

INTRODUCTION

In order to address one of the key concerns identified for the Eastern MDC for San Tin, namely potential contaminated soil and waste disposal arising from contaminated land uses and the subsequent impacts which may arise during the development programme, a focused Contamination Assessment Plan (CAP) for the site is hereby submitted. The CAP has been developed in response to a 27 March 1998 meeting with EPD, preliminary 2 April field investigations at the Study area, and revisions to the project design in 1998. This CAP sets out in detail the requirements for a baseline contamination evaluation of the site, to be undertaken by DSD at the detailed design stage. The CAP should be reviewed immediately prior to the site investigation works and submitted to EPD for approval.

1.1

BACKGROUND

For the Environmental Impact Assessment (EIA) studies for the Main Drainage Channels and Poldered Village Protection Scheme for San Tin, NWNT, preliminary site visits observed a number of properties in or adjacent to the proposed channel alignment to have visible staining and contamination, which was suspected to be derived from the particular land use. In these cases, the primary land uses of concern were noted to be trailer storage yards, scrap yards or vehicle maintenance facilities.

Although contamination appeared to be localised, the implications for development relate to the following:

- Disposal of potentially contaminated soils which will arise during excavation in or adjacent to the proposed channel. At present, no specific sampling and analysis has been performed, and thus no firm estimate is available for the quantity of contaminated soils which will be generated in the works. For the purposes of this correspondence, a total undifferentiated volume of 115,000m³ of spoil is projected to be generated in the scheme.
- Disposal of ground water where excavations take place below the water table. As the Study site is located in low lying coastal margins near the Shenzhen River, shallow ground water may therefore be encountered during the construction programme.
- Potential health risks to site construction workers during development works. This is likely to involve a short term risk, and as the majority of the works is likely to involve the use of mechanical excavators the potential interface with workers is not considered to be significant.
- Potential health risks to future site users. This is not considered to be a major concern, as the channel will be paved and the area is not heavily populated.

1.2 OBJECTIVE

The main objective of this CAP and future investigation is to further define soil and/or ground water contamination levels which were identified in the previous preliminary site inspections, to assess the requirements for disposal of contaminated soil and ground water (where encountered). If possible, the investigation should detail the quantity of material which is contaminated and thus requiring special handling and disposal. Any potential impacts of the construction programme to construction workers will also be considered, where appropriate.

1.3 ENVIRONMENTAL LEGISLATION AND NON-STATUTORY GUIDELINES

Assessments of land contamination sources and the potential impacts to particular development projects are investigated under the EPD's direction and oversight in accordance with their Practice Note for Professional Persons (*ProPECC PN 3/94*), *Contaminated Land Assessment and Remediation*, and the 1997 Technical Memorandum on Environmental Impact Assessment Process (EIA Ordinance) (EIAO TM).

In accordance with *ProPECC PN 3/94*, the assessment evaluation should be made to:

- 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 ground water.

In *ProPECC PN 3/94*, the Dutch Ministry of Public Housing, Land-Use and Environment Guidelines (1994) are used as criteria by the EPD for evaluating what is classified as a contaminated material.

Under the EIAO, *Annex 19: Guidelines for Assessment of Other Impacts*, consideration shall be given to a number of potentially contaminating historical land uses, including oil installations and repair workshops. As these land uses are identified, this CAP has been prepared to outline appropriate actions for investigating possible contamination. Depending upon the results of the contamination assessment, a Remedial Action Plan (RAP) may be developed.

2 SCOPE AND METHODOLOGY OF THE ASSESSMENT

2.1 SCOPE

Further to the March 1998 meeting with EPD, the scope of the proposed contamination investigation involves the following:

- Drilling of an adequate number of soil borings at the site to provide appropriate coverage of the areas in question. The depth of each boring will be determined based on field conditions, but is estimated to be a maximum of approximately 3 to 5 m depth, within the footprint and vicinity of the proposed channel.
- Collection of a minimum of three soil samples at each of the drill holes, at depths of within 0.5 m of the surface, and approximately 3 m, or at a location determined by the on-site geologist.
- Where encountered, collection of at least one representative grab ground water sample from the channel area.
- Soil samples will be analysed for Total Petroleum Hydrocarbons (TPH) and heavy metals. A selected number of the soil samples will be analysed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and the Toxicity Characteristic Leaching Procedure (TCLP). Samples for VOC/SVOC analysis will be selected on the basis of field monitoring using a hand held organic vapour meter.
- Chemical analysis of groundwater samples for TPH, VOCs and SVOCs.

2.2 *METHODOLOGY*

2.2.1 *Drilling*

The boreholes will be drilled using a mobile drill rig, hand auger or suitable sampling tool. Prior to drilling, the drill equipment will be cleaned with a non-phosphate soap solution and water, with a distilled water rinse. This procedure will be repeated after use at each borehole to avoid potential cross contamination between boreholes, and during sampling to ensure that any contamination from the surface of the site does not affect deeper substrata or the ground water.

The drilling process should be directed by DSD and the lithology should be recorded. The final borehole depth will be dependent upon the site conditions at the discretion of the on-site geologist. The proposed locations of the borings is shown on the shown in *Figure 6.3b* of the EIA Report. *Table 2.2a* presents details of the rationale for the sample locations and possible pollutants.

Table 2.2a

Sampling and Investigation Locations

Site Location Number	Site Location	Potential Source	Possible Pollutants	Test Methods (US EPA Method)
1	Highways Department - Lok Ma Chau Maintenance Yard.	Adjacent to old leaking drums outside of fence	petroleum oils, lubricants, solvents or degreasers, heavy metals	TPH by USEPA Method 8015M; VOC/SVOC by USEPA Method 8240/8270; TCLP
2	At boundary of trailer storage yard, along edge of existing channel	Unprotected fuel drums were stored here	petroleum oils, lubricants, solvents or degreasers	TPH by USEPA Method 8015M; VOC/SVOC by USEPA Method 8240/8270; TCLP
3	From ditch/run-off point at rear of trailer storage yard	Adjacent to vehicle service bay	petroleum oils, lubricants, solvents or degreasers	TPH by USEPA Method 8015M; VOC/SVOC by USEPA Method 8240/8270; TCLP
4	From large soil pile (fill material) in earth works area	Noted abundant used fuel filters and oil canisters	petroleum oils, lubricants, solvents or degreasers, unidentified contaminants	TPH by USEPA Method 8015M; VOC/SVOC by USEPA Method 8240/8270; TCLP

Refer to Figure 6.3b of the EIA Report and photographs for locations and detail.

Sampling Programme

The sampling programme will be undertaken following appropriate protocols so as to minimize the potential for cross-contamination between sampling locations. The soil sampling methodologies are based on methods developed by the US EPA, adapted to Asian standards of operation and practice as appropriate. These methods include decontamination procedures, sample collection, preparation and preservation, and chain-of-custody documentation, as outlined below.

Decontamination Procedures

Sampling equipment used during the course of the investigation programme will be decontaminated using the following procedures.

- Manual wash and scrub with non phosphate detergent;
- Distilled water rinse; and
- Air drying.

During sampling and decontamination activities, disposable latex gloves should be worn to prevent transfer of contaminants from other sources. Any disposable equipment such as latex gloves should be discarded after each use.

Soil Sample Collection

Soil samples will be placed into appropriate clean glass bottles or sampling containers (provided by the laboratory) immediately after collection. They will then be transferred to an ice box or cooler container, also provided by the laboratory. Samples will be kept as cool as possible, by regularly replacing the icepacks. All samples should be collected under chain of custody protocols as described below.

Soil samples will be collected for head space analysis using an appropriate organic vapour meter, to assist in the selection of any samples for analysis for volatile or semivolatile organic compounds. The meter will be calibrated before use to a known calibration standard of isobutylene gas.

Groundwater Sample Collection

Groundwater samples will be collected to be representative of the conditions at proposed channel. Field measurements of temperature, pH, and specific conductance (SC) will be taken from the samples.

A bottom loading PVC or disposable Teflon® bailer will be used to collect the ground water grab samples from the boring. The bailer will be decontaminated before use, and in between sampling. Immediately after collection, samples will be transferred to labelled sample containers containing the necessary preservatives (supplied by the laboratory). Samples will be packed in the coolers with icepacks prior to shipment under chain of custody to the laboratory.

2.2.3 *Sample Management*

The drilling and sampling will be performed by qualified DSD staff on site. All samples collected will be placed in a cooler with ice and kept at less than 4 degrees Celsius. Samples will be dispatched to the analytical laboratory for analysis as soon as possible following sampling. All samples will be handled under chain of custody protocols and relinquished to the laboratory representative at the drill site or at a location specified by laboratory.

2.3 *ANALYTICAL PROGRAMME*

The selected soil samples submitted from each of the borings will be analysed for:

- total petroleum hydrocarbons (TPH) by USEPA Method 8015; and
- priority pollutant and Dutch List metals by Atomic Absorption (AA).

In addition, if field evidence indicates the presence of contamination (ie any discolouration, odour, or instrument response on the organic vapour meter), then a selected number of these samples will also be analysed for:

- volatile organic compounds (VOCs) by USEPA Method 8240; and
- semivolatile organic compounds (SVOCs) by USEPA Method 8270.

A number of the samples will be tested for the Toxicity Characteristic Leaching Procedure (TCLP) by USEPA 1311/6010/7000 Series Methods.

At least two ground water samples collected from the borings will be analysed for TPH, SVOCs, and VOCs.

2.3.1 *Quality Control and Quality Assurance (QA/QC)*

Samples collected should be representative of field conditions. At each sampling location, soil and groundwater samples should be collected using pre-cleaned sampling equipment. All sample containers should be provided by the contracted laboratory who guarantee their sterilization and preservative contents.

The following samples should be collected during the field investigation:

- one groundwater duplicate for the full suite of analyses;
- one trip blank for analysis of VOCs (prepared prior to field investigation and transported with VOC samples); and
- one equipment (rinsate) blank for the full suite of analyses.

Precision will be calculated as the relative percent difference (RPD) between the original sample and the blind duplicate. For water and soil, the acceptance criteria for precision are 20% RPD and 30% RPD, respectively. Accuracy will be assessed by analysis of trip blanks and rinsate blanks to ensure that no bias is present in the analytical data. If any compound is detected in the trip blank or rinsate blank, the data will be qualified.

2.3.2 *Analytical Laboratory*

Analysis of samples will be carried out by an appropriately qualified analytical laboratory located in Hong Kong. The laboratory shall maintain high standards of analytical and technical services for the detection of trace organic contaminants. All analysis will be conducted according to standard procedures set by the US EPA.

2.3.3 *Programme Schedule*

The entire assessment programme is expected to be completed within approximately one month, comprising the following activities:

- mobilisation of the subcontractor (pending the access arrangements);
- field sampling programme (up to 5 days in field);
- analytical programme/laboratory turnaround (expected 10 days); and
- assessment and reporting (estimate 2 weeks).

Typical turn around times for the analyses are 10 working days.

3 *PROJECT ADMINISTRATION*

3.1 *ASSESSMENT AND REPORTING*

A Contamination Assessment Report (CAR) presenting the findings of the contamination assessment programme will be developed after obtaining analytical results from the laboratory. The report will present the methodology used during the soil boring and sampling work, details of field observations, and findings of the investigation programme. It will include visual observations made during the investigation programme, provision of data regarding boreholes and analytical results from soil and ground water sample analyses.

As there are currently no legislative standards requiring clean up of soil and ground water contamination in Hong Kong, the analytical results will be compared against international standards for soil and ground water contamination (Dutch Standards). Arising from the on-site observations and the quantitative sampling results received, professional judgement will be provided regarding soil and ground water contamination, and the necessity of appropriate mitigation measures.

As necessary, a Remedial Action Plan (RAP) will be prepared in consultation with the EPD. In light of the fact that there are no standards for the cleanup of soil and ground water in Hong Kong, any proposed recommendation will examine the relevant issues of soil and ground water treatment versus disposal, as well as outline requirements for construction workers to follow to limit potential future exposures in the event that construction activities encounter contamination. The results of the sampling programme, the report, and the objectives of the RAP should be reviewed with EPD prior to finalisation. It should be noted that no estimate of the time frame for any mitigation is presented at this time. Appropriate mitigation will incorporate the proposed land use with the contamination type as well as concentrations.