

**Emissions Control Project at Castle Peak
Power Station 'B' Units**

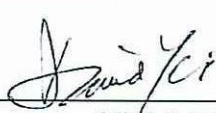

Groundwater Monitoring Plan

Revision: 4

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	Certified by:	Verified by:	
Name	David Yip	Marcus Ip	
Position	Environmental Team Leader	Independent Environmental Checker	
Signature			
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1 INTRODUCTION

1.1 BACKGROUND

The Castle Peak Power Company (CAPCO) has initiated the *Emissions Control Project at Castle Peak Power Station "B" Units (CPB)* (the Project), in response to the Government of the Hong Kong Special Administrative Region (HKSARG)'s stated intent to reduce emissions in Hong Kong.

An Environmental Impact Assessment (EIA) for the Project was undertaken and the EIA report was approved under the *Environmental Impact Assessment Ordinance (EIAO)* (Cap. 499) on 25 October 2006 (AEIAR-102/2006). Environmental Permit No. EP-251/2006 for the Project (EP) was granted on 10 November 2006. Condition 3.1 of the EP requires a Groundwater Monitoring Plan (GWMP) to be deposited with the Environmental Protection Department (EPD) before the commencement of the construction of the Project.

1.2 OBJECTIVE OF THE GWMP

The GWMP is intended to provide information, guidance and methodology for groundwater monitoring at the Project site (*Figure 1.1a*) as per the requirement of the EP and includes the following information:

- Groundwater monitoring locations (with at least three (3) monitoring locations);
- Methodology for groundwater monitoring;
- Groundwater monitoring schedule (including monitoring frequency and period); and
- Actions to be recommended and taken in case of increase of existing total petroleum hydrocarbons (TPH) concentrations as well as precautionary measures for avoiding exposure of contaminants to site personnel.

1.3 STRUCTURE OF THE GWMP

The remainder of the document is structured as follows:

- *Section 2* presents the proposal for groundwater monitoring;
- *Section 3* presents the recommended actions to be taken in the event of elevated TPH concentrations; and
- *Section 4* presents the precautionary measures for avoiding contact of contaminants with site personnel.

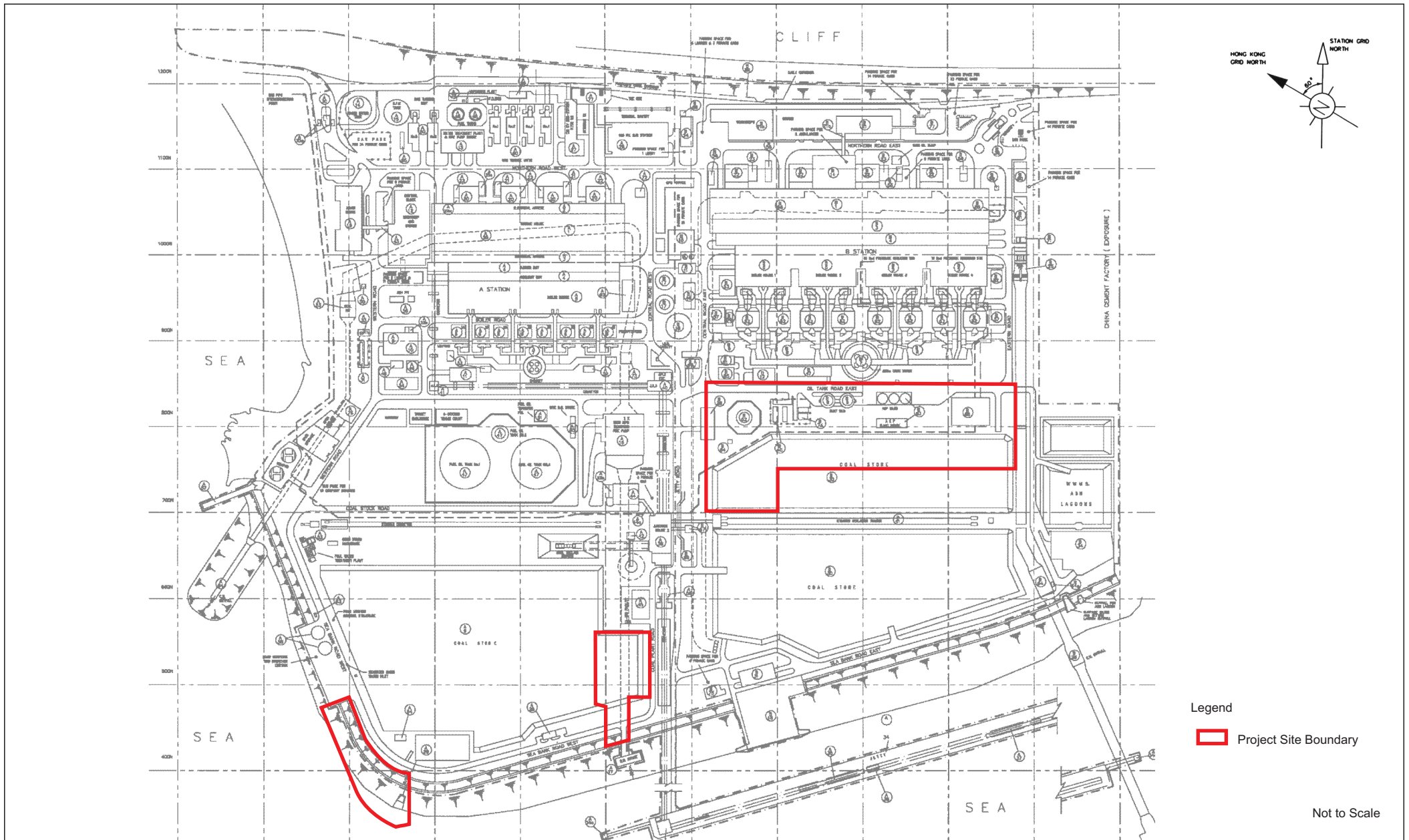


Figure 1.1a

Site Layout Map

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Legend
 Project Site Boundary

Not to Scale

Environmental
Resources
Management



The following section presents the groundwater monitoring locations, sampling and testing methodology, schedule and reporting during the construction and operation of the Project.

2.1 ENVIRONMENTAL LEGISLATION AND NON-STATUTORY GUIDELINES

The groundwater monitoring will be carried out in accordance with the guidelines set out in the Environmental Protection Department (EPD)'s *Guidance Note for Contaminated Land Assessment and Remediation; Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management; Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshop* and other relevant guidelines.

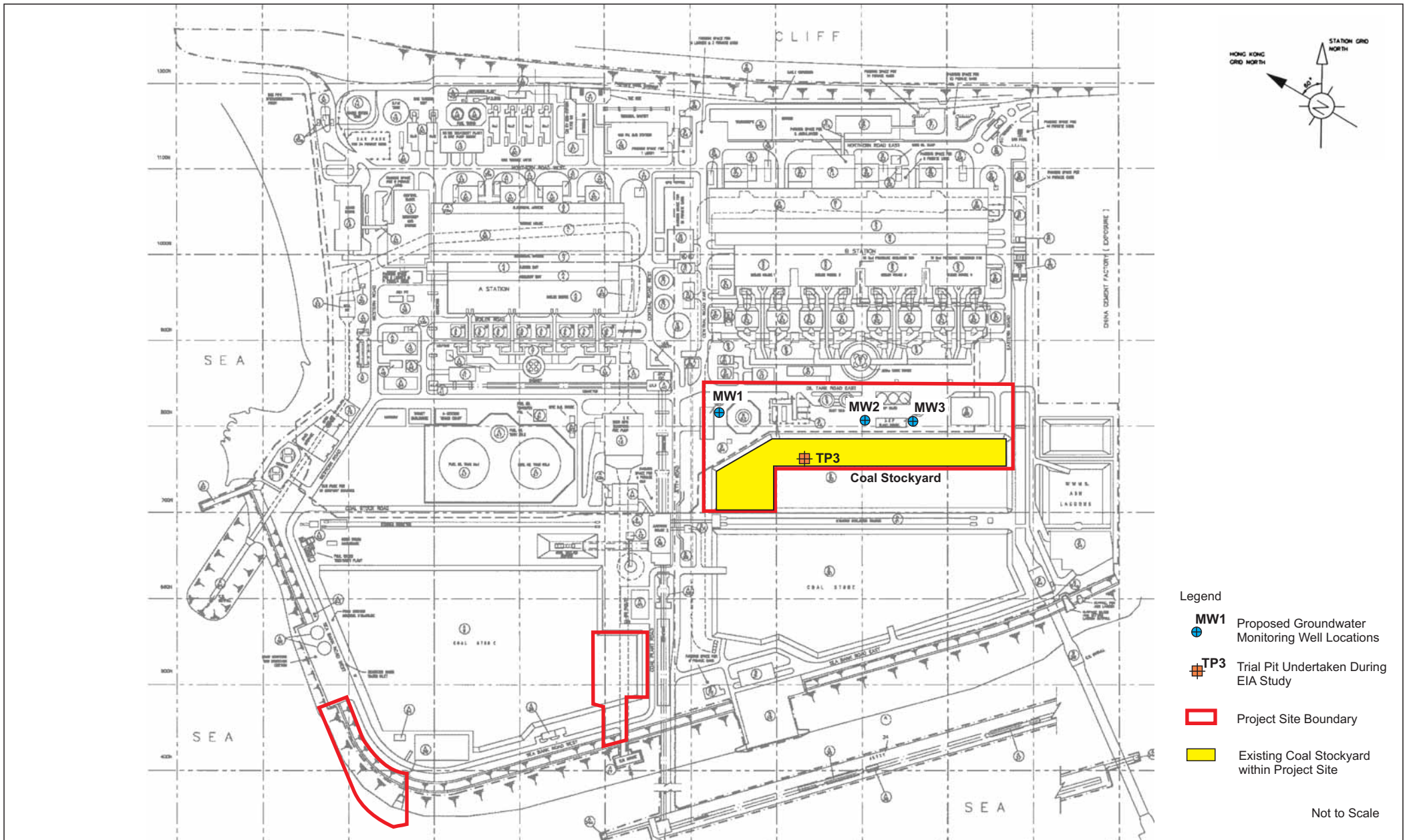
2.2 GROUNDWATER MONITORING STRATEGY

2.2.1 Groundwater Monitoring Locations

The groundwater monitoring locations are recommended based on the requirements of the EP and take into account the Project site constraints including accessibility, existing underground and aboveground utilities and structures as well as workability during the construction period.

Most of the Project areas in the existing coal stockyard will be subject to extensive earth moving, heavy civil engineering activities like piling and foundation works. As such, it will be impractical to install monitoring wells in the existing coal stockyard. In addition to heavy civil engineering works, there are also critical site constraints in the Project areas to the north of the coal stockyard. There are congested utility networks comprising pipelines, trenches, sumps, cables, hydrants as well as other built facilities. To allow groundwater monitoring at the same locations during the operational phase of the Project, potential clashes of the permanent works of the Project with the monitoring wells will need to be avoided.

From an environmental point of view, the groundwater monitoring locations have been selected such that they will capture any potential TPH contamination in the groundwater within the Project Site Boundary that exceeds the applicable criteria presented in *Section 2.1* above. Taking into consideration the above, they are located relatively close to TP3 (please refer to *Figure 2.1a* for the location of TP3), where soil contamination was previously identified during the EIA study for the Project, and distributed relatively evenly within the area of the Project Site in which TP3 is located.



- Legend
- ⊕ MW1 Proposed Groundwater Monitoring Well Locations
 - ⊕ TP3 Trial Pit Undertaken During EIA Study
 - Project Site Boundary
 - Existing Coal Stockyard within Project Site

Not to Scale

Figure 2.1a Proposed Groundwater Monitoring Well Locations

Three (3) groundwater monitoring well locations within the Project site, namely MW1 to MW3, are proposed for the groundwater monitoring during the construction of the Project, including:

- MW1: located adjacent to the north-east corner of the existing Coal Plant Substation;
- MW2: located north-west of the existing ACP Plant House; and
- MW3: located adjacent to the north-east corner of the existing ACP Plant House.

Figure 2.1a shows the proposed groundwater monitoring well locations and the location of TP3.

2.2.2 *Methodology for Groundwater Monitoring*

Groundwater Well Installation

Purpose made UPVC or HDPE slotted risers and blank pipes (50mm diameter) will be used for the groundwater wells. The slotted risers will be installed from 2m below groundwater levels to 1-2 m above groundwater levels. The risers will be connected with blank pipes up to approximate 0.5m above ground surface. Voids between risers/pipes and the drill holes will be filled with clean gravel. Wells will be purged (pumped or bailed) five times the volumes of the wells after installation to get rid of dirt or potential cross contamination during well installation.

Groundwater Sample Collection

The groundwater sampling will be undertaken following appropriate protocols so as to minimise the potential for cross-contamination between monitoring locations:

- Wells will be purged (pumped or bailed) three times the volumes of the wells before each sampling to ensure no stagnant groundwater will be collected and that the representative samples from each well is collected (please refer also to the following section on *Quality Control and Quality Assurance*);
- Groundwater will be sampled from the monitoring wells using new disposable Teflon bailers for each sampling at each location;
- Groundwater samples will be taken and placed into laboratory supplied clean glass bottle or sample containers immediately after collection;
- Before sampling commences, the laboratory will be consulted on the particular sample size and preservation procedures that are necessary for the target parameter analyses;

- The sample containers will be laboratory cleaned, made of glass or other suitable materials with aluminium or Teflon-lined lids, so that the container surface will not react with the sample or adsorb contaminants;
- The containers will be labelled with the sampling location codes at which the samples are taken; and
- They will then be transferred to an icebox or cooler container. Samples will be kept between 0 and 4°C but not frozen.

The proposed groundwater sampling programme is described as follows:

- One (1) groundwater (GW) sample will be collected from each monitoring well; and
- Free-floating products in groundwater, if observed, will also be collected for laboratory analysis.

Groundwater Sampling Management

Samples will be dispatched to the analytical laboratory for analysis as soon as practicable following sampling. All samples will be handled under chain of custody protocols and relinquished to the laboratory representative at the site or at a location specified by the laboratory.

Analytical Parameters

With respect to the requirement specified in the EP, it is proposed that the groundwater samples collected be analysed for TPH concentrations for all three monitoring locations.

Analytical Method

TPH will be analysed using United States Environmental Protection Agency (US EPA) Methods 8260 and 8015.

Quality Control and Quality Assurance (QC/QA)

Samples collected should be representative of field conditions. Wells will be purged (pumped or bailed) to three times their volume before sampling each to ensure that no stagnant groundwater will be collected and that a representative sample from each well is collected. Samples will be collected at the same point on tidal cycle to ensure that the influence of tidal movement to the groundwater in the wells will not mislead the results of the monitoring.

At each sampling location, groundwater samples will be collected using new disposable Teflon bailers. All sample containers will be provided by the contracted laboratory who guarantees their sterilisation and preservative contents.

Appropriate QC/QA samples will also be collected during the groundwater sampling, including:

- Groundwater duplicates (one duplicate sample per sampling event) for the full suite of analyses to assess the precision of the procedures; and
- Trip blanks (one per cooler/shipment) for the full suit of target parameters in order to assess the potential contamination of the sample handling and transportation processes.

Precision will be calculated as the relative percent difference (RPD) between the original sample and the blind duplicate. For water, the acceptance criterion for precision is 20% RPD. Accuracy will be assessed by analysis of blank samples to ensure that no bias is present in the analytical data.

Analytical Laboratory

Analysis of samples will be carried out by an appropriate, HOKLAS-accredited (or other equivalent scheme approved by the EPD) analytical laboratory. The laboratory should maintain high standards of analytical and technical services for the detection of trace organic contaminants. All analyse will be conducted according to standard procedures set by the US EPA, along with internal QC/QA procedures.

2.2.3

Groundwater Monitoring Schedule

According to the arrangements in the current construction plan, the construction works of the Project will commence in September 2007⁽¹⁾ and are envisaged to be completed in 2011. Excavation works will be required for the construction of the piles and shallow foundations to support the new facilities. The potential contact with the contaminants will be during the excavation and piling works in the foundation construction period. Groundwater monitoring is proposed to be carried out once prior to the commencement of major piling and foundation works. Bi-weekly (ie once every two weeks) groundwater monitoring will be conducted during an initial period of three months after the commencement of major piling and foundation works, and quarterly monitoring will be conducted provided that the monitoring results for the initial three-month period are all below the relevant RBRG values for TPH⁽²⁾. Should the results of the bi-weekly monitoring show exceedance of the relevant RBRG values for TPH, the bi-weekly monitoring programme would be extended. In addition, appropriate actions as described in *Section 3* of this document would be taken.

Should the results show exceedance of the relevant RBRG values for TPH during the quarterly groundwater monitoring programme, bi-weekly groundwater monitoring would be resumed for a three-month period

(1) Construction of major foundation works for the Project commenced on 25 October 2007.

(2) Results of the bi-weekly groundwater monitoring conducted during the initial three-month period from November 2007 to January 2008 (results reported in Monthly EM&A Reports submitted to EPD) indicate that the TPH levels are all well below the relevant RBRG value.

following the exceedance. In addition, appropriate actions as described in *Section 3* of this document would be taken.

Upon the completion of the first year of quarterly groundwater monitoring, a review of the monitoring frequency will be conducted and the outcome will be discussed with EPD.

The control on groundwater management during the construction of the Project will be audited during the weekly site inspections to be conducted by the Environmental Team Leader.

2.3 ***REPORTING***

The findings of the groundwater monitoring will be evaluated and reported in a Groundwater Monitoring Report for submission to EPD.

2.4 ***HEALTH AND SAFETY***

All personnel involved in groundwater sampling works will attend construction site safety training to be provided by CAPCO prior to commencing the works at the Site. During the sampling activities, disposable latex gloves will be worn to prevent transfer of contaminants from other sources. Any disposable equipment such as latex gloves will be disposed of as general waste after each use.

RECOMMENDED ACTIONS IN THE EVENT OF ELEVATED TPH CONCENTRATIONS

As reported in the approved EIA report of the Project, TPH concentrations at above Dutch "B" and "C" levels were encountered in all the groundwater samples. This indicated that elevated concentrations of TPHs may be present in the groundwater within the Project Site area.

The first monitoring will be carried out prior to the commencement of the major piling and foundation works for the Project. The groundwater samples taken will be checked for the presence of free product. The analytical results for the various fractions of petroleum hydrocarbons will be compared against the Risk-based Remediation Goals (RBRGs) as stipulated in EPD's *Guidance Note for Contaminated Land Assessment and Remediation* and *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management*. In the event of free product being observed or the RBRG being exceeded, groundwater sampling and testing for the monitoring location concerned will be adjusted as described in *Section 2.2.3*. A focused assessment on the potential environmental impact posed by the discharge or disposal of groundwater, should it be required, will also be conducted. If an adverse environmental impact is identified, appropriate mitigation measures will be proposed.

The results of the additional groundwater monitoring will be provided to EPD.

***PRECAUTIONARY MEASURES FOR AVOIDING CONTACT OF
CONTAMINANTS WITH SITE PERSONNEL***

As discussed in *EIA*, the potential human contact with the TPH in the groundwater will be during the excavation and piling works at the foundation construction period. To minimise the contacts of the workers with the contaminated materials and to ensure a safe work environment during the construction works, the following control measures are proposed:

- Prior to commencing any construction works, a health and safety risk assessment should be performed for the construction works to identify potential work related hazards and prepare appropriate control measures and the need of Personal Protective Equipment (PPE).
- The workers should inspect and check their PPE before, during and after use. In cases where any of the PPE is impaired, the workers should stop work immediately and inform their supervisor. The workers should not be allowed to re-start their work until the impaired PPE is replaced.
- The workers should always maintain basic hygiene standard (eg hand wash before leaving the site). The workers should also be responsible for cleaning and storing their own PPE in a secure place before leaving the site.
- Eating, drinking and smoking should be strictly prohibited within the site.
- The designated site management representatives must be informed if any workers feel uncomfortable physically or mentally during the construction works. All workers should leave the work areas and the works should be temporarily suspended until the reason for the uncomfortable feeling has been identified.
- Submersible water pump and the associated equipments, if any, should be cleaned after use for pumping out groundwater.