

6.1 INTRODUCTION

During the course of the EIA Study, an assessment of the operational records of the Sha Tin STW indicated that the lagoon areas to be redeveloped for the Project have been used in the past for sludge drying and disposal. In addition, part of the existing carparking area, which will be occupied by the Stage III Extension was observed during a site visit to be contaminated by what appeared to be diesel/oil. In order to further investigate these potential land contamination issues, a land contamination investigation was undertaken.

Site investigation works were carried out in two phases to meet the following objectives.

- characterise concentrations of contaminants in soil for assessment against the Dutch Guideline Values;
- investigate the leaching potential of the identical contaminants in soil that is to be excavated, in order to assess if the potentially contaminated materials are likely to meet the landfill disposal requirements; and
- confirm the total volume of contaminated soil requiring disposal.

This section provides a description of the site investigation works and an assessment of the potential environmental impacts associated with the handling and disposal of any contaminated wastes encountered during the construction phase of the Project.

6.2 ENVIRONMENTAL LEGISLATION AND NON-STATUTORY GUIDELINES

Assessments of land contamination and the potential impacts are guided by the *Professional Persons Environmental Consultative Committee Practice Note 3/94 - Contaminated Land Assessment and Remediation* (ProPECC PN 3/94), and the *Technical Memorandum on Environmental Impact Assessment Process* (EIA TM). In accordance with ProPECC PN 3/94, the assessment evaluation should:

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

Under the ProPECC PN 3/94 note, and in the absence of any formal legislation requiring cleanup of soil and groundwater contamination in Hong Kong, the "*Dutch Ministry of Housing, Planning and Environmental Soil and Groundwater Standards*" (the Dutch List) (1995) are used as reference criteria by the EPD for the classification of contaminated materials.

Under the *EIA Ordinance, Annex 19: Guidelines for Assessment of Other Impacts*, consideration shall be given to a number of potentially contaminating historical land uses, including generating a Contamination Assessment Plan (CAP).

The following legislation, documents and guidelines also cover or have some bearing upon land contamination assessment and the handling, treatment and disposal of contaminated waste in Hong Kong:

- *Waste Disposal Ordinance (Cap 354)*;
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)*; and
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*, Environmental Protection Department (1992).

6.3

ASSESSMENT PROGRAMME AND METHODOLOGY

The methods used for examining the degree of contamination in the primary areas of concern, where excavation for foundations of some Project items will be carried out, was developed and agreed with DSD and EPD. The primary areas of concern included the sludge lagoons and the carparking area. This Contamination Assessment Plan (CAP) was agreed with EPD before the field investigation commenced. Details of the CAP are presented in *Annex H*.

The main features of the Phase 1 investigation are summarised as follows:

- identification of eight sampling locations at the sludge lagoon and carparking areas, as presented in *Figures 6.3a*;
- collection of two soil samples at each location, at 0.5 and 1.5 m below ground level⁽⁴⁰⁾;
- analysis of all samples for a suite of contaminants, including the heavy metals cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), lead (Pb) and Zinc (Zn), and polychlorinated biphenyls (PCBs). The four soil samples collected from the existing carparking areas were also analysed for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs).

After the initial Phase 1 investigation was completed and the results reported to the EPD, a Phase 2 proposal, to further examine the degree of contamination in the areas where previous analytical data indicated some contamination by heavy metals, was developed and agreed with DSD and EPD.

The scope of the Phase 2 contamination assessment was as follows:

- identification of 14 additional sampling locations at the sludge lagoon areas as presented in *Figure 6.3b*;
- collection of up to three soil samples at each additional location, at specific depths below ground level (total of 33 samples). It should be noted that three

⁽⁴⁰⁾ It should be noted that an additional sample was taken at the surface at one location (S4) based on the on-site observation that this area appeared to be dark and possibly contained dried sewage sludge.

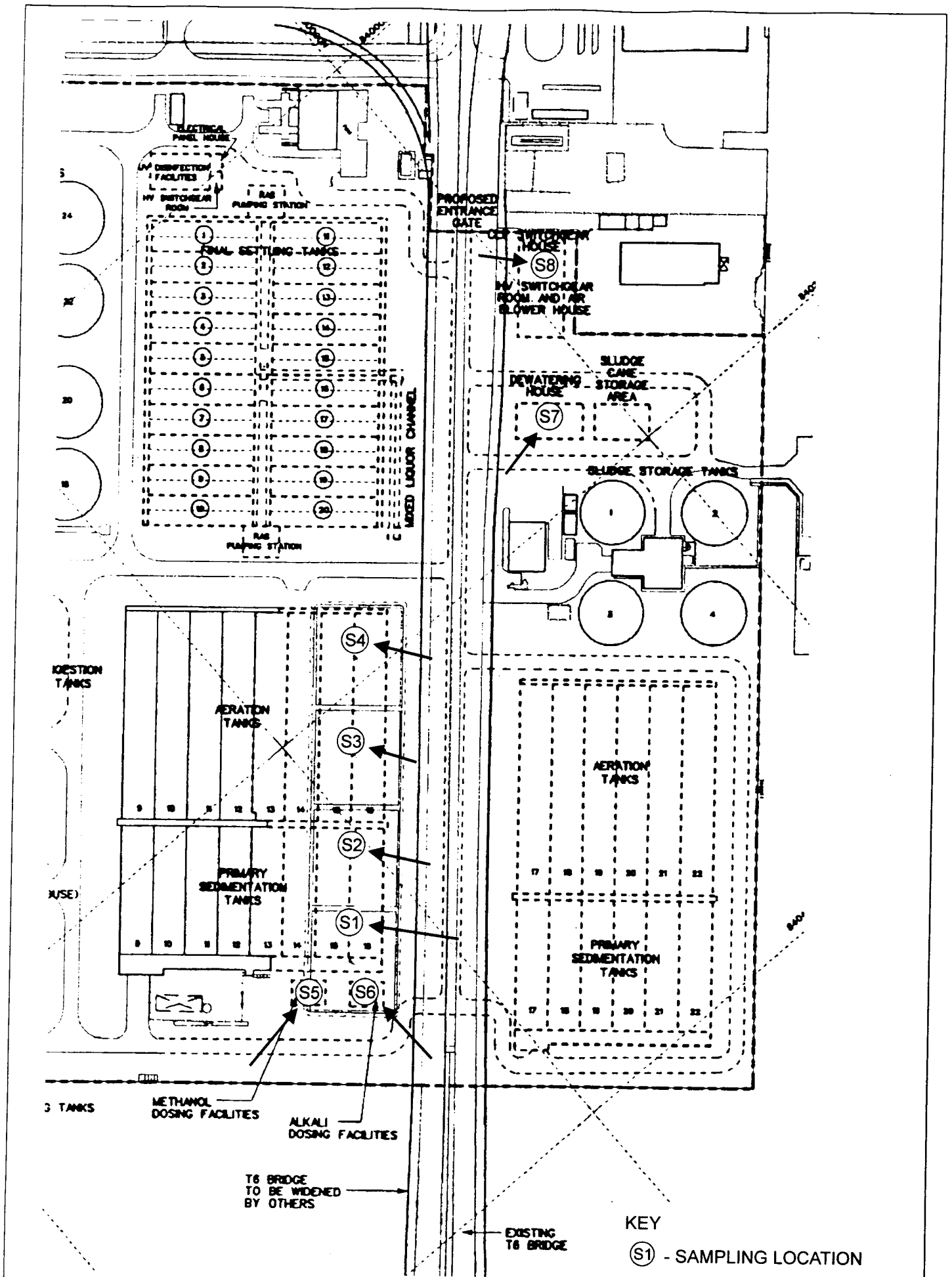


FIGURE 6.3a

SOIL SAMPLING LOCATIONS

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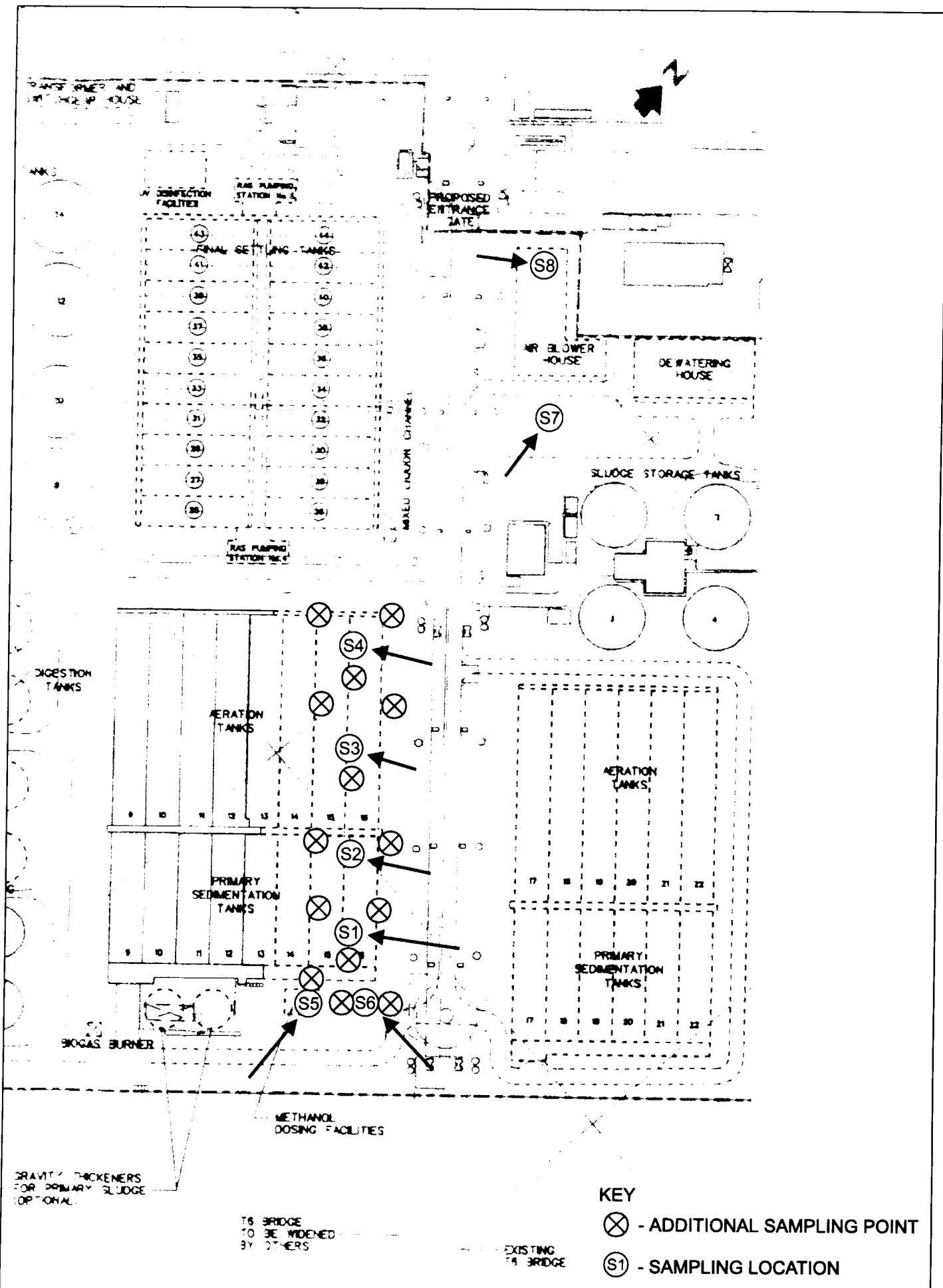


FIGURE 6.3b

SOIL SAMPLING LOCATIONS

samples were collected from the most contaminated hot spot at the site (Sludge Lagoon S4);

- analysis of all samples for the full suite of 12 metals specified in the "Dutch List" (see *Table 6.3a*), including cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), Zinc (Zn), mercury (Hg), arsenic (As), barium (Ba), tin (Sn), cobalt (Co), and molybdenum (Mo); and
- screening analysis of a number of samples using the toxicity characteristic leaching procedure (TCLP) for the same 12 metals plus silver (Ag), beryllium (Be), thallium (Tl), vanadium (V), tin (Sb), and selenium (Se), in order to assess whether the untreated potentially contaminated soil meets the landfill disposal criteria.

The Phase 2 sampling programme was performed from 27 January to 29 January 1999. All sampling was conducted using a backhoe and samples were collected directly from the backhoe bucket.

As stated above, there are currently no legally binding standards for the clean up of soil and groundwater contamination in the Hong Kong SAR. In the absence of any criteria defined by the Hong Kong SAR Government, the analytical results for the contaminants detected as part of this investigation have been assessed with reference to the "*Dutch Ministry of Housing, Planning and Environmental Soil and Groundwater Standards*"⁽⁴¹⁾ (the Dutch List). These guidelines can be used to evaluate levels of contamination. It should be noted that the Dutch List is used in Hong Kong as a non-enforceable reference due to its widespread international recognition and applicability.

In the Netherlands, the Dutch List (which was revised in 1995) is an enforceable standard whereby contaminants are subdivided into categories, dependent upon the concentrations of key contaminants. For the purposes of this investigation, soil samples were classified according to the old Dutch List as follows:

- "A" Values are characteristic of clean, uncontaminated soils;
- "B" Values imply that some form of pollution is present and further investigation may be required; and
- "C" Values imply significant pollution and some intervention or cleanup would be required.

The relevant Guideline Values are presented in *Table 6.3a*.

⁽⁴¹⁾ It should be noted that the Dutch List currently adopted by EPD has been revised in 1994 in the Netherlands. While Level A and Level C are maintained as "Target (T)" and "Intervention (I)" levels respectively, the Dutch B level has been eliminated based on ecotoxicological and human toxicological study undertaken by the Dutch Government Research Institution.

Table 6.3a *Classification of Heavy Metals and Other Contaminants*

Compound	Class A ^(a)	Concentration (mg kb ⁻¹) Class B ^(b)	Class C ^(c)
Cadmium (Cd)	1	5	20
Chromium (Cr)	100	250	800
Copper (Cu)	50	100	500
Nickel (Ni)	50	100	500
Lead (Pb)	50	150	600
Zinc (Zn)	200	500	3,000
Mercury (Hg)	0.5	2	10
Arsenic (As)	20	30	50
Barium (Ba)	200	400	2,000
Tin (Sn)	20	50	300
Cobalt (Co)	20	50	300
Molybdenum (Mo)	10	40	200
PCBs (total)	0.05	1	10
TPH ^(d)	100	1,000	5,000
PAHs ^(e)	0.05	1	10

Notes:

- (a) A - level implies soil uncontaminated.
- (b) B - level implies contamination present and further investigation required.
- (c) C - level implies significant contamination present and cleanup (preferably back to the A - level) required.
- (d) TPH classification is determined based upon concentration of mineral oil.
- (e) PAH concentration is determined based upon total concentration of 10 individual PAH compounds.

Source: "Dutch Ministry of Housing, Planning and Environmental Soil and Groundwater Standards" (1995)

6.4 POTENTIAL SOURCES OF IMPACT

Excavations will be required for the foundation works of some of the proposed facilities. The majority of the excavated materials will comprise of fill material, as the Sha Tin STW was developed on reclaimed land. These materials are expected to be inert in nature and could be reused on site if they meet the necessary engineering requirements.

In the course of reviewing the operational history of the Sha Tin STW, it was identified that from time to time sludge was dried and disposed of on-site in a series of lagoons next to the primary sedimentation tank number 12, as shown in *Figure 6.3a*. In addition, an area of existing carpark was suspected as being potentially contaminated with diesel oil. This area will form part of the new dewatering house and sludge cake storage area. Excavated material from these two areas may contain elevated levels of heavy metals and organic compounds which have the potential to pose health hazards to construction workers if not

adequately managed. Any high levels of contamination could also cause additional off-site impacts if the excavated materials are not disposed of properly.

A description of general hazardous properties of the contaminants is presented in *Table 6.4a*.

Table 6.4a *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"> • Can be toxic by inhalation, ingestion and contact • Very elevated concentrations may be flammable
Oils, oily wastes	<ul style="list-style-type: none"> • Can be toxic by direct contact • May be flammable • May be indicative of high levels of other contaminants
Heavy metals (including cadmium, chromium, lead, and mercury)	<ul style="list-style-type: none"> • Can be toxic by ingestion and direct contact • Most are potentially toxic to marine fauna and flora
Polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCB)	<ul style="list-style-type: none"> • Toxic by direct contact and ingestion

6.4.1 *Assessment of Analysis Results*

The results of the sample analyses are discussed below.

Heavy Metals - Phase 1 Investigation

The sample results are presented in *Table 6.4b*. Based on the sample analyses, it is noted that the detected concentrations of chromium (1,216 mg kg⁻¹) and copper (6,948 mg kg⁻¹) in the S4 surface sample exceeded the Dutch "C" Values of 800 and 500 mg kg⁻¹, respectively. The S4 surface sample also had concentrations of cadmium, mercury, lead, and zinc in excess of the Dutch B Values. This sample was suspected to contain a high proportion of dried sludge based on its general blackish appearance and odour.

Of the remaining soil samples, only concentrations of lead in samples S2 at 0.5 m (265 mg kg⁻¹), S4 at 1.5m (236 mg kg⁻¹), and S6 at 1.5 m (186 mg kg⁻¹), exceeded the Dutch B Value. All of the other lead concentrations were above the Dutch A Value for lead (50 mg kg⁻¹). None of the remaining metals were detected at concentrations which exceeded the Dutch A Values.

Table 6.4b

Contaminant Levels in Excavated Materials - Phase 1 Investigation

Sampling Locations	Depth	Concentration (mg kg ⁻¹)										
		Cd	Cr	Cu	Hg	Pb	Zn	PCBs	TPH	PAHs		
S1	0.5	0.3	9.3	25.0	0.2	61.2	120	<0.1	-	-	-	
	1.5	0.2	4.7	16.4	0.1	105	69	<0.1	-	-	-	
S2	0.5	0.5	2.4	7.8	<0.1	265 ^(b)	97	<0.1	-	-	-	
	1.5	0.7	5.0	14.4	0.1	74.1	85	<0.1	-	-	-	
S3	0.5	0.8	4.7	20.3	<0.1	148	125	<0.1	-	-	-	
	1.5	0.1	6.4	10.1	<0.1	102	50	<0.1	-	-	-	
S4	Surface	5.1 ^(c)	1,216 ^(c)	6,948 ^(c)	4.4 ^(b)	167 ^(b)	2,759 ^(b)	<0.1	-	-	-	
	0.5	0.1	2.2	6.4	<0.1	84.2	32	<0.1	-	-	-	
	1.5	0.1	2.0	9.8	<0.1	236 ^(b)	49	<0.1	-	-	-	
S5	0.5	0.1	2.4	3.9	<0.1	82.8	83	<0.1	-	-	-	
	1.5	0.3	3.1	16.2	0.2	119	47	<0.1	-	-	-	
S6	0.5	0.4	4.9	13.9	<0.1	127	146	<0.1	-	-	-	
	1.5	0.2	3.3	19.2	0.1	186 ^(b)	129	<0.1	-	-	-	
S7	0.5	0.2	7.6	23.3	0.1	138	118	<0.1	<0.1	<0.1	<0.1	
	1.5	0.4	8.5	20.6	0.1	133	146	<0.1	<0.1	<0.1	<0.1	
S8	0.5	0.3	5.6	13.4	0.1	114	137	<0.1	<0.1	<0.1	<0.1	
	0.5	0.1	2.3	3.7	0.1	100	56.7	<0.1	<0.1	<0.1	<0.1	
Class A ^(a)	1	100	50	50	0.5	50	200	0.05	100	0.05	0.05	
Class B ^(b)	5	250	100	100	2.0	150	500	1	1000	1	1	
Class C ^(c)	20	800	500	500	10	600	3000	10	5000	10	10	

Notes:

(a) A - level implies soil uncontaminated. Here applies to non-bold text.

(b) B - level implies contamination present and further investigation required.

(c) C - level implies significant contamination present and cleanup (preferably back to the A - level) required.

A total of 33 samples were analysed in the second investigation. The results of the analyses are presented in *Annex H*. It was noted that the detected concentrations of the following metals exceeded the respective Dutch "C" Values:

- chromium: 1 sample;
- copper: 7 samples;
- nickel: 1 sample;
- zinc: 1 sample;
- tin: 7 samples.

Table 6.4c presents the results for the samples that exceeded the respective Dutch C Values. It should be noted that the samples that exceeded the Dutch C Values were primarily found in soil from Sludge Lagoon S4 and at the 0 m sampling depth (i.e. surface samples). This was the location previously identified as being of concern, based on the presence of dried sludge at the surface. It should also be noted that the concentrations observed at these "hot spots" decreased significantly with depth, and in only two cases did the next lower sample (i.e. from 0.5 m depth) exceed the respective Dutch B Value, where the concentration of copper decreased from 7,600 mg kg⁻¹ to 120 mg kg⁻¹ (Dutch B Value of copper is 100 mg kg⁻¹); and where the concentration of tin decreased from 1,900 mg kg⁻¹ to 140 mg kg⁻¹ (Dutch B Value for tin is 50 mg kg⁻¹). This lends support to the conclusion that the dried sludge is the source of the heavy metals, and that the contamination does not generally extend nor migrate to any depth greater than 0.5m.

Table 6.4c Sample Results Exceeding Dutch "C" Values - Phase 2 Investigation (in mgkg⁻¹)

Lagoon	Sample	Depth (m)	Chromium	Copper	Nickel	Zinc	Tin
S4	S4BL	0	ND	2,600	1,900	ND	540
S4	S4BR	0	ND	11,000	ND	ND	1,800
S4	S4C	0	1,200	9,700	ND	4,300	1,900
S4	S4TL	0	ND	7,600	ND	ND	1,700
S4	S4TR	0	ND	4,900	ND	ND	1,300
S6	S6L	0.5	ND	3,300	ND	ND	520
S6	S6L	1.5	ND	3,100	ND	ND	420
Dutch C Value			800	500	500	3,000	300

Note:
mg kg⁻¹ = milligrams per kilogram.
ND = not detected at reported detection limit

In addition, samples collected from location S6 at 0.5m and 1.5 m also had concentrations in excess of a Dutch C Value (copper and tin).

The five S4 surface samples also had concentrations of chromium (four samples), nickel (one sample), lead (three samples), zinc (four samples), and barium (two samples) in excess of the respective Dutch B Values. There are also some surface or sub-surface samples exceeding the Dutch B Values for lead (Pb), zinc (Zn) and

nickel (Ni) as shown in *Table 6.4d*. These soils can be left *in situ*, provided there is no health and safety risk to the occupier or operator. Should the soil at location S2 also require excavation, it should also be treated as a material exceeding the Dutch C level and be disposed at an approved landfill.

Table 6.4d *Sample Results Exceeding Dutch "B" Values - Phase 2 Investigation (in mgkg⁻¹)*

Lagoon	Sample	Depth (m)	Lead	Zinc	Nickel
S2	S2BL	0.5	270	190	ND
S2	S2BL	1.5	81	910	ND
S2	S2TL	0.5	170	85	ND
S4	S4BL	0	79	1,600	1,900
S4	S4BR	0	310	920	340
S4	S4BR	0.5	200	87	ND
S4	S4C	0	380	4,300	16
S4	S4C	0.5	170	130	ND
S4	S4TL	0	120	1,400	5.9
S4	S4TR	0	150	2,600	26
S6	S6L	0.5	55	1,400	6.3
S6	S6L	1.5	120	1,400	250
S6	S6R	0.5	180	170	ND
Dutch B Value			150	500	100

Note:
mgkg⁻¹ = milligrams per kilogram.
ND = not detected at reported detection limit

Polycyclic Aromatic Hydrocarbons

Detectable concentrations of PAH were not reported for any of the samples.

Total Petroleum Hydrocarbons

All samples analysed for TPH were observed to be below the limit of detection, implying that significant soil contamination by oil and diesel had not arisen.

Polychlorinated Biphenyls

No detectable concentrations of polychlorinated biphenyls (PCBs) were reported for any of the soil samples analysed. As the limit of detection is an order of magnitude below the Dutch B Value possible, PCB contamination is not a source of concern.

Results of TCLP Tests

Under analyses to determine the toxicity characteristic leaching potential (TCLP), no concentrations of contaminants were detected in excess of the landfill disposal

acceptance criteria for contaminated soil. The disposal criteria are presented in Table 6.4e.

Table 6.4e *Landfill Disposal Criteria for Contaminated Soil*

Parameter	TCLP Limit (ppm)
Cadmium (Cd)	10
Chromium (Cr)	50
Copper (Cu)	250
Nickel (Ni)	250
Lead (Pb)	50
Zinc (Zn)	250
Mercury (Hg)	1
Tin (Sb)	250
Silver (Ag)	50
Antimony (Sb)	150
Arsenic (As)	50
Beryllium (Be)	10
Thallium (Tl)	50
Vanadium (V)	250
Selenium (Se)	1
Barium (Ba)	1000

Assessment of Phase 1 Investigation Results

It was considered that the contaminated soil at S4, suspected to contain a high proportion of dried sludge, should be excavated and disposed of to landfill in a carefully controlled manner. As the results indicated that soil below the 0.5 m level was not contaminated, excavation and controlled off-site disposal was judged not to be appropriate below that depth.

According to the initial estimates, the volume of contaminated materials that needs to be disposed of at landfill will be on the order of approximately 700 m³. For sampling locations where soil contamination levels exceed the Dutch "B" Value, it was suggested that the soil be left *in situ* unless it has to be excavated for foundation development purposes. This will not cause health and safety risks to construction workers and the future users of the site if the precautionary measures, as proposed in Section 6.5.1, are adopted.

Assessment of Phase 2 Investigation Results

The Phase 2 site investigation indicated that soil from below the 0.5 m level was not significantly contaminated (i.e. in excess of Dutch C) at location S4, therefore excavation and controlled off-site disposal is judged only to be appropriate for the upper 0.5m.

Soil from location S6 (lower quadrant of Lagoon S1) was noted to contain Class C concentrations of copper and tin to a depth of 1.5 m. Therefore, it is

recommended that the soil to a depth of 2m at location S6 should also be removed for controlled landfill disposal.

Based on this assessment, the total volume of contaminated materials that needs to be disposed of at landfill will be approximately 1,400 m³ from these two areas .

For sampling locations where soil contamination levels exceed the Dutch "B" Value (see *Table 6.4d*), it is suggested that no special remedial or cleanup measures will be required, unless the soil is to be excavated for foundation purposes. That is, for the areas to be excavated for foundation development for the new primary sedimentation tanks and aeration tanks, the excavated materials, which have been confirmed to exceed the Dutch B Value (as shown in *Table 6.4d*), will also have to be disposed of in a controlled manner at an approved landfill (exact volumes will have to be determined based on the actual excavation works needed). This should not cause major health and safety risks to construction workers, provided the precautionary measures recommended in *Section 6.5.1* are followed. In addition, as the site will be fully covered by newly built sewage treatment facilities and groundwater is not used in the site, health and safety risks to the future users of the site are highly unlikely.

None of the samples exceed the landfill acceptance criteria (based on the results of TCLP tests), and hence no special treatment is required for the identified materials prior to landfill disposal.

6.5 *EVALUATION OF IMPACTS*

Other than sludge drying, no major activities with the potential to contaminate soil or groundwater are known to have taken place in the study area. Thus land contamination impacts are not considered to represent a major concern during the construction programme for the Stage III Extension. The main issue is the potential requirement to handle and dispose of contaminated soils during foundation excavation.

6.5.1 *Health and Safety*

There are no major health and safety issues related to contaminated soil. As groundwater is not used for potable supply within and in the vicinity of the Sha Tin STW, the only potential exposure would be to construction workers during the foundation excavation period of the Stage III Extension. It is considered that the majority of the works are to be carried out using plant and mechanical excavators. The duration for the direct interface of the workers with the contaminated materials should be relatively short, and if the precautionary measures recommended *Section 6.5.3* are enforced, no major health and safety risk is likely.

Potential exposure to contaminated dust is also likely to be minimal or only for a relatively short period of time. Such emissions can be readily controlled by implementing conventional dust control measures during the excavation works. These include the use of water sprays and damping, thereby minimising any potential interface with contaminated materials.

6.5.2 *Operational Phase*

During the operational phase of the Project the risks and impacts associated with the potential presence of contaminated soils are expected to be minimal, as the Stage III Extension area will be covered with sewage treatment facilities and concrete, thereby minimising any potential interface with any contaminants present in the soil.

6.5.3 *Recommended Mitigation Measures*

Land contamination impacts are not considered to represent a major constraint for the Project. There are no sensitive receivers noted, and the only potential exposure of the contaminated material would be to the construction workers during the construction period. However, any potential exposure to the contaminated surface soil at S4 and to the soil at location S6 can be minimised by implementing the following precautionary measures.

- The use of bulk earth moving equipment will minimise potential contact of contaminated material with site construction workers.
- Exposure to any contaminated materials present should be minimised by wearing appropriate clothing and personal protective gear such as gloves, safety boots and masks, when interacting directly with contaminated material. Adequate hygiene and washing facilities should also be provided on site, and smoking and eating should be prohibited during the excavation, handling, removal and disposal of the contaminated material.
- The contractor should ensure that rainfall and surface run-off is diverted around the potential contaminated areas being worked.
- The use of clean imported top soil and the use of suitable barrier systems in areas to be used for landscaping (i.e. those areas not covered by concrete foundations). The timely placement of the fill top soil layer, or the concrete foundation on top of the native materials, should be considered to bring the site to finished grade.
- Stockpiling of contaminated soils and excavated materials should be prohibited unless covered. Vehicles/lorries containing any contaminated materials should be suitably covered to limit potential dust emissions or contaminated wastewater run-off under wet conditions.
- The Contractor should obtain the necessary waste disposal permits from the appropriate authorities, in accordance with appropriate regulations including the *Waste Disposal Ordinance (Cap 354)*, and *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354)*; and
- Only licensed waste hauliers should be employed for the collection, transportation and disposal of contaminated wastes to the appropriate approved landfill. This should be performed under a ticketing system to facilitate tracking of the contaminated wastes in order to ensure that illegal disposal of wastes does not occur.

The Contractor should incorporate these recommendations into a comprehensive on-site waste management plan. Based on the results of the TCLP tests, further

measures for the treatment or stabilisation of the contaminated soil are not considered to be necessary.

6.5.4 *Residual Impact*

Based on the above assessment, there will be no residual land contamination concerns associated with the Stage III Extension, provided that the above measures are adopted.

6.6 *ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENT*

The effective management of contaminated waste arisings during the construction and operation phase of the Project should be monitored through the site audit programme. The details of the programme relating to contaminated waste management will be included in the *EM&A Manual*.

6.7 *CONCLUSIONS*

The potential land contamination issues resulting from the construction and operation of the Project have been assessed. The key issue is the removal of contaminated materials during the construction phase. Based on the results of the land contamination study and the sample analysis, it is estimated that approximately 1,400 m³ of contaminated soil will have to be excavated and disposed of at landfill during the construction phase. These materials are confirmed to be acceptable for landfill disposal without any special treatment. The landfill utilised for disposal will be the South East New Territories (SENT) Landfill, pending prior approval from the Facility Management Division of the EPD during the construction phase of the Project. Provided that the mitigation measures proposed for the control of the contaminated materials are adopted, the impacts associated with contaminated waste during the Stage III Extension should be insignificant.