site and no other apparent pollution sources were identified in the immediate vicinity which may have lead to significant land contamination concerns.
Works Area 5	The site is located on reclaimed land. According to the historic photographs shown in <b>Figure 13.18</b> , the site was undeveloped prior to around 1993. Since then, site formation works for the North Lantau Highway were apparent. It was not until 1998 that building structures were established for the subsequent Penny’s Bay Reclamation project when the site was known to have been used for site offices and as a storage area which was concrete-paved. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 6	The site is located on reclaimed land. According to the historic photographs shown in <b>Figure 13.19</b> , the site was undeveloped prior to around 1995. Since then, site formation works for the North Lantau Highway were apparent. Site offices for the previous Yam O Road Watermains works were then established in circa 2000. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concern.

Area	Past Land Use Description
Works Area 23	The site is located on reclaimed land. According to the historic photographs shown in <b>Figure 13.20</b> , the site had not been reclaimed prior to around 1986. In around 1987, land reclamation works commenced, apparently for the landing of Tsing Ma Bridge tower. Barging points and concrete batching plants were known to exist on the site during the construction phase of the Tsing Ma Bridge and North Lantau Highway. The Hong Kong United Dockyard and Shell Oil Depot are located more than 100m and 600m, respectively, from the site. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 18	The site formed part of the former Pillar Point Vietnamese Refugee Camp between 1989 and 2000 but, according to the historic photographs shown in <b>Figure 13.15</b> , the part of the site in question was undeveloped prior to 2003 and comprised natural vegetated hillside. Since 2003, a golf driving range (the River Trade Golf) has been established which covers part of the works area and no pollution sources were identified. The landfill gas flare and ammonia stripping plant of the closed Pillar Point Valley Landfill are located at more than 50m from the site. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 19	The site is within the closed Pillar Point Valley Landfill boundary which commenced operation to receive waste in 1983 and closed in 1996. The site comprised the works sites for the restoration works of the landfill between 2004 and 2006. According to the historic photographs shown in <b>Figure 13.15</b> , part of the site was undeveloped with signs of vegetation whilst some areas show the presence of site offices and the area has been used for open storage since 2004. The landfill gas flare and ammonia stripping plant of the closed Pillar Point Valley Landfill are in close proximity to the site. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concern.

### Existing Land Use and Activities

13.4.2.5 A series of sawmill factories have existed along the coastal reclamation area in the Pillar Point area of Tuen Mun since around 1988 and these are subject to short term tenancies under the Government land leasing terms. The operation of these sawmills involves the loading and unloading of timber materials between barges and warehouses at the barging point. Further processing of these timber materials will mainly be cutting to the prescribed length and size for temporary storage and delivery. In addition, the River Trade Golf facility is located at Tuen Mun Area 46, which will interface with the proposed toll plaza, and which comprises a golf driving range and recreation area and has been in operation since 2007. This is also subject to a short term tenancy. Also, the proposed toll plaza and part of its associated link roads would be located at the existing River Trade Golf and the rural, undisturbed woodlands at and adjacent to Tuen Mun Area 46 (**Figures 13.8 and 13.21**). No apparent pollution sources were identified in the immediate vicinity of the site which would lead to significant land contamination

concern. No historic or current potential contamination activities are anticipated or were identified in these areas.

- 13.4.2.6 In terms of the southern end of the project, the site formation and associated infrastructure development for Hong Kong International Airport was carried out in the 1990s and included the construction of the North Lantau Highway (**Figure 13.9**). These works involved the formation of a number of man-made cut slopes at the toe of the natural terrain hillside along the North Lantau coastline and the formation of several major reclamation areas, most notably at Chek Lap Kok itself and at the Siu Ho Wan MTR Depot. There are several locations on the reclaimed land along Cheung Tung Road which are currently vacant (e.g. adjacent to Tai Ho Offtake and Piggings Station) or occupied as works areas (e.g. storage areas and site offices for Penny’s Bay Reclamation, site offices for Yam O Road Watermains, etc). However, there were no existing contamination hotspots identified adjacent to the proposed southern connection at north Lantau.
- 13.4.2.7 In addition, one of the proposed works areas, WA19 (**Figure 3.8a and Figure 13.15**), will interface with the Pillar Point Landfill. The existing closed Pillar Point Valley Landfill commenced its operation to receive waste from 1983 and closed in 1996, and the landfill restoration work commenced in 2004 and completed in 2006. Only some open car parks, storage areas and site offices exist within this area and no potential contamination hotspots have been identified.
- 13.4.2.8 A summary of the existing land uses of the main works sites for the project including the six works areas are summarised in **Table 13.3** below:

**Table 13.3 Existing Land Uses of the Project Site**

Area	Existing Land Use Description
Elevated viaduct at Pillar Point	The elevated viaducts would be located within the footprint of the sawmills on the coastal reclamation area in Pillar Point. The viaducts also would also cross the Pillar Point Fire Station which is located north of the sawmills. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Toll Plaza and associated buildings	The site would be located partly at the existing River Trade Golf and partly on the rural, undisturbed woodlands at and adjacent to Tuen Mun Area 46. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Elevated viaduct at Tai Ho Wan	The elevated viaducts would be located on land reclaimed after 1992 for the North Lantau Highway. The areas beside North Lantau Highway and Cheung Tong Road. are currently vacant. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 4	The site is currently concrete-paved and unoccupied. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.

Area	Existing Land Use Description
Works Area 5	The site is current paved and used as site offices and a storage area for Penny’s Bay Reclamation project. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 6	The site is currently paved and unoccupied. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 23	The site is currently an open storage of concrete casted blocks. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 18	The site is currently paved and used as an open car park for the River Trade Golf. The landfill gas flare and ammonia stripping plant of the closed Pillar Point Valley Landfill are located more than 50m from the site. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 19	The site is currently paved and unoccupied. The landfill gas flare and ammonia stripping plant of the closed Pillar Point Valley Landfill are in close proximity to the site. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concern.

### **Future Land Use**

- 13.4.2.9 In accordance with the Guidance Note for Contaminated Land Assessment and Remediation, Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management, there are 4 different post-restoration land use scenarios (Urban Residential, Rural Residential, Industrial, Public Parks) reflecting the typical physical settings in Hong Kong are categorised under which people could be exposed to contaminated soil and groundwater.
- 13.4.2.10 RBRGs have been developed to protect workers at industrial sites, the public visiting public parks, and residents in urban and rural areas. Separate sets of RBRGs have been developed according to different land uses, as the ways in which people come into contact with contaminated soil and/or groundwater, including the intensity and frequency of their contact, are largely dependent on the type of land use.
- 13.4.2.11 The future land use includes land that will be occupied during both the construction and operation phases of the project. During the construction phase, the demarcation of works sites would include the footprints of the works items as described in Section 3 of this EIA report and would encroach upon the following areas:
- Marine tunnel portals would be constructed at the new reclamations of the TM-CLKL project at Pillar Point of Tuen Mun (northern connection) and at the north-eastern end of the HKBCF (**Figures 3.2a and 3.2b**). As such,

no land contamination issues would be anticipated;

- The northern viaduct of TM-CLKL would be constructed from the northern portal of the submarine tunnel in Tuen Mun, encroaching upon an area of about 3,500 m<sup>2</sup> of the Pillar Point reclamation area which is currently occupied by two sawmills (Wai Sang Sawmill Ltd and Shou Cheong Sawmill Ltd) (see **Figure 3.4a**), before passing over Lung Mun Road and descending to the proposed toll plaza in Area 46. The slip roads would span over the hill slopes and adjacent to the existing Lung Mun Road. However, no potential contamination hotspots have been identified in these areas;
- The toll plaza would be constructed on the land currently occupied by the the River Trade Golf at Tuen Mun Area 46 and part of the rural hill slopes immediately outside the boundary of the closed Pillar Point Valley Landfill (**Figure 13.21**). Based on the historic and existing land use, no contamination issue would be anticipated; and
- At the southern connection, the elevated marine viaducts would connect the southern portal on the reclamation to the NLH transport corridor (**Figure 13.8**). As described above the NLH transport corridor is on reclaimed land and as such, no contamination issues would be anticipated based on the historic and existing land uses in this area.

13.4.2.12 A summary of the future land uses of the main works sites for the project including the six works areas are summarised in **Table 13.4** below:

**Table 13.4 Future Land Uses of the Project Site**

Area	Future Land Use Description
Elevated viaduct at Pillar Point	The site is proposed for the future elevated viaducts. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Toll Plaza and associated buildings	The site is proposed for the future toll plaza and its associated buildings. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Elevated viaduct at Tai Ho Wan	The site is proposed for the future elevated viaducts. No other apparent pollution sources were identified in the immediate vicinity of the site which may lead to significant land contamination concerns.
Works Area 4	The site is proposed to be used for the general storage of materials and viaduct segment and site office. Concrete pavement works will be carried out as necessary. No major site formation works will be carried out.
Works Area 5	The site is proposed to be used for the site offices and the general storage of materials and viaduct segments on the concrete paved land, which would be the same as its existing use. No major site formation works will be carried out.

Area	Future Land Use Description
Works Area 6	The site is proposed to be used for site offices and the general storage of materials and viaduct segments and on the concrete paved land, which would be the same as its previous use. No major site formation works will be carried out.
Works Area 23	The site is proposed to be used for site offices and as the casting yard for fabrication of precast units, storage of work boat and materials, which would be the same as its previous use. Concrete pavement works will be carried out as necessary. No major site formation works will be carried out.
Works Area 18	The site is proposed to be used for the general storage of materials and viaduct segment and site office on the concrete paved land. No major site formation works will be carried out.
Works Area 19	The site is proposed to be used for the general storage of materials and viaduct segment and site office on the concrete paved land, which would be the same as its previous use. No major site formation works will be carried out.

13.4.2.13 During the operation phase, the future land use of the entire TM-CLKL would be classified as “Roads”. The corresponding RBRGs for the land use in accordance with the Guidance Note for Contaminated Land Assessment and Remediation, Guidance Manual for Use of Risk-Based Remediation Goals for Contaminated Land Management would be “Lower of Industrial or Public Park”, based on which the land contamination assessment and remediation (if required) criteria would be carried out.

### **13.4.3 Reconnaissance Site Visit**

13.4.3.1 Reconnaissance site visits were carried out on 19 August 2008 and 15 January 2009 to both the areas where the proposed northern and southern connections of the TM-CLKL would be constructed. An additional visit to the area of the proposed northern connection, specifically to the 2 possibly affected sawmills, was carried out on the 3 March 2009 in which interviews were also conducted with the owners of the sawmills in order to verify the desktop review findings and identify if any additional polluting activities may exist to cause hotspots of land contamination. The observations of the reconnaissance site visit were in line with the desktop review and no contamination hotspots were identified.

### **13.4.4 Sensitive Receivers**

13.4.4.1 If contamination hotspots were identified, the future construction workers would be more prone to be exposed to the potential contaminated material than the future land users within the study area, due to their exposure to potential contaminants during excavation and preparation of foundation works. Depending on the nature of the contaminants, hazards during preparation of foundations and subsurface services could be significant. The principal exposure routes for workers would include:

- Ingestion of contaminated soil through eating, drinking or smoking on site;

- Dermal contact with contaminated spoil; and
- Inhalation of contaminants if they are volatile.

### **13.5 Impact Assessment**

13.5.1.1 Based on the above initial site appraisal, reconnaissance site visits and the review of previous relevant information, no land contamination hotspots were identified at the southern connection of the TM-CLKL in the north Lantau area.

13.5.1.2 In addition, at the proposed northern connection on TM-CLKL at Pillar Point, Tuen Mun, no potential land contamination hotspots identified at the sawmill factories, the land that would be encroached upon by the selected alignment layout. Details of the preliminary site appraisal of these sawmills are summarised in the preliminary site appraisal checklist (based on Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshop ) as included in **Appendix K**.

13.5.1.3 Based on the above review and site visits, there would be no potential land contamination hotspots identified according to the Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshop. Therefore, no further site investigation works for the land contamination assessment would be recommended.

### **13.6 Mitigation Measures**

13.6.1.1 The results of the assessment did not reveal any contamination hotspots that might be affected by the proposed works and as such no mitigation measures in the form of contaminated land remediation is required.

### **13.7 Residual Impacts**

13.7.1.1 No significant contaminated land impacts are predicted during the construction and operational phases and as such, no residual impacts are also predicted.

### **13.8 Environmental Monitoring and Audit**

13.8.1.1 No EM&A activities for the construction and operational phases are recommended as no significant impacts are predicted.