resource and environmental management

Papua New Guinea Liquefied Natural Gas Project

PNG LNG

GROUNDWATER IMPACT ASSESSMENT – DOWNSTREAM FACILITIES

- VE30023-R001, vers.2
- 25 November 2008

SINCLAIR KNIGHT MERZ
SKM

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Executive Summary

Background

Sinclair Knight Merz Pty Limited, formerly Resource & Environmental Management Pty Ltd, has been engaged by Coffey Natural Systems Pty Ltd undertake a groundwater impact assessment for Esso Highlands Limited's Papua New Guinea Liquefied Natural Gas Project.

This report presents the groundwater impact assessment for the downstream component of the Project (the Liquefied Natural Gas process plant, supporting utilities and infrastructure, Figure ES.1), which is located approximately 20 km northwest of Port Moresby.

The impact assessment is required to undertake the following:

- provide an assessment of the existing environmental condition of Portion 152;
- establish an environmental baseline for the downstream component of the Papua New Guinea Liquefied Natural Gas Project;
- provide an assessment of the potential for developing groundwater supplies and address the potential for other water users to be impacted by such development;
- provide an assessment of the potential for contamination of groundwater resources beneath and adjacent Portion 152, both during and following operation; and
- identify management strategies to assist in mitigating contaminant events and impacts.

Regulatory framework

Water resource management and the management of potential soil and water contaminants for the Papua New Guinea Liquefied Natural Gas Project are regulated by the Environment Act (2000). The Environment Act has the primary objective of controlling activities that may give rise to adverse environmental or social impacts and addresses aspects of a proposed or existing development that may result in the release of contaminants to the environment either through accident, misuse or inappropriate storage.

The regulation and management of Papua New Guinea water resources falls under the influence of the Department of Environment and Conservation, as too is the regulation of Water Resources and Wastewater Discharge into the environment (groundwater, rivers, springs, lakes & sea). The Department of Environment and Conservation issues Water Use Permits to cover these types of activities, with specific conditions to be complied with by permit holders.

Papua New Guinea's *Drinking Water Quality Standards* have been adopted from the World Health Organisation's *Drinking Water Quality Guidelines*. However, for receptors other than humans, environmental guidelines developed by Australia's Natural Resource Management Ministerial Council and Environment Protection and Heritage Council are considered appropriate to complement the adopted drinking water guidelines in assessing the existing environmental status of Portion 152 and the future environmental performance of the Papua New Guinea Liquefied Natural Gas Project.

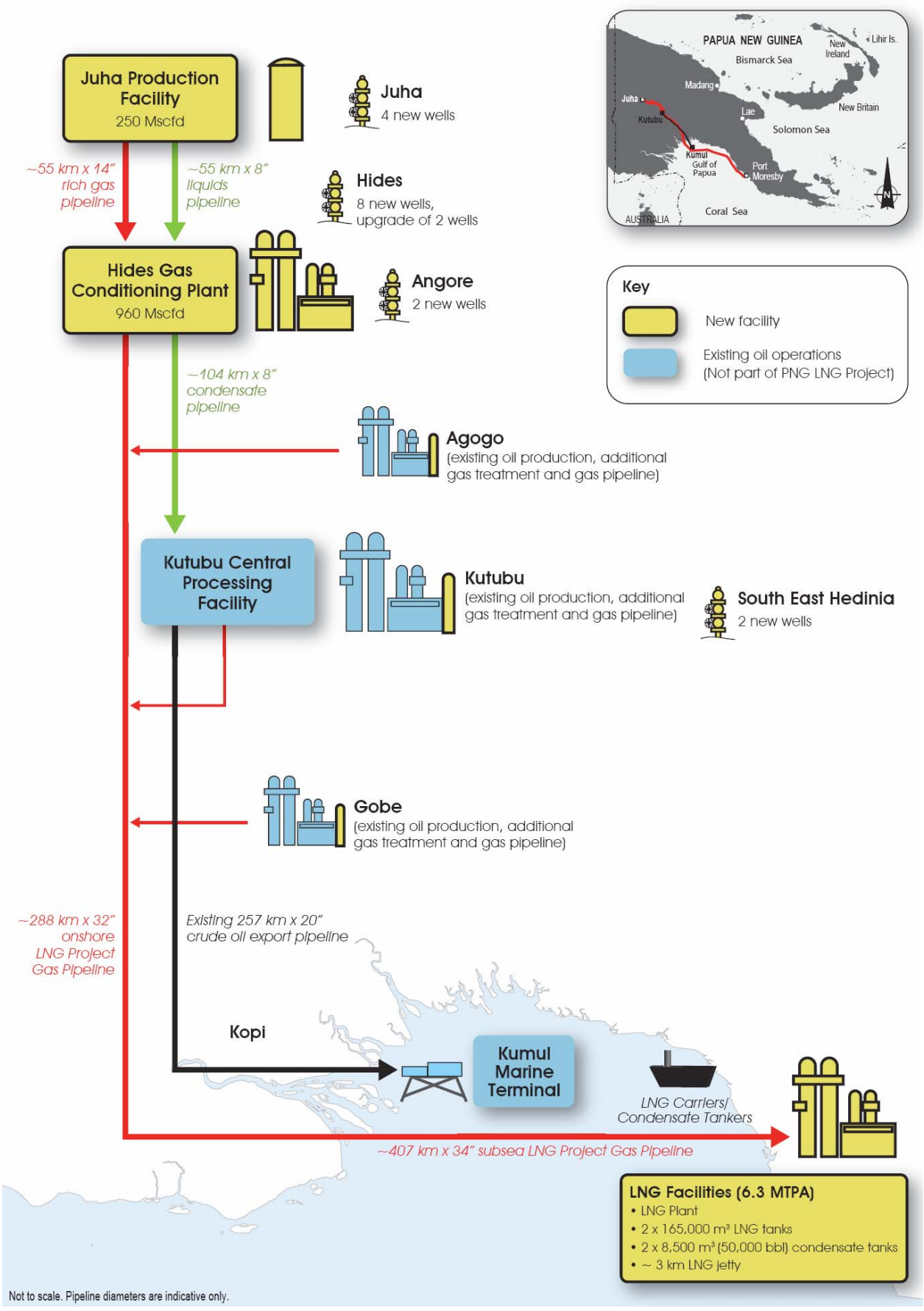

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Figure
ES.1
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Hydrogeological setting

The most important groundwater resources around Portion 152 are associated with colluvial and alluvial sediments of the coastal plain. Aquifers hosted by these sediments are typically buried beneath five to ten metres of low permeability clayey sediments. Vertical groundwater hydraulic gradients are reported to be upwards, and the aquifers are assessed as having relatively low permeability.

Neighbouring villages (Boera and Papa, to the south and north of Portion 152, respectively) utilise groundwater as their primary source of water supply.

Environmental baseline for Portion 152

A baseline environmental survey has been completed for Portion 152, comprising the sampling of soils at 16 locations around the area of the Liquefied Natural Gas process plant and associated infrastructure, groundwater from five wells (three on site and two at neighbouring village wells), and surface water from the Vaihua River:

- *General*
  There is no evidence (at the sampled locations) that historic usage of Portion 152 has limited the suitability of the site for future use as a commercial or industrial facility.
- *Soils*
  The analytical program did not identify elevated concentrations of any of the analytes tested for, e.g. heavy metals, hydrocarbons, pesticides, herbicides, volatile organic compounds, or cyanide, that exceed relevant adopted criteria.
- *Groundwater*
  Apart from two sample locations, one on Portion 152 and the Papa village well, groundwater appears to be palatable in terms of salinity. Manganese and lead are reported in groundwater sampled from near the centre of Portion 152 and Boera village, respectively, above the adopted drinking water guidelines. The source of the elevated concentrations is uncertain and requires further assessment.

Groundwater supply potential

A preliminary assessment of the potential for developing a Project water supply from Portion 152 groundwater resources indicates that it may be possible to access suitable volumes to meet Project water requirements. It is likely that some form of treatment (such as desalination and biological treatment) will be required to ensure water supply potability, and more than ten production wells are likely to be required to meet the anticipated water demand.

However, additional work will be required to adequately assess long-term safe yields of the resource and the potential for adverse impact to existing users to arise. Depending on the results of further studies, it may be necessary to supplement supplies from a seawater desalination plant.

Groundwater impact assessment

Two important naturally occurring constraints to groundwater contamination exist within the physical environment of Portion 152 should there be an accidental release of potential groundwater contaminants. These include near surface low permeability clayey sediments, which have the capacity to retard the mobility of contaminants, and upward groundwater hydraulic gradients within the coastal plain shallow groundwater system, which will inhibit the infiltration of potential contaminants (if released) through the soil profile.

Due the **operational phase** of the Project, the impact assessment has not identified any aspects of the Project that may pose a serious risk of impacting adversely on groundwater resources. However, three aspects of the Project are considered to present a moderate risk of impacting adversely on groundwater resources, including:

- Condensate storage tanks and transfer system (hydrocarbon release).
- Diesel storage and distribution system (hydrocarbon release).
- Groundwater supply development (groundwater drawdown, reduced coastal discharge).

Following Project **decommissioning,** risk levels associated with the Project will reduce greatly by removing contaminant sources and cessation of groundwater supply (if developed). With the exception of the condensate storage tanks and transfer system, all of the former site facilities are unlikely to continue to contribute residual risk to groundwater resources. Depending on the performance of the condensate storage and transfer system during operation of the Project, there is low potential for ongoing adverse impact to groundwater resources associated with that facility.

Mitigation recommendations

International best practice engineering design and management principles in all parts of the plant and associated infrastructure will assist in mitigating against the release of potential groundwater contaminants to the environment and impacts associated with groundwater supply development.

Engineering design to mitigate against contaminant release to the environment should be complemented by the development of an Environmental Management Plan and an appropriately designed groundwater monitoring network.

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Glossary of terms and abbreviations

Terms

Alluvial
Relating to sediments that have been deposited by rivers and streams.

Aquifer
A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.

Aquitard
A saturated but poorly permeable bed, formation, or group of formations that does not yield water freely to a well or a spring. An aquitard may transmit appreciable water to or from adjacent aquifers.

Baildown recovery test
A test made by removing water from a well using a bailer for a period of time after which measurements of water level recovery in the well are recorded. The data is used to estimate the hydraulic characteristics of the aquifer.

Base flow
That portion of stream flow derived from groundwater seeping into a stream.

Colluvial
Relating to sediments that have been carried by gravity down hill slopes where they then accumulate.

Confined aquifer
An aquifer that lies below a low permeability material. The piezometric surface in confined aquifers is above the base of the confining material, eg. artesian aquifers.

Drawdown
The distance between the static water level and the surface of the cone of depression.

Ecosystem
Term used to describe species in an environment and their relationship with one another and the non-living (abiotic) community.

Electrical conductivity
The capacity of a material to conduct electricity. In a fluid, electrical conductivity increases with total dissolved solids. A measure of water salinity. (see total dissolved solids)

Groundwater
The water contained in interconnected pores, gaps or fractures located below the watertable in an unconfined aquifer or located in a confined aquifer.

Groundwater affecting activity
Any activity that has the potential to change groundwater conditions (levels and quality).

Hydraulic conductivity
A coefficient of proportionality describing the rate at which water can move through a permeable medium. Horizontal hydraulic conductivity (K_h) refers to the coefficient of proportionality in the

horizontal direction, whereas vertical hydraulic conductivity (K_v) refers to the coefficient of proportionality in the vertical direction.

Hydraulic gradient
The rate of change in total head per unit distance in a given direction. The direction of gradient is that yielding the maximum rate of decrease in head.

Pigging
An operation performed on pipelines to clean and inspect them whilst allowing the continued flow of product.

Screen
Perforated well casing that allows water to enter the well from an aquifer.

Standing water level
The level at which groundwater within a well occurs. A measure of the hydraulic potential of an aquifer over the screened interval of the well.

Storativity;
The volume of water released from, or taken into, storage within an aquifer per unit surface area of the aquifer per unit change in head. In an unconfined aquifer, storativity is the same as specific yield.

Transmissivity;
The rate at which water is transmitted through a unit width of aquifer or aquitard under a unit hydraulic gradient. It is the product of aquifer thickness and hydraulic conductivity.

Total dissolved solids;.
The total amount of dissolved solid matter found in a sample of water. A measure of salinity.

Unconfined aquifer;
A water table aquifer.

Water table
The surface between the unsaturated and saturated zones of the subsurface at which the hydrostatic pressure is equal to that of the atmosphere.

Well;
A borehole that has been cased with pipe, usually steel or PVC plastic, in order to keep the borehole open in unconsolidated sediments or unstable rock. Often used interchangeably with the term bore.

Abbreviations

EC	electrical conductivity
L	litre
m	metres
m bgl	metres below ground level
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
m/day	metres per day
m^2/day	metres squared per day
m^3/day/m	cubic metres per day
TDS	total dissolved solids
μS/cm	microSiemens per centimetre

1. Project overview

The Papua New Guinea Liquefied Natural Gas (PNG LNG) Project involves the development of a number of gas fields and facilities in a series of development phases to produce liquefied natural gas (LNG) for export. The development will also produce condensate. The development of the Hides, Angore, and Juha gas fields and blowdown of the gas caps at the existing Kutubu, Agogo and Gobe oil fields will supply the gas resources. An extensive onshore and offshore pipeline network will enable transportation of the gas to a new LNG Plant near Port Moresby and stabilised condensate to the existing oil processing and storage, and offloading facilities at the Kutubu Central Processing Facility and Kumul Marine Terminal respectively. Small amounts of condensate are also produced at the LNG Facilities site.

Esso Highlands Limited (Esso), a Papua New Guinea subsidiary of the Exxon Mobil Corporation (ExxonMobil), is the operator of the PNG LNG Project. The PNG LNG Project will be developed in five phases over a period of 10 years to ensure reliability and consistent quality of supply of LNG for over the 30 year life of the project.

A list of the proposed developments is provided below, and Figure 1.1 shows a schematic of facilities and pipelines:

Upstream Development Components:

- Hides gas field development:
  - Seven wellpads with a total of eight new wells and re-completion of two existing wells.
  - Hides gathering system including gas flowlines from new and re-completed Hides wells.
  - Hides spineline and mono-ethylene glycol (MEG) Pipeline in the same right of way (ROW).
  - Hides Gas Conditioning Plant.
  - Hides–Kutubu Condensate Pipeline in the same ROW as the LNG Project Gas Pipeline.
- Juha gas field development:
  - Three new wellpads with four new wells.
  - Juha gathering system including gas flowlines from new Juha wells.
  - Juha spinelines and MEG Pipeline in the same ROWs.
  - Juha Production Facility.
  - Juha–Hides pipelines right of way (ROW) containing three pipelines including Juha–Hides Rich Gas Pipeline, Juha–Hides Liquids Pipeline and Hides–Juha MEG Pipeline.

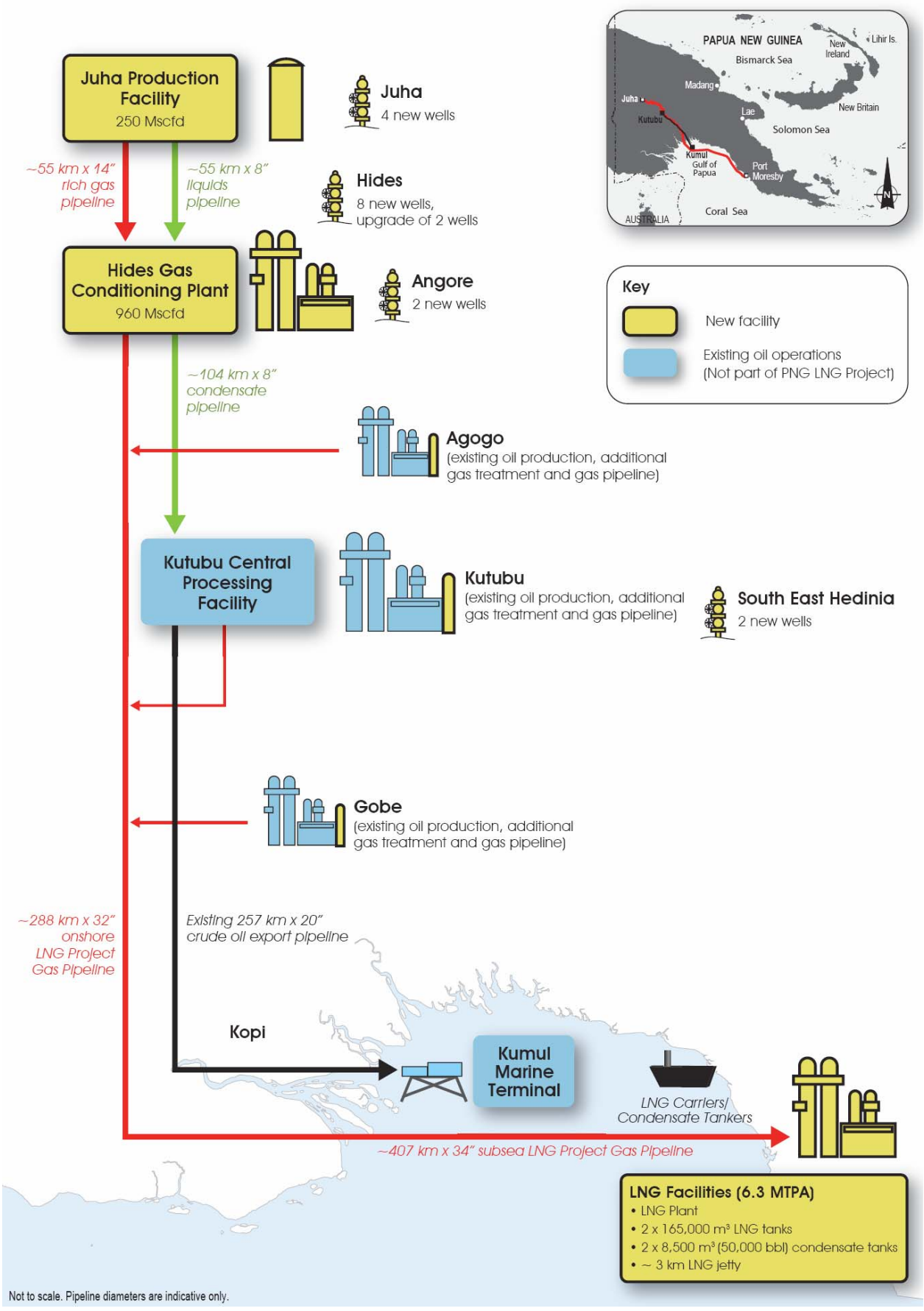

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Figure
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Angore gas field development:

- Two new wellpads with two new wells.
- Angore gathering system including gas flowlines from new Angore wells.
- Angore spineline and Angore MEG Pipeline to Hides Gas Conditioning Plant, both in the same ROW.

- Gas from existing fields:
  - Gas treatment at the Agogo Production Facility and a new Agogo Gas Pipeline from the Agogo Production Facility to LNG Project Gas Pipeline.
  - Gas treatment at the Gobe Production Facility and a new Gobe Gas Pipeline from the Gobe Production Facility to LNG Project Gas Pipeline.
  - Gas treatment at the Kutubu Central Processing Facility and a new Kutubu Gas Pipeline from the Kutubu Central Processing Facility to the LNG Project Gas Pipeline.
  - South East Hedinia gas field development: one new wellpad and two new wells; new gathering system including gas flow lines from the South East Hedinia new wells to the Kutubu Central Processing Facility in the same ROW as the Kutubu Gas Pipeline.
- Kopi scraper station.
- LNG Project Gas Pipeline:
  - Onshore: from Hides Gas Conditioning Plant to Omati River Landfall.
  - Offshore: Omati River Landfall to Caution Bay Landfall.

LNG Facilities Development Components:

- Onshore LNG Plant including gas processing and liquefaction trains, storage tanks, flare system and utilities.
- Marine facilities including jetty, LNG and condensate export berths, materials offloading facility and tug moorage.

Supporting Facilities and Infrastructure:

In addition to the principal gas production, processing and transport, and LNG production and export facilities, the project will involve the following permanent infrastructure and facilities:

- New roads and upgrade of existing roads.
- New bridges and upgrade of existing bridges.
- Upgrade of two existing airfields (upstream at Komo and Tari).
- New helipads (multiple).
- New wharf and an upgrade of the existing Kopi roll-on, roll-off facility.
- Water supply systems and pipelines, wastewater and waste management facilities.

- Operations Camps (at Hides, Juha and Tari).

A series of temporary works and access roads will also be required during the construction phase, including:

- Construction camps (multiple).
- Material/pipe laydown areas.

2. Groundwater impact assessment

2.1. Introduction

Sinclair Knight Merz Pty Limited (SKM), formerly Resource & Environmental Management Pty Ltd, has been engaged by Coffey Natural Systems Pty Ltd (Coffey) to undertake a groundwater impact assessment for the PNG LNG Project (the Project).

Documentation for the Project is to be completed in two stages:

(i) Downstream aspects of the development (the LNG plant and associated infrastructure). Figure 2.1 presents a locality plan for the LNG plant site.

(ii) Upstream aspects of the development (such as gas production, processing and conditioning, and product transfer pipelines).

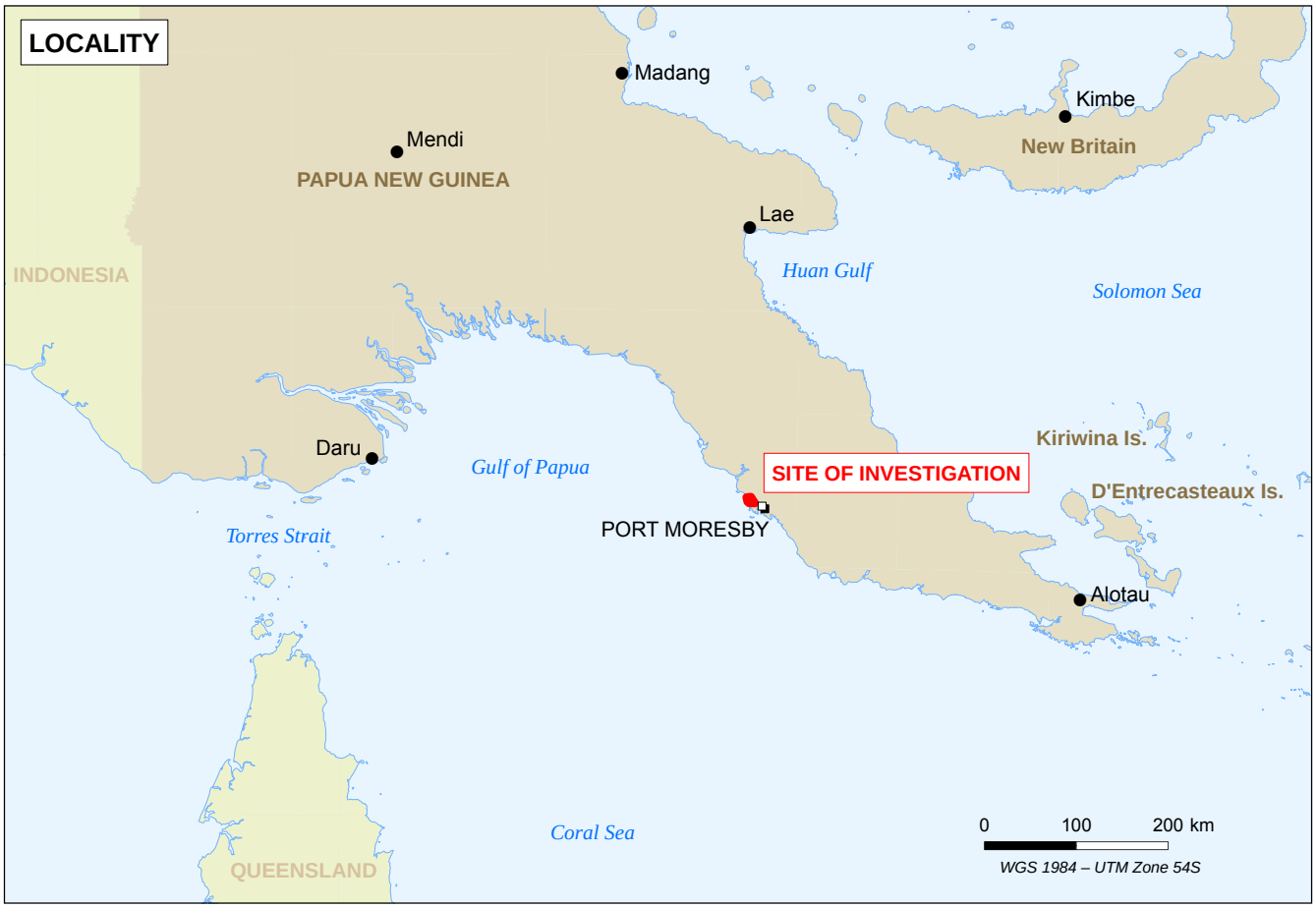
This report fulfils the first stage of a two-stage groundwater assessment, and presents the groundwater impact assessment for the LNG facility and associated infrastructure, and addresses:

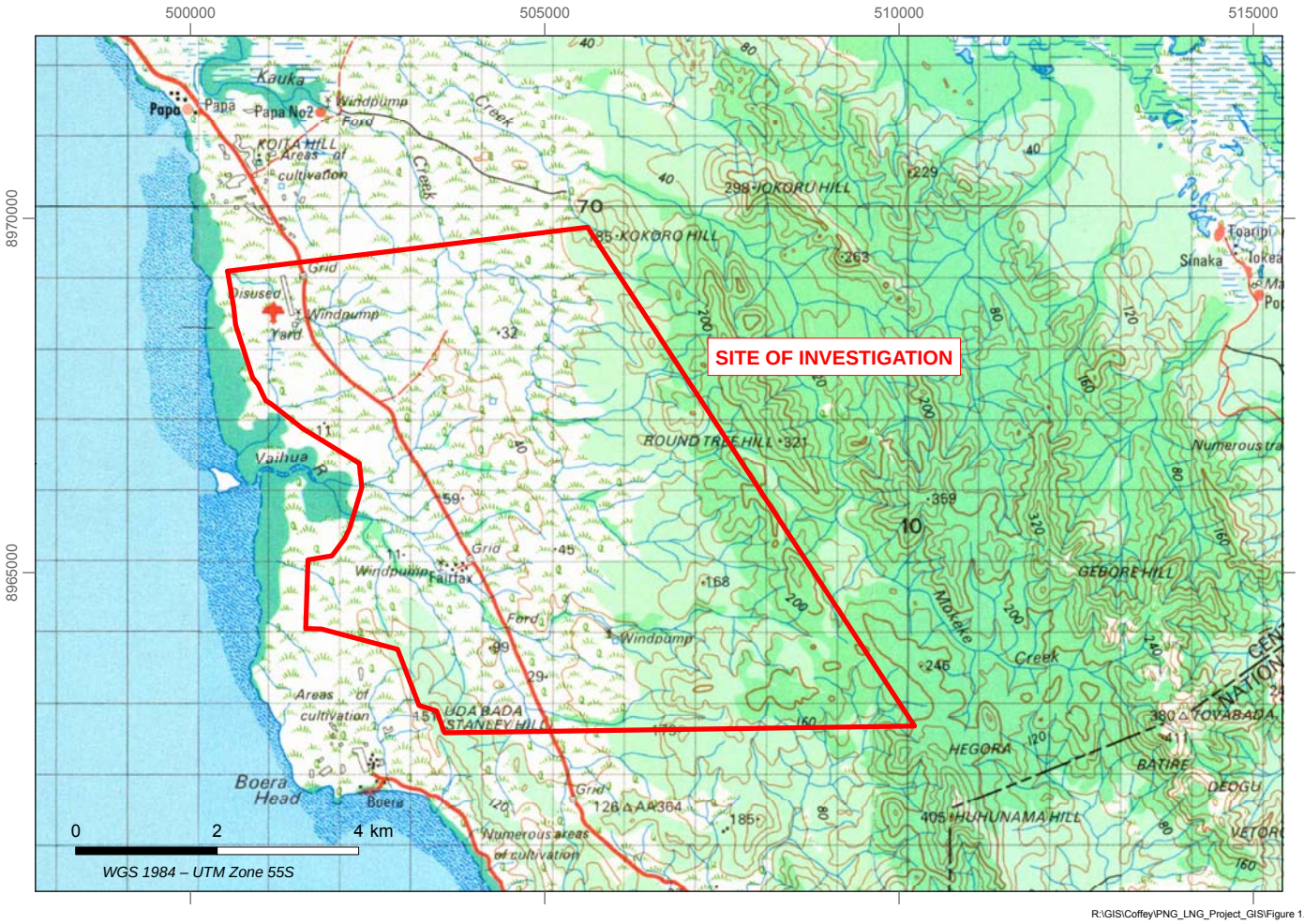
- The environmental baseline for soil and groundwater conditions (prior to construction and commissioning of the LNG facility).
- Potential groundwater contaminant issues in relation to operation of the LNG facility.
- Groundwater supply development for the LNG facility (processing and potable supply).

2.2. Scope of work

The Project brief identifies the following scope of work for the groundwater impact assessment:

- Impact related issues
  - identification of activities and facilities that could impact on groundwater resource condition during Project construction and operation;
  - identification of legislation, guidelines and policies that apply to potential groundwater affecting activities associated with Project construction and operation;
  - identification of management strategies that can be employed to avoid, reduce or mitigate adverse impacts to groundwater resources, consistent with obligations under relevant legislation, guidelines and policies;
  - assess ongoing liabilities relating to groundwater resources (residual impacts) associated with the Project; and
  - identify mitigation strategies to manage / alleviate contamination impacts.





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groundwater impact assessment
PORTION 152 LOCALITY PLAN

Figure 2.1

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- Groundwater resource related issues in the study area
  - resource characterisation and current uses; and
  - identification of beneficial uses of groundwater.

2.3. Report structure

This report is structured as follows:

- Section 1; General Project overview
- Section 2; Introduction (background information and scope of work).
- Section 3; Regulatory framework (in relation to environmental approvals and management).
- Section 4; Physical setting (important background information regarding climate, topography, geology and hydrogeology).
- Section 5; Baseline environmental assessment of Portion 152 (an assessment of existing soil and groundwater conditions on and beneath the Project site).
- Section 6; Potential groundwater impacting activities (associated with the Project).
- Section 7; Groundwater impact assessment (assessment of risk posed to groundwater resource condition by Project process and associated activities).
- Section 8; Discussion and conclusions (wrap-up of the downstream Project facility potential to impact adversely on groundwater conditions).
- Section 9; References (supporting references).
- Appendices: Supporting information and calculations.

3. Regulatory framework

3.1. Legislation

The PNG LNG Project has been determined by the PNG Department of Environment and Conservation (DEC) as a Level 3 activity (DEC, 2004). Level 3 activities are described in Schedule 2 of the Environment (Prescribed Activities) Regulation (2002), and defined within the Environment Act as being of national importance and/or having the potential to result in significant environmental impact.

Water resource management and the management of potential soil and water contaminants for PNG's mining industry (including the oil and gas industry) is regulated by the Environment Act (2000) (Lyday, 2001). The Environment Act replaces the Environmental Contaminants Act (1978), Water Resources Act (1982) and Environmental Planning Act (1978).

The Environment Act has the primary objective of controlling activities that may give rise to adverse environmental or social impacts (ESCAP, 2003). The Environment Act addresses aspects of a proposed or existing development that may result in the release of prohibited chemicals (contaminants) to the environment (including soil and water resources), either through accident, misuse or inappropriate storage. In the case of the PNG LNG Project, activities such as landfilling (with putrescible or hazardous materials), operation of burn (or flare) pits, mud pits and water disposal pits, release of treated waste water to the environment, and the use and storage of hazardous goods and chemicals would be covered by the Environment Act.

The Environment Act offers specific guidance with regard to the use of water resources (both surface and underground). Specifically, landholders or occupiers can freely access adjoining surface water resources for stock and domestic purposes (including employees). In addition, the PNG Government has the ability to issue permits allowing access to water resources by users other than those who hold land adjoining those water resources. These permits will normally specify a rate of water take and the use to which the water is put. In addition, permits can be obtained to allow the release of water and contaminants to the environment, and will usually stipulate conditions and standards by which to control this release.

The Environment Act also requires permits be issued by the relevant PNG Government agency for the purpose of conducting water investigations. Whilst the act doesn't specifically define what is meant by 'investigation', it is assumed to relate to intrusive investigations and not to the act of sampling water for assessment of water quality parameters.

In short, the regulation and management of PNG water resources falls under the influence of the DEC. The regulation of Water Resources and Wastewater Discharge into the environment (groundwater, rivers, springs, lakes & sea) is also the function of the DEC. The Environment Act provides comprehensive standards for protection of environment and water. The DEC issues Water Use Permits with conditions to be complied with by the permit holders. The Permits can be for groundwater exploration, extraction of groundwater and surface water or discharge of wastewater into a water body.

The extraction, treatment and distribution of water and the collection, treatment and discharge of wastewater are the functions of two State-owned water utilities. The PNG Waterboard established under the Water Supply and Sewerage Act, manages water supplies and sewerage services in eleven major centres throughout the country whilst Eda Ranu, registered under the Companies Act and solely owned by the PNG Government, operates the Port Moresby City Water Supply and Sewerage systems.

The water supply and sanitation services not operated by these two utilities are operated and managed by Provincial governments or local governments, and this would be the case for village water supplies located near Portion 152 [1] (eg. Boera and Papa; refer Figure 2.1).

3.2. Guidelines for assessing the environmental status of Portion 152

PNG's *Drinking Water Quality Standards* have been adopted from the World Health Organisation's *Drinking Water Quality Guidelines* (WHO, 1998). However, other guidelines may need to be referenced to assist in fully assessing the environmental status of Portion 152 with respect to the Project:

- Groundwater quality may also need to be assessed in terms of potential impact to receptors other than humans (e.g. marine and aquatic ecosystem criteria).
- It is understood there are no adopted guidelines for assessing the environmental status of soils in PNG.

In December 1998, PNG formally joined the non-statutory Australian and New Zealand Environment Protection Council (ANZECC), making the organisation a regional Ministerial forum for member governments to develop coordinated policies with regard to national and international environment and conservation issues. ANZECC was replaced in 2001 by the statutory:

- Natural Resource Management Ministerial Council (NRMMC), which oversees natural resource management matters.
- Environment Protection and Heritage Council (EPHC), which oversees environment protection matters.

PNG has observer status on both the NRMMC and EPHC, and for this reason it is considered appropriate that, with the exception of the WHO *Drinking Water Quality Guidelines,* environmental guidelines developed by either of these Ministerial Councils are appropriate for undertaking the current baseline (and any future) environmental assessment of Portion 152. In particular:

- The national Water Quality Management Strategy (NWQMS).
- The national Environmental Protection Measures (NEPM).

1 The project has applied for new leases over the area of interest for project development, however at the time that this study was completed, that area equated to the boundary of Portion 152

4. Physical setting

4.1. Climate and hydrology

With an annual average rainfall of less than 1,000 mm/yr, Port Moresby and the surrounding areas are located in one of the driest regions of PNG. Annual average evaporation in the region is more than 2,000 mm/yr (Douglas Environmental Services, 2007) such that there is a significant rainfall deficit. The mean annual temperature in the Project area is around 27^{o}C (www.worldweather.org).

Although, a large number of watercourses drain Portion 152 (Figure 4.1) they are typically dry between wet seasons, suggesting that limited base flow extends into the dry season. The exception is Laloki River further to the north of Papa (Figure 2.1). Vaihua River, which drains to Caution Bay on the western boundary of Portion 152, and Kauka Creek (Figure 4.1) are the most significant of the watercourses on Portion 152.

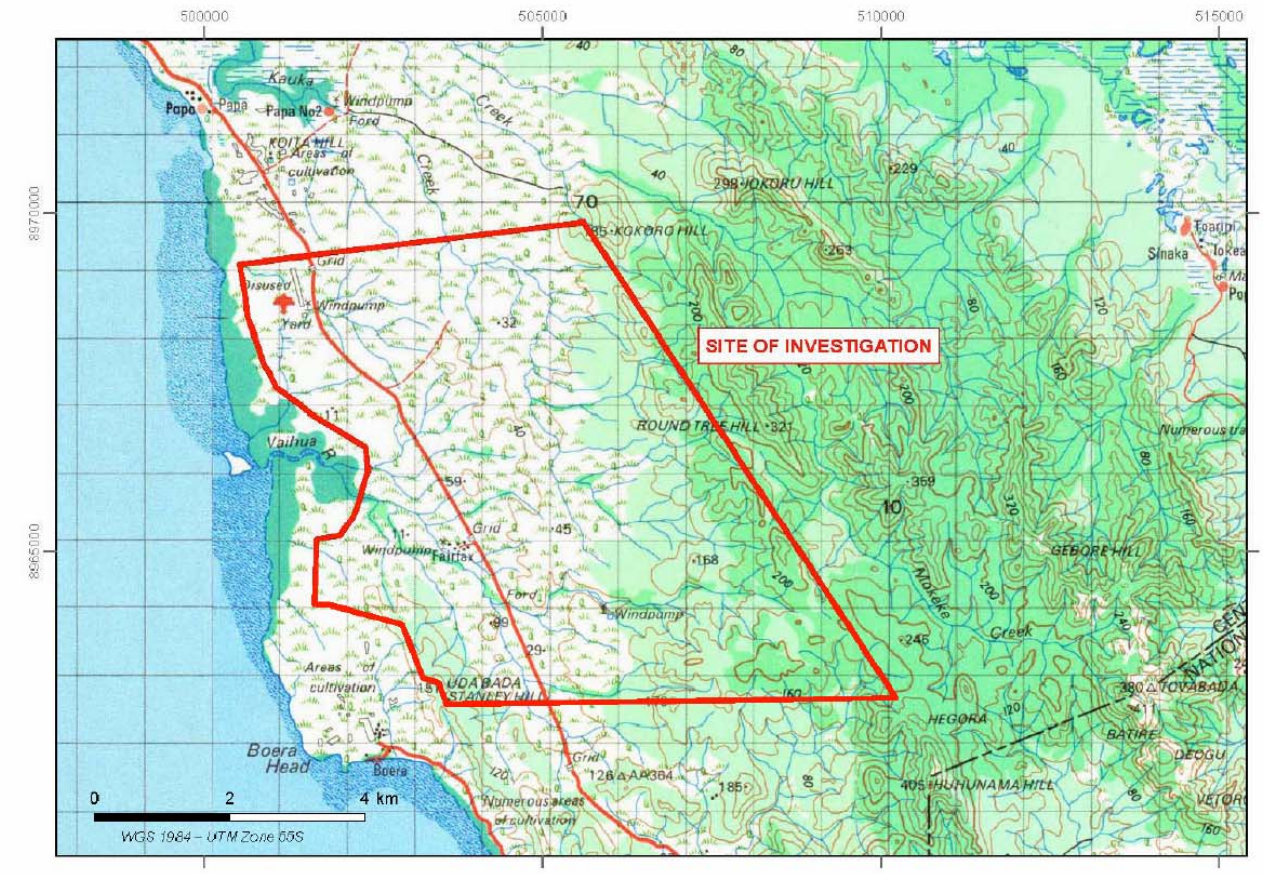
4.2. Topography and geology

The region comprises of flat to slightly undulating plains, with ranges of low hills and ranges generally trending NNW-SSE (Figure 4.1). The hills and bedrock in the region generally comprises siliceous argillites, cherts, calcarentites, mudstones, basalts and tuffs, as well as gabbro intrusives in some areas. It is possible that the valleys occurring on and adjacent to Portion 152 are expressions of synclinal structure (Rooke, 1988).

Alluvial and colluvial deposits have formed within the valleys and depressions in the region of Portion 152, possibly as a result of progressive inundation due to rising sea levels. Tidal flats and estuarine deposits dominate the area around Lea Lea and Papa, and along river and creek mouths further south, e.g. where Vaihua River discharges to Caution Bay. The alluvial deposits reportedly attain thicknesses of up to 25 m (Rooke, 1988).

Colluvial and talus deposits exist at the foot of hills, and these inter-finger with alluvial clays on the coastal plains (Rooke, 1988).

PNG is an area of complex tectonics with active subduction zones with shallow and deep earthquakes, and is one of the World's most active seismic and volcanic regions (McCue, undated). Figure 4.2 presents a plan showing PNG seismic events, indicating that the downstream Project area is located within a region that is less seismically active than other parts of PNG.



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PORTION 152 TOPOGRAPHICAL PLAN

Figure
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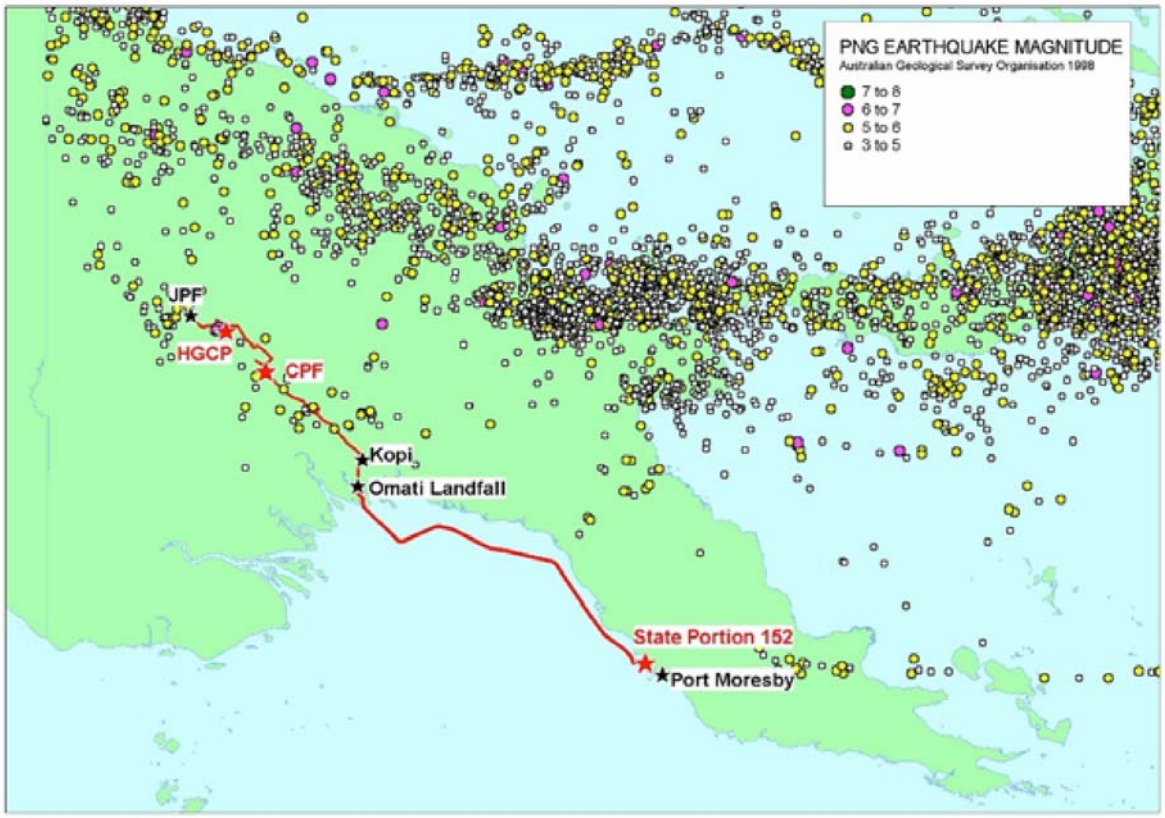


Figure 4.2 PNG seismic events map (1900-2002)

4.3. Hydrogeology

General

Most water wells constructed in the area around Portion 152 access alluvial/colluvial sediments of the coastal plain, and provide low yields of often brackish water. A thick layer of clay (5 to 10 m thick) typically provides cover to many of the alluvial basins on the coastal plain, and is often underlain by 5 to 15 m of, often clayey and silty, sands and gravels that form potential alluvial/colluvial aquifers.

The shallow clay typically forms a confining layer to the potential aquifers. However, there is limited saturation of the confining clays, such that pumping of the aquifers typically results in pumping water levels declining below the top of the aquifer so that unconfined conditions prevail (Rooke, 1998). Rooke further suggests that the more prospective sand and gravel aquifers occur close to streams and creeks.

While most bores in the region are completed in the alluvial sediments, Kidd (1975) reports a well that draws groundwater from a calcareous silty sandstone (calcarenite) that possibly represents a fractured rock aquifer. Although the well is low yielding, it produced the freshest reported groundwater sampled during Kidd's study.

Drilling of a borehole in the Boera-Porebada area revealed that the potentiometric surface of the aquifer increased as drilling progressed (Rooke, 1988), suggesting that upward hydraulic gradients occur in this area. Groundwater salinity in this borehole also became fresher with depth.

Golder Associates (2007) constructed a number of test pits to depths of up to 3.2 m on Portion 152. Of the 18 pits constructed, water filled two of these to depths of between 2.3 and 2.4 m. It was suggested that the groundwater level was higher under Gilgai soils, although this is likely due to Gilgai being formed in depressions. One other pit encountered 1.2 m of clayey silty calcareous sand above a stiff clay and significant water seepage at the sand-clay interface, indicating a possible perched aquifer that is probably limited in extent and capacity to deliver Project water supplies.

Recharge and discharge mechanisms

An accurate estimate of groundwater recharge for the area around Portion 152 is not available from the literature. However, due to the relatively thick layer of clay above the aquifer and possible upward groundwater hydraulic gradients on the coastal plain (Rooke, 1988), direct infiltration of surface waters across the plains is likely to be minimal. Recharge to the alluvial aquifers is thought to predominantly occur from streams running through the coarser sediments at the footslopes of hills (Rooke, 1988).

Groundwater is expected to flow from inland toward the coast where it will discharge. Other discharge mechanisms will include evaporative losses where water tables are shallow (say, less than 2 m depth) or via evapotranspiration where deep-rooted vegetation accesses the water table.

Aquifer hydraulic properties

Limited aquifer testing has been undertaken in the area of Portion 152. However, work undertaken by Rooke (1988) provides an estimate of aquifer transmissivity of 16 m^2/day that Rooke regards an under-estimate. Estimates of specific capacity of the alluvial/colluvial and fractured rock groundwater systems range between 13 and 22 m^3/day/m (Rooke, 1988), and 2.25 m^3/day/m (Kidd, 1975), respectively.

5. Baseline environmental assessment of Portion 152 soils and groundwater

5.1. Soil and water sampling

Overview

To establish an environmental baseline for Portion 152, from which to assess future environmental performance of the LNG plant and associated activities, a targeted environmental site assessment has been undertaken. The report detailing the site assessment (methodology, laboratory reports and conclusions) is presented as Appendix A.

A preliminary review of the site and historical site activities identified a range of potential prior contamination issues, and a targeted soil and groundwater investigation program was designed to assess these issues. Table 5.1 presents a summary of the potential contamination issues.

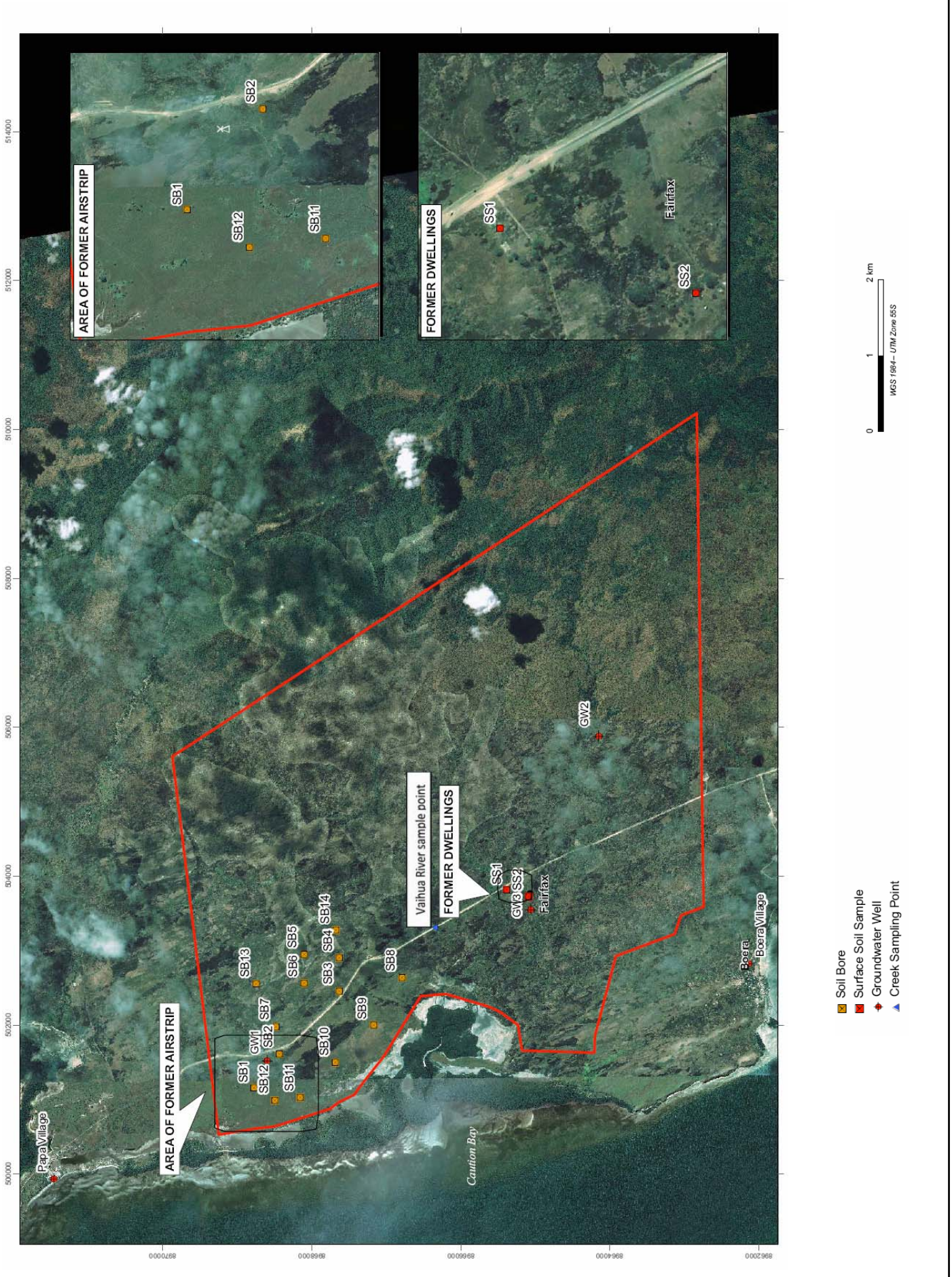
The investigations comprised a visual assessment of Portion 152 along with a limited soil and groundwater sampling and analysis program consisting of:

- 16 soil investigation locations (prefixed with SB or SS; see Figure 5.1).
- Three on-site and two off-site groundwater investigation locations (prefixed with GW; see Figure 5.1, off-site sampling locations not shown).
- Submission of selected soil and groundwater samples to NATA-registered laboratories to assess the presence of identified potential contaminants (see Table 5.1).

Results and findings - soils

A detailed listing of analytical results is presented within the site assessment report presented as Appendix A, along with certified laboratory analytical reports. The following presents a summary of the laboratory reported results.

Soil pH	Soil pH ranged from 6.6 to 8.5. Generally soil pH was between 7.5 and 8.5, indicating neutral to alkaline conditions exist at the locations tested.
Heavy metals	All reported concentrations of analysed heavy metals were below the adopted NEPM (1999) F commercial industrial guidelines. All reported concentrations of arsenic were below laboratory levels of reporting (LORs). Concentrations of manganese ranged from 375 to 1,860 mg/kg, with one soil sample (at location SB3; Figure 5.1) reporting a concentration of manganese in exceedance of the most sensitive NEPM (1999) HIL guideline (A – residential) of 1,500 mg/kg.



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Project: GQ-01-1

PNG LNG Project
groundwater impact assessment
SITE LAYOUT AND SAMPLING LOCATION PLAN

Figure
5.1
Mar 2008

Nutrients	Sulfate concentrations ranged from 610 to 930 mg/kg. Total N concentrations ranged from 590 to 2,320 mg/kg. Phosphorous concentrations ranged from below laboratory Limits of Reporting (LOR) to 0.52 mg/kg.
Phenoxy acid herbicides & cyanide	All reported concentrations of phenoxy acid herbicides and cyanide were below Laboratory LORs and adopted guidelines (where available).
OC/OP pesticides	All reported concentrations of OC and OP pesticides were below Laboratory LORs and adopted guidelines.
TPH, BTEX & PAHs (hydrocarbons)	All reported concentrations of TPH/BTEX and PAHS were below Laboratory LORs and adopted guidelines.
E. coli & faecal coliforms	All reported concentrations of *E. coli* were below Laboratory LORs and adopted guidelines. Concentrations of faecal coliforms ranged from below laboratory LOR to 9 faecal coliforms/g at location SS2, marginally in excess of the laboratory LOR.
Comprehensive Victorian EPA screen	Two samples (from one each from locations SB3 and SB11) were submitted for a comprehensive Victorian EPA screen, which included the analytes listed above as well as VOCs, polychlorinated biphenyls (PCBs), phenols and fluoride. Concentrations of the additional analytes were reported at less than Laboratory LORs and/or adopted guidelines values (where available).

With the exception of minor ash and cinders at one location (SS01, Figure 5.1), no other visual or olfactory evidence of contamination was identified during the site inspection. The soil investigation program generally identified natural soil, with limited fill material encountered.

The analytical program did not identify elevated concentrations of any of the analytes tested for, i.e.: heavy metals, hydrocarbons, pesticides, herbicides, nutrients, PCBs, cyanide, fluoride, VOCs, faecal coliforms or *E. coli*.

Based on the results of the environmental site assessment documented as Appendix A, there is no evidence at the locations tested that historical usage of the site has limited the suitability of the site for future commercial/industrial use.

Table 5.1 Historic contamination potential for Portion 152

Portion area	Issue	Potential contaminants of concern
Site –wide	Fill from unknown sources used to level areas of the site, establish roads and foundations	pH, OC/OP pesticides, heavy metals [1], nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts
	Presence of range of scrap and waste materials that may present an aesthetic limitation	None
Cleared areas – possible plantations or pastures	Potential herbicide and pesticide contamination associated with historical agricultural use of the site	Heavy metals, OC/OP pesticides, phenoxy acid herbicides, triazines
Former pastoral station buildings	Underslab/building termiticide treatments at former buildings	Arsenic and OC pesticide - soil impacts
	Residual oils/fuels associated with equipment/vehicle storage/traffic	TPH/PAH, lead, cresols/phenols, VHCs - soil impacts
	Above/underground storage of fuel for vehicles and generator	TPH/BTEX/PAH, lead – soil/groundwater impacts
	Historical use of septic system/waste disposal	pH, heavy metals, nutrients and faecal coliform/*E. coli* - soil/groundwater impacts
Former airfield	Imported fill used to establish airfield	pH, OC/OP pesticides, heavy metals, nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts
	Workshops/sheds associated and fuel storage associated with former airfield	heavy metals, TPH/PAH, lead, cresols/phenols, VHCs - soil impacts
Cattle yards	Historical use of cattle treatments	Arsenic, nutrients and OC/OPs
Foreshore & backwater areas	Heavy metals within sediment material – mine tailings (i.e. from rivers to north and south of site)	Heavy metals & cyanide

Notes: 1. Including arsenic, cadmium, copper, chromium, cobalt, nickel, manganese, lead, mercury, zinc

Results and findings – groundwater

The groundwater sampling program was undertaken to assist in developing an understanding of baseline groundwater conditions and to determine suitability of developing Portion 152 for commercial/industrial use. The following presents a list of the analytical program groundwater samples were submitted to:

- heavy metals screen;
- TPH, VOCs, PCBs, Phenols & OC/OP pesticides;
- major cations (Ca, Mg, Na and K);
- major anions (Cl, SO_4 and Alkalinity as $CaCO_3$); and
- fluoride and cyanide.

The groundwater samples were not tested for biological parameters. However, in uninhabited areas, such as Portion 152, it is not expected that biological contaminants such as faecal coliforms will be an issue and this is supported by the soil sampling results.

Constraints encountered during the groundwater sampling program (e.g. limited purging prior to sample collection) means the laboratory analytical program provides indicative water quality data and may not be truly representative of actual groundwater conditions. Follow up sampling would be required to provide greater confidence in the reported water quality parameters.

Groundwater samples collected during the field program for laboratory analysis were also tested for a range of parameters in the field using a calibrated electronic meter. Table 5.2 presents a summary of selected field measured parameters, and Figure 5.1 presents a locality plan for the wells (GW-1, GW-2 and GW-3). The villages of Boera and Papa are located to the south and north of Portion 152, respectively.

Table 5.2 Field measured groundwater quality data

Location	pH	Salinity	
		EC[1]	TDS[2]
Boera Village	8.1	750	485
Papa Village	7.7	1,810	1,175
GW-1	6.8	420	275
GW-2	7.5	790	515
GW-3	7.8	2,340	1,520

Note:
1. Electrical conductivity, as *u*S/cm
2. Total dissolved solids, as mg/L assuming conversion factor of ECx0.65. WHO water quality guideline for salinity is not health-based but relates to palatability. Less than 600 mg/L is considered palatable, whilst greater than 1,000 mg/L is considered unpalatable.

Table 5.3 presents reported laboratory analytical data (fluoride and heavy metals) for groundwater samples collected from five locations on and near Portion 152 (three groundwater wells; GW-1 to 3, and two village wells; Boera and Papa). Also presented for comparison purposes are WHO *Drinking water Guideline values* (2004) for the same analytes. Full details of the analytical results are presented as Appendix A. However, note that other analytes tested for (apart from major ions), e.g. pesticides, hydrocarbons and phenols, were not reported above laboratory LORs, and there are no WHO health-based guidelines for major ions.

In terms of salinity and WHO guidelines, alone, groundwater sampled from well GW-3 (on Portion 152) and from the Papa Village well is considered unpalatable. All of the other groundwater samples can be considered to have 'good' palatability.

Table 5.3 Groundwater quality data – laboratory analytical program [1]

Parameter	Guideline [2]	GW-1	GW-2	GW-3	Boera [3]	Papa [3]
Fluoride	1.5	0.1	0.1	0.3	na	na
Arsenic	0.01	0.002	<0.001	<0.001	<0.001	0.002
Barium	0.7	0.02	0.015	0.056	0.001	0.019
Cadmium	0.003	0.0003	0.0008	0.0004	0.00008	0.0003
Chromium	0.05	<0.001	<0.001	<0.001	0.001	<0.001
Copper	2	0.001	0.002	0.001	0.001	0.002
Lead	0.01	<0.001	<0.001	<0.001	**0.022**	<0.001
Manganese	0.4	**0.751**	0.312	<0.001	0.013	0.078
Mercury	0.001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001
Nickel	0.02	0.004	0.002	<0.001	0.012	<0.001
Zinc	3	0.088	0.144	0.018	1.04	0.012

Notes:
1. All as mg/L, **bold** type indicates guideline exceedance
2. WHO Guidelines (2004). No health based guidelines for major ions. Consequently, major ion data not presented.
3. '<' concentrations occur below laboratory level of reporting

'na' not analysed

On Portion 152, heavy metals in sampled groundwater are reported at concentrations below the relevant WHO guideline, with the exception of manganese in groundwater sampled from GW-1. Manganese in GW-1 groundwater is reported at a concentration almost twice WHO guideline. The source of this manganese is uncertain but may be in relation to old pumping equipment still remaining in the well, or from the decay of marine invertebrates within the formation that is intersected by the well.

At nearby villages, heavy metals in groundwater sampled from all sites are reported at concentrations below the relevant WHO guideline, with the exception of lead in groundwater sampled from the Boera well. The Boera water sample was collected directly from a water storage drum, and lead is reported at a concentration twice that of the WHO guideline. The source of this lead is uncertain but may be the result of dissolution from the pipes delivering water from the well to dwellings.

Results and findings – surface water

The surface water sampling program was undertaken to assist in developing an understanding of baseline surface water conditions on Portion 152 with respect to heavy metals only.

The single surface water sample collected during the field program for laboratory analysis was also tested for a range of parameters in the field using a calibrated electronic meter. Table 5.4 presents a summary of field and laboratory measured parameters, and Figure 5.1 presents a locality plan for the sampled site.

Table 5.4 Field and laboratory measured surface water quality data [1]

Parameter	Guideline [2]	Vaihua River
Field		
pH	1.5	7.9
EC[3]	0.01	870
TDS[4]	<1,000	565
Laboratory		
Arsenic	0.01	0.002
Barium	0.7	0.025
Cadmium	0.003	0.0001
Chromium	0.05	<0.001
Copper	2	0.001
Lead	0.01	<0.001
Manganese	0.4	0.039
Mercury	0.001	<0.0001
Nickel	0.02	0.001
Zinc	3	0.006

Notes:
1. All as mg/L, **bold** type indicates guideline exceedance
2. WHO Guidelines (2004).
3. Electrical conductivity, as *u*S/cm
4. Total dissolved solids, as mg/L assuming conversion factor of ECx0.65. WHO water quality guideline for salinity is not health-based but relates to palatability. Less than 600 mg/L is considered palatable, whilst greater than 1,000 mg/L is considered unpalatable.

On Portion 152, heavy metals were reported for the surface water sample collected from Vaihua River at concentrations below the relevant WHO guideline. Surface water appears to be slightly alkaline and reports (field measured) salinity concentrations that are considered palatable.

5.2. Groundwater resource assessment

Water quality

The field measured water quality data presented in Table 5.2 suggests better quality groundwater (i.e. lower salinity) can possibly be sourced from the southern part of Portion 152. Water from this area can be considered potable (less than 1,000 mg/L), but would possibly require some form of treatment to ensure it can be used safely for potable purposes (e.g. to manage possible biological contaminants). It will be important to address the possible sources of lead in groundwater sampled from Boera Village to ensure the Project workforce is not exposed to lead concentrations that may pose an adverse risk to human health.

Water supply potential

Estimates of future construction and camp water demand for the LNG facility range around 125 m^3/hour (35 L/s) over a 24 hour period.

Calcarenite outcrop is evident around Portion 152, and it is likely that a calcarenite aquifer has been the target for development of former stock water points on Portion 152, e.g. at locations GW-1, 2 and 3 (Figure 5.1).

GW-1 and GW-3 both appear to be hand dug wells, and are lined with concrete pipe of approximately 1.2 m diameter. The screened intervals of these wells are unknown, but they are between 10 and 12.5 m deep, respectively.

GW-2 is cased with 8" steel pipe. The screened interval and material is unknown, but the well is obstructed at around 4.2 m depth. During the groundwater sampling program described above, the opportunity was taken to complete a baildown recovery test on the well to provide data to assist in a very coarse estimate of aquifer permeability. The poor condition of the well (e.g. possibly due to corrosion, an obstruction below watertable and blocked screens) means that the estimates are likely to be an under-estimate of actual permeability. Figure 5.2 graphically presents the results of the recovery test, and Table 5.5 presents estimates of aquifer parameters derived from the test.

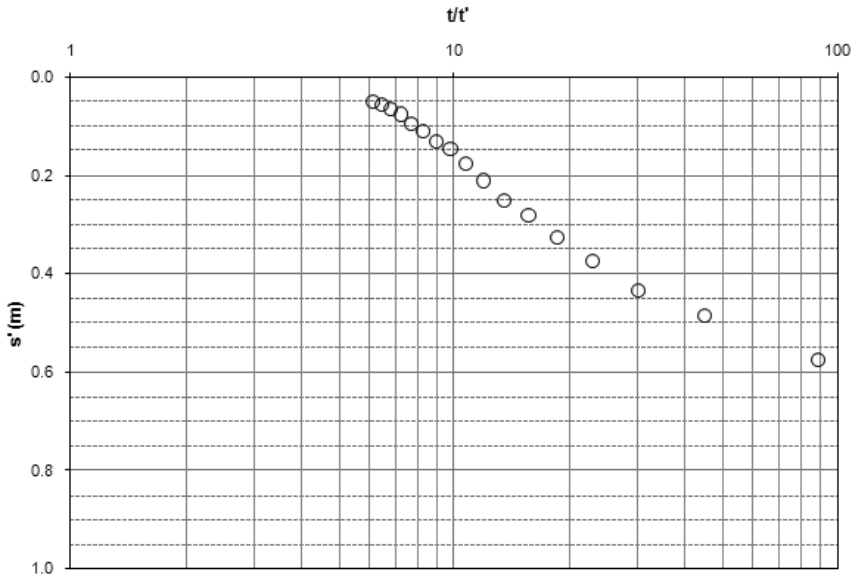

Figure 5.2
Recovery test data for GW-2 (s' on the y-axis represents water level recovery, t/t' on the x-axis relates the recovery data to both time since pumping started [t] and time since pumping stopped [t'])

The results of the testing conducted at GW-2 fall within the lower bound range of estimates provided by others (e.g. Rooke, 1988 and Kidd, 1975), and do not provide conclusive evidence that groundwater supply development for the Project is feasible. Importantly, in terms of sustainable water resource development, the recovery test (limited though it is) suggests the aquifer is recharged and not a closed basin (i.e. the aquifer will be replenished if developed for a water supply, although it will be important to balance abstractions against replenishment rates).

Table 5.5 Aquifer test parameter estimates

Well	**Q**[1] (m^3/day)	**Time of test** (days)	**T**[2] (m^2/day)	**K**[3] (m/day)
GW-2	3.9	0.03	1.2	0.6

Notes:
1. Pumping rate (based on 120 L bail volume over 44 minutes)
2. Transmissivity
3. Hydraulic conductivity, assuming 2 m aquifer thickness (depth between rest water level and obstruction), compare with Rooke (1988) who provides estimates of between 1.3 and 5 m/day

Using the estimated transmissivity values presented in Table 5.5, and those quoted by Rooke (1988), a simple analytical model has been developed to assess likely pumping rates that might be sustained from individual production wells in support of a Project water supply. The model is based on the Theis equation (Kruseman and de Ridder, 1994). Table 5.6 presents some of the underlying assumptions for the analytical model. Figure 5.3 presents model predictions and Appendix B presents model set-up details and results in more detail.

Table 5.6 Analytical model - underlying assumptions

24 hr water demand[1]	**Base of aquifer** (m bSWL) [2]	**D** (m) [3]	**K** (m/day) [4]	**S** (m^2/day) [4]	**Time of supply** (days)
3,000	20	5.0	0.6 (GW-2 test) 1.3 (Rooke, 1988) 5.0 (Rooke, 1988)	0.001	730

Notes:
1. Based on upper bound demand estimate of around 125m^3/hour
2. metres below standing water level; the lowest level to which groundwater can be drawn to prior to pump failure, design pumping rate needs to consider this parameter
3. Aquifer thickness; one of the parameters that constrains transmissivity (T=KD), see Glossary of Terms for explanation)
4. Hydraulic conductivity; one of the parameters that constrains transmissivity (T=KD), see Glossary of Terms for explanation)
5. Storativity, dimensionless, see Glossary of Terms for explanation)

Based on the predictions presented in Figure 5.3 and assumptions presented in Table 5.6, for a projected water demand of 35 L/s (3,000 m^3/day), the Project wellfield configuration would comprise:

- More than 70 production wells, based on a 'low' aquifer transmissivity value of 1.3 m^2/day.
- More than 35 production wells, based on a 'moderate' aquifer transmissivity value of 6.5 m^2/day.
- More than 12 production wells, based on a 'high' aquifer transmissivity value of 25 m^2/day.

In a situation where the water demand is less, the configurations outlined above would be (approximately) proportionately less.

The analysis presented here is very conservative as it is a basic assumption of the Theis solution that the pumped aquifer is totally confined and is not influenced by leakage from confining layers, or the pumped aquifer becoming unconfined (unconfined storage will mitigate drawdown).

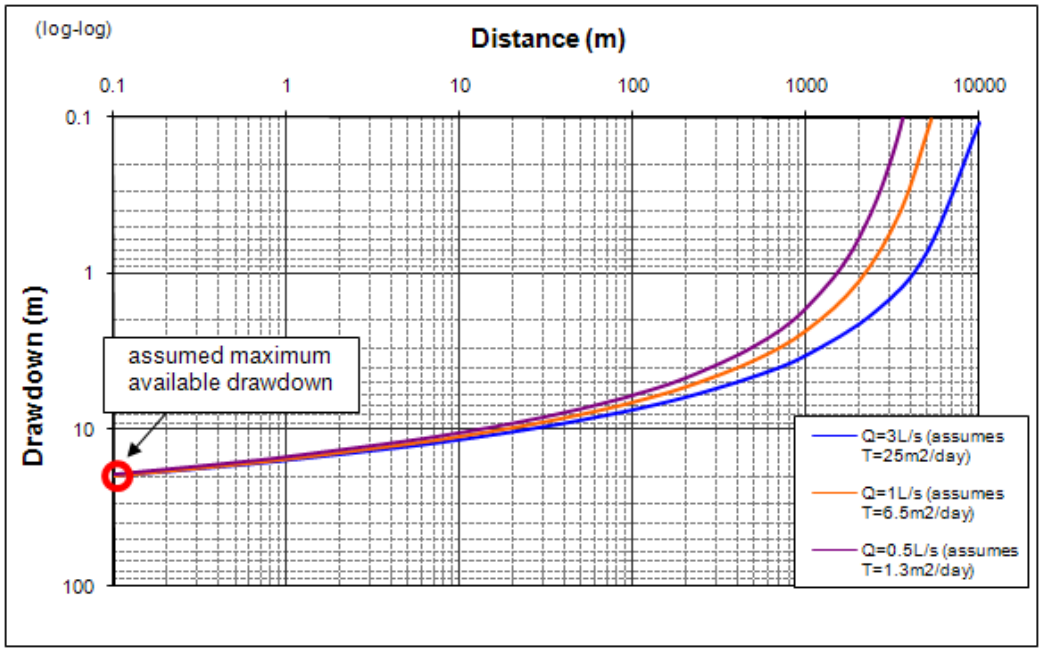

Figure 5.3 Analytical model solutions for groundwater production from a single well. The predicted extent of drawdown from the production well increases with higher pumping values.

6. Potential groundwater impacting activities

6.1. Overview

The LNG plant includes inlet gas facilities, an acid gas removal unit (AGRU), dehydration, mercury removal, refrigeration, liquefaction and fractionation. LNG and heavier hydrocarbon condensates will all be generated during the process, the latter two products at much smaller quantities than for LNG.

The following references have been utilised in preparation of the information presented in this section:

- PNG LNG Concept Selection document *Pre-Feed Process Design Basis* (ref. PGLN-KB-PBDES-800001).
- PNG LNG Concept Selection document *Process System Description* (ref. PGLN-KB-PBDES-000001).
- PNG LNG Concept Selection document *Heating Medium Selection Study* (ref. PGLN-KB-PROPT-800006).
- PNG LNG Concept Selection document *Offsites and Utility Systems Design Report* (ref. PGLN-KB-PBDES-000002).
- PNG LNG Concept Selection document *Mercury Removal Optimization Study* (ref. PGLN-KB-PROFT-800005).
- PNG LNG Concept Selection document *Water Load Sheet* (ref. PGLN-KB-PLZZZ-000001).

6.2. LNG Process

Description

To present the risk of adverse impact to groundwater resources beneath and adjacent to Portion 152 as a result of the proposed PNG LNG Project it is necessary to consider those activities associated with the Project that have the potential to introduce contaminants to the groundwater system. Figure 6.1 presents a process flow diagram showing the different stages of LNG and condensate production for the proposed plant. Not explicitly shown on Figure 6.1 is the reticulation system for transferring feed and treated gas, and condensate around the LNG plant, which forms a potential source of groundwater contaminants should some form of damage occur to **pipe work** or **transfer vessels** that results in leakage of product.

The **Feed Gas Separator** removes small liquid slugs from pigging from the gas stream prior to its entering the AGRU. The recovered liquids have the potential to be contaminated with heavier (non-volatile) hydrocarbon residues, which have the potential to form a source of groundwater contaminants if not managed appropriately.

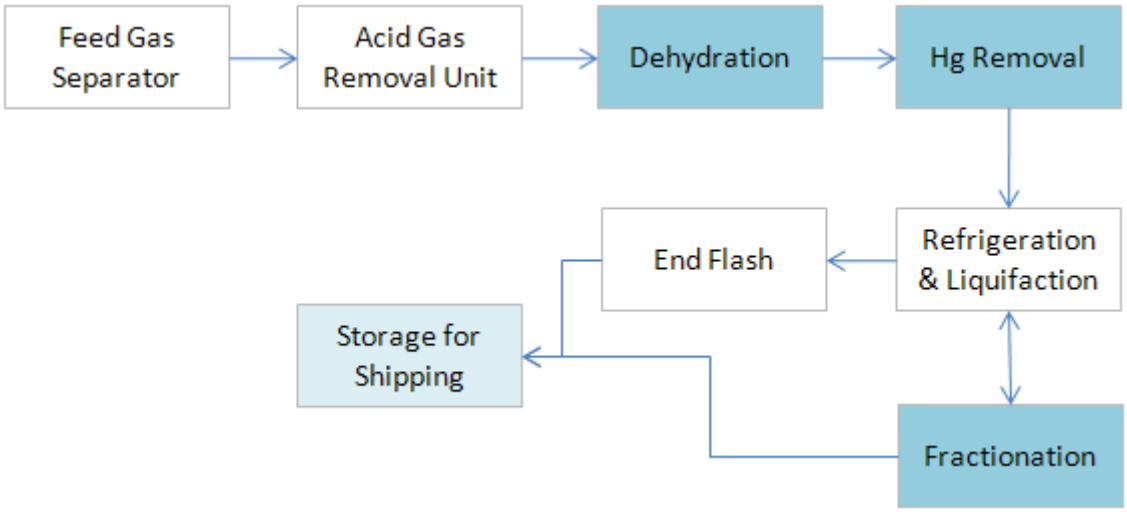

Figure 6.1 Simplified process flow diagram for the PNG LNG Project. Shaded process activity indicates heightened risk of contamination to groundwater. Darker shading indicates process where liquid contaminants are generated, lighter shading indicates large storage volumes of potential contaminants.

Feed gas entering the **AGRU** will be free of heavy hydrocarbon liquids. The AGRU removes CO_2 through the use of temperature control and a solvent solution possibly containing amines (aliphatic compounds). Removal of acid gas flows (CO_2, H_2S and inlet total S) will not present a direct risk to groundwater conditions. However, aliphatic compounds within the solvent solution do present a potential risk of contamination of groundwater resources in the event of accidental releases to the environment. The solvent solution containing the acid gas flows is cycled through the **Rich Amine Flash Drum** where co-absorbed hydrocarbons are flashed off (and sent to the fuel gas system) and the acid gas is stripped from solution for disposal to the incinerator.

AGRU treated gas then flows to the **Dehydration** unit, where the water saturated gas stream is dried and recovered water is sent to the water treating facility. The dried gas stream then enters the **Mercury Absorber**, which removes any Hg that is present in the feed gas, with the Hg-rich effluent flowing to the **Mercury Absorber Afterfilters** and the treated feed gas entering the LNG liquefaction unit.

The **LNG liquefaction** unit refrigerates and liquefies the gas stream. The vapour stream, however, is further cooled and condensed before entering the **LNG Endflash Drum**, from where liquefied gas (LNG) is sent to the **LNG storage tanks** and the remaining vapour stream is further compressed and used as plant fuel gas. Condensate recovered during fractionation is recovered as a separate product and sent to the **Condensate Storage tanks**.

Within the **Refrigeration** unit a series of cooling and condensation operations take place from where liquefied natural gas (LNG) is flashed to the **LNG Endflash Drum** from where it is transferred to the **LNG storage tanks**.

At the **LNG storage tanks**, LNG is stored at near atmospheric pressure and very low temperatures (around 105 kPa and -161^{o}C, respectively). Any generated vapors at the storage tanks will be collected and returned to the plant fuel gas system.

Potential groundwater contaminants associated with the LNG Process

Table 6.1 presents a list of primary constituents of feed gas that will be transferred onto Portion 152 via the pipeline from upstream gas production and conditioning facilities. The constituents can be considered as potential groundwater contaminants, but only if released to the environment in quantities that pose a risk to human or environmental receptors.

The organic compounds comprising the feed gas are all volatile, meaning that their vapour pressures will result in significant volatization under normal conditions. As a consequence, these compounds are not considered as primary constituents of concern with regard to the potential to contaminate groundwater resources in the Project Area. Exceptions, however, include some of the heavier volatile organic compounds (VOCs), such as benzene, xylene and toluene, which can contaminate groundwater.

In addition, through the LNG production process the potential for semi- or non-volatile compounds to be generated exists, and this is further discussed in Section 6.

Table 6.1 Feed gas chemical constituents (design)

Organic compounds	Non-organic compounds
Methane (87.89)	Water (0.01)
Ethane (6.75)	Carbon dioxide (0.49)
Butane (2.45)	Nitrogen (0.77)
i-Butane (0.51)	Hydrogen sulfide (0.0)
n-Butane (0.64)	Mercury (0.0)
i-Pentane (0.22)	
n-Pentane (0.16)	
Hexane (0.6)	
Heptane (0.03)	
Octane (0.01)	
Benzene (tbd)	
Toluene (tbd)	
Xylene (tbd)	

Notes:
1. MOL% in ( )
2. tbd;' to be determined'

With the exception of mercury (Hg), the non-organic compounds listed in Table 6.1 do not form a primary source of potential contamination of the Project area's groundwater resources. For example:

- Water (H_2O) is a contaminant within the LNG process but is not a direct potential environmental contaminant, other than the fact that water may form the solute for transfer of other contaminants (such as hydrocarbons and heavy metals) to the environment and (ultimately) groundwater.
- Carbon dioxide (CO_2), hydrogen sulphide (H_2S) and nitrogen (N_2) are also contaminants within the LNG process but, being gases, are not considered as potential groundwater contaminants. The potential for N_2 to form soluble compounds (nutrients) exists, and in that form may pose a contaminant source for groundwater.

However, the heavy metal Hg, which can bio-accumulate, does have the potential to contaminate groundwater resources of the Project Area if not managed appropriately through the process stream.

6.3. Utility and Offsite systems

Overview

A number of Offsite and Utility systems will operate alongside the LNG plant and are necessary for LNG production. Utility systems are directly related to LNG production, whilst offsite systems work to support LNG production. The following provides an overview of those systems that are typical to any LNG production facility and have the potential to release contaminants to the environment:

- *Heating Medium system (Utility)*
  The LNG plant will incorporate a hot oil heating medium system, which will comprise of three hot oil pumps.
- *Fuel Gas system (Utility)*
  The LNG plant fuel gas system will comprise of a high and low pressure gas system. The system will provide fuel to such facilities as the gas turbines (power generation) and propane compressor.
- *Demineralised Water system (Utility)*
  The demineralised water system comprises (i) a reverse osmosis unit and a demineraliser unit, and (ii) a 150 m^3 water storage tank. Demineralised water will be used for such activities as solvent makeup in the AGRU and washing of gas turbine blades.
- *Fire Water system (Offsite)*
  A 5,000 m^3 tank will be used to provide a supply of fire water for the LNG plant and supporting facilities (e.g. camp accommodation). In addition, seawater will provide a backup firewater source.
- *Freshwater supply (Offsite)*
  A wellfield is to be commissioned to meet the water needs of the LNG plant and supporting facilities. It is likely that the targeted groundwater resource will comprise the alluvial/colluvial groundwater system beneath Portion 152.

- *Effluent Disposal system (Offsite)*
  LNG plants and supporting facilities generate a range of effluent and wastes as part of routine operations, including maintenance activities. Effluent and waste is to be treated to meet appropriate standards and permit conditions prior to disposal. Treatment facilities include:

  - *waste water treatment facility*; manages effluent streams arising from clean water sewer, oily waste water sewer and chemical contaminated waste water sewer;

  - *non-hazardous solid waste treatment facility*; manages such waste as non-hazardous filter elements and molecular sieve, as well as putrescible and non-putrescible wastes (such as wood, plastics and food wastes). Combustible wastes will be incinerated, whilst other wastes will be contained within engineered containments (such as landfill); and

  - *hazardous solid waste treatment facility*; manages wastes such as amine carbon filters, used molecular sieves arising from dehydration and Hg removal beds, chemical wastes, sludges sourced from pigging and tanks, and medical wastes. These wastes will be stabilised and disposed of by licensed third parties.

- *Flare and Vent systems (Offsite)*
  During normal operation, shutdown conditions and plant emergencies the flare and vent systems provide for safe disposal of process waste gases and liquids. The flare system comprises a hot gas flare (to flare fluids with a high water content or heavy hydrocarbons), a cold gas flare (to flare fluids containing no water), and a low pressure flare (to flare operation vapour releases from the LNG storage and loading facility).

- *Drain systems (Offsite)*
  Drain systems will collect different effluents generated around the LNG plant:

  - waste water drains will provide for segregation of waste water sources and treatment (where necessary) for disposal, and monitoring will be undertaken to ensure water disposed offsite meets appropriate standards (as stipulated in Water Use Permits)

  - oily water will be delivered to an oil-water separator and treatment (CPI) facility, following which the recovered oil will be contained on site and water will be sent to the plant outfall.

- *Sanitary Sewage systems (Offsite)*
  Sanitary sewage will be treated using bio-technologies that involve biological oxidation, clarification and chlorination, prior to being sent to the combined outfall.

- *Storm water systems (Offsite)*
  Surface water run-off arising from parts of the plant site that could give rise to contamination will be contained on site by curbing and guttering for treatment via the CPI facility before being released to the combined outfall. Run-off from areas of the plant unlikely to give rise to water contamination will be delivered directly to the combined outfall.

- *Diesel Storage and Distribution system (Offsite)*
  The LNG plant will have the facility to receive, store and distribute diesel fuel for use in the plant and by tugs. Storage will be in tanks of various sizes contained within appropriately sized and designed bunds.

Potential groundwater contaminants associated with the utility and offsite systems

Table 6.2 presents a list of potential contaminants that may arise from operation of the utility and offsite systems.

Table 6.2 Potential contaminants associated with LNG support systems

Utility	Offsite
Hydrocarbons (from Hot Oil and Fuel Gas systems)	**Hydrocarbons** (from Effluent, Flare and Vent, Drain, Storm Water & Diesel Storage and Delivery systems)
Brine (from Demineralised Water system)	**Hazardous and dangerous chemicals** (from Effluent, Drain & Storm Water systems)
	Biological, Pharmaceutical and Nutrients (from Sewage system)

Potential impacts associated with groundwater supply development

Development of a water supply for the Project from groundwater resources will alter the groundwater balance of the Project area, such that aquifer water levels will decline and groundwater discharge at the coast will diminish. The extent to which this occurs will depend on abstraction rates and aquifer parameters.

7. Groundwater impact assessment

7.1. Overview

In relation to the LNG plant and process, most of the feed gas is comprised of volatile organic compounds, which will volatilise under normal conditions if released to the environment. However, some VOCs (such as benzene, toluene and xylene) in liquid form have the potential to contaminate groundwater, as do other heavier (yet volatile) hydrocarbons that will be produced during the process, but at very low quantities. Hydrocarbons along with Hg and aliphatic compounds form potential groundwater contaminants should there be an accidental release to the environment. The most important facilities within the plant that could act as sources of groundwater contaminants include the condensate storage tanks, fractionation unit, the AGRU and the dehydrator unit.

In relation to supporting activities and facilities around the LNG plant, a small number of potential groundwater contaminant sources exist. The most important of these include the waste water, storm water and the sewage systems, as well as hazardous and dangerous goods, and diesel fuel storage areas.

Groundwater supply development also has the potential to impact on the groundwater resources beneath and adjacent to Portion 152, possibly resulting in reduced discharge to the ocean and reduced access to adequate groundwater supplies by neighbouring villages.

Two important naturally occurring constraints to groundwater contamination exist within the physical environment surrounding Portion 152 should there be an accidental release. These include: (i) up to 5 m thickness of low permeability clayey sediments that will restrict the percolation of (potentially) contaminant laden soil water to the watertable and bind most potential contaminants during infiltration; and (ii) upward hydraulic gradients reportedly exist within the coastal plain shallow groundwater system, which will act to restrict infiltration and mixing of (potentially) contaminant laden soil water to the upper section of the watertable that occurs within the shallow clayey profile (contaminants that are denser than water will possibly migrate below the watertable, but these forms of contaminants have not been identified in the LNG process stream).

This section of the report addresses each of these aspects of the Project in relation to the risk of adverse (or unacceptable) impact occurring to the groundwater resources of, and adjacent to, Portion 152. The analysis references the following documents as well as drawing on information presented in earlier sections of this report:

- PNG LNG Concept Selection document *Emissions and Effluent Summary* (ref. PGLN-KB-PLZZ-000002).
- PNG LNG Concept Selection document *Concept Design Risk Assessment Report* (ref. PGLN-EH-FRRSK-800002).
- PNG LNG Concept Selection document *Tank Type Comparison LNG Storage Tanks* (ref. PGLN-KB-CRZZZ-800001).
- PNG LNG Concept Selection document *Dehydration Optimization Study* (ref. PGLN-KB-PROPT-800004).

7.2. Methodology

The impact assessment takes the form of a qualitative assessment of the scale of risk posed to groundwater resources by potential groundwater affecting activities associated with the LNG facility and water supply development.

Consistent with risk assessments undertaken elsewhere on similar projects, the basic aim is to provide a measure of the potential for a receptor to be adversely impacted by a particular threat (or potential groundwater affecting activity). *Risk* (R) is usually defined as the product of *likelihood* (L) and *consequence* (C), i.e. $R=LxC$, where:

- *likelihood* comprises an analysis of *threat level* (how severe is the potential threat) and *association* (how much influence can a particular threat have on a potential receptor based on mitigation strategies and physical environment); and
- *consequence* is a measure of the seriousness of impact if it occurs.

Appendix C presents risk assessment matrices for each of the potential groundwater affecting activities associated with the Project. Four risk assessment categories are proposed: **A**, **B**, **C** and **D**. Table 7.1 describes these.

Table 7.1 Groundwater impact assessment risk categories

Risk categories	Description
A	**Serious potential for adverse impact** ■ poses a serious risk to groundwater resource condition ■ possibly difficult to mitigate against and remediate accidental release
B	**Moderate potential for adverse impact** ■ poses a moderate risk to groundwater resource condition ■ possibly problematic to mitigate against and remediate accidental release
C	**Low potential for adverse impact** ■ poses a low risk to groundwater resource condition ■ likely to require routine approaches to mitigate against and remediate accidental release
D	**Adverse impact unlikely** ■ does not pose a real risk to groundwater resource condition

7.3. Operational and residual risk

7.3.1. LNG plant

Table 7.2 presents a listing of the LNG plant facilities having the potential to generate a groundwater contaminant stream, along with a brief description of the contaminant and its source, the possible frequency of 'contaminant' release to the environment, factors that will mitigate either the release of the contaminant or its' environmental impact once released, and an assessment of

A major physical control to mitigation of potential contaminant events impacting on groundwater resources is the 5 m or more thickness of very low permeability clayey sediments that underlies the LNG plant and reported upward hydraulic gradients within the coastal plain groundwater system (Rooke, 1988).

7.3.2. Utility and Offsite systems

Table 7.3 presents a listing of the Utility and Offsite systems having the potential to generate a groundwater contaminant stream. The qualitative assessment of the scale of risk posed to groundwater resources by potential contaminant release (in consideration of the mitigating factors) follows the approach presented in Table 7.1. As for the LNG facility, the 5 m or more thickness of very low permeability clayey sediments that underlies Portion 152 and upward hydraulic gradients within the coastal plain groundwater system present major physical controls to mitigation of potential contaminant events impacting on groundwater resources.

7.3.3. Groundwater supply development

Groundwater resources beneath Portion 152 present an option for developing water supplies to meet the needs of the LNG plant and support facilities (e.g. equipment washdown, office and camp accommodation, and hydrotest).

Table 7.4 presents a listing of potential impacting activities that may be associated with groundwater supply development:

- Depending on the 'bulk' salinity of groundwater (i.e. the mixed salinity of groundwater drawn from a Portion 152 wellfield) it may be necessary to undertake some level of desalination to meet potable water demands.
- It is possible that some level of treatment will be required to management potential biological contaminants of the groundwater resource (e.g. faecal coliforms, giardia).
- Anticipated total fresh water demand for the Project ranges between 640 and 900 ML/yr (i.e. approximately 20 to possibly more than 30 L/s). This range includes construction, process and potable demands.

An alternative option for Project supply development is sea water desalination, in which case it is unlikely there will be any potential adverse risk to groundwater resources.

Table 7.2 Analysis of potential for adverse groundwater impact arising from LNG plant facilities and processes

Facility	Potential contaminant	Source description	Frequency of release	Mitigation of contamination [1]	Operational Risk [2]	Residual Risk [3]
Feed Gas Separator	Hydrocarbon contaminated process water	Effluent from flowline pigging	Intermittent	Effluent collected in bunded area, stabilised and disposed of by licensed third parties.	**C**	**D**
AGRU	Solvents	Amine solution drain	Infrequent	Amine solution held within closed process. Accidental contaminant release will occur to paved and drained catchment. Amine carbon filters managed by disposal to solid waste treatment facility.	**D**	**D**
Dehydration unit	Hydrocarbon contaminated process water	Water recovered from dried gas stream	Continuous	Recovered water treated in waste water system. Accidental contaminant release will occur to paved and drained catchment.	**C**	**D**
Hg Absorber	Hg	Filter beds	Continuous	Hg recovery undertaken within a closed process circuit. Spent Hg laden material will be recovered for re-cycling. Spent S impregnated activated carbon absorbent will be in accordance with licence conditions.	**D**	**D**
Fractionation unit	Hydrocarbon condensate	Condensate recovered during fractionation	Continuous	Condensate recovery undertaken within a closed process circuit. Condensate stored in purpose built above ground storage tanks. Accidental contaminant release will occur to paved and drained catchment.	**C**	**D**
LNG and condensate storage tanks, and product transfer system	Hydrocarbons	Condensate release	Infrequent	LNG storage tanks will be purpose built full containment tanks. Condensate tanks will also be purpose built and bunded. Oil spill prevention and response plan is in place	**B**	**C**

Notes: 1. In addition to low permeability clayey sediments that underlie the LNG plant & upward groundwater hydraulic gradients
2. During Project life. 3. Following Project decommissioning

Table 7.3 Analysis of potential for adverse groundwater impact arising from utility and offsite systems

Facility	Potential contaminant	Source description	Frequency of release	Mitigation of contamination [1]	Operational Risk [2]	Residual Risk [3]
Heating Medium system	Heavy fraction hydrocarbons	Heavy hydrocarbon release	Continuous	Hot oil held within closed process. Accidental contaminant release will occur to paved and drained catchment.	**D**	**D**
Demineralised Water system	Brine	RO reject water	Intermittent	Brine collected within process for disposal to combined outfall.	**D**	**D**
Effluent Disposal system	Non-hazardous putrescibles and non-putrescibles	Office and camp wastes	Intermittent	Wastes are to be treated to appropriate standard and disposed of in accordance with best practice.	**D**	**D**
	Hazardous materials and chemical wastes, hydrocarbon effluent	LNG process wastes			**C**	
Flare and Vent systems	Hydrocarbons	LNG process and storage wastes	Continuous	Waste gases and liquid hydrocarbons flared and other wastes fully incinerated in purpose built facility.	**D**	**D**
Drain systems	Sediment	LNG process plant effluent collection	Intermittent	Effluents treated to appropriate standard and disposed of to combined outfall.	**D**	**D**
	Hydrocarbon effluent	LNG process plant effluent collection			**C**	
Sanitary Sewage system	Biological and pharmaceutical	Office and camp facilities	Continuous	Wastes treated using latest bio-technologies prior to disposal at combined outfall. Medical wastes to be excluded from sewage system.	**D**	**D**

Notes: 1. In addition to low permeability clayey sediments that underlie the LNG plant & upward groundwater hydraulic gradients
2. During Project life. 3. Following Project decommissioning

Table 7.3 Analysis of potential for adverse groundwater impact arising from utility and offsite systems (cont.)

Facility	Potential contaminant	Source description	Frequency of release	Mitigation of contamination [1]	Operational Risk [2]	Residual Risk [3]
Storm Water system	Suspended solids and sediment	Unpaved areas	Intermittent	Oily wastes treated in CPI facility to appropriate standard prior to disposal to combined outfall.	**D**	**D**
	Hydrocarbon effluent	Paved areas			**C**	
CPI Oil Sump	Hydrocarbon contaminated effluent	Oil and water separation	Intermittent	Separated oil contained on site, water treated to appropriate standard prior to disposal at combined outfall.	**C**	**D**
Diesel Storage and Distribution system	Hydrocarbons	Hydrocarbon release	Continuous	Diesel storage system will be purpose built, above ground and within containment bunds. Assumes no underground fuel delivery systems.[2] Oil spill prevention and response plan is in place.	**B**	**D**

Notes: 1. In addition to low permeability clayey sediments that underlie the LNG plant & upward groundwater hydraulic gradients
2. During Project life. 3. Following Project decommissioning

Table 7.4 Analysis of potential for adverse groundwater impact arising from groundwater supply development

Facility	Potential impact	Source description	Frequency of release	Mitigation of impact	Operational Risk [2]	Residual Risk [3]
Water supply	Groundwater drawdown	Drawdown interferes with village water supplies, reduces discharge to marine ecosystems	Continuous	Wellfield will be operated under permit conditions. Distance to near-by villages (~4 km) will mitigate interference effects from Project water supply development.	**B**	**D**
Water supply	Salinisation	Water supply draws poorer quality water (from bounding aquifers or ocean)	Continuous	Abstraction rates from individual wells will be low and so will mitigate against sea water intrusion. Waste waters from desalination and office/camp accommodation will be delivered to combined outfall, and not allowed to re-enter groundwater system.	**B**	**D**

Notes: * Category 'A' – **high** potential for adverse impact; Category 'B' – **moderate** potential for adverse impact; Category 'C' – **low** potential for adverse impact; Category 'D' – adverse impact **unlikely**

8. Conclusions and recommendations

8.1. Conclusions

8.1.1. General

Many of the constituents of the LNG process are volatile organic compounds, the exception being condensate. Under normal conditions (temperature, wind etc.) these volatile compounds when released to the environment will volatilise, thereby greatly reducing their potential for contaminating groundwater resources beneath and adjacent Portion 152. It is during the production of the end-products that potential groundwater contaminants are generated, e.g. liquid forms of VOCs (such as benzene, xylene and toluene), oily waste water, brines, heavy metals and hydrocarbon residues.

8.1.2. Operational impact assessment

The groundwater resource beneath and adjacent Portion 152 appears to be of a quality suitable for meeting the various water demands of the Project, e.g. potable supply and washdown waters.

The impact assessment has not identified any aspects of the Project that may pose a serious risk of impacting adversely on groundwater resources. However, three aspects of the Project are considered to present a moderate risk of impacting adversely on groundwater resources, including:

- Condensate storage tanks and transfer system (hydrocarbon release).
- Diesel storage and distribution system (hydrocarbon release).
- Groundwater supply development (groundwater drawdown, possible impact on existing groundwater users and environmental receptors, e.g. coastal mangrove ecosystems, which may be reliant to some extent on ‘fresher’ groundwater that discharges from inland to meet environmental water requirements).

A number of other aspects of the Project present a low risk of impacting adversely on groundwater resources, including:

- Feed gas separator (hydrocarbon effluent).
- Dehydration unit (potential hydrocarbon contaminated waste water).
- Fractionation unit (condensate release).
- Effluent disposal system (hazardous waste containment).
- Drain systems (hydrocarbon effluent release).
- Storm water system (hydrocarbon effluent release).
- CPI oil sump (hydrocarbon effluent release).

8.1.3. Residual impact assessment

Decommissioning of the Project facilities will reduce the risk of adverse impact to Portion 152 groundwater resources by removing contaminant sources and cessation of groundwater supply (if developed).

With the exception of the condensate storage tanks and transfer system, all of the former site facilities are unlikely to continue to contribute any residual risk to groundwater resources. Depending on the performance of the condensate storage and transfer system during operation of the Project, there is low potential for ongoing adverse impact to groundwater resources.

8.1.4. Water quality issues

The water sampling program conducted in association with the impact assessment identified lead concentrations in the water sample collected from Boera village at concentrations approximately twice the PNG *Drinking Water Standards* guideline (0.022 mg/L compared to 0.01 mg/L). The reported concentration could be representative of lead concentrations in the aquifer utilised for the village water supply, but is more likely associated with the village water storage and distribution system (eg. lead fittings). Lead can pose a serious risk to human health, particularly in young children and pregnant women. Further information on lead in water can be found at www.who.int/water_sanitation_health/en/.

The water sampling program also identified manganese in groundwater sampled from the central part of Portion 152 (GW-1) at concentrations exceeding the PNG *Drinking Water Standards* guideline (0.75 mg/L compared to 0.4 mg/L). The reported concentration could be related to old pumping equipment still remaining in the well, or from the decay of marine invertebrates within the formation that is intersected by the well. Manganese may cause neurological effects in humans, and should be considered further if groundwater is developed for potable project water supplies. Further information on manganese in water can be found at www.who.int/water_sanitation_health/en/.

8.2. Recommendations

To mitigate against release of potential groundwater contaminants to the environment and impacts associated with potential groundwater supply development, it will be important for the operators to apply international best practice engineering design and management principals in all parts of the plant and associated infrastructure. This will need to be underpinned by an understanding of site conditions, adherence to appropriate codes and standards, and implementation of quality assurance procedures and protocols. In particular:

a) an environmental management plan (EMP) should be prepared for the Project;
b) the installation of below ground liquid product (or waste) storage vessels and delivery systems should be avoided;
c) suitable containment bunding be provided for all parts of the plant area where hazardous or dangerous goods are stored or used; and
d) spill response plans should be developed for the Project and personnel involved in operating and maintaining the plant should receive adequate training in the implementation of the plan.

An appropriately designed groundwater monitoring network should be installed within the LNG plant area and near to other potentially contaminating activities (such as the proposed desalination plant if it is built on land, diesel fuel storages and CPI oil sump). The monitoring network will provide early warning of any potential groundwater contaminant events and allow implementation of remedial works prior to contaminants migrating and impacting on offsite receptors. Operation of the monitoring network should include:

a) collection of baseline data prior to commencement of construction (if possible) and commissioning;
b) preparation of a groundwater management plan that identifies the timing of monitoring events, the parameters to be monitored for (eg. groundwater levels and salinity, hydrocarbons and metals), and sample collection, preservation and chain-of-custody protocols; and
c) data evaluation and reporting procedures.

If a groundwater supply is developed for the LNG plant and support facilities, wellfield design will need to consider the influence of wellfield operation on neighbouring village wells (eg. at Boera and Papa). Further work is necessary to fully assess suitability of Portion 152 groundwater resources for development of a Project water supply, although data presented in this report suggests it may be possible. It may also be necessary to adopt a two-fold solution to meeting Project water demands by commissioning a dedicated wellfield, and supplementing groundwater supplies with seawater desalination.

A particular potential issue for the development of a Project groundwater supply is the concentration of lead reported for the Boera Village water sample and manganese for the groundwater sample collected from monitoring location GW-1. It will be important to confirm, through further sampling and laboratory analysis, the source of these metals is not from groundwater, otherwise additional treatment may be required prior to using groundwater for potable purposes.

A number of mitigation strategies are proposed to assist the operators in addressing issues associated with the Project that have the potential to impact on groundwater resource condition (water quality as well as water availability for ecosystems and existing users). The following lists recommended mitigation measures for the Project:

Issue	Recommended mitigation measure
Accidental spill of fuels, oils and other chemicals from vehicles / machinery and storage areas	■ Vehicles and machinery maintained to a high level of safety with respect to leaks. Drivers will be appropriately trained and have the required driving license. ■ Fuel, lubricating oils and chemicals will be stored in appropriately designed and sized designated areas that have impervious liners and/or bunds as appropriate. ■ Establish an onshore spill response plan appropriate to the project phase and include staff training at induction to inform workers of their responsibilities under the plan.
Acidification of Soil, surface and groundwater environments	■ Develop and implement Acid Sulfate Soils management plan.
Soil, surface and/or groundwater contamination	■ Suitable containment provided for all parts of the plant area where hazardous or dangerous goods are stored or used.
Groundwater contamination	■ Install a groundwater monitoring network within the LNG Facilities site and on the downstream hydraulic gradient side of potentially contaminating/impacting activities (e.g. the landfill site). ■ Network would be designed to alert the operator to the need for remedial action to contain a leak/spill.
Heavy fraction hydrocarbon contamination from heating medium system	■ Interception and treatment of runoff potentially containing hydrocarbons.
Contamination from effluents (i.e., stormwater and oily wastes)	■ Effluents treated to appropriate standard and disposed of to combined outfall. For example stormwater and oily wastes treated in CPI facility to appropriate standard prior to disposal in retention pond, in addition sufficient time is allowed for sediment and solids to settle within the pond prior to final offsite discharge in accordance with waste discharge permit.

Issue	Recommended mitigation measure
Hydrocarbon contamination (diesel storage and distribution system)	■ Diesel storage system will be purpose-built, above ground and within double-walled tanks or containment bunds. Oil spill prevention and response plans will be in place.
Hydrocarbon contamination due to condensate release (gas and condensate storage tanks and product transfer system)	■ MEG slop storage tanks will be purpose-built full-containment tanks and bunded. Hydrocarbon spill prevention and response plan will be in place.
Biological and pharmaceutical contamination from office and camp facilities (sanitary sewage system)	■ Biological, pharmaceutical and medical wastes will be treated and disposed of using appropriate technologies, which will be detailed in the environmental management plan. ■ Sewage treatment plants will be operated in accordance with the manufacturer's specifications and will comply with the conditions for discharge quality (including disinfection) specified in the relevant waste discharge permits.

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Limitation statement

The sole purpose of this report and the associated services performed by Sinclair Knight Merz (SKM) is to provide an assessment of groundwater impacts that may arise as a result of development of the PNG LNG Project, in accordance with the scope of services set out in the contract between SKM and *Coffey Natural Systems* ('the Client'). That scope of services was defined by the request of the Client.

SKM derived the data in this report primarily that provided by the Client, and. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, SKM has relied upon and presumed accurate certain information (or absence thereof) relative to the information provided by the Client. Except as otherwise stated in the report, SKM has not attempted to verify the accuracy or completeness of any such information.

The findings, observations and conclusions expressed by SKM in this report are not, and should not be considered, an opinion concerning the quality of the PNG LNG Project system design. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon information, drawings supplied by the Client, and information available in the public domain in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client and The operators Highlands, and is subject to and issued in connection with the provisions of the agreement between SKM and the Client. SKM accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

APPENDIX A
BASELINE SURVEY REPORT

PNG GROUNDWATER IMPACT ASSESSMENT

Appendix A 1 - Limited Soil Investigation Program

BACKGROUND

ExxonMobil is undertaking a feasibility study for the development of a LNG project in Papua New Guinea (PNG). The proposed PNG LNG project is to comprise the construction of infrastructure to process and transport hydrocarbon products from the Highlands of PNG south to the shoreline of the Gulf of Papua. From here, an offshore pipeline will transport the gas to an LNG liquefaction plant on the east side of the Gulf (to the west of Port Moresby). The investigation area, State Portion 152, is a candidate site for the development of an LNG plant.

This assessment is part of a larger project being implemented by SKM which involves a groundwater impact assessment of the proposed LNG facility (located on the Gulf of Papua near Port Moresby), with upstream activities (such as gas production, processing and conditioning, and product transfer pipelines) the subject of desktop studies.

This current project involves a site visit and limited intrusive soil investigation to allow a baseline assessment of the nature and extent of soil and groundwater pre-existing contamination issues at the site prior to the development of the proposed LNG facility.

Investigation Area

The investigation site is located approximately located 20 km north-west of Port Moresby on State Portion 152 (SP152 – Figure 1.2 within main report). The investigation area is approximately 4110 hectares and is bounded by Caution Bay to the west and mountainous terrain to the east. An investigation layout plan is provided as Figure 1.2 (within main report).

Soil Investigation Approach

A preliminary review of the site and historical site activities identified a range of potential contamination issues, with a site inspection and limited soil investigation program designed to assess a number of identified issues. Potential contamination issues are outlined in Table A1 - 1.1.

Table A1 - 1.1 Potential Contamination Issues

Site Area	Issue	Potential Contaminants
Site Wide Issues	Fill from unknown sources used to level areas of the site, establish roads and foundations	pH, OC/OP pesticides, heavy metals, nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts
	Presence of range of scrap and waste materials that may present an aesthetic limitation	
Cleared Areas – Possible plantation areas/pastures sown	Potential herbicide and pesticide contamination associated with historical agricultural use of the site	Heavy metals, OC/OP pesticides, phenoxy acid herbicides, triazines
Former Station Buildings	Underslab/building termiticide treatments at former buildings	Arsenic and OC pesticide - soil impacts
	Residual oils/fuels associated with equipment/vehicle storage/traffic	TPH/PAH, lead, cresols/phenols, VHCs - soil impacts
	Above/under ground storage of fuel for vehicles and generator	TPH/BTEX/PAH, lead – soil/groundwater impacts
	Historical use of septic system/waste disposal	pH, heavy metals, nutrients and faecal coliform/e-coli - soil/groundwater impacts
Former airfield	Imported fill used to establish airfield	pH, OC/OP pesticides, heavy metals, nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts
	Workshops/sheds associated and fuel storage associated with former airfield	heavy metals, TPH/PAH, lead, cresols/phenols, VHCs - soil impacts
Cattle yards	Historical use of cattle treatments	Arsenic, nutrients and OC/OPs
Foreshore/Backwater Areas	Heavy metals within sediment material – mine tailings (i.e. from rivers to north and south of site)	Heavy metals & cyanide

*Heavy metals includes Arsenic, Cadmium, Copper, Chromium, Cobalt, Nickel, Manganese, Lead, Mercury and Zinc.

The assessment of potential issues included a visual assessment along with a limited soil investigation program comprising a total of 16 soil investigation locations and submission of select samples to assess for potential contaminants. Timing constraints limited the soil investigation program, however all areas of the site identified in the desktop review were visually assessed with soil bores installed at a number of locations. The location of soil investigations was limited by site access and ordinance clearance constraints.

SOIL INVESTIGATION

Methodology

Along with visual inspection to identify visual/olfactory evidence of contamination, a total of 14 soil bores were installed and two surface samples were collected across the site to assess the potential contamination issues as outlined in Table A1 - 2.1

Table A1 - 2.1 Assessment of Potential Contamination Issues

Site Area	Issue	Potential Contaminants	Method
Site Wide Issues	Fill from unknown sources used to level areas of the site, establish roads and foundations	pH, OC/OP pesticides, heavy metals, nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts	Visual assessment and Soil Bores SB2, SB3, SS1 and SS2
Cleared Areas – Possible plantation areas/pastures sown	Potential herbicide and pesticide contamination associated with historical agricultural use of the site	Heavy metals, OC/OP pesticides, phenoxy acid herbicides, triazines	Visual assessment and all Soil Bores
Former Station Buildings	Underslab/building termiticide treatments at former buildings	Arsenic and OC pesticide - soil impacts	Visual assessment and surface samples SS1 and SS2
	Residual oils/fuels associated with equipment/vehicle storage/traffic	TPH/PAH, lead, cresols/phenols, VHCs - soil impacts	
	Above/under ground storage of fuel for vehicles and generator	TPH/BTEX/PAH, lead – soil/groundwater impacts	
	Historical use of septic system/waste disposal	pH, heavy metals, nutrients and faecal coliform/e-coli - soil/groundwater impacts	
Former airfield	Imported fill used to establish airfield	pH, OC/OP pesticides, heavy metals, nutrients and broader suite of contaminants including but not limited to TPH/PAH/VHCs -soil and groundwater impacts	Visual assessment and SB1, SB2 and SB12
	Workshops/sheds associated and fuel storage associated with former airfield	heavy metals, TPH/PAH, lead, cresols/phenols, VHCs - soil impacts	
Cattle yards	Historical use of cattle treatments	Arsenic, nutrients and OC/OPs	Visual Assessment
Foreshore/Backwater Areas	Heavy metals within sediment material – mine tailings (i.e. from rivers to north and south of site)	Heavy metals & cyanide	Visual Assessment

Intrusive soil investigations were undertaken on site between the 29th and 30th of May 2008. Soil bore samples were collected using a hand auger with the surface samples collected using a hand trowel. All soil sampling equipment was cleaned prior to the commencement of drilling and between locations to minimise the potential of cross contamination between sampling locations.

A soil investigation plan is provided as Figure 4.1 (within main report). Each soil bore was advanced at least 0.5 metres into natural soil to a maximum depth of 1.0 metres below ground level (m bgl) at various locations across the investigation site.

During drilling, soils were logged in accordance with the Unified Soil Classification (USC) system. An experienced SKM scientist also noted the absence or evidence of contamination (e.g. suspicious fill, staining or odour). Samples were collected from the subsurface, at changes in lithology (including each distinct fill layer), at the commencement of natural soils, at the base of the borehole and at a minimum of 0.5 m intervals.

All sample locations were within areas cleared of ordinances by client personnel prior to the inception of the soil investigation program.

Analytical Program

Soil samples were placed in laboratory supplied and cleaned glass jars and stored on ice in an insulated cooler prior to transport to the laboratory under standard chain of custody protocols.

In general, samples submitted for analysis generally comprised surficial samples (0 to 0.1 m bgl). A summary of the adopted analytical program is provided as Table A1 - 3.1

Australian Laboratory Services (ALS) was selected as the primary analytical laboratory and Labmark as the secondary laboratory. ALS and Labmark are National Association of Testing Authorities (NATA) accredited for all of the proposed analyses and conduct analyses in accordance with the requirements of Schedule B(3) of the NEPM.

Table A1 - 3.1 Adopted Analytical Program

Analysis	Analytical Schedule
13 metals screen* & soil pH	15 - generally 1 sample per soil investigation location
OC/OP pesticides, TPH/BTEX, PAHs	5 – targeting potential contamination issues
Cyanide, Phenoxy Acid Herbicides	2 – targeting potential contamination issues
Faecal coliforms & E-coli	2 – targeting potential contamination issues
Nutrients including nitrate, nitrite, sulphate, phosphate, total N, TKN and total sulphur	2 – targeting potential contamination issues
Vic EPA Screen**	2 – targeting potential contamination issues

*The 13 metals suite includes As, Ba, Be, Cd, Cr, Co, Cu, Mn, Ni, Pb, V, Zn & Hg

**The Vic EPA screen (448.2) comprises the following analysis TPH C6-C36 fraction, PAH's, PCB's, phenols, OC pesticides, volatile organic compounds (VOCs), metals (Ag, As, Be, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, V and Zn), total cyanide and fluoride.

QA/QC samples include 1 in 20 inter laboratory duplicates, 1 in 20 intra laboratory duplicates, one trip blank per esky containing samples required for analysis of volatile constituents and one equipment rinsate blank from the augering equipment following decontamination.

Adopted Assessment Criteria

The adopted assessment guidelines include:

- National Environmental Protection (Assessment of Site Contamination) Measure (NEPM. 1999), F- Commercial/Industrial guidelines;
- National Environmental Protection (Assessment of Site Contamination) Measure (NEPM. 1999), A- Residential guidelines (most sensitive NEPM Human Intervention Levels); and
- Guidelines for Assessing Service Station Sites, NSW Environment Protection Authority, 1994, sensitive landuse (for TPH/BTEX only).

Site Investigation Results

Site Investigation Results

During the drilling of SB1-SB14, the following lithology was generally encountered:

- Black to brown sandy clays comprising high to very high plasticity clays and fine to medium grained sands with occasional gravel up to depths between 0.5 and 1.0mbgl, and followed at depth at some locations by:
- Sandy Gravelly Silt, brown/cream with fine to coarse grained sands and calcite gravels up to 30mm until the base of the boreholes.

Surface samples SS01 and SS02 comprised of black/brown sandy gravelly clay material. Minor ash and cinders were encountered in SS01.

With the exception of minor ash and cinders indentified in soil investigation location SS01, no other visual/olfactory evidence of contamination was identified in the field.

Soil bore lithological logs are provided as Appendix A1 - A.

Soil Analytical Results

A summary of the soil analytical data is provided in Table A1 - 1 to Table A1 - 6 with certified laboratory analytical reports provided as Appendix A1 - B.

Soil pH

Soil pH ranged from 6.6 in SB1_0-0.1 to 8.5 in SB11_0-0.1. Generally soil pH was between 7.5 and 8.5 indicating neutral to slightly alkaline conditions exist at the locations tested.

Heavy metals

All reported concentrations of analysed heavy metals were below the adopted NEPM (1999) F commercial industrial guidelines.

All reported concentrations of arsenic were below laboratory LORs.

Concentrations of manganese ranged from 375 mg/kg in SB3_0.4-0.5 to 1,860 mg/kg in SB1_0-0.1, with one soil samples (SB1_0-0.1) reporting a concentration of manganese marginally in exceedence of the most sensitive NEPM(1999) HIL guideline (A – residential) of 1,500 mg/kg.

Nutrients

Concentrations of nutrients were reported as follows:

- sulphate ranged from 610 mg/kg in SB9_0-0.1 to 930 mg/kg in SB11_0-0.1;
- total N ranged from 590 mg/kg in SB11_0-0.1 to 2,320 mg/kg in SB9_0-0.1; and
- phosphorous ranged from below laboratory Limits of Reporting (LOR) to 0.52 mg/kg in SB09_0-0.1.

Phenoxy Acid Herbicides and Cyanide

All reported concentrations of phenoxy acid herbicides and cyanide were below Laboratory LORs and adopted guidelines (where available).

OC/OP pesticides

All reported concentrations of OC and OP pesticides were below Laboratory LORs and adopted guidelines.

TPH/BTEX & PAHs

All reported concentrations of TPH/BTEX and PAHS were below Laboratory LORs and adopted guidelines.

Cyanide

All reported concentrations of cyanide were below Laboratory LORs and adopted guidelines.

E-Coli and Faecal Coliforms

All reported concentrations of E-Coli were below Laboratory LORs and adopted guidelines. Concentrations of faecal coliforms ranged from below laboratory LOR to 9 feacal coliforms/g in SS2, marginally in excess of the laboratory LOR.

Comp. VIC EPA Screen

Two samples (SB3_0-0.1 and SB11_0-0.1) were submitted for a comprehensive Victorian EPA screen, which apart from the aforementioned analytes, includes VOCs, polychlorinated biphenyls (PCBs), phenols and fluoride.

Concentrations less than laboratory LORs and/or adopted guidelines values (where available) were reported for all VOCs, PCBs, phenols and fluoride.

Data Quality Assessment

The quality of analytical data produced for this soil investigation program has been assessed with reference to the following issues:

- sampling technique;
- preservation and storage of samples upon collection and during transport to the laboratory;
- sample holding times;
- analytical procedures;
- laboratory limits of reporting;
- laboratory quality assurance/quality control (QA/QC) procedures; and
- occurrence of apparently unusual or anomalous results.

Laboratory QA/QC procedures and results are detailed in the certified laboratory results contained in Appendix A1 - B. A summary of the data quality assessment is included as Appendix A1 - C.

For the soil investigation program elevated Relative Percentage Difference's (RPD's) above the acceptable difference of 50% were observed for a number of compounds between both the primary sample and intra and inter laboratory duplicates. Elevated RPD's were identified for heavy metals, nutrients and fluoride, A number of the elevated RPD's were the result of one or more of the following:

- Concentrations were reported close to the LOR where precision and accuracy on determining values is compromised and therefore not considered significant in terms of overall interpretation of contamination issues at the site.
- Elevated RPD's for contaminants in soils are often related to soil heterogeneity of the sample rather than the accuracy and/ or precision as reflected by sampling or analytical technique.

- Elevated RPD's reported between the primary and inter-laboratory duplicate sample were in many cases not considered significant as the blind coded intra-laboratory duplicate reported results close to that of the primary result providing confidence in the primary reported data.

Due to logistical constraints, holding times for a number of analytes were exceeded. Based on the results reported, the majority of analytes which were analysed out of holding time reported concentrations below laboratory LORs.

Due to limited sample quantities, duplicate analysis was not undertaken for a number of analytes. It is recommended in future sampling events, duplicate analysis for all analytes is undertaken at a minimum of 1 in 20 primary samples to allow a complete QA/QC assessment of the primary data.

In summary, quality control information from the primary laboratory and supported with field duplicate analysis from the secondary laboratory indicates an acceptable degree of QA/QC information was collected and reported.

All samples were collected, stored and transported to the laboratory in accordance with standard SKM Chain of Custody protocols which are consistent with the requirements of Schedule B(2) of the NEPM (NEPC,1999). Laboratory analysis was undertaken within specified holding times and in accordance with National Association of Testing Authorities (NATA) accepted analytical procedures and the requirements of Schedule B(3) of the NEPM (NEPC,1999).

Trip blanks for both laboratories were below LOR supporting the appropriate storage and transport of collected samples to the laboratories. The rinsate sample reported trace concentrations of manganese and cadmium with all other analytes below LOR. Based on the low concentrations reported, it is not considered this issue will significantly alter the interpretation of the primary results with the majority of samples reporting concentrations of heavy metals and wide range of other analytes below adopted guideline values.

CONCLUSIONS

An assessment of potential contamination issues was undertaken between the 29th and 30th of May 2008 and comprised of a site inspection and a limited intrusive investigation comprising of 14 soil bores and collection of 2 surficial samples.

With the exception of minor ash and cinders at one location, no other visual/olfactory evidence of contamination was identified in the site inspection. The soil investigation program generally identified natural soil, with limited fill material encountered.

The analytical program did not identify concentrations of heavy metals, TPH/BTEX, PAHs, OC/OP pesticides, phenoxy acid herbicides, PCBs, cyanide, fluoride, VOCs in excess of adopted commercial/industrial guidelines at the locations tested.

Based on the results of this limited investigation comprising visual inspection and soil investigation of select areas of the site, no evidence of contamination was identified at the locations tested that poses a

significant risk to human health based on future commercial/industrial use of the site. Please note that the site encompasses over 4,000 hectares with the adopted investigation only targeting select areas, with subsequent limitations detailed in Section 4.

LIMITATIONS

This report has been prepared in accordance with the program outlined in the proposal prepared for Coffey Geosciences. The services performed by SKM have been conducted in a manner consistent with the level of quality and skills generally exercised by members of its profession and consulting practice. No warranty or guarantee of site conditions is intended.

This report is solely for the use of Coffey Geosciences and may not contain sufficient information for purposes of other parties or for other uses. Any reliance on this report by third parties shall be at such parties' sole risk. This report shall only be presented in full and may not be used to support any other objectives than those set out in the report, except where written approval with comments are provided by SKM

The information in this report is considered to be accurate with respect to information provided and conditions encountered at the site at the time of investigation and considering the inherent limitations associated with extrapolating information from a sample data set. Subsurface conditions can vary across a particular site and no practical degree of sampling can ever eliminate the possibility that conditions may be present at a site that have not been represented through sampling. Actual conditions in areas not sampled may differ from predictions.

SKM has used the methodology and sources of information outlined within this report and have made no independent verification of this information beyond the agreed scope of works. SKM assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that the information provided to SKM was false.

Since subsurface conditions (including contamination concentrations) can change within a limited period of time and space, this inherent limitation to the representation of site conditions provided by this report should always be taken into consideration particularly if the report is used after a delay in time. No responsibility for any changes in site conditions beyond the time of this investigation is assumed by SKM.

ATTACHMENTS

Tables

Table A1 - 1 – Summary of Soil Analytical Data – Heavy Metals, Fluoride, Cyanide and Nutrients
Table A1 - 2 - Summary of Soil Analytical Data – TPH/BTEX and PAHs
Table A1 - 3 - Summary of Soil Analytical Data – Phenols, Chlorinated Hydrocarbons * PCBs
Table A1 - 4 – Summary of Soil Analytical Data – OC/OP Pesticides
Table A1 - 5 – Summary of Soil Analytical Data - VOCs
Table A1 - 6 – Summary of Soil Analytical Data - Phenoxyacetic acids, E-Coli and Faecal Coliforms

Attachments

Attachment A1 - A	Soil Lithological Logs
Attachment A1 - B	Soil Laboratory Analytical Reports
Attachment A1 - C	Data Quality Assessment

TABLES A1

Table A1 - 5. Summary of Soils Analytical Results - Volatile Organic Compunds (VOCs)

Project Number VE30023

PNG LNG Project

					Sample Location	SB03_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	SB11_0.0-0.1
					Laboratory	ALS	ALS	ALS	LABMARK
					Date Sampled	29/05/2008	29/05/2008	29/05/2008	29/05/2008
					Lab Report	EB0807386	EB0807386	EB0807386	E038049
					Duplication		Primary	Intra	Inter
ANALYTE	**ALS LOR**	**LABMARK LOR**	**Units**	**NEPM (1999) - Health Investigation Levels - A**	**NEPM (1999) - Health Investigation Levels - F**				
Volatile Organic Compunds (VOCs)									
Fumigants									
2.2-Dichloropropane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2-Dichloropropane	0.5		mg/kg			<0.5	<0.5	<0.5	-
cis-1.3-Dichloropropylene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
trans-1.3-Dichloropropylene	0.5		mg/kg			<0.5	<0.5	<0.5	-
1.2-Dibromoethane (EDB)	0.5		mg/kg			<0.5	<0.5	<0.5	-
Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	5	5	mg/kg			<5	<5	<5	<5
Chloromethane	5	5	mg/kg			<5	<5	<5	<5
Vinyl chloride	5	5	mg/kg			<5	<5	<5	<5
Bromomethane	5	5	mg/kg			<5	<5	<5	<5
Chloroethane	5	5	mg/kg			<5	<5	<5	<5
Trichlorofluoromethane	5	5	mg/kg			<5	<5	<5	<5
1.1-Dichloroethene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Iodomethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	-
trans-1.2-Dichloroethene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.1-Dichloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
cis-1.2-Dichloroethene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.1.1-Trichloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.1-Dichloropropylene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2-Dichloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Trichloroethene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Dibromomethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.1.2-Trichloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.3-Dichloropropane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.1.1.2-Tetrachloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
trans-1.4-Dichloro-2-butene	0.5		mg/kg			<0.5	<0.5	<0.5	-
cis-1.4-Dichloro-2-butene	0.5		mg/kg			<0.5	<0.5	<0.5	-
1.1.2.2-Tetrachloroethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2.3-Trichloropropane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Pentachloroethane	0.5		mg/kg			<0.5	<0.5	<0.5	-
1.2-Dibromo-3-chloropropane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Halgonenated Aromatic Compounds									
Chlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Bromobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
2-Chlorotoluene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
4-Chlorotoluene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.3-Dichlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.4-Dichlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2-Dichlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2.4-Trichlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
1.2.3-Trichlorobenzene	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Trihalomethanes									
Chloroform	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5
Bromoform	0.5	0.5	mg/kg			<0.5	<0.5	<0.5	<0.5

Notes:

- Not Analysed

LOR - Limits of Reporting

*Guidelines for assessing Service Station Sites: (NSW EPA 1994)

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

Table A1 - 4. Summary of Soil Analytical Results - OC/OP Pesticides
Project Number: VE30023
PNG LNG Project

						Sample Location	SB03_0.0-0.1	SB04_0.0-0.1	SB06_0.0-0.1	SB09_0.0-0.1	SB11_0.0-0.1	SB11_0.0-0.1	SB12_0.0-0.1
						Laboratory	ALS	ALS	ALS	ALS	ALS	LABMARK	ALS
						Date Sampled	29/05/2008	29/05/2008	29/05/2008	30/05/2008	29/05/2008	29/05/2008	29/05/2008
						Lab Report	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	E038049	EB0807386
						Duplication					Primary	Inter	
ANALYTE	**ALS LOR**	**LABMARK LOR**	**Units**	**NEPM (1999) - Health Investigation Levels - A**	**NEPM (1999) - Health Investigation Levels - F**	**NEPM (1999) - Ecological Investigation Levels - EILs**							
Organochlorine Pesticides (OCPs)													
alpha-BHC	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	0.05	mg/kg	10	50		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	0.05	0.05	mg/kg	10	50		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Chlordane (sum)	0.05	0.05	mg/kg	10	50		-	<0.05	-	<0.05	<0.05	<0.05	-
trans-Chlordane	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	0.05	0.05	mg/kg	200	1000		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	0.2	0.2	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan (sum)	0.05	0.05	mg/kg				-	<0.05	-	<0.05	<0.05	<0.05	-
beta-Endosulfan	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin ketone	0.05	0.05	mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.2	0.2	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Organophosphorus Pesticides (OPPs)													
Dichlorvos	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Demeton-S-methyl	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Monocrotophos	0.2		mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
Dimethoate	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Diazinon	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Chlorpyrifos-methyl	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Parathion-methyl	0.2		mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
Malathion	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Fenthion	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Chlorpyrifos	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Parathion	0.2		mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2
Pirimphos-ethyl	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Chlorfenvinphos	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Bromophos-ethyl	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Fenamiphos	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Prothiofos	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Ethion	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Carbophenothion	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Azinphos Methyl	0.05		mg/kg				<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05

Notes:
- Not Analysed
LOR - Limits of Reporting
p - results pending
NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)
NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

Table A1 - 3. Summary of Soils Analytical Results - Chlorinated Hydrocarbons, Phenols & PCBs
Project Number: VES30023
PNG LNG Project

						Sample Location	SB03_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	DUP2_0.0-0.1
						Laboratory	ALS	ALS	ALS	LABMARK
						Date Sampled	29/05/2008	29/05/2008	29/05/2008	29/05/2008
						Lab Report	EB0807386	EB0807386	EB0807386	E038049
						Duplication		Primary	Intra	Inter
ANALYTE	**ALS LOR**	**LABMARK LOR**	**Units**	**NEPM (1999) - Health Investigation Levels - A**	**NEPM (1999) - Health Investigation Levels - F**	**NEPM (1999) - Ecological Investigation Levels - EILs**				
Phenols										
Phenol	0.5	0.5	mg/kg	8500	42500		<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
2-Methylphenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
3- & 4-Methylphenol	0.5	1	mg/kg				<0.5	<0.5	<0.5	<0.5
2-Nitrophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<1.0
2.4-Dimethylphenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
2.4-Dichlorophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
2.6-Dichlorophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
4-Chloro-3-Methylphenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
2.4.6-Trichlorophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
2.4.5-Trichlorophenol	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	1	1	mg/kg				<1	<1	<1	<1
Chlorinated Hydrocarbons										
1.3-Dichlorobenzene	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	-
1.4-Dichlorobenzene	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	-
1.2-Dichlorobenzene	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	-
Hexachloroethane	0.5		mg/kg				<0.5	<0.5	<0.5	-
1.2.4-Trichlorobenzene	0.5	0.5	mg/kg				<0.5	<0.5	<0.5	-
Hexachloropropylene	0.5		mg/kg				<0.5	<0.5	<0.5	-
Hexachlorobutadiene	0.5		mg/kg				<0.5	<0.5	<0.5	-
Hexachlorocyclopentadiene	2.5		mg/kg				<2.5	<2.5	<2.5	-
Pentachlorobenzene	0.5		mg/kg				<0.5	<0.5	<0.5	-
Hexachlorobenzene (HCB)	1		mg/kg				<1.0	<1.0	<1.0	-
PCBs										
PCBs	0.1	3	mg/kg				<0.1	<0.1	-	<3

Notes:

- Not Analysed

LOR - Limits of Reporting

p - results pending

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM EILs: Sample in excess of Adopted Guideline (NEPC 1999)

Table A1 - 2. Summary of Soil Analytical Results - TPH/BTEX and PAHs
Project Number: VE30023
PNG LNG Project

ANALYTE	ALS LOR	LABMARK LOR	Units	NEPM (1999) - Health Investigation Levels - A	NEPM (1999) - Health Investigation Levels - F	NSW EPA (1994)	Sample Location	SB03_0.0-0.1	SB04_0.0-0.1	SB06_0.0-0.1	SB09_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	DUP2_0.0-0.1	SB13_0.0-0.1	SS01
							Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	LABMARK	ALS	ALS
							Date Sampled	29/05/2008	29/05/2008	29/05/2008	30/05/2008	29/05/2008	29/05/2008	29/05/2008	29/05/2008	30/05/2008
							Lab Report	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	E038049	EB0807386	EB0807386
							Duplication					Primary	Intra	Inter		
Total Petroleum Hydrocarbons (TPH)																
C6 - C9 Fraction	10	50	mg/kg			65		<10	<10	<10	<10	<10	<10	<50	<10	<10
C10 - C14 Fraction	50	50	mg/kg					<50	<50	<50	<50	<130^	<50	<50	<50	<50
C15 - C28 Fraction	100	100	mg/kg					<100	<100	<100	<100	<250^	<100	<100	<100	<100
C29 - C36 Fraction	100	100	mg/kg					<100	<100	<100	<100	<250^	<100	<100	<100	<100
Total C10 -C36			mg/kg			1000*/5000**										
BTEX																
Benzene	0.2	1	mg/kg			1		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<0.2	<0.2
Toluene	0.5	1	mg/kg			130		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5
Ethylbenzene	0.5	1	mg/kg			50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5
meta- & para-Xylene	0.5	2	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
ortho-Xylene	0.5	1	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5
Total Xylene			mg/kg			25		-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																
Naphthalene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	0.5	1	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5
Benzo(k)fluoranthene	0.5		mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Benzo(a)pyrene	0.5	0.5	mg/kg	1	5	1		-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	0.5	0.5	mg/kg					-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of PAHs			mg/kg	20	100	20		-	-	-	-	-	-	-	-	-

Notes:

- Not Analysed

LOR - Limits of Reporting

^ Elevated LOR

*Guidelines for assessing Service Station Sites: (NSW EPA 1994)

** Dutch Intervention Guidelines (2000)

p - results pending

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

NSW EPA Guidelines for Assessing Service Station Sites

Table A1 - 1. Summary of Soils Analytical Results - pH, Heavy Metals, Cyanide, Fluoride and Nutrients
Project Number: VE30023
PNG LNG Project

ANALYTE	ALS LOR	LABMARK LOR	Units	NEPM (1999) - Health Investigation Levels - A	NEPM (1999) - Health Investigation Levels - F	Sample Location	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1	SB06_0.0-0.1	SB07_0.0-0.1	SB09_0.0-0.1	SB10_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	DUP2_0.0-0.1
						Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	LABMARK
						Date Sampled	29/05/2008	29/05/2008	29/05/2008	29/05/2008	29/05/2008	29/05/2008	29/05/2008	30/05/2008	30/05/2008	29/05/2008	29/05/2008	29/05/2008
						Lab Report	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	E038049
						Duplication										Primary	Intra	Inter
Moisture																		
Moisture Content (dried @ 103°C)	1		%				24.5	25.3	20.2	21	19.2	20.9	22.8	13.9	13.9	-	21.7	-
pH																		
pH Value	0.1	0.1	pH units				6.6	7.8	8.1	7.9	8	8	7.6	-	7.6	8.5	8.6	8.1
Heavy Metals																		
Antimony	5	1	mg/kg				-	<5	-	-	-	-	-	-	-	<5	<5	2
Arsenic	5	1	mg/kg	100	500		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	3
Barium	10	5	mg/kg				200	-	80	190	170	100	180	180	360	-	-	97
Beryllium	1	1	mg/kg	20	100		<1	<1	<1	<1	<1	<1	<1	<1	1	<1	4	<1
Cadmium	1	0.1	mg/kg	20	100		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1
Chromium	2	1	mg/kg	100*	500*		10	25	14	33	32	26	18	23	10	12	25	16
Cobalt	2	1	mg/kg	100	500		29	13	10	17	14	15	18	15	28	8	18	13
Copper	5	2	mg/kg	1000	5000		11	33	19	39	32	34	27	33	16	17	30	29
Lead	5	2	mg/kg	300	1500		28	11	7	12	12	10	15	11	21	8	16	14
Manganese	5	5	mg/kg	1500	7500		**1860**	-	375	538	401	466	770	598	1300	-	-	427
Molybdenum	2	1	mg/kg				-	<2	-	-	-	-	-	-	-	<2	<2	<1
Nickel	5	1	mg/kg	600	3000		12	24	15	28	20	28	22	27	19	13	23	21
Selenium	2	2	mg/kg				-	<5	-	-	-	-	-	-	-	<5	<5	<2
Silver	2		mg/kg				-	<2	-	-	-	-	-	-	-	<2	<2	-
Tin	5	1	mg/kg				-	<5	-	-	-	-	-	-	-	<5	<5	<1
Vanadium	5		mg/kg				26	48	29	60	61	43	43	39	40	18	31	-
Zinc	5	5	mg/kg	7000	35000		7	42	24	52	35	58	41	61	16	22	38	39
Mercury	0.1	0.05	mg/kg	15**	75**		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11
Cyanide and Flouride																		
Cyanide (total)	1	1	mg/kg	250***	1250***		-	-	-	<1	-	-	-	<1	-	<1	<1	<1
Fluoride (soluble)	40	1	mg/kg				-	140	-	-	-	-	-	-	-	140	190	15
Sulphate																		
Sulfate as SO4 2-	100	10	mg/kg		2000****		-	-	-	680	-	-	-	610	-	930	1410	260
Sulfur - Total as S (LECO)	0.01	100	%				-	-	-	-	-	-	-	-	-	-	-	300
Nutrients																		
Nitrite as N (Sol.)	0.1	0.1	mg/kg				-	-	-	<0.1	-	-	-	0.2	-	<1.0^	2	<0.1
Nitrate as N (Sol.)	0.1	0.1	mg/kg				-	-	-	1.5	-	-	-	0.3	-	<5.0^	2.5	5.9
Nitrite + Nitrate as N (Sol.)	0.1		mg/kg				-	-	-	1.5	-	-	-	0.5	-	<5.0^	4.4	-
Total Kjeldahl Nitrogen as N	20	10	mg/kg				-	-	-	1670	-	-	-	2320	-	590	1360	2250
Total Nitrogen as N	20	10	mg/kg				-	-	-	1670	-	-	-	2320	-	590	1360	2260
Reactive Phosphorus as P	0.1		mg/kg				-	-	-	<0.10	-	-	-	0.52	-	<5.00^	4.92	-

Notes:

- Not Analysed

LOR - Limits of Reporting

* Assumes chromium VI

** Assumes inorganic mercury

*** Assumes free cyanide

**** NEPM EIL guideline for protection of built structures

^ Elevated LOR

p - results prnging

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

Table A1 - 1. Summary of Soils Analytical Results - pH, Heavy Metals, Cyanide, Fluoride and Nutrients

Project Number: VE30023

PNG LNG Project

					Sample Location	SB11_0.5-0.6	SB12_0.0-0.1	SB13_0.0-0.1	SB14_0.0-0.1	SS01	SS02
					Laboratory	ALS	ALS	ALS	ALS	ALS	ALS
					Date Sampled	29/05/2008	29/05/2008	29/05/2008	30/05/2008	30/05/2008	30/05/2008
					Lab Report	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386	EB0807386
					Duplication						
ANALYTE	**ALS LOR**	**LABMARK LOR**	**Units**	**NEPM (1999) - Health Investigation Levels - A**	**NEPM (1999) - Health Investigation Levels - F**						
Moisture											
Moisture Content (dried @ 103°C)	1		%			34.8	27.9	17.8	20.3	13.8	14.2
pH											
pH Value	0.1	0.1	pH units			8	8.1	7.9	8	7.8	8
Heavy Metals											
Antimony	5	1	mg/kg			-	-	-	-	-	-
Arsenic	5	1	mg/kg	100	500	<5	<5	<5	<5	<5	<5
Barium	10	5	mg/kg			110	320	180	160	260	190
Beryllium	1	1	mg/kg	20	100	<1	<1	<1	<1	<1	<1
Cadmium	1	0.1	mg/kg	20	100	<1	<1	<1	<1	<1	<1
Chromium	2	1	mg/kg	100*	500*	23	12	22	40	62	66
Cobalt	2	1	mg/kg	100	500	16	23	17	21	22	26
Copper	5	2	mg/kg	1000	5000	31	12	32	49	62	110
Lead	5	2	mg/kg	300	1500	14	18	14	11	50	846
Manganese	5	5	mg/kg	1500	7500	664	1370	672	771	754	921
Molybdenum	2	1	mg/kg			-	-	-	-	-	-
Nickel	5	1	mg/kg	600	3000	25	16	25	44	66	72
Selenium	2	2	mg/kg			-	-	-	-	-	-
Silver	2		mg/kg			-	-	-	-	-	-
Tin	5	1	mg/kg			-	-	-	-	-	-
Vanadium	5		mg/kg			38	34	46	60	69	72
Zinc	5	5	mg/kg	7000	35000	40	13	48	73	342	495
Mercury	0.1	0.05	mg/kg	15**	75**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cyanide and Flouride											
Cyanide (total)	1	1	mg/kg	250***	1250***	-	-	-	-	-	-
Fluoride (soluble)	40	1	mg/kg			-	-	-	-	-	-
Sulphate											
Sulfate as SO4 2-	100	10	mg/kg		2000****	-	-	-	-	-	-
Sulfur - Total as S (LECO)	0.01	100	%			-	-	-	-	-	-
Nutrients											
Nitrite as N (Sol.)	0.1	0.1	mg/kg			-	-	-	-	-	-
Nitrate as N (Sol.)	0.1	0.1	mg/kg			-	-	-	-	-	-
Nitrite + Nitrate as N (Sol.)	0.1		mg/kg			-	-	-	-	-	-
Total Kjeldahl Nitrogen as N	20	10	mg/kg			-	-	-	-	-	-
Total Nitrogen as N	20	10	mg/kg			-	-	-	-	-	-
Reactive Phosphorus as P	0.1		mg/kg			-	-	-	-	-	-

Notes:

- Not Analysed

LOR - Limits of Reporting

* Assumes chromium VI

** Assumes inorganic mercury

*** Assumes free cyanide

**** NEPM EIL guideline for protection of built structures

^ Elevated LOR

p - results prnging

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

Table A1 - 6. Summary of Soils Analytical Results - Phenoxyacetic acids, E-Coli and Faecal Coliforms

Project Number VE30023

PNG LNG Project

ANALYTE	ALS LOR	LABMARK LOR	Units	NEPM (1999) - Health Investigation Levels - A	NEPM (1999) - Health Investigation Levels - F	NEPM (1999) - Ecological Investigation Levels - EILs	SB04_0.0-0.1	SB09_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	DUP2_0.0-0.1	SS02
Sample Location							SB04_0.0-0.1	SB09_0.0-0.1	SB11_0.0-0.1	DUP2_0.0-0.1	DUP2_0.0-0.1	SS02
Laboratory							ALS	ALS	ALS	ALS	LABMARK	ALS
Date Sampled							29/05/2008	30/05/2008	29/05/2008	29/05/2008	29/05/2008	30/05/2008
Lab Report							EB0807386	EB0807386	EB0807386	EB0807386	E038049	EB0807386
Duplication									Primary	Intra	Inter	
Phenoxyacetic Acid Herbicides												
4-Chlorophenoxy acetic acid	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
2.4-DB	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Dicamba	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Mecoprop	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
MCPA	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
2.4-DP	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
2.4-D	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Triclopyr	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
2.4.5-TP (Silvex)	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
2.4.5-T	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
MCPB	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Picloram	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Clopyralid	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Fluroxypyr	0.02		mg/kg				<0.02	<0.04	<0.02	<0.02	-	-
Faecal Coliforms & E.coli												
Faecal Coliforms	-	2	Faecal Coliforms/g				-	-	<3	<3	<2	9
E. coli	-	2	Ecoli/g				-	-	<3	<3	<2	<3

Notes:
- Not Analysed
LOR - Limits of Reporting

NEPM A: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM F: Sample in excess of Adopted Guideline (NEPC 1999)

NEPM EILs: Sample in excess of Adopted Guideline (NEPC 1999)

ATTACHMENT A1 - A

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB01

PROJECT NUMBER:	**VE30023**	TOTAL DEPTH (m):	**0.7**
PROJECT NAME:	**PNG - Programme PNG Sub**	DATE COMMENCED:	**29/05/08**
LOCATION:	**PNG**	DATE COMPLETED:	**29/05/08**
DRILLING CO:	**SKM**	DRILLING METHOD	**Hand Auger**
		BOREHOLE DIAMETER:	**150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, no odour/staining	D	F	SB01_0-0.1	Former Airfield
		0.5				D	F	SB01_0.5-0.6	
						M	F	SB01_0.6-0.7	
					EOH @ 0.7 on Limestone				
		1.0							
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB02

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, calcrete gravels throughout, no odour/staining	D/M	F	SB02_0-0.1	Former Airfield
		0.5			SILTY SANDY CLAY: Light brown, moderate plasticity, fine to coarse grained sands, calcrete gravels up to 30mm in diameter, no odour/staining	D/M	F	SB02_0.4-0.5	
		1.0			EOH @ 1.0m	M	H	SB02_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

SOIL BORE LOG

SOIL BORE NUMBER: SB03

PROJECT NUMBER:	**VE30023**	TOTAL DEPTH (m):	**1.0**
PROJECT NAME:	**PNG - Programme PNG Sub**	DATE COMMENCED:	**29/05/08**
LOCATION:	**PNG**	DATE COMPLETED:	**29/05/08**
DRILLING CO:	**SKM**	DRILLING METHOD	**Hand Auger**
		BOREHOLE DIAMETER:	**150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, no odour/staining	D/M	F	SB03_0-0.1	Scrap Metal (shrapened) adjacent the borehole
		0.5						SB03_0.4-0.5	
		1.0			EOH @ 1.0m			SB03_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB04

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, no odour/staining	D	H	SB04_0-0.1	
					SANDY CLAY: Light brown, low plasticity, fine to coarsed grained sands, calcrete gravels up to 5mm in diameter, no odour/staining	M	F	SB04_0.3-0.4	
		0.5			SILTY SANDY CLAY: Light brown, low plasticity, fine to medium grained sands, calcrete gravels up to 10mm in diameter, no odour/staining	M	F	SB04_0.5-0.6	
						M	F	SB04_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

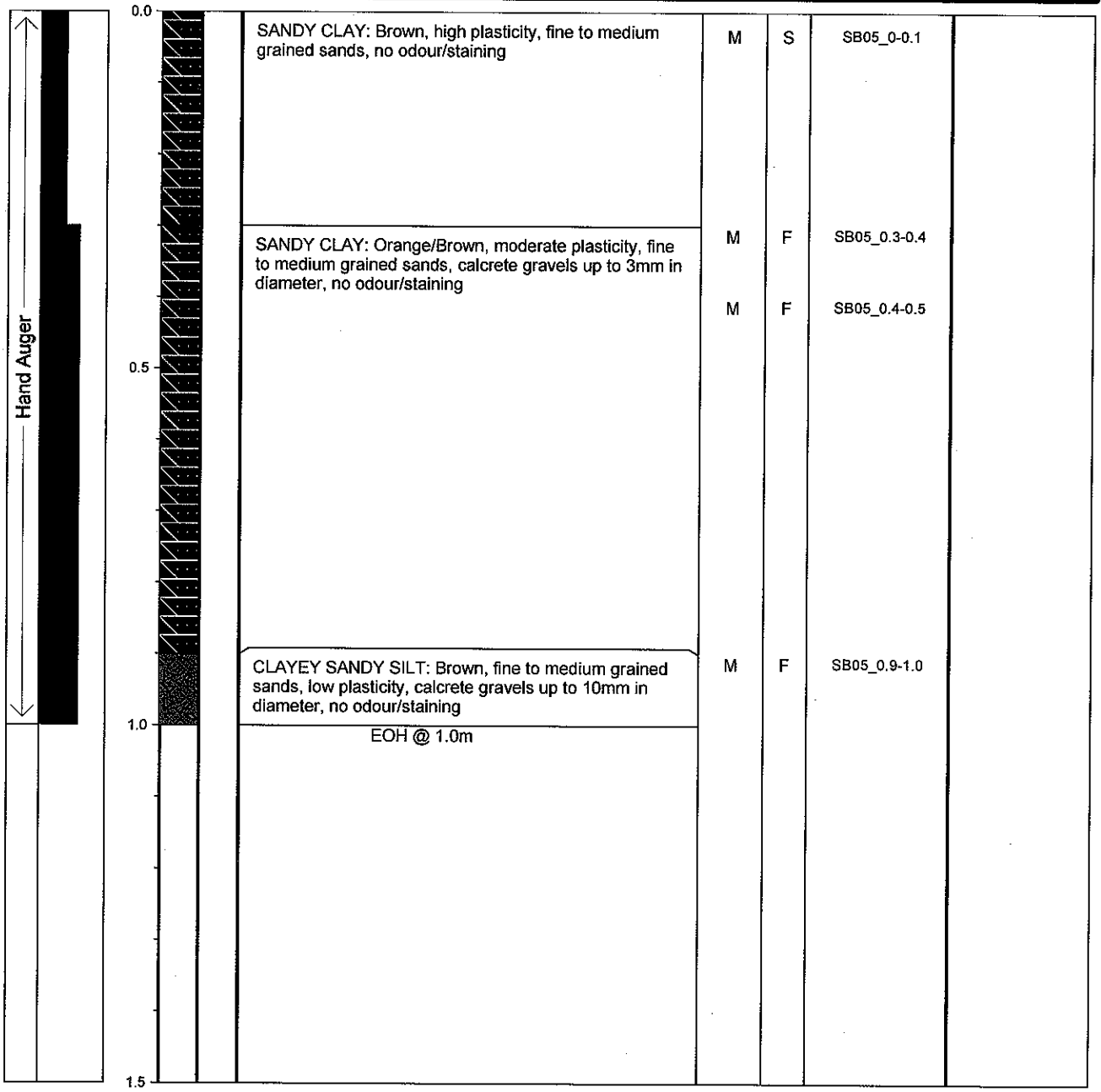
SOIL BORE LOG

SOIL BORE NUMBER

SB05

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**



DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Brown, high plasticity, fine to medium grained sands, no odour/staining	M	S	SB05_0-0.1	
					SANDY CLAY: Orange/Brown, moderate plasticity, fine to medium grained sands, calcrete gravels up to 3mm in diameter, no odour/staining	M	F	SB05_0.3-0.4	
		0.5				M	F	SB05_0.4-0.5	
					CLAYEY SANDY SILT: Brown, fine to medium grained sands, low plasticity, calcrete gravels up to 10mm in diameter, no odour/staining	M	F	SB05_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

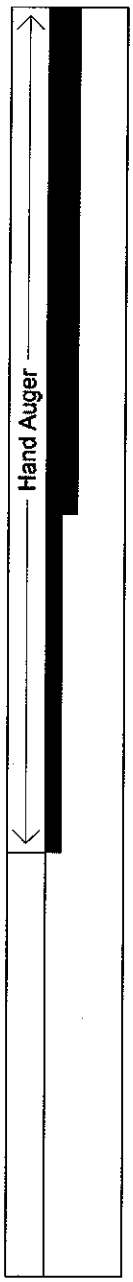
SOIL BORE LOG

SOIL BORE NUMBER

SB06

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**



DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Brown, high plasticity, fine to medium grained sands, no odour/staining	M	F	SB06_0-0.1	
		0.5			SANDY SILTY CLAY: Light Brown, moderate plasticity, fine to medium grained sands, no odour/staining	M	F	SB06_0.3-0.4	
					SANDY CLAYEY SILT: Cream, fine to medium grained sands, low plasticity, calcrete gravels up to 10mm in diameter, no odour/staining	M	F	SB06_0.6-0.7	
		1.0			EOH @ 1.0m	M	S	SB06_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

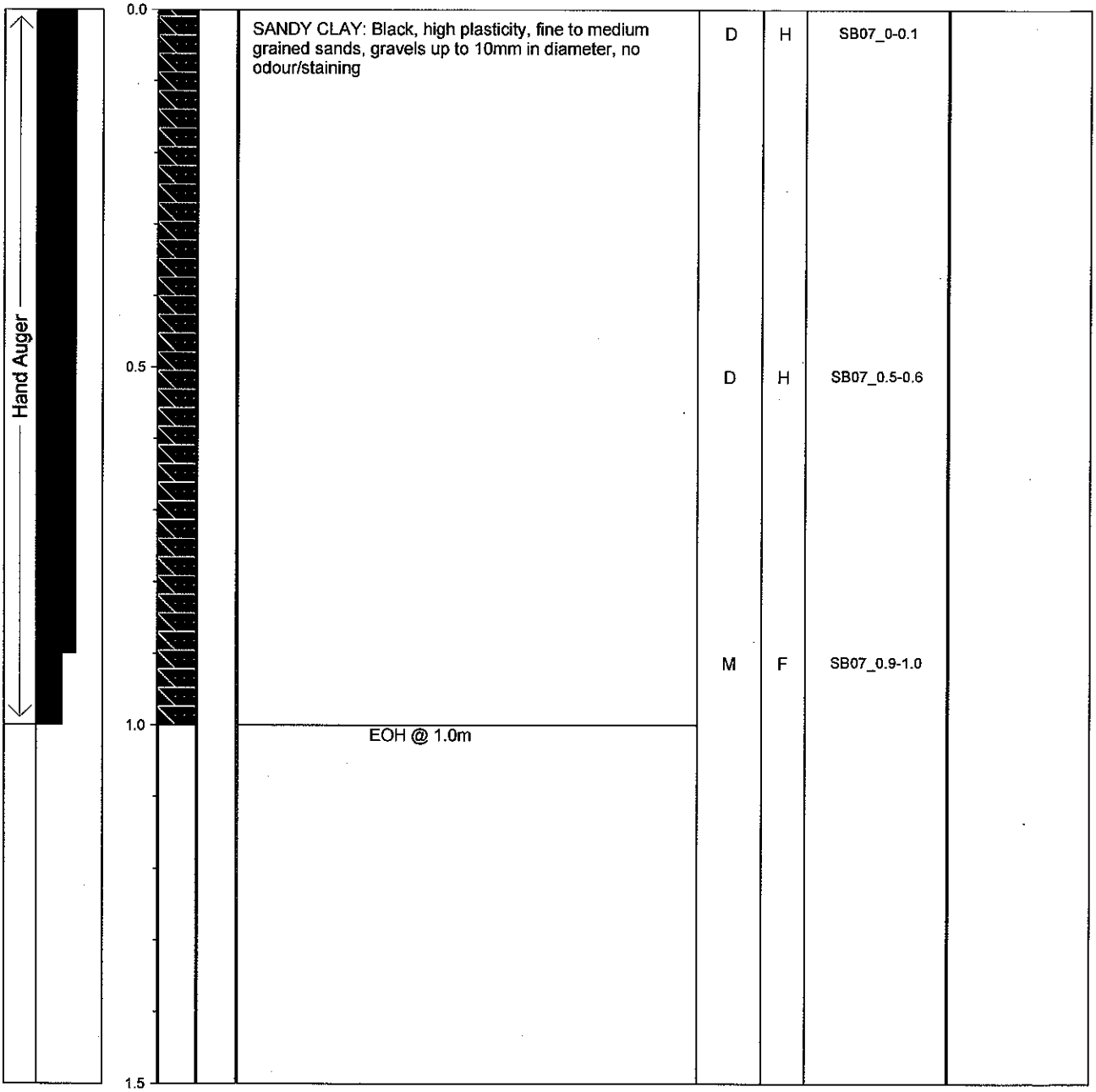
SOIL BORE LOG

SOIL BORE NUMBER

SB07

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**



DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 10mm in diameter, no odour/staining	D	H	SB07_0-0.1	
		0.5				D	H	SB07_0.5-0.6	
		1.0			EOH @ 1.0m	M	F	SB07_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB08

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 4mm in diameter, no odour/staining	D	H	SB08_0-0.1	
		0.5				D	F	SB08_0.5-0.6	
		1.0			EOH @ 1.0m	M	F	SB08_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED: 25/6

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB09

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 4mm in diameter, no odour/staining	D	H	SB09_0-0.1	
		0.5				D	F	SB09_0.5-0.6	
		1.0			EOH @ 1.0m	M	F	SB09_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

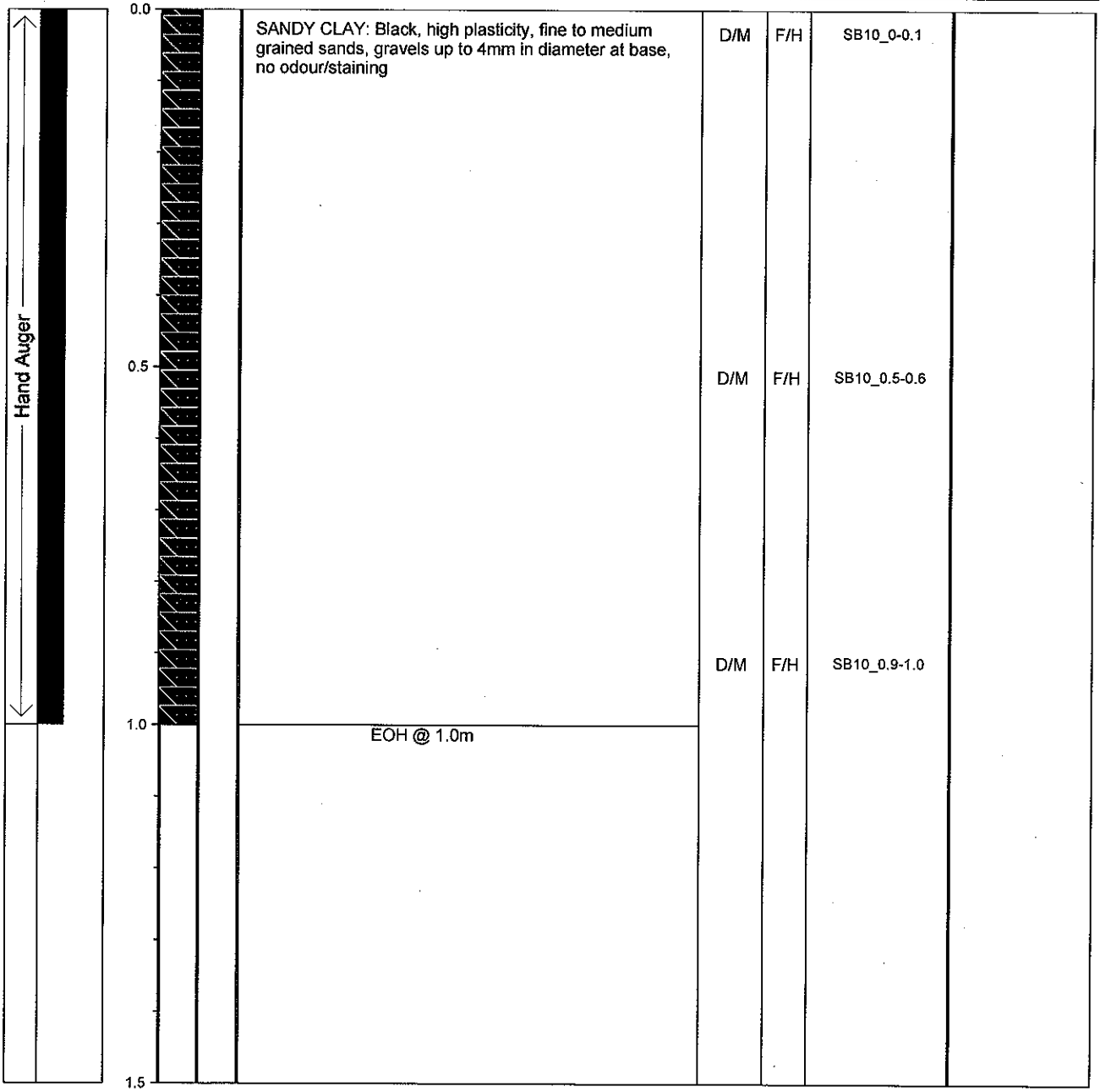
SOIL BORE LOG

SOIL BORE NUMBER

SB10

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**



DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 4mm in diameter at base, no odour/staining	D/M	F/H	SB10_0-0.1	
		0.5				D/M	F/H	SB10_0.5-0.6	
		1.0			EOH @ 1.0m	D/M	F/H	SB10_0.9-1.0	
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB11

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 4mm in diameter at base, no odour/staining	M	F	SB11_0-0.1 DUP2	
		0.5				M	F	SB11_0.5-0.6	
						M	F	SB11_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB12

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Dark Brown, very high plasticity, fine to medium grained sands, gravels up to 10mm in diameter, no odour/staining	M	F	SB12_0-0.1	
		0.5				M	F	SB12_0.5-0.6	
						M	F	SB12_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB13

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Black, high plasticity, fine to medium grained sands, gravels up to 10mm in diameter, no odour/staining	M	F	SB13_0-0.1	
		0.5				M	F	SB13_0.5-0.6	
						M	F	SB13_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/09

rem

SOIL BORE LOG

SOIL BORE NUMBER

SB14

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **1.0**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY CLAY: Grey/Black, high plasticity, fine to medium grained sands, no odour/staining	D	H	SB14_0-0.1	
		0.5			CLAYEY SILT: Brown, fine to medium grained sands, gravels up to 5mm in diameter, no odour/staining	M	F	SB14_0.5-0.6	
						M	F	SB14_0.9-1.0	
		1.0			EOH @ 1.0m				
		1.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SS1

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **0.1**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY GRAVELLY CLAY: Black/brown, low plasticity, gravels up to 15mm in diameter, medium grained sand, minor ash/cinders, no odour/staining	M	L	SS1	Surface Scrape
					EOH @ 0.1m				
		0.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 3/6/08

rem

SOIL BORE LOG

SOIL BORE NUMBER

SS2

PROJECT NUMBER: **VE30023**
PROJECT NAME: **PNG - Programme PNG Sub**
LOCATION: **PNG**
DRILLING CO: **SKM**

TOTAL DEPTH (m): **0.1**
DATE COMMENCED: **29/05/08**
DATE COMPLETED: **29/05/08**
DRILLING METHOD **Hand Auger**
BOREHOLE DIAMETER: **150 mm**

DRILLING INFO.			MATERIAL PROPERTIES					FIELD RECORD INFORMATION	
METHOD	(no resistance) PENETRATION (refusal)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION	MATERIAL DESCRIPTION	MOISTURE CONDITION	STRENGTH	SAMPLE ID	COMMENTS
Hand Auger		0.0			SANDY GRAVELLY CLAY: Black/brown, low plasticity, gravels up to 15mm in diameter, medium grained sand, minor ash/cinders, no odour/staining	M	F	SS2	Surface Scrape
					EOH @ 0.1m				
		0.5							

MOISTURE
W = Wet
M = Moist
D = Dry

STRENGTH

Fine Grain	Coarse Grain
S = Soft	L = Loose
F = Firm	D = Dense
H = Hard	VD = Very Dense

LOGGED: VS
CHECKED:

DATE: 29/05/08
DATE: 25/6/08

ATTACHMENT A1 - B

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0807386**	Page	: 1 of 32
Amendment	: **1**		
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Brisbane
Contact	: MR PETER HOWIESON	Contact	: Tim Kilmister
Address	: UNIT 9, 15 FULLARTON RD KENT TOWN SA, AUSTRALIA 5067	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: PHowieson@skm.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 08 83631777	Telephone	: +61-7-3243 7222
Facsimile	: +61 08 83631477	Facsimile	: +61-7-3243 7218
Project	: GQ-01	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-JUN-2008
Sampler	: VOLKER STROEHER	Issue Date	: 03-JUL-2008
Site	: ----		
		No. of samples received	: 51
Quote number	: EN/003/08	No. of samples analysed	: 18

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Carsten Emrich	Senior Organic Chemist	Organics
Jennifer Correa	Analyst	Microbiology
Kim McCabe	Senior Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals
Lana Nguyen		Organics
Minh Wills	Senior Analyst	Inorganics
Minh Wills	Senior Analyst	Organics
Peter Donaghy	Laboratory Supervisor	Newcastle
Sarah Millington	Senior Inorganic Chemist	Inorganics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **24 hours holding time for microbiological water samples does not apply to soil samples.**
- **ALS is not NATA accredited for the analysis of Faecal Coliforms and E.coli in soil matrix. All QC passed for the analysis of Faecal Coliforms and E.coli.**
- **ED042T (Sulfur - Total as S (LECO)): Insufficient sample was provied for analysis - Sample 23 (SB11_0.0-0.1)**
- **EG005T (Total metals) EB0807386-032 has insufficient sample for this analysis.**
- **EG005T (Total Metals): EB0807386-005 (SB03_0.0-0.1) shows poor matrix spike recovery due to sample matrix interferences. insufficient sample to confirm.**
- **EK057/EK059/EK071G: LOR raised for Reactive P, Nitrite & NoX on sample ID 'SB11_0.0-0.1' due to matrix interference.**
- **EP202: Particular sample required dilution due to matrix interferences. LOR values have been adjusted accordingly.**
- **Insufficient sample EB0807386 041 was provided for EA002 -pH (1:5) QC analysis**
- **Microbiological samples were processed as received.**
- **Pesticides: Sample SB13_0.0-0.1 shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.**
- **Results for sample SB11_0.0-0.1 reported as recieved due to there being insufficient sample to perform moisture correction.**
- **Semi-volatile TPH: LOR values raised for sample SB13_0.0-1.1 due to insufficient sample.**
- **SVOC: Poor surrogate recovery for sample SB11_0.0-0.1 due to matrix interference.**
- **The LOR for Faecal Coliforms and E.coli is 3.**
- **Total Cyanide (EK026): Sample SB11_0.0-0.1 (EB0807386-032) has insufficient mass available for this analysis.**
- **Volatile TPH/BTEX & VOC: Poor matrix spike recovery for sample SB11_0.0-0.1 due to matrix interference. Insufficient sample has been provided for re-extraction and re-analysis..**
- **Where MPN = Most Probable Number**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
			Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit	EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**6.6**	**7.8**	**8.1**	**7.9**	**8.0**
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**24.5**	**25.3**	**20.2**	**21.0**	**19.2**
ED040T : Total Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	----	----	----	**680**	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	----	----	----	**0.02**	----
EG005T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	----	<5	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	**200**	----	**80**	**190**	**170**
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**10**	**25**	**14**	**33**	**32**
Cobalt	7440-48-4	2	mg/kg	**29**	**13**	**10**	**17**	**14**
Copper	7440-50-8	5	mg/kg	**11**	**33**	**19**	**39**	**32**
Lead	7439-92-1	5	mg/kg	**28**	**11**	**7**	**12**	**12**
Manganese	7439-96-5	5	mg/kg	**1860**	----	**375**	**538**	**401**
Molybdenum	7439-98-7	2	mg/kg	----	<2	----	----	----
Nickel	7440-02-0	2	mg/kg	**12**	**24**	**15**	**28**	**20**
Selenium	7782-49-2	5	mg/kg	----	<5	----	----	----
Silver	7440-22-4	2	mg/kg	----	<2	----	----	----
Tin	7440-31-5	5	mg/kg	----	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	**26**	**48**	**29**	**60**	**61**
Zinc	7440-66-6	5	mg/kg	**7**	**42**	**24**	**52**	**35**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK026: Total Cyanide								
Total Cyanide	57-12-5	1	mg/kg	----	----	----	<1	----
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	<1	----	----	----
EK040T: Fluoride Total								
Fluoride	16984-48-8	40	mg/kg	----	**140**	----	----	----
EK057: Nitrite as N								
Nitrite as N (Sol.)	----	0.1	mg/kg	----	----	----	<0.1	----
EK058: Nitrate as N								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
			Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit	EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EK058: Nitrate as N - Continued								
^ Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	----	1.5	----
EK059: Nitrite plus Nitrate as N (NOx)								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	----	1.5	----
EK061: Total Kjeldahl Nitrogen (TKN)								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	----	----	1670	----
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	----	----	----	1670	----
EK071: Reactive Phosphorus as P (Dissolved)								
Reactive Phosphorus as P	----	0.10	mg/kg	----	----	----	<0.10	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	<0.10	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	----	<0.2	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	<0.05	----	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	----	<0.2	----	<0.2	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EP068B: Organophosphorus Pesticides (OP) - Continued									
Dimethoate	60-51-5	0.05	mg/kg		----	<0.05	----	<0.05	----
Diazinon	333-41-5	0.05	mg/kg		----	<0.05	----	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg		----	<0.05	----	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg		----	<0.2	----	<0.2	----
Malathion	121-75-5	0.05	mg/kg		----	<0.05	----	<0.05	----
Fenthion	55-38-9	0.05	mg/kg		----	<0.05	----	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg		----	<0.05	----	<0.05	----
Parathion	56-38-2	0.2	mg/kg		----	<0.2	----	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg		----	<0.05	----	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg		----	<0.05	----	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg		----	<0.05	----	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg		----	<0.05	----	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg		----	<0.05	----	<0.05	----
Ethion	563-12-2	0.05	mg/kg		----	<0.05	----	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg		----	<0.05	----	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg		----	<0.05	----	<0.05	----
EP068C: Triazines									
Atrazine	1912-24-9	0.05	mg/kg		----	----	----	<0.05	----
Simazine	122-34-9	0.05	mg/kg		----	----	----	<0.05	----
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg		----	<0.5	----	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg		----	<0.5	----	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg		----	<0.5	----	----	----
EP074E: Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	75-71-8	5	mg/kg		----	<5	----	----	----
Chloromethane	74-87-3	5	mg/kg		----	<5	----	----	----
Vinyl chloride	75-01-4	5	mg/kg		----	<5	----	----	----
Bromomethane	74-83-9	5	mg/kg		----	<5	----	----	----
Chloroethane	75-00-3	5	mg/kg		----	<5	----	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg		----	<5	----	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg		----	<0.5	----	----	----
Iodomethane	74-88-4	0.5	mg/kg		----	<0.5	----	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg		----	<0.5	----	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg		----	<0.5	----	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg		----	<0.5	----	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg		----	<0.5	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EP074E: Halogenated Aliphatic Compounds - Continued									
1.1-Dichloropropylene	563-58-6	0.5	mg/kg		----	<0.5	----	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichloroethane	107-06-2	0.5	mg/kg		----	<0.5	----	----	----
Trichloroethene	79-01-6	0.5	mg/kg		----	<0.5	----	----	----
Dibromomethane	74-95-3	0.5	mg/kg		----	<0.5	----	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg		----	<0.5	----	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg		----	<0.5	----	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg		----	<0.5	----	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg		----	<0.5	----	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg		----	<0.5	----	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg		----	<0.5	----	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg		----	<0.5	----	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachloroethane	76-01-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg		----	<0.5	----	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg		----	<0.5	----	----	----
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	0.5	mg/kg		----	<0.5	----	----	----
Bromobenzene	108-86-1	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg		----	<0.5	----	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg		----	<0.5	----	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg		----	<0.5	----	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg		----	<0.5	----	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg		----	<0.5	----	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg		----	<0.5	----	----	----
EP074G: Trihalomethanes									
Chloroform	67-66-3	0.5	mg/kg		----	<0.5	----	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg		----	<0.5	----	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg		----	<0.5	----	----	----
Bromoform	75-25-2	0.5	mg/kg		----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	----	----	<0.5	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Fluoranthene	206-44-0	0.5	mg/kg		----	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		----	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	----	<0.5	----
EP075A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	0.5	mg/kg		----	<0.5	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	----	----	----
4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg		----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachlorophenol	87-86-5	1	mg/kg		----	<1	----	----	----
EP075B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	----	----
2-Methylnaphthalene	91-57-6	0.5	mg/kg		----	<0.5	----	----	----
2-Chloronaphthalene	91-58-7	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	----	----
N-2-Fluorenyl Acetamide	53-96-3	0.5	mg/kg		----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time: 29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
				EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EP075B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(b) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg	----	<1	----	----	----
7.12-Dimethylbenz(a)anthracene	57-97-6	0.5	mg/kg	----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	----
3-Methylcholanthrene	56-49-5	0.5	mg/kg	----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	----
EP075G: Chlorinated Hydrocarbons								
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	----	<0.5	----	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	----	<0.5	----	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	----	<0.5	----	----	----
Hexachloroethane	67-72-1	0.5	mg/kg	----	<0.5	----	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	----	<0.5	----	----	----
Hexachloropropylene	1888-71-7	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorocyclopentadiene	77-47-4	2.5	mg/kg	----	<2.5	----	----	----
Pentachlorobenzene	608-93-5	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	1.0	mg/kg	----	<1.0	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	<50	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	<100	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	<100	----
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	<0.5	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	----	----	----	<0.02	----
2.4-DB	94-82-6	0.02	mg/kg	----	----	----	<0.02	----
Dicamba	1918-00-9	0.02	mg/kg	----	----	----	<0.02	----
Mecoprop	93-65-2	0.02	mg/kg	----	----	----	<0.02	----
MCPA	94-74-6	0.02	mg/kg	----	----	----	<0.02	----
2.4-DP	120-36-5	0.02	mg/kg	----	----	----	<0.02	----
2.4-D	94-75-7	0.02	mg/kg	----	----	----	<0.02	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807386-002	EB0807386-005	EB0807386-006	EB0807386-008	EB0807386-012
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued									
Triclopyr	55335-06-3	0.02	mg/kg		----	----	----	<0.02	----
2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg		----	----	----	<0.02	----
2.4.5-T	93-76-5	0.02	mg/kg		----	----	----	<0.02	----
MCPB	94-81-5	0.02	mg/kg		----	----	----	<0.02	----
Picloram	1918-02-1	0.02	mg/kg		----	----	----	<0.02	----
Clopyralid	1702-17-6	0.02	mg/kg		----	----	----	<0.02	----
Fluroxypyr	69377-81-7	0.02	mg/kg		----	----	----	<0.02	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**74.4**	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		----	**76.5**	----	**81.2**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		----	**87.6**	----	**93.3**	----
EP074S: VOC Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	**84.0**	----	----	----
Toluene-D8	2037-26-5	0.1	%		----	**104**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	**94.0**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	----	----	**98.6**	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	----	----	**104**	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	----	----	**78.7**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	----	----	**93.7**	----
Anthracene-d10	1719-06-8	0.1	%		----	----	----	**79.7**	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	----	----	**84.2**	----
EP075S: Acid Extractable Surrogates									
2-Fluorophenol	367-12-4	0.1	%		----	**49.9**	----	----	----
Phenol-d6	13127-88-3	0.1	%		----	**45.8**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	**52.6**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	**82.2**	----	----	----
EP075T: Base/Neutral Extractable Surrogates									
Nitrobenzene-D5	4165-60-0	0.1	%		----	**49.7**	----	----	----
1.2-Dichlorobenzene-D4	2199-69-1	0.1	%		----	**40.9**	----	----	----
2-Fluorobiphenyl	321-60-8	0.1	%		----	**57.5**	----	----	----
Anthracene-d10	1719-06-8	0.1	%		----	**78.9**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	**91.6**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: **SOIL**				Client sample ID	SB01_0.0-0.1	SB03_0.0-0.1	SB03_0.4-0.5	SB04_0.0-0.1	SB05_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807386-002**	**EB0807386-005**	**EB0807386-006**	**EB0807386-008**	**EB0807386-012**
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	**86.5**	----	**83.1**	----
Toluene-D8	2037-26-5	0.1	%		----	**111**	----	**102**	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	**99.1**	----	**94.8**	----
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%		----	----	----	**73.2**	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
			Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit	EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**8.0**	**7.6**	**8.5**	**8.0**	**8.1**
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**20.9**	**22.8**	----	**34.8**	**27.9**
ED040T : Total Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	----	----	**930**	----	----
EG005T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	----	----	<5	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	**100**	**180**	----	**110**	**320**
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**26**	**18**	**12**	**23**	**12**
Cobalt	7440-48-4	2	mg/kg	**15**	**18**	**8**	**16**	**23**
Copper	7440-50-8	5	mg/kg	**34**	**27**	**17**	**31**	**12**
Lead	7439-92-1	5	mg/kg	**10**	**15**	**8**	**14**	**18**
Manganese	7439-96-5	5	mg/kg	**466**	**770**	----	**664**	**1370**
Molybdenum	7439-98-7	2	mg/kg	----	----	<2	----	----
Nickel	7440-02-0	2	mg/kg	**28**	**22**	**13**	**25**	**16**
Selenium	7782-49-2	5	mg/kg	----	----	<5	----	----
Silver	7440-22-4	2	mg/kg	----	----	<2	----	----
Tin	7440-31-5	5	mg/kg	----	----	<5	----	----
Vanadium	7440-62-2	5	mg/kg	**43**	**43**	**18**	**38**	**34**
Zinc	7440-66-6	5	mg/kg	**58**	**41**	**22**	**40**	**13**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	<1	----	----
EK040T: Fluoride Total								
Fluoride	16984-48-8	40	mg/kg	----	----	**140**	----	----
EK057: Nitrite as N								
Nitrite as N (Sol.)	----	0.1	mg/kg	----	----	<1.0	----	----
EK058: Nitrate as N								
^ Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	<5.0	----	----
EK059: Nitrite plus Nitrate as N (NOx)								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	<5.0	----	----
EK061: Total Kjeldahl Nitrogen (TKN)								

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time: 29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
				EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EK061: Total Kjeldahl Nitrogen (TKN) - Continued								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	----	**590**	----	----
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	----	----	**590**	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	----	0.100	mg/kg	----	----	<5.00	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.10	mg/kg	----	----	<0.10	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	<0.2	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EP068B: Organophosphorus Pesticides (OP) - Continued									
Malathion	121-75-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg		<0.05	----	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg		<0.2	----	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg		<0.05	----	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg		<0.05	----	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg		<0.05	----	<0.05	----	----
Carbophenothion	786-19-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg		<0.05	----	<0.05	----	----
EP068C: Triazines									
Atrazine	1912-24-9	0.05	mg/kg		----	----	<0.05	----	----
Simazine	122-34-9	0.05	mg/kg		----	----	<0.05	----	----
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg		----	----	<0.5	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg		----	----	<0.5	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg		----	----	<0.5	----	----
EP074E: Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	75-71-8	5	mg/kg		----	----	<5	----	----
Chloromethane	74-87-3	5	mg/kg		----	----	<5	----	----
Vinyl chloride	75-01-4	5	mg/kg		----	----	<5	----	----
Bromomethane	74-83-9	5	mg/kg		----	----	<5	----	----
Chloroethane	75-00-3	5	mg/kg		----	----	<5	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg		----	----	<5	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg		----	----	<0.5	----	----
Iodomethane	74-88-4	0.5	mg/kg		----	----	<0.5	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg		----	----	<0.5	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg		----	----	<0.5	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg		----	----	<0.5	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg		----	----	<0.5	----	----
1.1-Dichloropropylene	563-58-6	0.5	mg/kg		----	----	<0.5	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichloroethane	107-06-2	0.5	mg/kg		----	----	<0.5	----	----
Trichloroethene	79-01-6	0.5	mg/kg		----	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EP074E: Halogenated Aliphatic Compounds - Continued									
Dibromomethane	74-95-3	0.5	mg/kg		----	----	<0.5	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg		----	----	<0.5	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg		----	----	<0.5	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg		----	----	<0.5	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg		----	----	<0.5	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg		----	----	<0.5	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg		----	----	<0.5	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg		----	----	<0.5	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg		----	----	<0.5	----	----
Pentachloroethane	76-01-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg		----	----	<0.5	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg		----	----	<0.5	----	----
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	0.5	mg/kg		----	----	<0.5	----	----
Bromobenzene	108-86-1	0.5	mg/kg		----	----	<0.5	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg		----	----	<0.5	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg		----	----	<0.5	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg		----	----	<0.5	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg		----	----	<0.5	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg		----	----	<0.5	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg		----	----	<0.5	----	----
EP074G: Trihalomethanes									
Chloroform	67-66-3	0.5	mg/kg		----	----	<0.5	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg		----	----	<0.5	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg		----	----	<0.5	----	----
Bromoform	75-25-2	0.5	mg/kg		----	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
EP075A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	----	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	----	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	----	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	0.5	mg/kg		----	----	<0.5	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	----	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	----	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	----	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	----	<0.5	----	----
4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg		----	----	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	----	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	----	<0.5	----	----
Pentachlorophenol	87-86-5	1	mg/kg		----	----	<1	----	----
EP075B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	<0.5	----	----
2-Methylnaphthalene	91-57-6	0.5	mg/kg		----	----	<0.5	----	----
2-Chloronaphthalene	91-58-7	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		----	----	<0.5	----	----
N-2-Fluorenyl Acetamide	53-96-3	0.5	mg/kg		----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		----	----	<0.5	----	----
Benzo(b) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg		----	----	<1	----	----
7.12-Dimethylbenz(a)anthracene	57-97-6	0.5	mg/kg		----	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	<0.5	----	----
3-Methylcholanthrene	56-49-5	0.5	mg/kg		----	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
					EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EP075B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	<0.5	----	----
EP075G: Chlorinated Hydrocarbons									
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg		----	----	<0.5	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg		----	----	<0.5	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg		----	----	<0.5	----	----
Hexachloroethane	67-72-1	0.5	mg/kg		----	----	<0.5	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg		----	----	<0.5	----	----
Hexachloropropylene	1888-71-7	0.5	mg/kg		----	----	<0.5	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg		----	----	<0.5	----	----
Hexachlorocyclopentadiene	77-47-4	2.5	mg/kg		----	----	<2.5	----	----
Pentachlorobenzene	608-93-5	0.5	mg/kg		----	----	<0.5	----	----
Hexachlorobenzene (HCB)	118-74-1	1.0	mg/kg		----	----	<1.0	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	<130	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	<250	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	<250	----	----
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg		----	----	<0.02	----	----
2.4-DB	94-82-6	0.02	mg/kg		----	----	<0.02	----	----
Dicamba	1918-00-9	0.02	mg/kg		----	----	<0.02	----	----
Mecoprop	93-65-2	0.02	mg/kg		----	----	<0.02	----	----
MCPA	94-74-6	0.02	mg/kg		----	----	<0.02	----	----
2.4-DP	120-36-5	0.02	mg/kg		----	----	<0.02	----	----
2.4-D	94-75-7	0.02	mg/kg		----	----	<0.02	----	----
Triclopyr	55335-06-3	0.02	mg/kg		----	----	<0.02	----	----
2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg		----	----	<0.02	----	----
2.4.5-T	93-76-5	0.02	mg/kg		----	----	<0.02	----	----
MCPB	94-81-5	0.02	mg/kg		----	----	<0.02	----	----
Picloram	1918-02-1	0.02	mg/kg		----	----	<0.02	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
			Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	CAS Number	LOR	Unit	EB0807386-016	EB0807386-020	EB0807386-023	EB0807386-024	EB0807386-026
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
Clopyralid	1702-17-6	0.02	mg/kg	----	----	<0.02	----	----
Fluroxypyr	69377-81-7	0.02	mg/kg	----	----	<0.02	----	----
MW008: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	-	Faecal Coliforms/g	----	----	<3	----	----
Escherichia coli	----	-	Ecoli/g	----	----	<3	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	**80.4**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**56.4**	----	**76.6**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**63.6**	----	**88.8**	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	----	**82.9**	----	----
Toluene-D8	2037-26-5	0.1	%	----	----	**91.8**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	----	----	**84.2**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**106**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**111**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**87.0**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**102**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**86.3**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**92.0**	----	----	----	----
EP075S: Acid Extractable Surrogates								
2-Fluorophenol	367-12-4	0.1	%	----	----	**45.2**	----	----
Phenol-d6	13127-88-3	0.1	%	----	----	**50.2**	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	----	----	**44.6**	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	----	----	**72.9**	----	----
EP075T: Base/Neutral Extractable Surrogates								
Nitrobenzene-D5	4165-60-0	0.1	%	----	----	**36.9**	----	----
1.2-Dichlorobenzene-D4	2199-69-1	0.1	%	----	----	**25.8**	----	----
2-Fluorobiphenyl	321-60-8	0.1	%	----	----	**41.9**	----	----
Anthracene-d10	1719-06-8	0.1	%	----	----	**74.6**	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	----	----	**90.4**	----	----
EP080S: TPH(V)/BTEX Surrogates								

Analytical Results

Sub-Matrix: **SOIL**				Client sample ID	SB06_0.0-0.1	SB07_0.0-0.1	SB11_0.0-0.1	SB11_0.5-0.6	SB12_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00	29-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807386-016**	**EB0807386-020**	**EB0807386-023**	**EB0807386-024**	**EB0807386-026**
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**88.9**	----	**82.9**	----	----
Toluene-D8	2037-26-5	0.1	%		**108**	----	**96.5**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**88.9**	----	**88.6**	----	----
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%		----	----	**92.7**	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
					EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		**7.9**	**8.6**	**8.0**	**7.6**	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**17.8**	**21.7**	**20.3**	**13.9**	**13.9**
ED040T : Total Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	100	mg/kg		----	**1410**	----	----	**610**
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		----	**0.04**	----	----	**0.02**
EG005T: Total Metals by ICP-AES									
Antimony	7440-36-0	5	mg/kg		----	<5	----	----	----
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		**180**	----	**160**	**360**	**180**
Beryllium	7440-41-7	1	mg/kg		<1	**4**	<1	**1**	<1
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**22**	**25**	**40**	**10**	**23**
Cobalt	7440-48-4	2	mg/kg		**17**	**18**	**21**	**28**	**15**
Copper	7440-50-8	5	mg/kg		**32**	**30**	**49**	**16**	**33**
Lead	7439-92-1	5	mg/kg		**14**	**16**	**11**	**21**	**11**
Manganese	7439-96-5	5	mg/kg		**672**	----	**771**	**1300**	**598**
Molybdenum	7439-98-7	2	mg/kg		----	<2	----	----	----
Nickel	7440-02-0	2	mg/kg		**25**	**23**	**44**	**19**	**27**
Selenium	7782-49-2	5	mg/kg		----	<5	----	----	----
Silver	7440-22-4	2	mg/kg		----	<2	----	----	----
Tin	7440-31-5	5	mg/kg		----	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg		**46**	**31**	**60**	**40**	**39**
Zinc	7440-66-6	5	mg/kg		**48**	**38**	**73**	**16**	**61**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK026: Total Cyanide									
Total Cyanide	57-12-5	1	mg/kg		----	----	----	----	<1
EK026G: Total Cyanide By Discrete Analyser									
Total Cyanide	57-12-5	1	mg/kg		----	<1	----	----	----
EK040T: Fluoride Total									
Fluoride	16984-48-8	40	mg/kg		----	**190**	----	----	----
EK057: Nitrite as N									
Nitrite as N (Sol.)	----	0.1	mg/kg		----	**2.0**	----	----	**0.2**
EK058: Nitrate as N									

Analytical Results

Sub-Matrix: SOIL				Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EK058: Nitrate as N - Continued									
^ Nitrate as N (Sol.)	----	0.1	mg/kg		----	**2.5**	----	----	**0.3**
EK059: Nitrite plus Nitrate as N (NOx)									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	**4.4**	----	----	**0.5**
EK061: Total Kjeldahl Nitrogen (TKN)									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		----	**1360**	----	----	**2320**
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		----	**1360**	----	----	**2320**
EK071: Reactive Phosphorus as P (Dissolved)									
Reactive Phosphorus as P	----	0.10	mg/kg		----	----	----	----	**0.52**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	----	0.100	mg/kg		----	**4.92**	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	<0.05
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	<0.05
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	<0.2
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.05	mg/kg		<0.05	----	----	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg		<0.05	----	----	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg		<0.2	----	----	----	<0.2

Analytical Results

Sub-Matrix: SOIL				Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EP068B: Organophosphorus Pesticides (OP) - Continued									
Dimethoate	60-51-5	0.05	mg/kg		<0.05	----	----	----	<0.05
Diazinon	333-41-5	0.05	mg/kg		<0.05	----	----	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg		<0.05	----	----	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg		<0.2	----	----	----	<0.2
Malathion	121-75-5	0.05	mg/kg		<0.05	----	----	----	<0.05
Fenthion	55-38-9	0.05	mg/kg		<0.05	----	----	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg		<0.05	----	----	----	<0.05
Parathion	56-38-2	0.2	mg/kg		<0.2	----	----	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg		<0.05	----	----	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg		<0.05	----	----	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg		<0.05	----	----	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg		<0.05	----	----	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg		<0.05	----	----	----	<0.05
Ethion	563-12-2	0.05	mg/kg		<0.05	----	----	----	<0.05
Carbophenothion	786-19-6	0.05	mg/kg		<0.05	----	----	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg		<0.05	----	----	----	<0.05
EP068C: Triazines									
Atrazine	1912-24-9	0.05	mg/kg		----	----	----	----	<0.05
Simazine	122-34-9	0.05	mg/kg		----	----	----	----	<0.05
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg		----	<0.5	----	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg		----	<0.5	----	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg		----	<0.5	----	----	----
EP074E: Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	75-71-8	5	mg/kg		----	<5	----	----	----
Chloromethane	74-87-3	5	mg/kg		----	<5	----	----	----
Vinyl chloride	75-01-4	5	mg/kg		----	<5	----	----	----
Bromomethane	74-83-9	5	mg/kg		----	<5	----	----	----
Chloroethane	75-00-3	5	mg/kg		----	<5	----	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg		----	<5	----	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg		----	<0.5	----	----	----
Iodomethane	74-88-4	0.5	mg/kg		----	<0.5	----	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg		----	<0.5	----	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg		----	<0.5	----	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg		----	<0.5	----	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg		----	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EP074E: Halogenated Aliphatic Compounds - Continued									
1.1-Dichloropropylene	563-58-6	0.5	mg/kg		----	<0.5	----	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichloroethane	107-06-2	0.5	mg/kg		----	<0.5	----	----	----
Trichloroethene	79-01-6	0.5	mg/kg		----	<0.5	----	----	----
Dibromomethane	74-95-3	0.5	mg/kg		----	<0.5	----	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg		----	<0.5	----	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg		----	<0.5	----	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg		----	<0.5	----	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg		----	<0.5	----	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg		----	<0.5	----	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg		----	<0.5	----	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg		----	<0.5	----	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachloroethane	76-01-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg		----	<0.5	----	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg		----	<0.5	----	----	----
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	0.5	mg/kg		----	<0.5	----	----	----
Bromobenzene	108-86-1	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg		----	<0.5	----	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg		----	<0.5	----	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg		----	<0.5	----	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg		----	<0.5	----	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg		----	<0.5	----	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg		----	<0.5	----	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg		----	<0.5	----	----	----
EP074G: Trihalomethanes									
Chloroform	67-66-3	0.5	mg/kg		----	<0.5	----	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg		----	<0.5	----	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg		----	<0.5	----	----	----
Bromoform	75-25-2	0.5	mg/kg		----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time: 29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
				EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	----	----	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	<0.5
EP075A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	0.5	mg/kg	----	<0.5	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	<0.5	----	----	----
4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg	----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	<0.5	----	----	----
Pentachlorophenol	87-86-5	1	mg/kg	----	<1	----	----	----
EP075B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	----
2-Methylnaphthalene	91-57-6	0.5	mg/kg	----	<0.5	----	----	----
2-Chloronaphthalene	91-58-7	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	----
N-2-Fluorenyl Acetamide	53-96-3	0.5	mg/kg	----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time: 29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
				EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EP075B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(b) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg	----	<1	----	----	----
7.12-Dimethylbenz(a)anthracene	57-97-6	0.5	mg/kg	----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	----
3-Methylcholanthrene	56-49-5	0.5	mg/kg	----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	----
EP075G: Chlorinated Hydrocarbons								
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	----	<0.5	----	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	----	<0.5	----	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	----	<0.5	----	----	----
Hexachloroethane	67-72-1	0.5	mg/kg	----	<0.5	----	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	----	<0.5	----	----	----
Hexachloropropylene	1888-71-7	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorocyclopentadiene	77-47-4	2.5	mg/kg	----	<2.5	----	----	----
Pentachlorobenzene	608-93-5	0.5	mg/kg	----	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	1.0	mg/kg	----	<1.0	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	<100
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	<0.5
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	----	<0.02	----	----	<0.04
2.4-DB	94-82-6	0.02	mg/kg	----	<0.02	----	----	<0.04
Dicamba	1918-00-9	0.02	mg/kg	----	<0.02	----	----	<0.04
Mecoprop	93-65-2	0.02	mg/kg	----	<0.02	----	----	<0.04
MCPA	94-74-6	0.02	mg/kg	----	<0.02	----	----	<0.04
2.4-DP	120-36-5	0.02	mg/kg	----	<0.02	----	----	<0.04
2.4-D	94-75-7	0.02	mg/kg	----	<0.02	----	----	<0.04

Analytical Results

Sub-Matrix: SOIL			Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
			Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
Compound	CAS Number	LOR	Unit	EB0807386-029	EB0807386-032	EB0807386-035	EB0807386-038	EB0807386-041
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
Triclopyr	55335-06-3	0.02	mg/kg	----	<0.02	----	----	<0.04
2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	----	<0.02	----	----	<0.04
2.4.5-T	93-76-5	0.02	mg/kg	----	<0.02	----	----	<0.04
MCPB	94-81-5	0.02	mg/kg	----	<0.02	----	----	<0.04
Picloram	1918-02-1	0.02	mg/kg	----	<0.02	----	----	<0.04
Clopyralid	1702-17-6	0.02	mg/kg	----	<0.02	----	----	<0.04
Fluroxypyr	69377-81-7	0.02	mg/kg	----	<0.02	----	----	<0.04
MW008: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	-	Faecal Coliforms/g	----	<3	----	----	----
Escherichia coli	----	-	Ecoli/g	----	<3	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**82.8**	----	----	----	**80.6**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**92.0**	----	----	----	**91.2**
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	**86.1**	----	----	----
Toluene-D8	2037-26-5	0.1	%	----	**98.0**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	----	**87.6**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**98.1**	----	----	----	**112**
2-Chlorophenol-D4	93951-73-6	0.1	%	**103**	----	----	----	**116**
2.4.6-Tribromophenol	118-79-6	0.1	%	**82.4**	----	----	----	**106**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**94.3**	----	----	----	**106**
Anthracene-d10	1719-06-8	0.1	%	**82.6**	----	----	----	**96.6**
4-Terphenyl-d14	1718-51-0	0.1	%	**86.0**	----	----	----	**101**
EP075S: Acid Extractable Surrogates								
2-Fluorophenol	367-12-4	0.1	%	----	**Not Determined**	----	----	----
Phenol-d6	13127-88-3	0.1	%	----	**Not Determined**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	----	**Not Determined**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	----	**Not Determined**	----	----	----
EP075T: Base/Neutral Extractable Surrogates								
Nitrobenzene-D5	4165-60-0	0.1	%	----	**Not Determined**	----	----	----
1.2-Dichlorobenzene-D4	2199-69-1	0.1	%	----	**Not Determined**	----	----	----
2-Fluorobiphenyl	321-60-8	0.1	%	----	**Not Determined**	----	----	----
Anthracene-d10	1719-06-8	0.1	%	----	**Not Determined**	----	----	----

Analytical Results

Sub-Matrix: **SOIL**				Client sample ID	SB13_0.0-0.1	Dup2_0.0-0.1	SB14_0.0-0.1	SB10_0.0-0.1	SB09_0.0-0.1
				Client sampling date / time	29-MAY-2008 15:00	29-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00	30-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807386-029**	**EB0807386-032**	**EB0807386-035**	**EB0807386-038**	**EB0807386-041**
EP075T: Base/Neutral Extractable Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.1	%		----	**Not Determined**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**89.3**	**90.7**	----	----	**112**
Toluene-D8	2037-26-5	0.1	%		**107**	**104**	----	----	**149**
4-Bromofluorobenzene	460-00-4	0.1	%		**82.7**	**92.3**	----	----	**118**
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%		----	**84.1**	----	----	**106**

Analytical Results

Sub-Matrix: **SOIL**			Client sample ID	**SS01**	**SS02**	-----	-----	-----
			Client sampling date / time	30-MAY-2008 15:00	30-MAY-2008 15:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0807386-044**	**EB0807386-045**	**----**	**----**	**----**
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**7.8**	**8.0**	----	----	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**13.8**	**14.2**	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Barium	7440-39-3	10	mg/kg	**260**	**190**	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**62**	**66**	----	----	----
Cobalt	7440-48-4	2	mg/kg	**22**	**26**	----	----	----
Copper	7440-50-8	5	mg/kg	**62**	**110**	----	----	----
Lead	7439-92-1	5	mg/kg	**50**	**846**	----	----	----
Manganese	7439-96-5	5	mg/kg	**754**	**921**	----	----	----
Nickel	7440-02-0	2	mg/kg	**66**	**72**	----	----	----
Vanadium	7440-62-2	5	mg/kg	**69**	**72**	----	----	----
Zinc	7440-66-6	5	mg/kg	**342**	**495**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL**			Client sample ID	**SS01**	**SS02**	-----	-----	-----
			Client sampling date / time	30-MAY-2008 15:00	30-MAY-2008 15:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0807386-044**	**EB0807386-045**	**----**	**----**	**----**
EP080/071: Total Petroleum Hydrocarbons - Continued								
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
MW008: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	-	Faecal Coliforms/g	----	**9**	----	----	----
Escherichia coli	----	-	Ecoli/g	----	<3	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**114**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**118**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**101**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**110**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**97.6**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**106**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**99.6**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**123**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**95.9**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	**TRIP BLANK**	----	----	----	----
				Client sampling date / time	29-MAY-2008 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807386-001**	**----**	**----**	**----**	**----**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
EP080: BTEX									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**101**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%		**105**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**90.9**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	10	110
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	121
Toluene-D8	2037-26-5	81	117
4-Bromofluorobenzene	460-00-4	74	121
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	24	113
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	19	115
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137
EP075S: Acid Extractable Surrogates			
2-Fluorophenol	367-12-4	25	121
Phenol-d6	13127-88-3	24	113
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	29	122
EP075T: Base/Neutral Extractable Surrogates			
Nitrobenzene-D5	4165-60-0	23	120
1.2-Dichlorobenzene-D4	2199-69-1	32	129
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	121
Toluene-D8	2037-26-5	81	117
4-Bromofluorobenzene	460-00-4	74	121
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2.4-Dichlorophenyl Acetic Acid	19719-28-9	70	130

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115

ATTACHMENT A1 - C

RPD Summary of Soils Analytical Results - TPH/BTEX and PAHs

Project Number VE30023

PNG LNG Project

			Sample Location	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**					
Total Petroleum Hydrocarbons (TPH)								
C6 - C9 Fraction	10	50	mg/kg	<10	<10	-	<50	-
C10 - C14 Fraction	50	50	mg/kg	<130^	<50	-	<50	-
C15 - C28 Fraction	100	100	mg/kg	<250^	<100	-	<100	-
C29 - C36 Fraction	100	100	mg/kg	<250^	<100	-	<100	-
Total C10 -C36			mg/kg			-		-
BTEX								
Benzene	0.2	1	mg/kg	<0.2	<0.2	-	<1	-
Toluene	0.5	1	mg/kg	<0.5	<0.5	-	<1	-
Ethylbenzene	0.5	1	mg/kg	<0.5	<0.5	-	<1	-
meta- & para-Xylene	0.5	2	mg/kg	<0.5	<0.5	-	<2	-
ortho-Xylene	0.5	1	mg/kg	<0.5	<0.5	-	<1	-
Total Xylene			mg/kg	<1.0	<1.0	-	-	-
Polycyclic Aromatic Hydrocarbons								
Naphthalene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Acenaphthylene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Acenaphthene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Fluorene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Phenanthrene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Anthracene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Fluoranthene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Pyrene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Benz(a)anthracene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Chrysene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Benzo(b)fluoranthene	0.5	1	mg/kg	<0.5	<0.5	-	<1	-
Benzo(k)fluoranthene	0.5		mg/kg	<0.5	<0.5	-		-
Benzo(a)pyrene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Indeno(1.2.3.cd)pyrene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Dibenz(a.h)anthracene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Benzo(g.h.i)perylene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Sum of PAHs			mg/kg	-	-	-	-	-

Notes:
- Not Analysed
LOR - Limits of Reporting
^ Elevated LOR

RPD% above the allowable Field Duplicate Difference (50%)

RPD Summary of Soils Analytical Results - OC/OP Pesticides
Project Number VE30023
PNG LNG Project

			Sample Location	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**					
Organochlorine Pesticides (OCPs)								
alpha-BHC	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Hexachlorobenzene (HCB)	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
beta-BHC	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
gamma-BHC	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
delta-BHC	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Heptachlor	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Aldrin	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Dieldrin	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Heptachlor epoxide	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Total Chlordane (sum)	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
trans-Chlordane	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
alpha-Endosulfan	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
cis-Chlordane	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
4.4`-DDE	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
4.4`-DDD	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
4.4`-DDT	0.2	0.2	mg/kg	<0.2	-	-	<0.2	-
Endrin	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Endosulfan (sum)	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
beta-Endosulfan	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Endrin aldehyde	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Endosulfan sulfate	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Endrin ketone	0.05	0.05	mg/kg	<0.05	-	-	<0.05	-
Methoxychlor	0.2	0.2	mg/kg	<0.2	-	-	<0.2	-
Organophosphorus Pesticides (OPPs)								
Dichlorvos	0.05		mg/kg	<0.05	-	-	-	-
Demeton-S-methyl	0.05		mg/kg	<0.05	-	-	-	-
Monocrotophos	0.2		mg/kg	<0.2	-	-	-	-
Dimethoate	0.05		mg/kg	<0.05	-	-	-	-
Diazinon	0.05		mg/kg	<0.05	-	-	-	-
Chlorpyrifos-methyl	0.05		mg/kg	<0.05	-	-	-	-
Parathion-methyl	0.2		mg/kg	<0.2	-	-	-	-
Malathion	0.05		mg/kg	<0.05	-	-	-	-
Fenthion	0.05		mg/kg	<0.05	-	-	-	-
Chlorpyrifos	0.05		mg/kg	<0.05	-	-	-	-
Parathion	0.2		mg/kg	<0.2	-	-	-	-
Pirimphos-ethyl	0.05		mg/kg	<0.05	-	-	-	-
Chlorfenvinphos	0.05		mg/kg	<0.05	-	-	-	-
Bromophos-ethyl	0.05		mg/kg	<0.05	-	-	-	-
Fenamiphos	0.05		mg/kg	<0.05	-	-	-	-
Prothiofos	0.05		mg/kg	<0.05	-	-	-	-
Ethion	0.05		mg/kg	<0.05	-	-	-	-
Carbophenothion	0.05		mg/kg	<0.05	-	-	-	-
Azinphos Methyl	0.05		mg/kg	<0.05	-	-	-	-

Notes:
- Not Analysed
LOR - Limits of Reporting
RPD% above the allowable Field Duplicate Difference (50%)

RPD Summary of Soils Analytical Results - pH, Heavy Metals, Cyanide, Fluoride and Nutrients

Project Number VE30023

PNG LNG Project

			Sample Location	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**					
pH								
pH Value	0.1	0.1	pH units	8.5	8.6	1.2	8.1	4.8
Heavy Metals								
Antimony	5	1	mg/kg	<5	<5	-	2	-
Arsenic	5	1	mg/kg	<5	<5	-	3	-
Barium	10	5	mg/kg	-	-	-	97	-
Beryllium	1	1	mg/kg	<1	4	-	<1	-
Cadmium	1	0.1	mg/kg	<1	<1	-	<0.1	-
Chromium	2	1	mg/kg	12	25	70.3	16	28.6
Cobalt	2	1	mg/kg	8	18	76.9	13	47.6
Copper	5	2	mg/kg	17	30	55.3	29	**52.2**
Lead	5	2	mg/kg	8	16	66.7	14	**54.5**
Manganese	5	5	mg/kg	-	-	-	427	-
Molybdenum	2	1	mg/kg	<2	<2	-	<1	-
Nickel	5	1	mg/kg	13	23	55.6	21	47.1
Selenium	2	2	mg/kg	<5	<5	-	<2	-
Silver	2		mg/kg	<2	<2	-	-	-
Tin	5	1	mg/kg	<5	<5	-	<1	-
Vanadium	5		mg/kg	18	31	53.1	-	-
Zinc	5	5	mg/kg	22	38	53.3	39	**55.7**
Mercury	0.1	0.05	mg/kg	<0.1	<0.1	-	0.11	-
Cyanide and Flouride								
Cyanide (total)	1	1	mg/kg	-	<1	-	<1	-
Fluoride (soluble)	40	1	mg/kg	140	190	30.3	15	**161.3**
Sulphate								
Sulfate as SO4 2-	100	10	mg/kg	930	1410	41.0	260	**112.6**
Sulfur - Total as S (LECO)	0.01	100	%	-	-	-	300	-
Nutrients								
Nitrite as N (Sol.)	0.1	0.1	mg/kg	<1.0^	2	-	<0.1	-
Nitrate as N (Sol.)	0.1	0.1	mg/kg	<5.0^	2.5	-	5.9	-
Nitrite + Nitrate as N (Sol.)	0.1		mg/kg	<5.0^	4.4	-	-	-
Total Kjeldahl Nitrogen as N	20	10	mg/kg	590	1360	**79.0**	2250	**116.9**
Total Nitrogen as N	20	10	mg/kg	590	1360	**79.0**	2260	**117.2**
Reactive Phosphorus as P	0.1		mg/kg	-	-	-	-	-
Reactive Phosphorus as P	0.1		mg/kg	<5.00^	4.92	-	-	-

Notes:
- Not Analysed
LOR - Limits of Reporting
^ Elevated LOR
RPD% above the allowable Field Duplicate Difference (50%)

RPD Summary of Soils Analytical Results - Chlorinated Hydrocarbons, Phenols & PCBs

Project Number VE30023

PNG LNG Project

			Sample Location	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**					
Phenols								
Phenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2-Chlorophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2-Methylphenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
3- & 4-Methylphenol	0.5	1	mg/kg	<0.5	<0.5	-	<0.5	-
2-Nitrophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<1.0	-
2.4-Dimethylphenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2.4-Dichlorophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2.6-Dichlorophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
4-Chloro-3-Methylphenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2.4.6-Trichlorophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2.4.5-Trichlorophenol	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Pentachlorophenol	1	1	mg/kg	<1	<1	-	<1	-
Chlorinated Hydrocarbons								
1.3-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	-	-
1.4-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	-	-
1.2-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	-	-
Hexachloroethane	0.5		mg/kg	<0.5	<0.5	-	-	-
1.2.4-Trichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	-	-
Hexachloropropylene	0.5		mg/kg	<0.5	<0.5	-	-	-
Hexachlorobutadiene	0.5		mg/kg	<0.5	<0.5	-	-	-
Hexachlorocyclopentadiene	2.5		mg/kg	<2.5	<2.5	-	-	-
Pentachlorobenzene	0.5		mg/kg	<0.5	<0.5	-	-	-
Hexachlorobenzene (HCB)	1		mg/kg	<1.0	<1.0	-	-	-
PCBs								
PCBs	0.1	3	mg/kg	<0.1	-	-	<0.1	-

Notes:
- Not Analysed
LOR - Limits of Reporting
RPD% above the allowable Field Duplicate Difference (50%)

RPD Summary of Soils Analytical Results - Phenoxyacetic acids and Faecal Coliforms

Project Number VE30023

PNG LNG Project

			Sample Location	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**LABMARK LOR**	**Units**					
Phenoxyacetic acids								
4-Chlorophenoxy acetic acid	0.02		mg/kg	<0.02	<0.02	-	-	-
2.4-DB	0.02		mg/kg	<0.02	<0.02	-	-	-
Dicamba	0.02		mg/kg	<0.02	<0.02	-	-	-
Mecoprop	0.02		mg/kg	<0.02	<0.02	-	-	-
MCPA	0.02		mg/kg	<0.02	<0.02	-	-	-
2.4-DP	0.02		mg/kg	<0.02	<0.02	-	-	-
2.4-D	0.02		mg/kg	<0.02	<0.02	-	-	-
Triclopyr	0.02		mg/kg	<0.02	<0.02	-	-	-
2.4.5-TP (Silvex)	0.02		mg/kg	<0.02	<0.02	-	-	-
2.4.5-T	0.02		mg/kg	<0.02	<0.02	-	-	-
MCPB	0.02		mg/kg	<0.02	<0.02	-	-	-
Picloram	0.02		mg/kg	<0.02	<0.02	-	-	-
Clopyralid	0.02		mg/kg	<0.02	<0.02	-	-	-
Fluroxypyr	0.02		mg/kg	<0.02	<0.02	-	-	-
Faecal Coliforms & E.coli								
Faecal Coliforms	-	2	Faecal Coliforms/g	<3	<3	-	<2	-
E. coli	-	2	Ecoli/g	<3	<3	-	<2	-

Notes:

- Not Analysed

LOR - Limits of Reporting

RPD% above the allowable Field Duplicate Difference (50%)

Data Quality Summary - Summary of Tripblank/Rinsate Analytical Results

Project Number VE30023

PNG LNG Project

			Sample Location	TRIP BLANK	TRIPBLANK	RINSATE
			Laboratory	ALS	LABMARK	ALS
			Date Sampled	29/05/2008	29/05/2008	29/05/2008
			Lab Report	EB0807386	E038049	EB807251
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**			
Total Recoverable Hydrocarbons						
TPH C6-C9	20	10	µg/L	<20	<10	<20
TPH C10-C14	50	-	µg/L	-	-	<50
TPH C15-C28	100	-	µg/L	-	-	<100
TPH C29-C36	100	-	µg/L	-	-	<50
Sum TPH C10-C36	-	-	µg/L	-	-	-
BTEX						
Benzene	1	1	µg/L	<1	<1	<1
Toluene	2	1	µg/L	<2	<1	<2
Ethylbenzene	2	1	µg/L	<2	<1	<2
meta- & para-Xylene	2	2	µg/L	<2	<2	<2
ortho-Xylene	2	1		<2	<1	<2
Heavy Metals						
Arsenic	0.001	-	mg/L	-	-	<0.001
Beryllium	0.001	-	mg/L	-	-	<0.001
Barium	0.001	-	mg/L	-	-	<0.001
Cadmium	0.0001	-	mg/L	-	-	0.0001
Chromium	0.001	-	mg/L	-	-	<0.001
Cobalt	0.001	-	mg/L	-	-	<0.001
Copper	0.001	-	mg/L	-	-	<0.001
Lead	0.001	-	mg/L	-	-	<0.001
Manganese	0.001	-	mg/L	-	-	0.004
Nickel	0.001	-	mg/L	-	-	<0.001
Vanadium	0.01	-	mg/L	-	-	<0.01
Zinc	0.005	-	mg/L	-	-	<0.005
Mercury	0.0001	-	mg/L	-	-	<0.0001

Notes:
- Not Analysed
LOR - Limits of Reporting

DATA QUALITY SUMMARY REPORT - SOIL

Project No:	VE30023
Site:	PNG LNG Project
Matrix:	SOIL
Primary Laboratory:	ALS (Batch No EB0807386)
Secondary Laboratory:	LabMark (Batch No E038049)
No. of Tests Requested/ Reported:	2xVic EPA Screen, 16xMetals, 9xTPH/BTEX, 6XPAH, 17XpH, 5XSulpfate 5XNutrients, 7XOCPs/OPPs, 1XPhenols, 4XVOC, 4XPhenoxyacetic acids, 4XFaecal Coliforms
Frequency of QA/QC undertaken:	1 in 16 samples duplicated - see note 2
Frequency of QA/QC Required:	1 in 20 samples is required to be duplicated

Data Quality Issue Assessed	Issue Reviewed	Results Acceptable	Comments
Sampling Technique	✓	Y	
Sample Holding Times	✓	Y	See Note 1
Analytical Procedures	✓	Y	
Laboratory Limits of Reporting (below relevant guideline value)	✓	Y	
Field Duplicate Agreement (RPD%)	✓	Y	See Note 2
Blank Sample Analysis	✓		
Method Blank	✓	Y	
Rinsate Blank	✓	Y	
Trip Blank	✓	Y	
Laboratory Duplicate Agreement (RPD%)	✓	Y	
Matrix Spikes/Matrix Spike Duplicates	✓	Y	
Recovery Percentages	✓	Y	See Note 3
Duplicate Agreement (RPD%)	✓	Y	See Note 3
Surrogate Recoveries	✓	Y	
Other Issues	✓	Y	See Note 4

Other Observations:

Note 1: Due to logistical constraints in getting the primary and secondary samples to the laboratory, a number of analytes were tested out of holding time, including total cyanide, PCBs, OC pesticides, OP pesticides, phenols, PAHs and chlorinated hydrocarbons. This is not likely to significantly alter the interpretation of the primary results as these analytes were generally reported at concentrations below laboratory LOR, with the intra and inter duplicate analysis also supporting the primary analytical results reported.

Note 2: An Inter and intra-laboratory field duplicate was collected from soil bore sample SB11_0-0.1
Elevated RPDs were reported between the primary and intra and/or inter duplicate sample for chromium, cobalt, copper, lead, vanadium, zinc, fluoride, sulphate, TKN and Total nitrogen
Elevated RPD% for field duplicates are most likely attributed to the following; concentrations were reported close to the LOR where precision and accuracy on determining values is compromised and therefore not considered significant in terms of overall interpretation of contamination issues at the site; and/or the absolute differences between sample concentrations is small

Fluorides elevated RPDs for both samples are due to different analytical techniques used between the primary and secondary laboratories, with the primary lab reporting total fluoride and the secondary lab reporting soluble fluoride.
A number of analytes including OC/OP pesticides, PCBs and phenoxy acid herbicides were not duplicated. This was due to the primary and secondary samples having insufficient sample quantity to undertake required analysis. This does not significantly alter the interpretation of the primary results as all reported concentrations of these analytes were below laboratory LOR

Note 3: For a range of analytes including phenols, OP pesticides, PAHs and chlorinated hydrocarbons, control and matrix spike recoveries were not reported, exceeded or were below the desired limit, This does not significantly alter the interpretation of the primary data as all these analytes were reported at concentrations below laboratory LOR.

Note 4: Trip blanks were sent with samples to both primary and secondary laboratories and were tested for volatile TPH and BTEX. All concentrations were reported below the LOR

Note 4: Rinsate sample reported concentrations of manganese and cadmium marginally in excess of laboratory LOR. This does not significantly alter the interpretation of the primary data as reported concentrations were very low.

Summary Comments:

Soil analytical data can be used as a basis of interpretation, subject to the limitations outlined above.

Recommended Corrective Action:

none

Checked By:

RPD Summary of Soils Analytical Results - Volatile Organic Compunds (VOCs)

Project Number VE30023

PNG LNG Project

			Sample	SB11_0.0-0.1	DUP2_0.0-0.1		SB11_0.0-0.1	
			Laboratory	ALS	ALS		LABMARK	
			Date Sampled	29/05/2008	29/05/2008	RPD %	29/05/2008	RPD %
			Lab Report	EB0807386	EB0807386		E038049	
			Duplication	Primary	Intra		Inter	
ANALYTE	**ALS LOR**	**Labmark LOR**	**Units**					
Volatile Organic Compunds (VOCs)								
Fumigants								
2.2-Dichloropropane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2-Dichloropropane	0.5		mg/kg	<0.5	<0.5	-	-	-
cis-1.3-Dichloropropylene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
trans-1.3-Dichloropropylene	0.5		mg/kg	<0.5	<0.5	-	-	-
1.2-Dibromoethane (EDB)	0.5		mg/kg	<0.5	<0.5	-	-	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	5	5	mg/kg	<5	<5	-	<5	-
Chloromethane	5	5	mg/kg	<5	<5	-	<5	-
Vinyl chloride	5	5	mg/kg	<5	<5	-	<5	-
Bromomethane	5	5	mg/kg	<5	<5	-	<5	-
Chloroethane	5	5	mg/kg	<5	<5	-	<5	-
Trichlorofluoromethane	5	5	mg/kg	<5	<5	-	<5	-
1.1-Dichloroethene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Iodomethane	0.5	0.5	mg/kg	<0.5	<0.5	-	-	-
trans-1.2-Dichloroethene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.1-Dichloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
cis-1.2-Dichloroethene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.1.1-Trichloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.1-Dichloropropylene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Carbon Tetrachloride	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2-Dichloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Trichloroethene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Dibromomethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.1.2-Trichloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.3-Dichloropropane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Tetrachloroethene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.1.1.2-Tetrachloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
trans-1.4-Dichloro-2-butene	0.5		mg/kg	<0.5	<0.5	-	-	-
cis-1.4-Dichloro-2-butene	0.5		mg/kg	<0.5	<0.5	-	-	-
1.1.2.2-Tetrachloroethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2.3-Trichloropropane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Pentachloroethane	0.5		mg/kg	<0.5	<0.5	-	-	-
1.2-Dibromo-3-chloropropane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Hexachlorobutadiene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Halgonenated Aromatic Compounds								
Chlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Bromobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
2-Chlorotoluene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
4-Chlorotoluene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.3-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.4-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2-Dichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2.4-Trichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
1.2.3-Trichlorobenzene	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Trihalomethanes								
Chloroform	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Bromodichloromethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Dibromochloromethane	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-
Bromoform	0.5	0.5	mg/kg	<0.5	<0.5	-	<0.5	-

Notes:

- Not Analysed

LOR - Limits of Reporting

RPD% above the allowable Field Duplicate Difference (50%)

PNG GROUNDWATER IMPACT ASSESSMENT

APPENDIX A2 - Limited Groundwater Investigation Program

BACKGROUND

ExxonMobil is undertaking a feasibility study for the development of a LNG project in Papua New Guinea (PNG). The proposed PNG LNG project is to comprise the construction of infrastructure to process and transport hydrocarbon products from the Highlands of PNG south to the shoreline of the Gulf of Papua. From here, an offshore pipeline will transport the gas to an LNG liquefaction plant on the east side of the Gulf (to the west of Port Moresby). The investigation area, State Portion 152, is a candidate site for the development of an LNG plant.

This assessment is part of a larger project being implemented by SKM which involves a groundwater impact assessment of the proposed LNG facility (located on the Gulf of Papua near Port Moresby), with upstream activities (such as gas production, processing and conditioning, and product transfer pipelines) the subject of desktop studies.

This current project involves a limited groundwater investigation to assist in characterising the groundwater environment within the investigation area and surrounding region. A sub-component of the project involved a limited surface water investigation.

Investigation Area

The investigation site is located approximately located 20 km north-west of Port Moresby on State Portion 152 (SP152 – Figure 1.2 (within main document)). The investigation area is approximately 4110 hectares and is bounded by Caution Bay to the west and mountainous terrain to the east. An investigation layout plan is provided as Figure 1.2 (within main document).

Approach

The investigation program comprised of:

- Sampling three existing bores located within the investigation area (GW1 to GW3 – former windmill bores, likely used for stock watering purposes);
- Sampling surface water within investigation area (Vaihua River); and
- Sampling of existing groundwater bores located within villages of Papa and Boera (village supply wells).

A site layout and sampling location plan is provided as Figure 4.1 (within main document) with details of the groundwater wells provided as Table A2 - 2.1.

Table A2 - 2.1 Sampling Summary

ID	Easting	Northing	Type	EOH*	DTW *
GW01	**501518**	**8968603**	**Groundwater**	**10.15**	**5.86**
GW02	**505882**	**8964156**	**Groundwater**	**4.22**	**2.415**
GW03	**503550**	**8965063**	**Groundwater**	**12.5**	**0.62**
Boera	**-**	**-**	**Groundwater**	**7.53**	**1.25**
Papa	**-**	**-**	**Groundwater**	**10**	**-**
Creek**	**503312**	**8960349**	**Surface Water**		

*refer to details on the purge sheets – Appendix A2 – A

** Vaihua River

METHODOLOGY

Limitations

Typically, a field sampling program involving the collection of groundwater samples requires the removal of three wet bore volumes from a sampled well prior to sampling with collection and stabilisation of field parameters indicating that a representative groundwater sample is being collected. However, due to current condition and the large wet bore volumes in two of the three sampled Portion 152 wells it was not possible to follow this 'rule of thumb', and grab samples were collected from the two concrete lined wells (GW-1 and 3) whilst GW-2 was purged of only one wet bore volume.

Purging of the village water supply wells was also not undertaken prior to water sample collections, primarily due to not wanting to interfere with the water supplies normally drawn from the wells. At Papa, water was collected from the village well directly from a container used by villagers for bringing water to the surface. At Boera, the village well pump was being repaired and the water sample was collected from remnants at the bottom of a 200 L steel drum located near one of the dwellings.

The constraints imposed on the sampling program described above mean that the laboratory analytical program provides indicative water quality data and may not be truly representative of actual groundwater conditions.

Sampling Methodology

The water levels in each of the groundwater wells on-site were gauged prior to the collection of the samples. Two of the three wells were not purged prior to sampling, however GW3 was purged of 120 L prior to the collection of the samples. Field chemical parameters were recorded prior to the collection of each of the water samples. The pH, redox, electrical conductivity and temperature meters were calibrated prior to the commencement of purging (purge sheets provided as Appendix A2 - A).

Grab samples were collected from groundwater wells located at Boera and Papa. The surface water sample comprised of a grab sample collected from the Vaihua River upstream of Caution Bay within the investigation area near to the Port Moresby-Papa road.

Samples were placed in laboratory cleaned bottles containing appropriate preservatives, and then placed into a chilled esky for transport to the Australian Laboratory Services (ALS), an Australian National

Association of Testing Authorities (NATA) registered laboratory. Intra-duplicate and inter-duplicate groundwater samples (frequency of 1 in 10) were collected and sent to Labmark (another Australian NATA registered laboratory), respectively. Trip blanks were also submitted for analysis.

Groundwater samples collected for metals analysis from the wells onsite were filtered and acidified immediately upon delivery to the primary and secondary laboratories.

Analytical Program

The analytical program adopted for all the onsite groundwater samples included:

- Heavy metals screen
- TPH, VOCs, PCBs, Phenols & OC/OP pesticides;
- Major Cations (Ca, Mg, Na and K);
- Major Anions (Cl, SO_4 and Alkalinity as $CaCO_3$); and
- Fluoride and Cyanide.

Samples collected from groundwater wells at Boera and Papa and the surface water sample were analysed for a heavy metals screen only.

QA/QC samples include 1 in 10 inter laboratory duplicates, 1 in 10 intra laboratory duplicates and one trip blank per esky containing samples required for analysis of volatile constituents.

Adopted Assessment Criteria

The adopted water quality criteria include:

- National Water Quality Management Strategy (NWQMS) Australian Drinking Water Guidelines (also referred from here on as ADWG) 1996 guideline value; and
- World Health Organisation (WHO) Guidelines guideline values.

RESULTS

Field Parameters

Field data (purge) sheets are provided as Appendix A2 - A.

Field parameters for the groundwater samples collected are provided in Table A2 – 3.1.

Table A2 – 3.1 Field measured groundwater quality parameters

Location	Salinity EC [1]	TDS [2]	pH	Redox (mV)
Guideline [3]		<1,000		
GW-1 [4]	420	273	6.84	-8
GW-2	790	515	7.57	-96
GW-3 [4]	2,340	1,520	7.84	108
Boera Village [4]	750	485	8.07	114
Papa Village [4]	1,810	1,175	7.72	130

Notes:
1. Electrical conductivity, as uS/cm
2. Total dissolved solids, as mg/L assuming conversion factor of ECx0.65. 80 to 500 mg/L is considered 'good', 500 to 800 mg/L is considered 'fair', and 800 to 1,000 is considered 'poor'
3. NWQMS
4. Grab samples

Salinity for onsite wells:

- Salinity concentrations for onsite bores range between around 275 and 1,500 mg/L. The calculated salinity concentration of groundwater sampled from site:
  - GW-1 is considered 'good';
  - GW-2 is marginal and considered 'good' to 'fair'; and
  - GW-3 exceeds 1,000 mg/L, and would be considered 'unacceptable' by Australian standards. This high reported salinity concentration may be the result of evaporative concentration of salts in the well, which is open to the atmosphere and is approximately 1.2 m in diameter.

Salinity for Village wells:

- Salinity concentrations range between around 485 and 1,175 mg/L. The calculated salinity concentration of groundwater sampled from:
  - Boera is below the adopted drinking water guideline and is considered as being of 'good' quality based on salinity concentration only; and
  - Papa exceeds 1,000 mg/L, and would be considered marginal at best and 'unacceptable' by Australian standards.

pH

- pH in the groundwater samples ranged from 6.84 (GW1) to 8.07 (Boera Village) indicating that groundwater within the study area is neutral to slightly alkaline.

Redox

- Redox values for GW1 and GW2 were negative indicating a reducing environment, while redox values for GW2, Boera Village and Papa Village were positive indicating an oxidising environment.

Laboratory Analytical Results

A summary of analytical laboratory results is provided in Table A2 - 1 for all groundwater samples, with a summary of results provided in Table A2 - 2 for the collected surface water sample.

Major Anions

- The concentrations of chloride in all of the wells (6 to 625 mg/L) sampled were reported in excess of the aesthetic ADWG (1996) guideline of 5mg/L;
- The concentration of alkalinity (as CaCO3) in GW-01(202 mg/L) and GW-02(528 mg/L) were reported in excess of the ADWG and WHO guidelines for hardness of water (200mg/L); and
- All primary samples analysed reported concentrations of sulfate below the adopted guideline concentrations.

Major Cations

The concentration of sodium in GW-03 (336 mg/L) was reported in excess of the ADWG (1994) guideline for aesthetic concentrations of sodium (180 mg/L);

No relevant guidelines currently exist for all other cations.

Heavy Metals

Table A2 - 3.1 provides a summary of groundwater analytical heavy metals results for on-site wells, with Table A2 - 3.2 providing a summary of results for Village Wells.

Table A2 - 3.1 Groundwater quality (metals) – Onsite Wells

Parameter	Guideline [2]	GW-1	GW-2	GW-3
Heavy metals				
Arsenic	0.007 (*0.01*)	0.002	<0.001	<0.001
Barium	0.7 (*0.7*)	0.02	0.015	0.056
Cadmium	0.002 (*0.003*)	0.0003	0.0008	0.0004
Chromium	0.05 (*0.05*)	<0.001	<0.001	<0.001
Copper	2 (*2*)	0.001	0.002	0.001
Lead	0.01 (*0.01*)	<0.001	<0.001	<0.001
Manganese	0.5 (*0.4*)	**0.751**	0.312	<0.001
Mercury	0.001 (*0.001*)	<0.0001	<0.0001	0.0003
Nickel	0.02 (*0.02*)	0.004	0.002	<0.001
Zinc	3 (*3*)	0.088	0.144	0.018

Notes:
1. All as mg/L
2. NWQMS Australian Drinking Water Guidelines (1996 health based) & WHO Guidelines in (*italics*)
3. '<' concentrations occur below laboratory level of reporting

Table A2 - 3.2 Groundwater quality (metals) – Village Wells

Parameter	Guideline [2]	Boera	Papa
Arsenic	0.007 (*0.01*)	<0.001	0.002
Barium	0.7 (*0.7*)	0.001	0.019
Cadmium	0.002 (*0.003*)	0.0008	0.0003
Chromium	0.05 (*0.05*)	0.001	<0.001
Copper	2 (*2*)	0.001	0.002
Lead	0.01 (*0.01*)	**0.022**	<0.001
Manganese	0.5 (*0.4*)	0.013	0.078
Mercury	0.001 (*0.001*)	<0.0001	<0.0001
Nickel	0.02 (*0.02*)	0.012	<0.001
Zinc	3 (*3*)	1.04	0.012

Notes:
1. All as mg/L
2. NWQMS Australian Drinking Water Guidelines (1996 health based) & WHO Guidelines in (*italics*)
3. '<' concentrations occur below laboratory level of reporting

The following heavy metals concentrations were reported:

- Groundwater sampled from GW-01 reported a manganese concentrations of 0.751 mg/L, in excess of the of the adopted Australian Drinking Water Guidelines (1994) 0.5 mg/L and the adopted WHO (1994) Drinking Water Guideline of 0.4 mg/L; and

- Groundwater sampled from the Boera bore reported a lead concentration of 0.022 mg/L, in excess of the adopted Australian Drinking Water Guidelines (1994) and adopted WHO (1994) Drinking Water Guideline of 0.01 mg/L.

All other concentrations of metals in analysed samples were below the adopted potable water guideline criteria (where available).

All reported concentrations of heavy metals in the collected surface water sample were below adopted potable water guideline values.

TPH

All primary samples analysed reported TPH concentrations in the C6-C9 and C10-C36 fractions below laboratory LOR and adopted guideline values.

Fluoride and Total Cyanide

Fluoride concentrations in groundwater samples ranged from 0.1mg/L in GW-01 and GW-02 to 0.3mg/L in GW-03. These concentrations were below the adopted ADWG and WHO guidelines.

All reported total cyanide concentrations in primary groundwater samples GW-01, GW-02 and GW-03 were below Laboratory LORs and adopted guideline values.

Polychlorinated Biphenyls (PCBs)

All primary samples analysed reported concentrations of PCBs pesticides below laboratory LOR.

OC and OP Pesticides

All primary samples analysed reported concentrations of OC and OP pesticides below laboratory LOR.

Monocyclic Aromatic Compounds (MAHs)

All primary samples analysed reported concentrations of MAHs below laboratory LOR.

Oxygenated and Sulfonated Compounds and Fumigant

All primary samples analysed reported concentrations of oxygenated and sulfonated compounds and fumigants below laboratory LOR.

Halogenated Aliphatic and Aromatic Compounds

All primary samples analysed reported concentrations of halogenated aliphatic and aromatic compounds below laboratory LOR.

Trihalomethanes

All primary samples analysed reported concentrations of trihalomethanes below laboratory LOR.

Summary

Apart from manganese, heavy metals in groundwater sampled from all onsite groundwater bores were reported at concentrations below the adopted potable water quality guidelines. Groundwater sampled from onsite bore GW-1 reported a manganese concentration in excess of the adopted potable water quality guidelines. The source of this manganese is uncertain but may be in relation to old pumping equipment still remaining in the well.

Groundwater sampled from the village well at Boera reported a lead concentration in excess of the adopted potable water quality guidelines.

Figure A2 - 3.1 shows the groundwaters across the site are of two types. Groundwater sampled from GW-1 and GW-2 is Ca-CO3 type, whilst groundwater sampled from GW-3 is Na-Cl type.

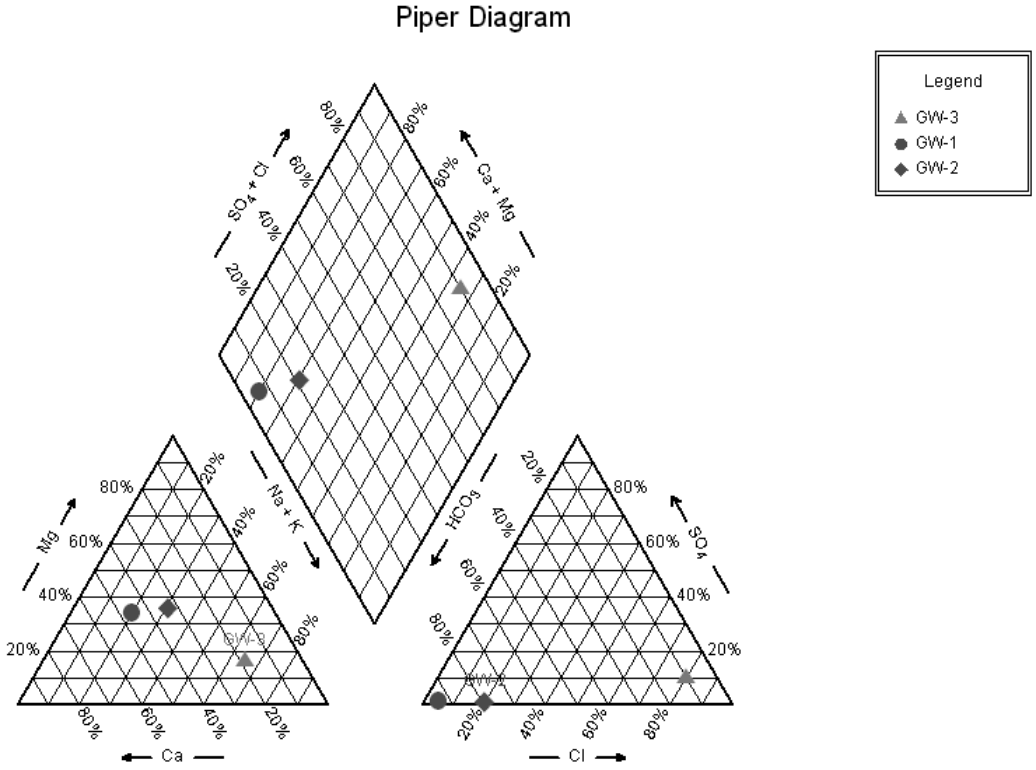


Figure A2 - 3.1 Piper tri-linear plot of groundwater major ion data

DATA QUALITY ASSESSMENT

The quality of analytical data produced for this groundwater investigation has been assessed with reference to the following issues:

- sampling technique;
- preservation and storage of samples upon collection and during transport to the laboratory;
- sample holding times;
- analytical procedures;
- laboratory limits of reporting;
- laboratory quality assurance/quality control (QA/QC) procedures; and
- occurrence of apparently unusual or anomalous results.

Laboratory QA/QC procedures and results are detailed in the certified laboratory results contained in Appendix A2 - B. A summary of the data quality assessment is included as Appendix A2 - C.

In summary, quality control information from the primary laboratory and supported with field duplicate analysis from the secondary laboratory indicates an acceptable degree of QA/QC information was collected and reported.

All samples were collected, stored and transported to the laboratory in accordance with standard SKM Chain of Custody protocols which are consistent with the requirements of Schedule B(2) of the NEPM (NEPC,1999). Laboratory analysis was undertaken within specified holding times and in accordance with National Association of Testing Authorities (NATA) accepted analytical procedures and the requirements of Schedule B(3) of the NEPM (NEPC,1999).

Trip blanks for both laboratories were below LOR supporting the appropriate storage and transport of collected samples to the laboratories.

Based on this assessment the analytical data presented in this is considered suitable to be used as a basis for interpretation.

CONCLUSIONS

The recently conducted groundwater sampling program undertaken around SP 152 indicates that groundwater of potable quality is available within the project area. However, further work that focuses on water quality issues as well as water yields will need to be completed to confirm this. It is recommended that this work includes the construction, testing and sampling of dedicated groundwater investigations wells, and a human health risk assessment to address metal concentrations that exceed adopted guideline values (eg. manganese).

The available salinity data suggests that the southern portion of the site is possibly more suitable for groundwater supply development.

The groundwater supplies for the local villages (Boera and Papa) vary significantly in terms of salinity concentrations and water delivery systems:

- Boera has a communal well that delivers potable quality water (in terms of salinity and the concentration of most metals sampled for) to different parts of the village via pipe work. The well compound is fenced and has a concrete cover. High reported lead concentrations in groundwater possibly arise from this pipe work and requires further attention.
- Papa also has a communal well but water is distributed from the well to the village via plastic containers. The well compound is not particularly secure and is not suitable for restricting run-off entering the well. The well provide sub-potable quality water (in terms of salinity).

Heavy metal analysis of the surface water sample collected from on-site reported concentrations of all analysed metals below adopted potable water quality guidelines. The salinity of the surface water sample was also below adopted potable water quality thresholds.

ATTACHMENTS

Tables

Table A2 - 1 – Summary of Groundwater Analytical Results
Table A2 - 2 - Summary of Surface Water Analytical Results

Attachments

Attachment A2 - A	Groundwater Purge Sheets
Attachment A2 - B	Soil Laboratory Analytical Reports
Attachment A2 - C	Data Quality Assessment

TABLES

Table A2 - 1. Summary of Groundwater Analytical Results

Sample ID	GW-3	GW-1	GW-2	DUP-01	GW-2	BOERA	PAPA
Date Sampled	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232	EB0807232	EB0807232	E037970	EB0807232	EB0807232
Label in Lab Report	GW-01	GW-02	GW-03		GW03		
Duplication	Primary	Primary	Primary	Intra	Inter	Primary	Primary

Analyte	Units	LOR	Australian Drinking Water Guidelines (ADWG) 1996 Health Based Guidelines	World Health Organisation (WHO) Guidelines 2004							
Dissolved Major Anions											
Sulfate as SO4 2-	mg/L	1	500		97	2	3	3	2	---	---
Chloride	mg/L	1	5[(1)]		625	6	79	82	74	---	---
Alkalinity											
Hydroxide Alkalinity as CaCO3	mg/L	1			<1	<1	<1	<1	---	---	---
Carbonate Alkalinity as CaCO3	mg/L	1			<1	<1	<1	<1	---	---	---
Bicarbonate Alkalinity as CaCO3	mg/L	1			136	202	528	539	---	---	---
Total Alkalinity as CaCO3	mg/L	1	200	200	136	202	528	539	581	---	---
Dissolved Major Cations											
Calcium	mg/L	1			84	40	80	78	65.2	---	---
Magnesium	mg/L	1			42	18	51	52	38.6	---	---
Sodium	mg/L	1	180[(1)]		*336*	19	77	77	64.2	---	---
Potassium	mg/L	1			7	2	13	13	12.2	---	---
Heavy Metals (Dissolved)											
Arsenic	mg/L	0.001	0.007	0.01	<0.001	0.002	<0.001	<0.001	0.001	<0.001**	0.002**
Beryllium	mg/L	0.001			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001**	<0.001**
Barium	mg/L	0.001	0.7	0.7	0.056	0.02	0.015	0.015	0.016	0.001**	0.019**
Cadmium	mg/L	0.0001	0.002	0.003	0.0004	0.0003	0.0008	0.0004	0.0002	0.0008**	0.0003**
Chromium	mg/L	0.001	0.05	0.05	<0.001	<0.001	<0.001	<0.001	*<0.005	0.001**	<0.001**
Cobalt	mg/L	0.001			<0.001	0.002	<0.001	<0.001	<0.001	<0.001**	<0.001**
Copper	mg/L	0.001	2	2	0.001	0.001	0.002	0.002	0.003	0.001**	0.002**
Lead	mg/L	0.001	0.01	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	0.022**	<0.001**
Manganese	mg/L	0.001	0.5	0.4	<0.001	0.751	0.312	0.328	0.401	0.013**	0.078**
Mercury	mg/L	0.0001	0.001	0.001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001**	<0.0001**
Nickel	mg/L	0.001	0.02	0.02	<0.001	0.004	0.002	0.002	0.003	0.012**	<0.001**
Vanadium	mg/L	0.01			<0.01	<0.01	<0.01	<0.01	0.003	0.02**	0.06**
Zinc	mg/L	0.005	3	3	0.018	0.088	0.144	0.144	0.222	1.04**	0.012**
Total Cyanide											
Total Cyanide	mg/L	0.004	0.08	0.07	<0.004	<0.004	<0.004	<0.004	0.01	---	---
Fluoride											
Fluoride	mg/L	0.1	1.5	1.5	0.3	0.1	0.1	0.1	<0.1	---	---
Polychlorinated Biphenyls (PCB)											
Total Polychlorinated biphenyls	µg/L	1			<1	<1	<1	<1	nd	---	---
Organochlorine Pesticides (OCPs)											
alpha-BHC	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Hexachlorobenzene (HCB)	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
beta-BHC	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
gamma-BHC	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
delta-BHC	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Heptachlor	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Aldrin	µg/L	0.5	0.3	0.03*	<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Heptachlor epoxide	µg/L	0.5	0.3		<0.5	<0.5	<0.5	<0.5	<0.5	---	---
trans-Chlordane	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
alpha-Endosulfan	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
cis-Chlordane	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Dieldrin	µg/L	0.5	0.3	0.03*	<0.5	<0.5	<0.5	<0.5	<0.5	---	---
4.4`-DDE	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
Endrin	µg/L	0.5		0.6	<0.5	<0.5	<0.5	<0.5	<0.5	---	---
beta-Endosulfan	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
4.4`-DDD	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---

NOTES:

(1) Aesthetic Guideline
(2) Dutch Intervention Guidelines for 'mineral oil'

1.2 Concentration exceeds Australian Drinking Water Guidelines (ADWG) 2004 guideline value
1.2 Concentration exceeds World Health Organisation (WHO) Guidelines 2004 guideline value
* Combined Aldrin and Dieldrin Guideline Value
** Total Metals Concentrations

Table A2 - 1. Summary of Groundwater Analytical Results

Sample ID	GW-3	GW-1	GW-2	DUP-01	GW-2	BOERA	PAPA
Date Sampled	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232	EB0807232	EB0807232	E037970	EB0807232	EB0807232
Label in Lab Report	GW-01	GW-02	GW-03		GW03		
Duplication	Primary	Primary	Primary	Intra	Inter	Primary	Primary

Analyte	Units	LOR	Australian Drinking Water Guidelines (ADWG) 1996 Health Based Guidelines	World Health Organisation (WHO) Guidelines 2004							
OCPs (Cont.)											
Endrin aldehyde	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	---	---	---
Endosulfan sulfate	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	---	---
4.4`-DDT	µg/L	2	20		<2	<2	<2	<2	<2	---	---
Endrin ketone	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	---	---	---
Methoxychlor	µg/L	2	300	20	<2	<2	<2	<2	<2	---	---
Organophosphorus Pesticides (OPPs)											
Dichlorvos	µg/L	0.5	1		<0.5	<0.5	<0.5	<0.5	<2	---	---
Demeton-S-methyl	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	---	---	---
Monocrotophos	µg/L	2	1		<2	<2	<2	<2	---	---	---
Dimethoate	µg/L	0.5	50		<0.5	<0.5	<0.5	<0.5	<2	---	---
Diazinon	µg/L	0.5	3		<0.5	<0.5	<0.5	<0.5	<2	---	---
Chlorpyrifos-methyl	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	---	---	---
Parathion-methyl	µg/L	2	100		<2	<2	<2	<2	---	---	---
Malathion	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<2	---	---
Fenthion	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<2	---	---
Chlorpyrifos	µg/L	0.5	10		<0.5	<0.5	<0.5	<0.5	<2	---	---
Parathion	µg/L	2	10		<2	<2	<2	<2	<2	---	---
Pirimphos-ethyl	µg/L	0.5	0.5		<0.5	<0.5	<0.5	<0.5	---	---	---
Chlorfenvinphos	µg/L	0.5	5		<0.5	<0.5	<0.5	<0.5	---	---	---
Bromophos-ethyl	µg/L	0.5	10		<0.5	<0.5	<0.5	<0.5	---	---	---
Fenamiphos	µg/L	0.5	0.3		<0.5	<0.5	<0.5	<0.5	---	---	---
Prothiofos	µg/L	0.5			<0.5	<0.5	<0.5	<0.5	<2	---	---
Ethion	µg/L	0.5	3		<0.5	<0.5	<0.5	<0.5	---	---	---
Carbophenothion	µg/L	0.5	0.5		<0.5	<0.5	<0.5	<0.5	---	---	---
Azinphos Methyl	µg/L	0.5	3		<0.5	<0.5	<0.5	<0.5	<2	---	---
Monocyclic Aromatic Hydrocarbons (MAHs)											
Benzene	µg/L	5	1	10	<5	<5	<5	<5	<5	---	---
Toluene	µg/L	5	800	700	<5	<5	<5	<5	<5	---	---
Ethylbenzene	µg/L	5	300	300	<5	<5	<5	<5	<5	---	---
meta- & para-Xylene	µg/L	5			<5	<5	<5	<5	<10	---	---
Styrene	µg/L	5	30	20	<5	<5	<5	<5	<5	---	---
ortho-Xylene	µg/L	5			<5	<5	<5	<5	<5	---	---
Isopropylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
n-Propylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.3.5-Trimethylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
sec-Butylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.2.4-Trimethylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
tert-Butylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
p-Isopropyltoluene	µg/L	5			<5	<5	<5	<5	<5	---	---
n-Butylbenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
Oxygenated Compounds											
Vinyl Acetate	µg/L	50			<50	<50	<50	<50	<5	---	---
2-Butanone (MEK)	µg/L	50			<50	<50	<50	<50	<5	---	---
4-Methyl-2-pentanone (MIBK)	µg/L	50			<50	<50	<50	<50	<5	---	---
2-Hexanone (MBK)	µg/L	50			<50	<50	<50	<50	<5	---	---
Sulfonated Compounds											
Carbon disulfide	µg/L	5			<5	<5	<5	<5	<5	---	---

NOTES:

(1) Aesthetic Guideline
(2) Dutch Intervention Guidelines for 'mineral oil'

1.2 Concentration exceeds Australian Drinking Water Guidelines (ADWG) 1996 guideline value
1.2 Concentration exceeds World Health Organisation (WHO) Guidelines 2004 guideline value
* Combined Aldrin and Dieldrin Guideline Value
** Total Metals Concentrations

Table A2 - 1. Summary of Groundwater Analytical Results

Sample ID	GW-3	GW-1	GW-2	DUP-01	GW-2	BOERA	PAPA
Date Sampled	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232	EB0807232	EB0807232	E037970	EB0807232	EB0807232
Label in Lab Report	GW-01	GW-02	GW-03		GW03		
Duplication	Primary	Primary	Primary	Intra	Inter	Primary	Primary

Analyte	Units	LOR	Australian Drinking Water Guidelines (ADWG) 1996 Health Based Guidelines	World Health Organisation (WHO) Guidelines 2004							
Fumigants											
2.2-Dichloropropane	µg/L	5			<5	<5	<5	<5	<5	---	---
1.2-Dichloropropane	µg/L	5		40	<5	<5	<5	<5	<5	---	---
cis-1.3-Dichloropropylene	µg/L	5			<5	<5	<5	<5	<5	---	---
trans-1.3-Dichloropropylene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.2-Dibromoethane (EDB)	µg/L	5			<5	<5	<5	<5	<5	---	---
Halogenated Aliphatic Compounds											
Dichlorodifluoromethane	µg/L	50			<50	<50	<50	<50	<50	---	---
Chloromethane	µg/L	50			<50	<50	<50	<50	<50	---	---
Vinyl chloride	µg/L	50	0.3	0.3	<50	<50	<50	<50	<50	---	---
Bromomethane	µg/L	50			<50	<50	<50	<50	<50	---	---
Chloroethane	µg/L	50			<50	<50	<50	<50	<50	---	---
Trichlorofluoromethane	µg/L	50			<50	<50	<50	<50	<50	---	---
1.1-Dichloroethene	µg/L	5	30	30	<5	<5	<5	<5	<5	---	---
Iodomethane	µg/L	5			<5	<5	<5	<5	<5	---	---
trans-1.2-Dichloroethene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.1-Dichloroethane	µg/L	5			<5	<5	<5	<5	<5	---	---
cis-1.2-Dichloroethene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.1.1-Trichloroethane	µg/L	5			<5	<5	<5	<5	<5	---	---
1.1-Dichloropropylene	µg/L	5			<5	<5	<5	<5	<5	---	---
Carbon Tetrachloride	µg/L	5	3		<5	<5	<5	<5	<5	---	---
1.2-Dichloroethane	µg/L	5	3	30	<5	<5	<5	<5	<5	---	---
Trichloroethene	µg/L	5		70	<5	<5	<5	<5	<5	---	---
Dibromomethane	µg/L	5			<5	<5	<5	<5	<5	---	---
1.1.2-Trichloroethane	µg/L	5	1900		<5	<5	<5	<5	<5	---	---
1.3-Dichloropropane	µg/L	5			<5	<5	<5	<5	<5	---	---
Tetrachloroethene	µg/L	5	50	40	<5	<5	<5	<5	<5	---	---
1.1.1.2-Tetrachloroethane	µg/L	5			<5	<5	<5	<5	<5	---	---
trans-1.4-Dichloro-2-butene	µg/L	5			<5	<5	<5	<5	<5	---	---
cis-1.4-Dichloro-2-butene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.1.2.2-Tetrachloroethane	µg/L	5			<5	<5	<5	<5	<5	---	---
1.2.3-Trichloropropane	µg/L	5			<5	<5	<5	<5	<5	---	---
Pentachloroethane	µg/L	5			<5	<5	<5	<5	--	---	---
1.2-Dibromo-3-chloropropane	µg/L	5		1	<5	<5	<5	<5	<5	---	---
Hexachlorobutadiene	µg/L	5	0.7	0.6	<5	<5	<5	<5	<5	---	---
Halogenated Aromatic Compounds											
Chlorobenzene	µg/L	5	300		<5	<5	<5	<5	<5	---	---
Bromobenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
2-Chlorotoluene	µg/L	5			<5	<5	<5	<5	<5	---	---
4-Chlorotoluene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.3-Dichlorobenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.4-Dichlorobenzene	µg/L	5	40	300	<5	<5	<5	<5	<5	---	---
1.2-Dichlorobenzene	µg/L	5	1500		<5	<5	<5	<5	<5	---	---
1.2.4-Trichlorobenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
1.2.3-Trichlorobenzene	µg/L	5			<5	<5	<5	<5	<5	---	---
Trihalomethanes											
Chloroform	µg/L	5		200	<5	<5	<5	<5	<5	---	---
Bromodichloromethane	µg/L	5		60	<5	<5	<5	<5	<5	---	---
Dibromochloromethane	µg/L	5		100	<5	<5	<5	<5	<5	---	---
Bromoform	µg/L	5		100	<5	<5	<5	<5	<5	---	---

NOTES:

(1) Aesthetic Guideline
(2) Dutch Intervention Guidelines for 'mineral oil'

1.2 Concentration exceeds Australian Drinking Water Guidelines (ADWG) 1996 guideline value
1.2 Concentration exceeds World Health Organisation (WHO) Guidelines 2004 guideline value
* Combined Aldrin and Dieldrin Guideline Value
** Total Metals Concentrations

Table A2 - 1. Summary of Groundwater Analytical Results

Sample ID	GW-3	GW-1	GW-2	DUP-01	GW-2	BOERA	PAPA
Date Sampled	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232	EB0807232	EB0807232	E037970	EB0807232	EB0807232
Label in Lab Report	GW-01	GW-02	GW-03		GW03		
Duplication	Primary	Primary	Primary	Intra	Inter	Primary	Primary

Analyte	Units	LOR	Australian Drinking Water Guidelines (ADWG) 1996 Health Based Guidelines	World Health Organisation (WHO) Guidelines 2004							
Naphthalene											
Naphthalene	µg/L	7			<7	<7	<7	<7	<5	---	---
Phenolic Compounds											
Phenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
2-Chlorophenol	µg/L	1	300		<1.0	<1.0	<1.0	<1.0	<2	---	---
2-Methylphenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
3- & 4-Methylphenol	µg/L	2			<2.0	<2.0	<2.0	<2.0	<4	---	---
2-Nitrophenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
2.4-Dimethylphenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
2.4-Dichlorophenol	µg/L	1	200		<1.0	<1.0	<1.0	<1.0	<2	---	---
2.6-Dichlorophenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	---	---	---
4-Chloro-3-Methylphenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
2.4.6-Trichlorophenol	µg/L	1	20	200	<1.0	<1.0	<1.0	<1.0	<2	---	---
2.4.5-Trichlorophenol	µg/L	1			<1.0	<1.0	<1.0	<1.0	<2	---	---
Pentachlorophenol	µg/L	2	10	9	<2.0	<2.0	<2.0	<2.0	<10	---	---
Total Petroleum Hydrocarbons (TPH)											
C6 - C9 Fraction	µg/L	20	150(2)	150(2)	<20	<20	<20	<20	<50	---	---
C10 - C14 Fraction	µg/L	50	600(2)	600(2)	<50	<50	<50	<50	<50	---	---
C15 - C28 Fraction	µg/L	100			<100	<100	<100	<100	<200	---	---
C29 - C36 Fraction	µg/L	50			<50	<50	<50	<50	90	---	---

NOTES:

(1) Aesthetic Guideline
(2) Dutch Intervention Guidelines for 'mineral oil'

1.2 Concentration exceeds Australian Drinking Water Guidelines (ADWG) 1996 guideline value
1.2 Concentration exceeds World Health Organisation (WHO) Guidelines 2004 guideline value
* Combined Aldrin and Dieldrin Guideline Value
** Total Metals Concentrations

Table A2 -2. Summary of Surface Water Analytical Results

Sample ID	SW-01
Date Sampled	28/05/2008
Lab Report No.	EB0807232
Duplication	Primary

Analyte	Units	LOR	Australian Drinking Water Guidelines (ADWG) 1996 Health	World Health Organisation (WHO) Guidelines 2004	
Heavy Metals (Total)					
Arsenic	mg/L	0.001	0.007	0.01	0.002
Beryllium	mg/L	0.001	NA	NA	<0.001
Barium	mg/L	0.001	0.7	0.7	0.025
Cadmium	mg/L	0.0001	0.002	0.003	0.0001
Chromium	mg/L	0.001	0.05	0.05	<0.001
Cobalt	mg/L	0.001	NA	NA	<0.001
Copper	mg/L	0.001	2	2	0.001
Lead	mg/L	0.001	0.01	0.01	<0.001
Manganese	mg/L	0.001	0.5	0.4	0.039
Mercury	mg/L	0.0001	0.001	0.001	<0.0001
Nickel	mg/L	0.001	0.02	0.02	0.001
Vanadium	mg/L	0.01	NA	NA	0.02
Zinc	mg/L	0.005	3	3	0.006

NOTES:

(1) Aesthetic Guideline

1.2 Concentration exceeds Australian Drinking Water Guidelines (ADWG) 2004 guideline value

1.2 Concentration exceeds World Health Organisation (WHO) Guidelines 2004 guideline value

ATTACHMENT A2 - A

Actual GW1

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	Coffey		
Job Number:	GQ-01	Bore Locked (Y/N)	N
Project:	PNG LNG	Well ID No.	GW-2
Location:	Camp	Chem Kit No.	Frog Pole
Depth to Groundwater (m-TOSC):	5.86	Well depth (m-PVC)	10.15
Depth to Groundwater (mPVC):		Free product thickness:	—
Depth to Groundwater (m-BGL):		RL from TOC:	0.5

Weather Conditions

Rain:	Wind Direction:
Temperature: 30	Wind Speed: —
Cloud Cover: thi	Upwind Activities:
Location Conditions:	
ignore of Rain trees destroyed windmill	

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

PV =

PV =

Old wind mill

Purging Information

Date:	Name:		
Method:	Tubing Material	Pump Depth	
Start Time:	Finish Time	Pump Speed	
Purge Volume (L)	No times purged	Total Purge Volumes (litres)	

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date: 28/5/08 Name: V. STROEMER

Method: bailer Tubing Material poly Pump Depth

Start Time Finish Time Pump Speed

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
11:35		6.84	0.423	-8	23.3	Clear no odour

Purger's Name:		Signature	Date / /
Sampler's Name:	V. STROEMER	Signature	Date / /
Checked by:	P. HOWE	Signature	Date 28/5/08

rem

Actual GW2

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	Coffey		
Job Number:	GQ-01	Bore Locked (Y/N)	
Project:	PNG LNG	Well ID No.	GW-3
Location:	Cased well	Chem Kit No.	~~Mono gasket Water Quality Kit~~
Depth to Groundwater (m-TOSC):	2.415	Well depth (m-PVC)	4.22
Depth to Groundwater (mPVC):		Free product thickness:	
Depth to Groundwater (m-BGL):		RL from TOC:	0.4

Weather Conditions

Rain: —	Wind Direction: S
Temperature: 30	Wind Speed: Slight
Cloud Cover: ✓	Upwind Activities:
Location Conditions:	
Inland of road	
~~to~~	

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

PV =

PV = 60 L

8" cased well

Purging Information

Date:	Name:		
Method:	Tubing Material	Pump Depth	
Start Time:	Finish Time	Pump Speed	
Purge Volume (L)	No times purged	Total Purge Volumes (litres)	

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
12:28	60	7.6	0.735	-90	25.2	
12:50	120	7.57	0.791	-96	25.6	

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date:		Name:	
Method:	Tubing Material	Pump Depth	
Start Time	Finish Time	Pump Speed	

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
12:28	60	7.6	0.735	-90	25.2	Slightly turbid
12:50	120	7.57	0.791	-96	25.6	Sulfurous

Purger's Name:		Signature	Date / /
Sampler's Name:	V. STROVANOR	Signature	Date / /
Checked by:	P. HOWE	Signature	Date 28/5/08

rem

Actual - GW3

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	Coffey		
Job Number:	GQ - 01	Bore Locked (Y/N)	N
Project:	PNG LNG	Well ID No.	GW1
Location:	Airfield	Chem Kit No.	WUMPIS FROG
Depth to Groundwater (m-TOSC):	0.62m	Well depth (m-PVC)	12.5
Depth to Groundwater (mPVC):		Free product thickness:	
Depth to Groundwater (m-BGL):		RL from TOC:	

Weather Conditions

Rain:	—	Wind Direction:	—
Temperature:	32	Wind Speed:	—
Cloud Cover:	—	Upwind Activities:	—

Location Conditions:
Old airfield / savannah grass
photo taken

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)
h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =
R =
H =
h =
PV =
PV =
PV =

unmonumented

Well is a casing 12.5m stick 1.2m diameter

Purging Information

Date:	Name:		
Method:	Tubing Material	Pump Depth	
Start Time:	Finish Time	Pump Speed	
Purge Volume (L)	No times purged	Total Purge Volumes (litres)	

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date: 28/5/08
Method: bail
Start Time 10:55
Tubing Material poly
Finish Time
Name: V. STROTHER
Pump Depth
Pump Speed

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
10:55	—	7.87	2.3	120		
10.58	—	7.84	2.34	108	23.2	Clear no odour

Purger's Name:		Signature	Date / /
Sampler's Name:	V. STROTHER	Signature	Date / /
Checked by:	P. HOWE	Signature	Date 28/5/08

rem

Papaw Village Well

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	COFFEY		
Job Number:	GQ-01	Bore Locked (Y/N)	N
Project:	PNG-LNG	Well ID No.	Papaw
Location:	Papaw	Chem Kit No.	1
Depth to Groundwater (m-TOSC):	—	Well depth (m-PVC)	—
Depth to Groundwater (mPVC):	—	Free product thickness:	—
Depth to Groundwater (m-BGL):	—	RL from TOC:	—

Weather Conditions

Rain: Nil	Wind Direction: S
Temperature:	Wind Speed: Mod
Cloud Cover: Mod	Upwind Activities: Nil
Location Conditions: Within Papaw Village	

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

PV =

PV =

GRAB SAMPLE

Purging Information

Date: 27/5/08	Name:		Pump Depth
Method:	Tubing Material		Pump Speed
Start Time:	Finish Time		Total Purge Volumes (litres)
Purge Volume (L)	No times purged		

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
			GRAB			

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date: 27/5/08 Name:

Method: GRAB Tubing Material Pump Depth

Start Time Finish Time Pump Speed

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
14:00	1L	7.72	1812	130	26.3	no odour/clear

Purger's Name:	V. Strachan	Signature	Date / /
Sampler's Name:	V. Strachan	Signature	Date / /
Checked by:	P. Howe	Signature	Date / /

rem

Boera Village well 1

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	COFFEY		
Job Number:	GR2-01	Bore Locked (Y/N)	N
Project:	PNG-LNG	Well ID No.	Boera 1
Location:	Boera	Chem Kit No.	1
Depth to Groundwater (m-TOSC):	—	Well depth (m-PVC)	10m
Depth to Groundwater (mPVC):	/	Free product thickness:	—
Depth to Groundwater (m-BGL):	/	RL from TOC:	—

Weather Conditions

Rain: Nil	Wind Direction: S
Temperature: -	Wind Speed: Mod
Cloud Cover: Mod	Upwind Activities: —
Location Conditions: within Boera Village	

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations In Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

PV =

PV = GRAB SAMPLE

Purging Information

Date: 27/5/08	Name:		Pump Depth
Method: GRAB	Tubing Material		Pump Speed
Start Time:	Finish Time		Total Purge Volumes (litres)
Purge Volume (L)	No times purged		

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date: 27/5/08 Name:

Method: GRAB Tubing Material Pump Depth

Start Time 12:55 Finish Time Pump Speed

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
12:55	1	8.07	750	114	—	Clear

Purger's Name: U. Stroehr Signature Date / /

Sampler's Name: U. Stroehr Signature Date / /

Checked by: P. Howe Signature Date / /

rem

Baera Village WELL2

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	Coffey Natural Systems		
Job Number:	GQ-07	Bore Locked (Y/N)	N
Project:	PNG LNG	Well ID No.	BOERA 2
Location:	BOERA VILLAGE	Chem Kit No.	
Depth to Groundwater (m-TOSC):		Well depth (m-PVC)	
Depth to Groundwater (mPVC):		Free product thickness:	—
Depth to Groundwater (m-BGL):	1.25 m	RL from TOC:	GROUND

Weather Conditions

Rain:	N	Wind Direction:	none
Temperature:	25°	Wind Speed:	—
Cloud Cover:	✓	Upwind Activities:	—

Location Conditions:

Village water well, photo taken

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

PV =

PV =

GRAB SAMPLE, Well 7.53 m deep.

Purging Information

Date:	28/5/08	Name:	V. STROEHER
Method:	Bail	Tubing Material	DISPOSABLE BAILER
Start Time:	09:06	Finish Time	09:13
Purge Volume (L)	—	No times purged	—
Pump Depth	~10 m		
Pump Speed	?		
Total Purge Volumes (litres)	—		

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date:		Name:	
Method:	Tubing Material	Pump Depth	
Start Time	Finish Time	Pump Speed	

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
09:12	3L	7.76	670	101	24.7	clear

Purger's Name:	Signature	Date	/ /
Sampler's Name:	Signature	Date	/ /
Checked by:	Signature	Date	28/5/08

rem

SURFACE WATER SAMPLE

Bore Purging and Groundwater Sampling Data Sheet

General Information

Client:	COFFEY		
Job Number:	GQ-01	Bore Locked (Y/N)	—
Project:	ANG-LNG	Well ID No.	Creek
Location:	Creek	Chem Kit No.	
Depth to Groundwater (m-TOSC):		Well depth (m-PVC)	
Depth to Groundwater (mPVC):		Free product thickness:	
Depth to Groundwater (m-BGL):		RL from TOC:	

Weather Conditions

Rain: —	Wind Direction: S
Temperature: 30	Wind Speed: —
Cloud Cover: —	Upwind Activities: —
Location Conditions: Creek	

Field Comments

Other Comments and Observations:

- Bore Conditions
- Fate of Tubing, etc. (left in hole/disposal)
- Purge Volume Calculations in Liters(screened & unscreened sections)

$$PV = [(H \times \pi \times r^2) + 0.2(h \times \pi \times (R^2 - r^2))] \times 1000$$

where H = height of water column (m) R = Bore Radius (m)

h = thickness of saturated filterpack (m) r = PVC Radius (m)

r =

R =

H =

h =

PV =

surface water sample

PV =

PV =

Purging Information

Date:	Name:		Pump Depth
Method:	Tubing Material		Pump Speed
Start Time:	Finish Time		Total Purge Volumes (litres)
Purge Volume (L)	No times purged		

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)

Purging should continue until measurements for pH are within 0.1 pH unit, EC is within 3%, Redox is within 10mV and Temperature is within 0.5 degC of the previous set of parameters.

Sampling Information

Date: 28/5/08 Name:

Method: GRAB Tubing Material Pump Depth

Start Time Finish Time Pump Speed

Time	Volume Removed (L)	pH	E.C. (mS/cm)	Redox (mV)	Temp (Cels)	Appearance (Colour / Odour / Turbidity)
28/5/	—	7.9	0.87	78	27.9	clear

Purger's Name: J. Stroehm Signature Date / /

Sampler's Name: J. Stroehm Signature Date / /

Checked by: P. Howe Signature Date / /

rem

ATTACHMENT A2 - B

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0807232**	Page	: 1 of 12
Client	: **SINCLAIR KNIGHT MERZ**	Laboratory	: Environmental Division Brisbane
Contact	: MR PAUL HOWE	Contact	: Tim Kilmister
Address	: UNIT 9, 15 FULLARTON RD KENT TOWN SA, AUSTRALIA 5067	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: paulhowe@rem.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 08 83631777	Telephone	: +61-7-3243 7222
Facsimile	: +61 08 83631477	Facsimile	: +61-7-3243 7218
Project	: GQ-01	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 02-JUN-2008
Sampler	: VOLKER STROEHER	Issue Date	: 11-JUN-2008
Site	: ----		
		No. of samples received	: 16
Quote number	: EN/003/08	No. of samples analysed	: 16

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jessica Janson	Supervisor - Acid Sulphate Soils	Inorganics
Kim McCabe	Senior Inorganic Chemist	Inorganics
Minh Wills	Senior Analyst	Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Chloride (ED045): Insufficient volume of sample (EB0807266-003) was provided for QC analysis.**
- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **Pesticides: Results for Monocrotophos should be scrutinised as QC data indicates abnormally low recovery.**
- **Retained Acidity not required because pH KCl greater than or equal to 4.5**

Analytical Results

Sub-Matrix: **SOIL**			Client sample ID	BH1_0.0-0.1	BH1_0.1-0.2	BH2_0.5-0.6	BH3_0.2-0.3	BH4_0.3-0.4
			Client sampling date / time	27-MAY-2008 15:00	27-MAY-2008 15:00	27-MAY-2008 15:00	27-MAY-2008 15:00	27-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0807232-009**	**EB0807232-010**	**EB0807232-011**	**EB0807232-012**	**EB0807232-013**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.6**	**9.7**	**8.9**	**9.2**	**7.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	**0.14**	<0.02	<0.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	**91**	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**86.4**	**83.8**	**25.3**	**14.1**	**0.98**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**17200**	**16800**	**5060**	**2810**	**196**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**27.7**	**26.8**	**8.12**	**4.51**	**0.31**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SOIL**			Client sample ID	BH5_0.7-0.8	BH6_0.3-0.4	DUP1_0.3-0.4	-----	-----
			Client sampling date / time	27-MAY-2008 15:00	27-MAY-2008 15:00	27-MAY-2008 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0807232-014**	**EB0807232-015**	**EB0807232-016**	**----**	**----**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**8.7**	**8.7**	**8.6**	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	<0.02	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**25.2**	**10.3**	**6.08**	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**5040**	**2060**	**1220**	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**8.08**	**3.29**	**1.95**	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	----	----

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		EB0807232-001	EB0807232-002	EB0807232-003	EB0807232-004	EB0807232-005
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		----	**136**	**202**	**528**	**539**
Total Alkalinity as CaCO3	----	1	mg/L		----	**136**	**202**	**528**	**539**
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		----	**97**	**2**	**3**	**3**
ED045P: Chloride by PC Titrator									
Chloride	16887-00-6	1	mg/L		----	**625**	**6**	**79**	**82**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		----	**84**	**40**	**80**	**78**
Magnesium	7439-95-4	1	mg/L		----	**42**	**18**	**51**	**52**
Sodium	7440-23-5	1	mg/L		----	**336**	**19**	**77**	**77**
Potassium	7440-09-7	1	mg/L		----	**7**	**2**	**13**	**13**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		----	<0.001	**0.002**	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L		----	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L		----	**0.056**	**0.020**	**0.015**	**0.015**
Cadmium	7440-43-9	0.0001	mg/L		----	**0.0004**	**0.0003**	**0.0008**	**0.0004**
Chromium	7440-47-3	0.001	mg/L		----	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		----	<0.001	**0.002**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		----	**0.001**	**0.001**	**0.002**	**0.002**
Lead	7439-92-1	0.001	mg/L		----	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		----	<0.001	**0.751**	**0.312**	**0.328**
Nickel	7440-02-0	0.001	mg/L		----	<0.001	**0.004**	**0.002**	**0.002**
Vanadium	7440-62-2	0.01	mg/L		----	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		----	**0.018**	**0.088**	**0.144**	**0.144**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	**0.0003**	<0.0001	<0.0001	<0.0001
EK026: Total Cyanide									
Total Cyanide	57-12-5	0.004	mg/L		----	<0.004	<0.004	<0.004	<0.004
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		----	**0.3**	**0.1**	**0.1**	**0.1**
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		----	**22.4**	**4.27**	**12.8**	**13.1**
^ Total Cations	----	0.01	meq/L		----	**22.4**	**4.34**	**11.9**	**11.9**
^ Ionic Balance	----	0.01	%		----	**0.13**	**0.76**	**3.96**	**5.00**
EP066: Polychlorinated Biphenyls (PCB)									

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807232-001**	**EB0807232-002**	**EB0807232-003**	**EB0807232-004**	**EB0807232-005**
EP066: Polychlorinated Biphenyls (PCB) - Continued									
Total Polychlorinated biphenyls	----	1	µg/L		----	<1	<1	<1	<1
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2	µg/L		----	<2	<2	<2	<2
Endrin ketone	53494-70-5	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2	µg/L		----	<2	<2	<2	<2
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2	µg/L		----	<2	<2	<2	<2
Dimethoate	60-51-5	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2	µg/L		----	<2	<2	<2	<2
Malathion	121-75-5	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2	µg/L		----	<2	<2	<2	<2
Pirimphos-ethyl	23505-41-1	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807232-001**	**EB0807232-002**	**EB0807232-003**	**EB0807232-004**	**EB0807232-005**
EP068B: Organophosphorus Pesticides (OP) - Continued									
Fenamiphos	22224-92-6	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L		----	<0.5	<0.5	<0.5	<0.5
EP074A: Monocyclic Aromatic Hydrocarbons									
Benzene	71-43-2	5	µg/L		----	<5	<5	<5	<5
Toluene	108-88-3	5	µg/L		----	<5	<5	<5	<5
Ethylbenzene	100-41-4	5	µg/L		----	<5	<5	<5	<5
meta- & para-Xylene	108-38-3 106-42-3	5	µg/L		----	<5	<5	<5	<5
Styrene	100-42-5	5	µg/L		----	<5	<5	<5	<5
ortho-Xylene	95-47-6	5	µg/L		----	<5	<5	<5	<5
Isopropylbenzene	98-82-8	5	µg/L		----	<5	<5	<5	<5
n-Propylbenzene	103-65-1	5	µg/L		----	<5	<5	<5	<5
1.3.5-Trimethylbenzene	108-67-8	5	µg/L		----	<5	<5	<5	<5
sec-Butylbenzene	135-98-8	5	µg/L		----	<5	<5	<5	<5
1.2.4-Trimethylbenzene	95-63-6	5	µg/L		----	<5	<5	<5	<5
tert-Butylbenzene	98-06-6	5	µg/L		----	<5	<5	<5	<5
p-Isopropyltoluene	99-87-6	5	µg/L		----	<5	<5	<5	<5
n-Butylbenzene	104-51-8	5	µg/L		----	<5	<5	<5	<5
EP074B: Oxygenated Compounds									
Vinyl Acetate	108-05-4	50	µg/L		----	<50	<50	<50	<50
2-Butanone (MEK)	78-93-3	50	µg/L		----	<50	<50	<50	<50
4-Methyl-2-pentanone (MIBK)	108-10-1	50	µg/L		----	<50	<50	<50	<50
2-Hexanone (MBK)	591-78-6	50	µg/L		----	<50	<50	<50	<50
EP074C: Sulfonated Compounds									
Carbon disulfide	75-15-0	5	µg/L		----	<5	<5	<5	<5
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	5	µg/L		----	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L		----	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L		----	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L		----	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L		----	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	75-71-8	50	µg/L		----	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L		----	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L		----	<50	<50	<50	<50

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807232-001**	**EB0807232-002**	**EB0807232-003**	**EB0807232-004**	**EB0807232-005**
EP074E: Halogenated Aliphatic Compounds - Continued									
Bromomethane	74-83-9	50	µg/L		----	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L		----	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L		----	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L		----	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L		----	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L		----	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L		----	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L		----	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L		----	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L		----	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L		----	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L		----	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L		----	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L		----	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L		----	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L		----	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L		----	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L		----	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L		----	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L		----	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L		----	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L		----	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L		----	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L		----	<5	<5	<5	<5
Hexachlorobutadiene	87-68-3	5	µg/L		----	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	5	µg/L		----	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L		----	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L		----	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L		----	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L		----	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L		----	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L		----	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L		----	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L		----	<5	<5	<5	<5
EP074G: Trihalomethanes									
Chloroform	67-66-3	5	µg/L		----	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L		----	<5	<5	<5	<5

Analytical Results

Sub-Matrix: WATER				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	CAS Number	LOR	Unit		EB0807232-001	EB0807232-002	EB0807232-003	EB0807232-004	EB0807232-005
EP074G: Trihalomethanes - Continued									
Dibromochloromethane	124-48-1	5	µg/L		----	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L		----	<5	<5	<5	<5
EP074H: Naphthalene									
Naphthalene	91-20-3	7	µg/L		----	<7	<7	<7	<7
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		----	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		----	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L		----	<2.0	<2.0	<2.0	<2.0
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		----	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		----	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		----	<50	<50	<50	<50
EP080: BTEX									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**77.2**	**75.4**	**75.8**	**69.6**
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		----	**101**	**99.7**	**93.3**	**87.4**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		----	**109**	**97.5**	**99.5**	**95.9**
EP074S: VOC Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	**84.1**	**90.8**	**95.8**	**94.8**
Toluene-D8	2037-26-5	0.1	%		----	**88.3**	**99.9**	**97.3**	**101**

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	TRIP BLANK	GW-01	GW-02	GW-03	DUP-01
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00
Compound	*CAS Number*	*LOR*	*Unit*		EB0807232-001	EB0807232-002	EB0807232-003	EB0807232-004	EB0807232-005
EP074S: VOC Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.1	%		----	**91.9**	**103**	**102**	**106**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	**40.2**	**34.5**	**34.9**	**34.4**
2-Chlorophenol-D4	93951-73-6	0.1	%		----	**89.4**	**80.4**	**75.4**	**72.0**
2.4.6-Tribromophenol	118-79-6	0.1	%		----	**109**	**73.8**	**89.8**	**87.4**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	**90.6**	**58.3**	**78.8**	**76.9**
Anthracene-d10	1719-06-8	0.1	%		----	**82.5**	**73.5**	**83.3**	**81.2**
4-Terphenyl-d14	1718-51-0	0.1	%		----	**100**	**101**	**98.6**	**94.8**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**94.1**	**84.1**	**85.0**	**89.4**	**88.6**
Toluene-D8	2037-26-5	0.1	%		**95.7**	**88.3**	**99.9**	**97.3**	**101**
4-Bromofluorobenzene	460-00-4	0.1	%		**104**	**91.9**	**88.8**	**88.4**	**91.4**

Analytical Results

Sub-Matrix: **WATER**				Client sample ID	SW-01	BOGRA	PAPA	----	----
				Client sampling date / time	28-MAY-2008 15:00	28-MAY-2008 15:00	28-MAY-2008 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EB0807232-006**	**EB0807232-007**	**EB0807232-008**	**----**	**----**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	**0.002**	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L		**0.025**	**0.001**	**0.019**	----	----
Cadmium	7440-43-9	0.0001	mg/L		**0.0001**	**0.0008**	**0.0003**	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.001**	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		**0.001**	**0.001**	**0.002**	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	**0.022**	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L		**0.039**	**0.013**	**0.078**	----	----
Nickel	7440-02-0	0.001	mg/L		**0.001**	**0.012**	<0.001	----	----
Vanadium	7440-62-2	0.01	mg/L		**0.02**	**0.02**	**0.06**	----	----
Zinc	7440-66-6	0.005	mg/L		**0.006**	**1.04**	**0.012**	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	10	110
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	94
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	10	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	43	116
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	33	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115

ATTACHMENT A2 - C

Data Quality Assessment - RPDs

Sample ID	GW-03	DUP-01		GW-03	GW-03
Date Sampled	28/05/2008	28/05/2008		28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232		EB0807232	E037970
Duplication	Primary	Intra		Primary	Inter

Analyte	Units	LOR			RPD			RPD
Dissolved Major Anions								
Sulfate as SO4 2-	mg/L	1	3	3	0.0	3	2	40.0
Chloride	mg/L	1	79	82	3.7	79	74	6.5
Alkalinity								
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	-	<1	---	-
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	-	<1	---	-
Bicarbonate Alkalinity as CaCO3	mg/L	1	528	539	2.1	528	---	-
Total Alkalinity as CaCO3	mg/L	1	528	539	2.1	528	581	9.6
Dissolved Major Cations								
Calcium	mg/L	1	80	78	2.5	80	65.2	20.4
Magnesium	mg/L	1	51	52	1.9	51	38.6	27.7
Sodium	mg/L	1	77	77	0.0	77	64.2	18.1
Potassium	mg/L	1	13	13	0.0	13	12.2	6.3
Heavy Metals (Dissolved)								
Arsenic	mg/L	0.001	<0.001	<0.001	-	<0.001	0.001	-
Beryllium	mg/L	0.001	<0.001	<0.001	-	<0.001	<0.001	-
Barium	mg/L	0.001	0.015	0.015	0.0	0.015	0.016	6
Cadmium	mg/L	0.0001	0.0008	0.0004	67.0	0.0008	0.0002	120
Chromium	mg/L	0.001	<0.001	<0.001	-	<0.001	*<0.005	-
Cobalt	mg/L	0.001	<0.001	<0.001	-	<0.001	<0.001	-
Copper	mg/L	0.001	0.002	0.002	0.0	0.002	0.003	40.0
Lead	mg/L	0.001	<0.001	<0.001	-	<0.001	<0.001	-
Manganese	mg/L	0.001	0.312	0.328	5.0	0.312	0.401	25.0
Mercury	mg/L	0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Nickel	mg/L	0.001	0.002	0.002	0.0	0.002	0.003	40.0
Vanadium	mg/L	0.01	<0.01	<0.01	-	<0.01	0.003	-
Zinc	mg/L	0.005	0.144	0.144	0.0	0.144	0.222	42.6
Total Cyanide								
Total Cyanide	mg/L	0.004	<0.004	<0.004	-	<0.004	0.01	-
Fluoride								
Fluoride	mg/L	0.1	0.1	0.1	0.0	0.1	<0.1	-
Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	µg/L	1	<1	<1	-	<1	nd	-
Organochlorine Pesticides (OCPs)								
alpha-BHC	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Hexachlorobenzene (HCB)	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
beta-BHC	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
gamma-BHC	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
delta-BHC	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Heptachlor	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Aldrin	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Heptachlor epoxide	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
trans-Chlordane	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
alpha-Endosulfan	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
cis-Chlordane	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Dieldrin	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
4.4`-DDE	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Endrin	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
beta-Endosulfan	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
4.4`-DDD	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
Endrin aldehyde	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Endosulfan sulfate	µg/L	0.5	<0.5	<0.5	-	<0.5	<0.5	-
4.4`-DDT	µg/L	2	<2	<2	-	<2	<2	-
Endrin ketone	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Methoxychlor	µg/L	2	<2	<2	-	<2	<2	-
Organophosphorus Pesticides (OP)								
Dichlorvos	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Demeton-S-methyl	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Monocrotophos	µg/L	2	<2	<2	-	<2	---	-
Dimethoate	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Diazinon	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Chlorpyrifos-methyl	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Parathion-methyl	µg/L	2	<2	<2	-	<2	---	-
Malathion	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Fenthion	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Chlorpyrifos	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Parathion	µg/L	2	<2	<2	-	<2	<2	-
Pirimphos-ethyl	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-

Exceeds desired RPD limit - 50%

Data Quality Assessment - RPDs

Sample ID	GW-03	DUP-01		GW-03	GW-03
Date Sampled	28/05/2008	28/05/2008		28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232		EB0807232	E037970
Duplication	Primary	Intra		Primary	Inter

Analyte	Units	LOR			RPD			RPD
Chlorfenvinphos	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Bromophos-ethyl	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Fenamiphos	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Prothiofos	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Ethion	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Carbophenothion	µg/L	0.5	<0.5	<0.5	-	<0.5	---	-
Azinphos Methyl	µg/L	0.5	<0.5	<0.5	-	<0.5	<2	-
Monocyclic Aromatic Hydrocarbons (MAHs)								
Benzene	µg/L	5	<5	<5	-	<5	<5	-
Toluene	µg/L	5	<5	<5	-	<5	<5	-
Ethylbenzene	µg/L	5	<5	<5	-	<5	<5	-
meta- & para-Xylene	µg/L	5	<5	<5	-	<5	<10	-
Styrene	µg/L	5	<5	<5	-	<5	<5	-
ortho-Xylene	µg/L	5	<5	<5	-	<5	<5	-
Isopropylbenzene	µg/L	5	<5	<5	-	<5	<5	-
n-Propylbenzene	µg/L	5	<5	<5	-	<5	<5	-
1.3.5-Trimethylbenzene	µg/L	5	<5	<5	-	<5	<5	-
sec-Butylbenzene	µg/L	5	<5	<5	-	<5	<5	-
1.2.4-Trimethylbenzene	µg/L	5	<5	<5	-	<5	<5	-
tert-Butylbenzene	µg/L	5	<5	<5	-	<5	<5	-
p-Isopropyltoluene	µg/L	5	<5	<5	-	<5	<5	-
n-Butylbenzene	µg/L	5	<5	<5	-	<5	<5	-
Oxygenated Compounds								
Vinyl Acetate	µg/L	50	<50	<50	-	<50	<5	-
2-Butanone (MEK)	µg/L	50	<50	<50	-	<50	<5	-
4-Methyl-2-pentanone (MIBK)	µg/L	50	<50	<50	-	<50	<5	-
2-Hexanone (MBK)	µg/L	50	<50	<50	-	<50	<5	-
Sulfonated Compounds								
Carbon disulfide	µg/L	5	<5	<5	-	<5	<5	-
Fumigants								
2.2-Dichloropropane	µg/L	5	<5	<5	-	<5	<5	-
1.2-Dichloropropane	µg/L	5	<5	<5	-	<5	<5	-
cis-1.3-Dichloropropylene	µg/L	5	<5	<5	-	<5	<5	-
trans-1.3-Dichloropropylene	µg/L	5	<5	<5	-	<5	<5	-
1.2-Dibromoethane (EDB)	µg/L	5	<5	<5	-	<5	<5	-
Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	µg/L	50	<50	<50	-	<50	<50	-
Chloromethane	µg/L	50	<50	<50	-	<50	<50	-
Vinyl chloride	µg/L	50	<50	<50	-	<50	<50	-
Bromomethane	µg/L	50	<50	<50	-	<50	<50	-
Chloroethane	µg/L	50	<50	<50	-	<50	<50	-
Trichlorofluoromethane	µg/L	50	<50	<50	-	<50	<50	-
1.1-Dichloroethene	µg/L	5	<5	<5	-	<5	<5	-
Iodomethane	µg/L	5	<5	<5	-	<5	<5	-
trans-1.2-Dichloroethene	µg/L	5	<5	<5	-	<5	<5	-
1.1-Dichloroethane	µg/L	5	<5	<5	-	<5	<5	-
cis-1.2-Dichloroethene	µg/L	5	<5	<5	-	<5	<5	-
1.1.1-Trichloroethane	µg/L	5	<5	<5	-	<5	<5	-
1.1-Dichloropropylene	µg/L	5	<5	<5	-	<5	<5	-
Carbon Tetrachloride	µg/L	5	<5	<5	-	<5	<5	-
1.2-Dichloroethane	µg/L	5	<5	<5	-	<5	<5	-
Trichloroethene	µg/L	5	<5	<5	-	<5	<5	-
Dibromomethane	µg/L	5	<5	<5	-	<5	<5	-
1.1.2-Trichloroethane	µg/L	5	<5	<5	-	<5	<5	-
1.3-Dichloropropane	µg/L	5	<5	<5	-	<5	<5	-
Tetrachloroethene	µg/L	5	<5	<5	-	<5	<5	-
1.1.1.2-Tetrachloroethane	µg/L	5	<5	<5	-	<5	<5	-
trans-1.4-Dichloro-2-butene	µg/L	5	<5	<5	-	<5	<5	-
cis-1.4-Dichloro-2-butene	µg/L	5	<5	<5	-	<5	<5	-
1.1.2.2-Tetrachloroethane	µg/L	5	<5	<5	-	<5	<5	-
1.2.3-Trichloropropane	µg/L	5	<5	<5	-	<5	<5	-
Pentachloroethane	µg/L	5	<5	<5	-	<5	--	-
1.2-Dibromo-3-chloropropane	µg/L	5	<5	<5	-	<5	<5	-
Hexachlorobutadiene	µg/L	5	<5	<5	-	<5	<5	-
Halogenated Aromatic Compounds								
Chlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
Bromobenzene	µg/L	5	<5	<5	-	<5	<5	-
2-Chlorotoluene	µg/L	5	<5	<5	-	<5	<5	-

[redacted] Exceeds desired RPD limit - 50%

Data Quality Assessment - RPDs

Sample ID	GW-03	DUP-01		GW-03	GW-03
Date Sampled	28/05/2008	28/05/2008		28/05/2008	28/05/2008
Lab Report No.	EB0807232	EB0807232		EB0807232	E037970
Duplication	Primary	Intra		Primary	Inter

Analyte	Units	LOR			RPD			RPD
4-Chlorotoluene	µg/L	5	<5	<5	-	<5	<5	-
1.3-Dichlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
1.4-Dichlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
1.2-Dichlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
1.2.4-Trichlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
1.2.3-Trichlorobenzene	µg/L	5	<5	<5	-	<5	<5	-
Trihalomethanes								
Chloroform	µg/L	5	<5	<5	-	<5	<5	-
Bromodichloromethane	µg/L	5	<5	<5	-	<5	<5	-
Dibromochloromethane	µg/L	5	<5	<5	-	<5	<5	-
Bromoform	µg/L	5	<5	<5	-	<5	<5	-
Naphthalene								
Naphthalene	µg/L	7	<7	<7	-	<7	<5	-
Phenolic Compounds								
Phenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2-Chlorophenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2-Methylphenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
3- & 4-Methylphenol	µg/L	2	<2.0	<2.0	-	<2.0	<4	-
2-Nitrophenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2.4-Dimethylphenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2.4-Dichlorophenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2.6-Dichlorophenol	µg/L	1	<1.0	<1.0	-	<1.0	---	-
4-Chloro-3-Methylphenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2.4.6-Trichlorophenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
2.4.5-Trichlorophenol	µg/L	1	<1.0	<1.0	-	<1.0	<2	-
Pentachlorophenol	µg/L	2	<2.0	<2.0	-	<2.0	<10	-
Total Petroleum Hydrocarbons (TPH)								
C6 - C9 Fraction	µg/L	20	<20	<20	-	<20	<50	-
C10 - C14 Fraction	µg/L	50	<50	<50	-	<50	<50	-
C15 - C28 Fraction	µg/L	100	<100	<100	-	<100	<200	-
C29 - C36 Fraction	µg/L	50	<50	<50	-	<50	90	-

[redacted] Exceeds desired RPD limit - 50%

DATA QUALITY SUMMARY REPORT - Groundwater

Project No:	PNG LNG - Groundwater Summary
Site:	Candidate Site
Matrix:	Groundwater
Primary Laboratory:	ALS (Batch Nos: EB0807232)
Secondary Laboratory:	Labmark (Batch Nos: E037970)
No. of Tests Requested/ Reported:	Total of 6 primary samples
Frequency of QA/QC undertaken:	Minimum of 1 in 10 samples
Frequency of QA/QC Required:	1 in 20 samples required to be duplicated.

Data Quality Issue Assessed	Issue Reviewed	Results Acceptable	Comments
Sampling Technique	✓	✓	
Sample Holding Times	✓	✓	See Note 1
Analytical Procedures	✓	✓	
Laboratory Limits of Reporting (below relevant guideline value)	✓	✓	
Field Duplicate Agreement (RPD%)	✓	✓	See Note 2
Blank Sample Analysis			
Method Blank	✓	✓	
Rinsate Blank	-	-	
Laboratory Duplicate Agreement (RPD%)	✓	✓	
Matrix Spikes/Matrix Spike Duplicates	✓	✓	
Recovery Percentages	✓	✓	See Note 3
Duplicate Agreement (RPD%)	✓	✓	
Surrogate Recoveries	✓	✓	
Other Issues (i.e Trip Blanks)	✓	✓	See Note 4

Other Observations:

Note 1: Holding times were exceeded by 1 day for a number of analytes tested at the secondary laboratory. This does not significantly alter the interpretation of the data as the results reported are supported by the primary and intra duplicate data reported.

Note 2: Elevated RPDs were reported between the primary sample and the intra and inter duplicate of 67% and 120% respectively for cadmium. This elevated RPD% is not considered significant in terms of the interpretation of the results as the absolute differences are small.

Note 3. A number of spike recoveries for the primary laboratory were lower or exceeded desired limits. This does not significantly alter the interpretation of the primary data as all analytes which reported control spike anomalies were reported below LOR

Note 3. All trip blank concentrations were reported below laboratory LORS

Data Quality Assessment - Tripblanks

Location	Tripblank	Tripblank
Laboratory	807232	37970
Date Sampled	28/05/2008	28/05/2008

Chemical	LOR	Units		
Total Recoverable Hydrocarbons				
TPH C6-C9	0.02	mg/kg	< 0.02	< 0.05
BTEX				
Benzene	0.002	mg/kg	< 0.002	< 0.001
Ethylbenzene	0.002	mg/kg	< 0.002	< 0.001
Toluene	0.002	mg/kg	< 0.002	< 0.001
Xylenes(ortho.meta and para)	0.004	mg/kg	< 0.004	< 0.003

Notes:

- Not Analysed

LOR - Limits of Reporting

APPENDIX B
ANALYTICAL MODEL SOLUTIONS

PNG LNG Project - groundwater supply potential

Calculate Drawdown (s) for known Discharge (Q) — **THEIS Analytical Solution (Theis, 1935)**

	INPUTS
Pumping rate of well (m3/day):	36
Storage coefficient (s) of aquifer:	1.00E-03
Transmissivity (m2/day):	3
Time since pumping started (days):	730

NOTE 1: Estimating 'T' from specific capacity data use:
[log t = -2.31 +0.81 log (spec cap)]

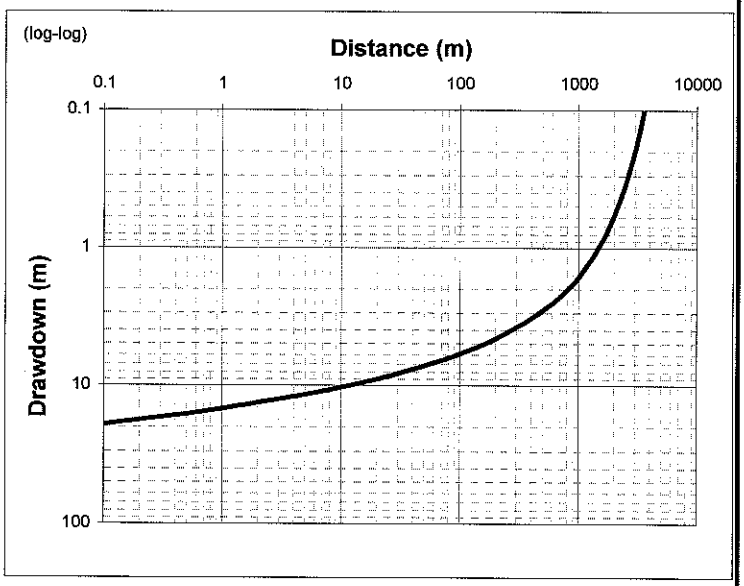
NOTE 2: If using 'T', divide by saturated thickness to give hydraulic conductivity (T=kB)

NOTE 3: Estimates of s (conservative): Unconfined=0.05, Semi=0.005, Confined=0.00005

NOTE 4: To convert Gallons/minute to litres/sec, divide by 13.2

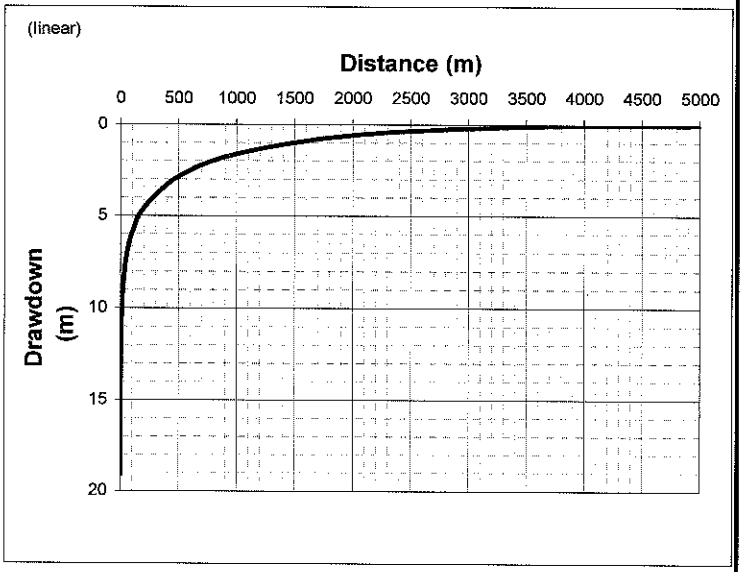
NOTE 5: To convert litres/sec to cubic metres/day, multiply by 86.4

Distance (m)	u	W(u)	Drawdown (m)
0.1	1.14E-09	2.00E+01	19.111653
0.5	2.85E-08	1.68E+01	16.037853
1	1.14E-07	1.54E+01	14.71404
5	2.85E-06	1.22E+01	11.640243
10	1.14E-05	1.08E+01	10.316437
20	4.57E-05	9.42E+00	8.9926562
30	1.03E-04	8.61E+00	8.2183294
50	2.85E-04	7.58E+00	7.2428987
75	6.42E-04	6.77E+00	6.468858
100	1.14E-03	6.20E+00	5.9199024
200	4.57E-03	4.82E+00	4.5993545
500	2.85E-02	3.01E+00	2.872072
1000	1.14E-01	1.70E+00	1.6271755
2000	4.57E-01	6.16E-01	0.5882981
3500	1.3984018	1.17E-01	0.1112653
5250	3.1464041	1.03E-02	0.0098435



Description:

Low transmissivity value (3m2/day, based on K=0.6m/day and D=5m) reduces well yield to less than 0.5 L/s. For a 35L/s supply this would require a wellfield consisting of more than 70 wells (including backup capacity). Yield constraints imposed largely by available drawdown and transmissivity.



PNG LNG Project - groundwater supply potential

Calculate Drawdown (s) for known Discharge (Q) — **THEIS Analytical Solution (Theis, 1935)**

	INPUTS
Pumping rate of well (m3/day):	77.5
Storage coefficient (s) of aquifer:	1.00E-03
Transmissivity (m2/day):	6.5
Time since pumping started (days):	730

NOTE 1: Estimating 'T' from specific capacity data use: [log t = -2.31 +0.81 log (spec cap)]

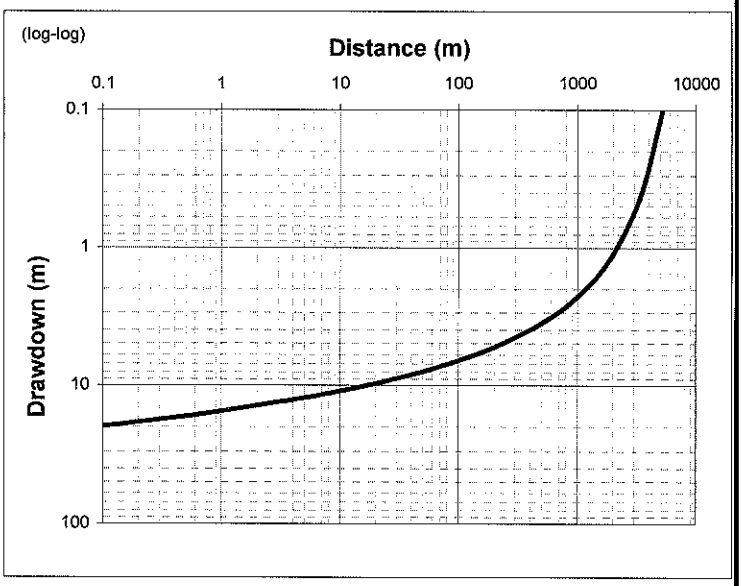
NOTE 2: If using 'T', divide by saturated thickness to give hydraulic conductivity (T=kB)

NOTE 3: Estimates of s (conservative): Unconfined=0.05, Semi=0.005, Confined=0.00005

NOTE 4: To convert Gallons/minute to litres/sec, divide by 13.2

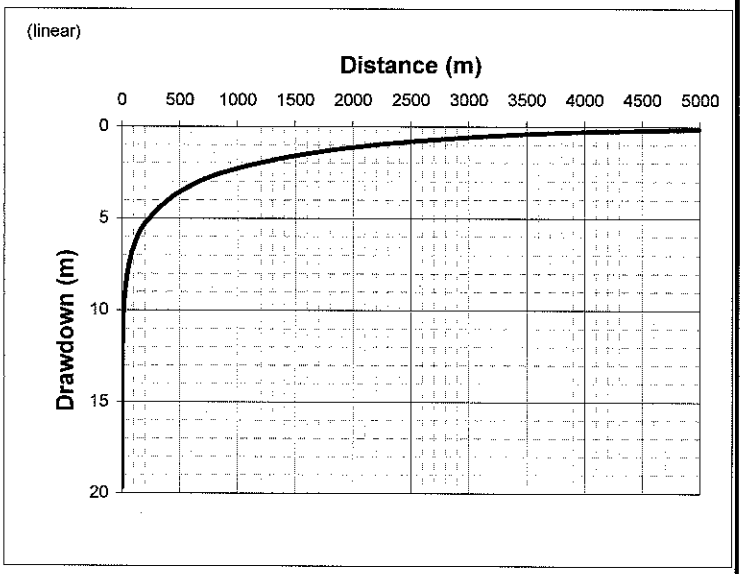
NOTE 5: To convert litres/sec to cubic metres/day, multiply by 86.4

Distance (m)	u	W(u)	Drawdown (m)
0.1	5.27E-10	2.08E+01	19.722752
0.5	1.32E-08	1.76E+01	16.668656
1	5.27E-08	1.62E+01	15.353328
5	1.32E-06	1.30E+01	12.299233
10	5.27E-06	1.16E+01	10.983909
20	2.11E-05	1.02E+01	9.6685967
30	4.74E-05	9.38E+00	8.8992043
50	1.32E-04	8.36E+00	7.9299331
75	2.96E-04	7.55E+00	7.160672
100	5.27E-04	6.97E+00	6.6149804
200	2.11E-03	5.59E+00	5.3011514
500	1.32E-02	3.77E+00	3.5728408
1000	5.27E-02	2.42E+00	2.2943958
2000	2.11E-01	1.18E+00	1.119628
3500	0.6454162	4.15E-01	0.393979
5250	1.4521865	1.07E-01	0.1019399



Description:

Moderate transmissivity value (6.5m2/day, based on K=1.3m/day and D=5m) reduces well yield to around 1 L/s. For a 35L/s supply this would require a wellfield consisting of more than 35 wells (including backup capacity). Yield constraints imposed largely by available drawdown and transmissivity.



PNG LNG Project - groundwater supply potential

Calculate Drawdown (s) for known Discharge (Q) — **THEIS Analytical Solution (Theis, 1935)**

	INPUTS
Pumping rate of well (m3/day):	280
Storage coefficient (s) of aquifer:	1.00E-03
Transmissivity (m2/day):	25
Time since pumping started (days):	730

NOTE 1: Estimating 'T' from specific capacity data use: [log t = -2.31 +0.81 log (spec cap)]

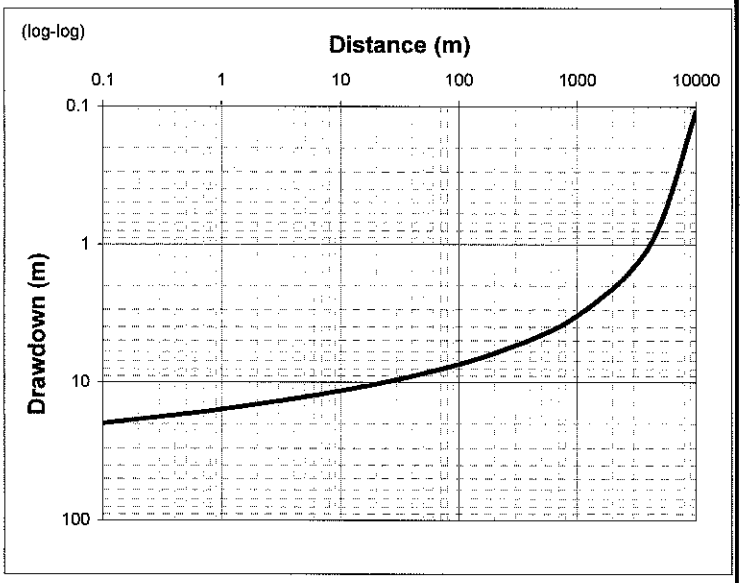
NOTE 2: If using 'T', divide by saturated thickness to give hydraulic conductivity (T=kB)

NOTE 3: Estimates of s (conservative): Unconfined=0.05, Semi=0.005, Confined=0.00005

NOTE 4: To convert Gallons/minute to litres/sec, divide by 13.2

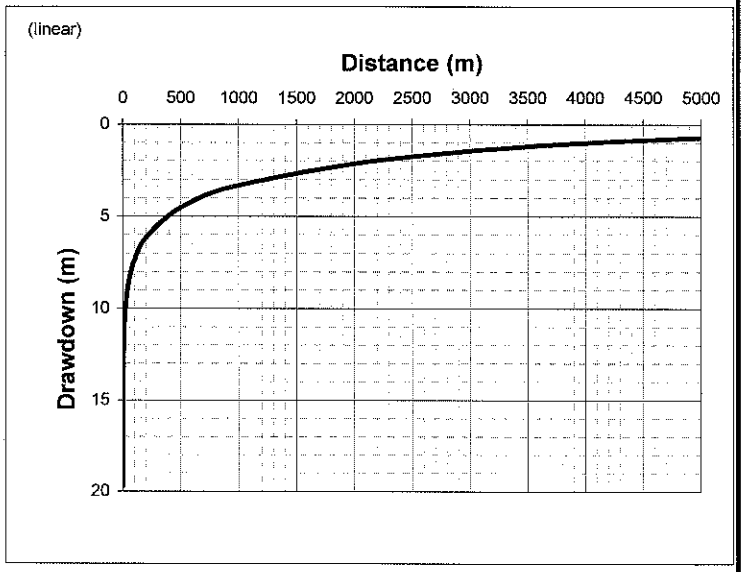
NOTE 5: To convert litres/sec to cubic metres/day, multiply by 86.4

Distance (m)	u	W(u)	Drawdown (m)
0.1	1.37E-10	2.21E+01	19.727266
0.5	3.42E-09	1.89E+01	16.858386
1	1.37E-08	1.75E+01	15.622826
5	3.42E-07	1.43E+01	12.753947
10	1.37E-06	1.29E+01	11.518388
20	5.48E-06	1.15E+01	10.282832
30	1.23E-05	1.07E+01	9.5600826
50	3.42E-05	9.70E+00	8.6495374
75	7.71E-05	8.89E+00	7.9268196
100	1.37E-04	8.32E+00	7.4140696
200	5.48E-04	6.93E+00	6.1788764
500	3.42E-03	5.10E+00	4.5481172
1000	1.37E-02	3.73E+00	3.3216756
2500	8.56E-02	1.96E+00	1.750892
5000	0.3424658	8.10E-01	0.721592
10000	1.369863	1.22E-01	0.1084523



Description:

High transmissivity value (25m2/day, based on K=5m/day and D=5m) allows yields of around 3 L/s to be supported. For a 35L/s supply this would require a wellfield consisting of more than 12 wells (including backup capacity).



APPENDIX C
RISK ASSESSMENT MATRICES

Risk assessment methodology

The impact assessment takes the form of a qualitative assessment of the scale of risk posed to groundwater resources by potential groundwater affecting activities associated with the LNG facility and water supply development.

Consistent with risk assessments undertaken elsewhere on similar types of projects, the basic aim is to provide a measure of the potential for a receptor to be adversely impacted by a particular threat (or potential groundwater affecting activity).

Risk (R) is usually defined as the product of likelihood (L) and consequence (C), i.e. R=LxC, where:

- likelihood comprises an analysis of threat level (how severe is the potential threat) and association (how much influence can a particular threat have on a potential receptor based on mitigation strategies and physical environment); and
- consequence is a measure of the seriousness of impact if it occurs, in the case of the project, the level of effort that is likely required to manage impacts and remediate.

	L	*C*
1	unlikely	routine
2	low	moderate
3	moderate	problematic
4	serious	difficult

	R	
A	(L xC ranges above 7.5)	high potential for adverse impact
B	(L xC ranges between 5 and 7.5)	moderate potential for adverse impact
C	(L xC ranges between 2.5 and 5)	low potential for adverse impact
D	(L xC ranges below 2.5)	adverse impact unlikely

Likelihood analysis

☐ Likelihood comprises an analysis of threat level (T; i.e. how severe is the potential threat) and association (A; i.e. how much influence can a particular threat have on a potential receptor based on mitigation strategies and physical environment)

L=TxA

LNG Plant (facilities & processes)

	Feed gas separator	AGRU	Dehydration unit
THREAT to groundwater resource condition	2	1	2
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	2	1	2
CONSEQUENCE (management effort)	2	2	2
Risk category	C	D	C

	Hg absorber	Fractionation unit	Condensate store/t'fer
THREAT to groundwater resource condition	1	2	2
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	2	2
CONSEQUENCE (management effort)	2	2	3
Risk category	D	C	B

	Heating med.	Demin. water	Effluent
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	2	2	2
Risk category	D	D	D

	Flare/vent	Drains	Sanitary effluent
THREAT to groundwater resource condition	1	2	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	2	1
CONSEQUENCE (management effort)	2	2	1
Risk category	D	C	D

	CPI	Stormwater	Diesel storage
THREAT to groundwater resource condition	2	2	2
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	2	2	2
CONSEQUENCE (management effort)	2	2	3
Risk category	C	C	B

	drawdown	discharge	quality
THREAT to groundwater resource condition	2	2	2
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	2	2	2
CONSEQUENCE (management effort)	3	3	3
Risk category	B	B	B

Likelihood analysis

☐ Likelihood comprises an analysis of threat level (T; i.e. how severe is the potential threat) and association (A; i.e. how much influence can a particular threat have on a potential receptor based on mitigation strategies and physical environment)

L=TxA

LNG Plant (facilities & processes)

	Feed gas separator	AGRU	Dehydration unit
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	2	2	2
Risk category	D	D	D

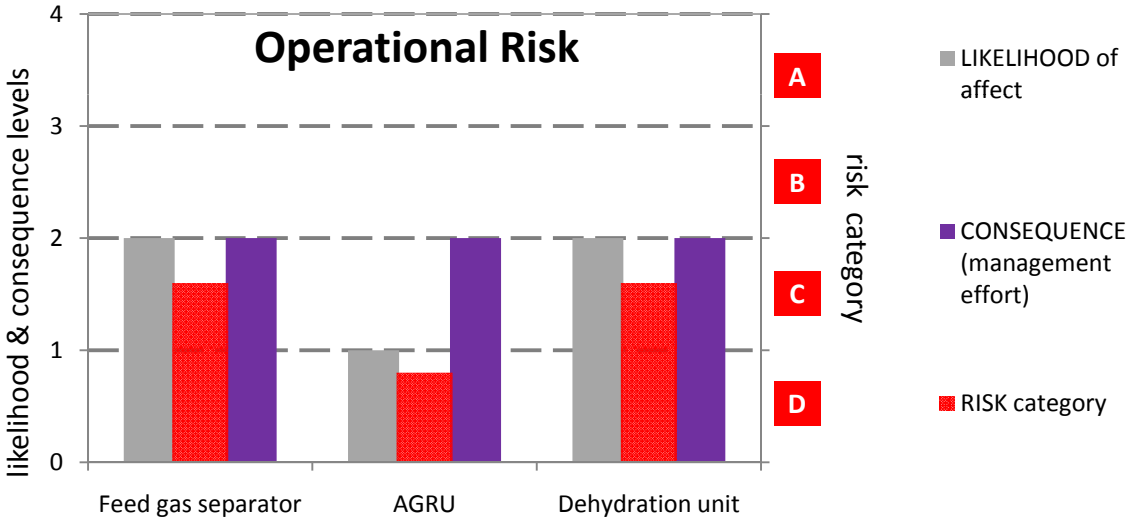
	Hg absorber	Fractionation unit	Condensate store/t'fer
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	2	2	3
Risk category	D	D	C

	Heating med.	Demin. water	Effluent
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	2	1	1
Risk category	D	D	D

	Flare/vent	Drains	Sanitary effluent
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	1	1	1
Risk category	D	D	D

	CPI	Stormwater	Diesel storage
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	1	1	2
Risk category	D	D	D

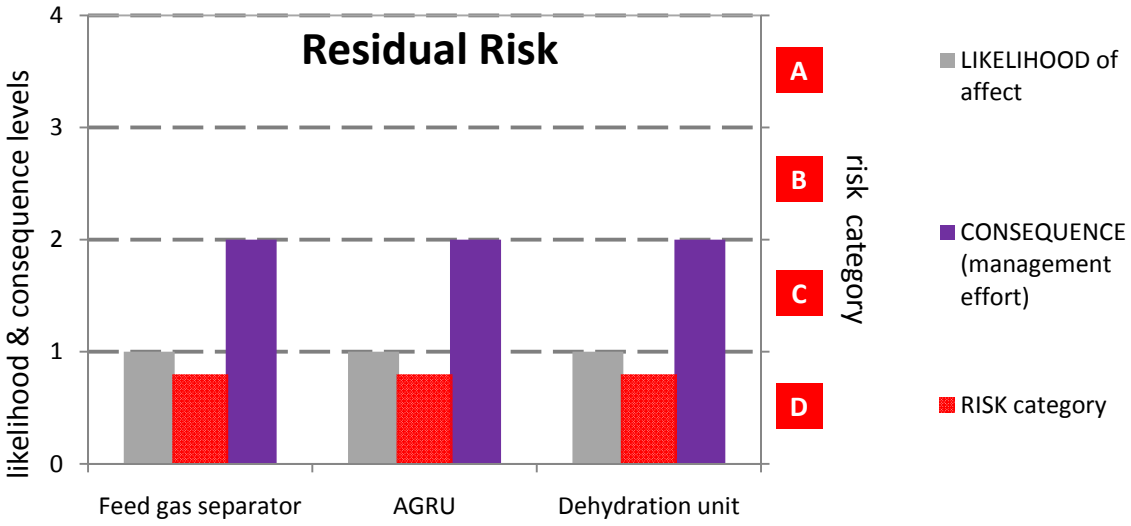
	drawdown	discharge	quality
THREAT to groundwater resource condition	1	1	1
ASSOCIATION (mitigation potential)	1	1	1
LIKELIHOOD of affect	1	1	1
CONSEQUENCE (management effort)	1	1	1
Risk category	D	D	D



Feed gas separator: *flowline pigging effluent - collection required in bunded area for off-site disposal, mitigation of impact by clayey profile & possibly mobile in groundwater*

AGRU: *solvents - held within closed process, filters disposed to solid waste facility, solvent volatility reduces risk potential*

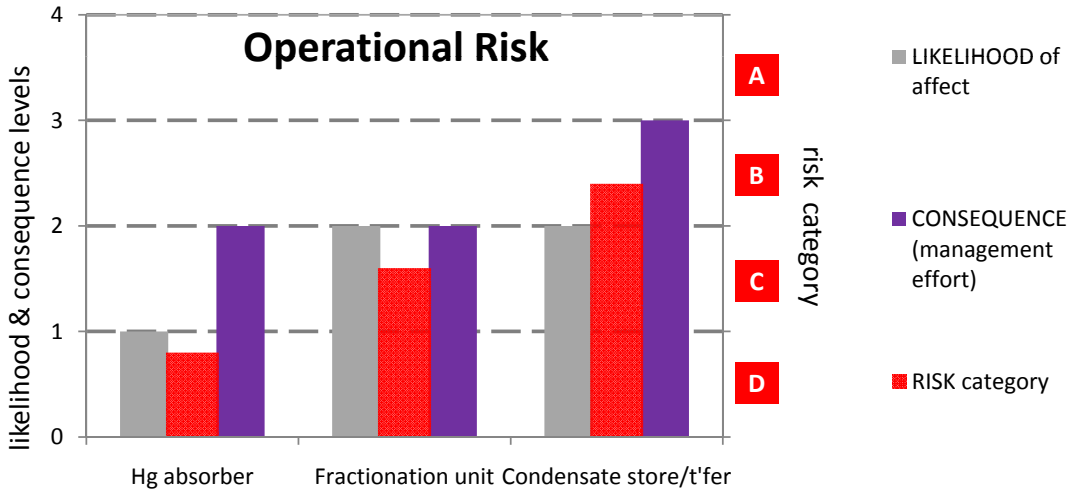
Dehydration unit: *oily water recovered from dried gas stream -water treated in wastewater system, mitigation of impact by clayey profile & possibly mobile in groundwater*



Feed gas separator: *flowline pigging effluent - no source following Plant decommissioning, but ongoing management issue for any contamination that may exist due to clayey soils*

AGRU: *solvents - no source following Plant decommissioning, ongoing management issue for any contamination that may exist mitigated by volatility*

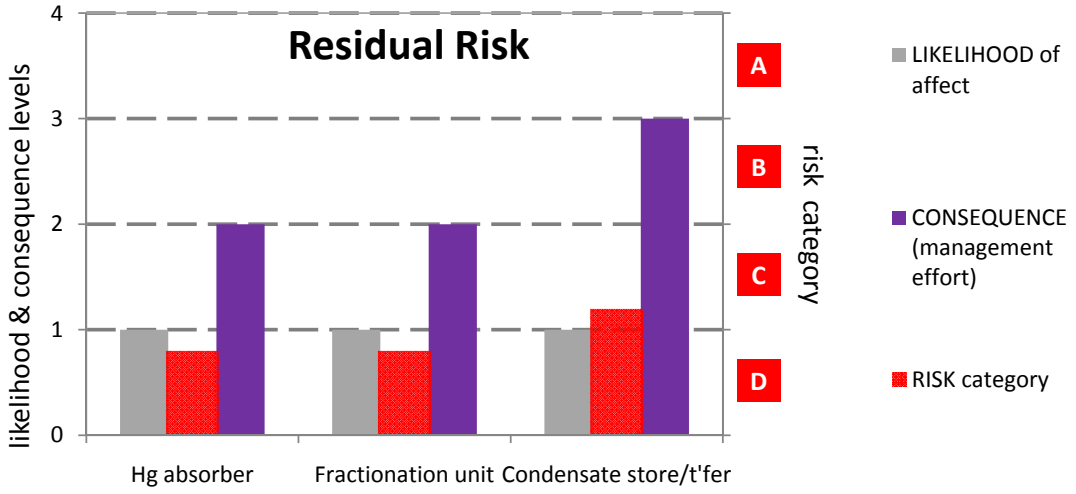
Dehydration unit: *water recovered from dried gas stream - no source following Plant decommissioning, but ongoing management issue for any contamination that may exist due to clayey soils*



Hg absorber: *Hg recovery - collected within closed circuit for offsite disposal,probably not readily transported through clayey soil zone due to absorptive capacity, but if enters groundwater can pose serious risk to ecosystems*

Fractionation unit: *hydrocarbon condensate - recovery takes place within closed circuit for storage in purose built above ground tanks, risk assessed at recovery*

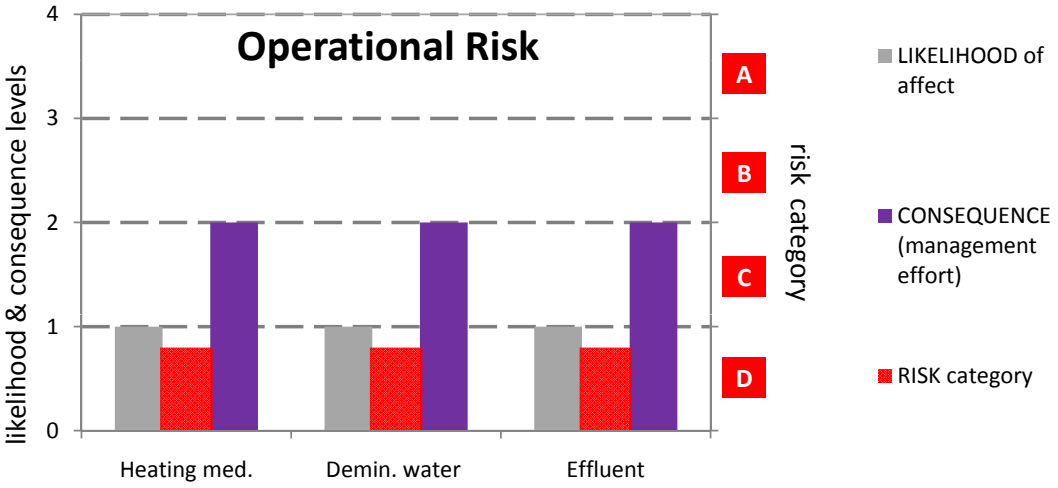
Condensate storage & transfer: *hydrocarbon condensate - above ground storage and transfer, risk assessed on basis of volume*



Hg absorber: *Hg recovery - threat removed at decommissioning, residual contamination, if present, problematic to remediate*

Fractionation unit: *hydrocarbon condensate - threat removed at decommissioning, residual contamination, if present, problematic to remediate*

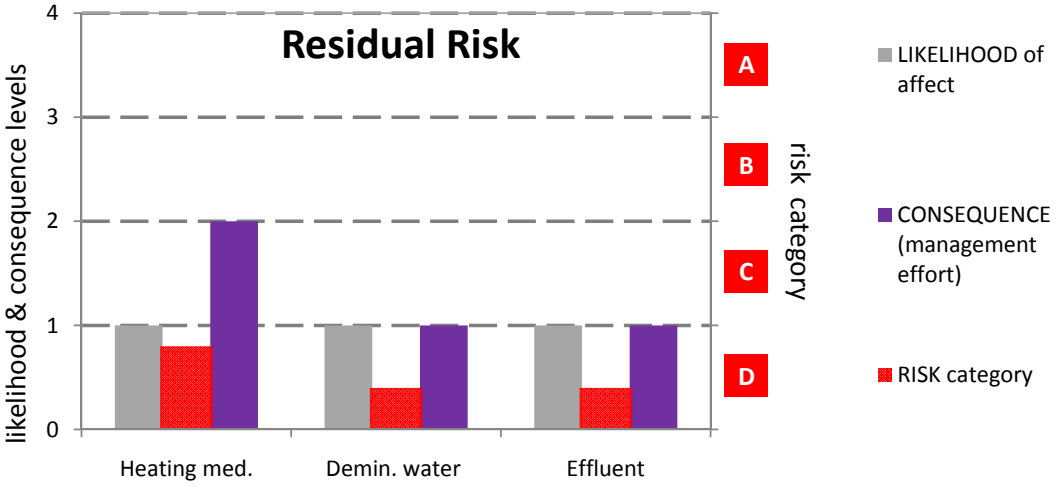
Condensate storage & transfer: *hydrocarbon condensate - threat removed at decommissioning, residual contamination, if present, difficult to remediate particularly*



Heating medium system: *heavy-end hydrocarbons - held within closed circuit, threat mitigated by clayey soil profile but possibly difficult to remediate is released to groundwater*

Demineralised water system: *brine - brine release to groundwater system has potential to impact on beneficial use, management could be problematic if this occurs, threat and consequence levels constrained by volumes generated*

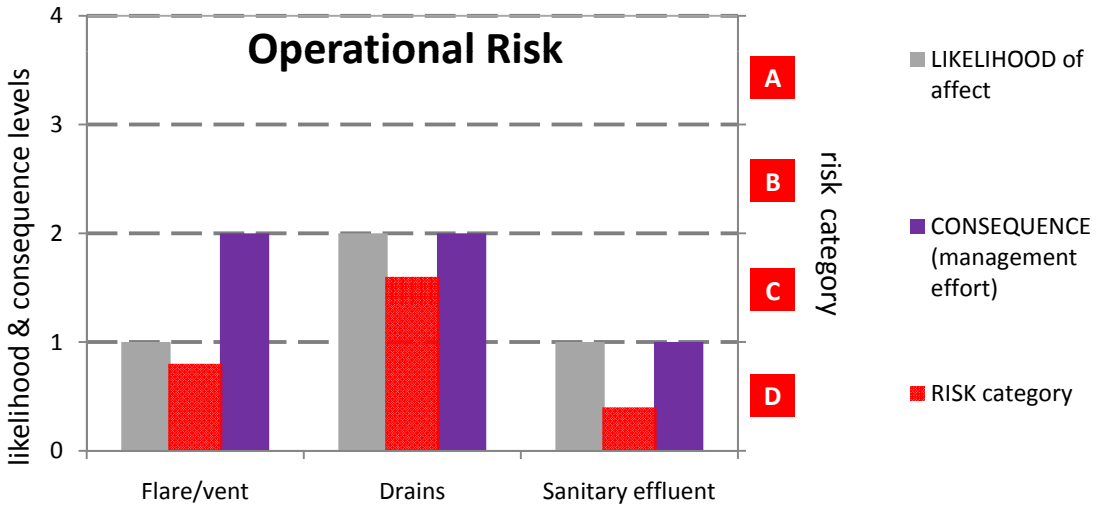
Effluent disposal system: *sewage and biological contaminants - has potential to impact on beneficial use, management could be problematic if this occurs, threat and consequence levels constrained by volumes generated*



Heating medium system: *heavy-end hydrocarbons - source ends with decommissioning, but residual contamination (if it exists) may be problematic to remediate*

Demineralised water system: *brine - source ends with decommissioning, residual contamination will naturally attenuate*

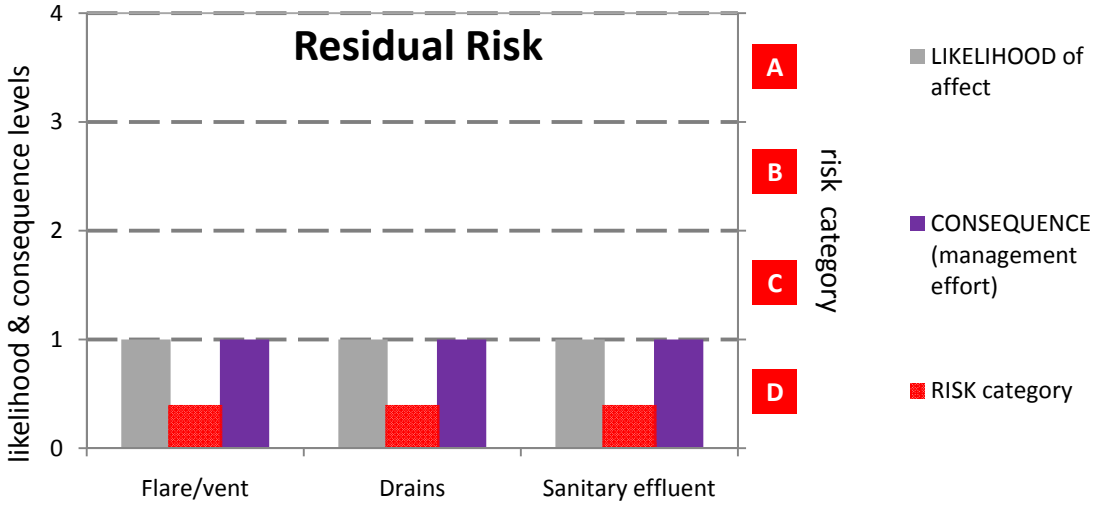
Effluent disposal system: *sewage and biological contaminants - source ends with decommissioning, residual contamination will naturally attenuate*



Flare & vent system: *hydrocarbons - potential contaminants flarerd thereby mitigating threat, clayey profile mitigates againts groundwater contamination*

Drain system: *sediment and hydrocarbons - effluent treated onsit, greatest threat posed by hydrocarbons but mitigated by clayey profile*

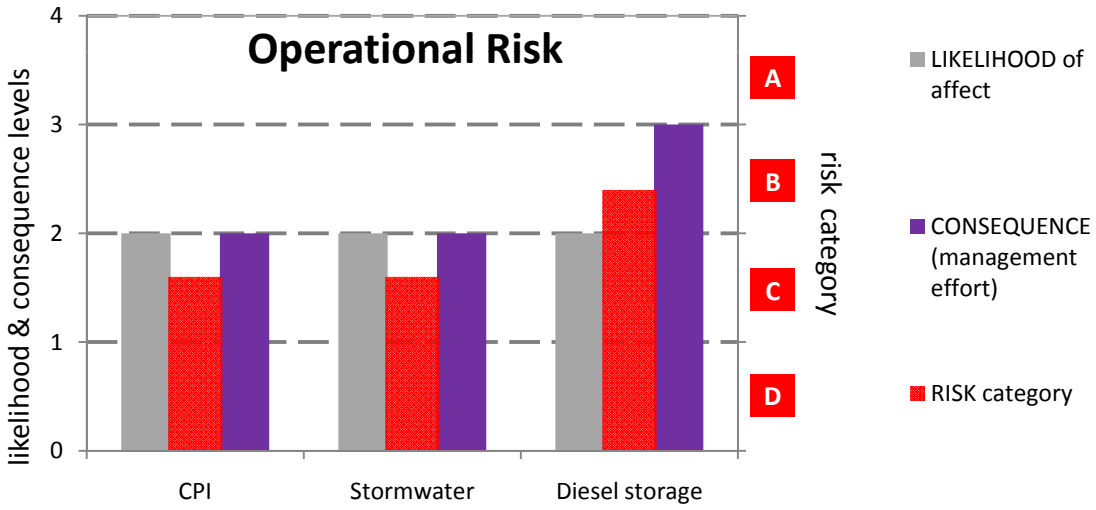
Saintary wastes: *medical & pharmaceuticals - excluded from sewage system, low potential for groundwater contamination*



Flare & vent system: *hydrocarbons - source ceases with decommissioning, any residual contamination will be mainly restricted to the shallow soil profile*

Drain system: *sediment and hydrocarbons - source ceases with decommissioning, threat mitigated by clayey soil profile*

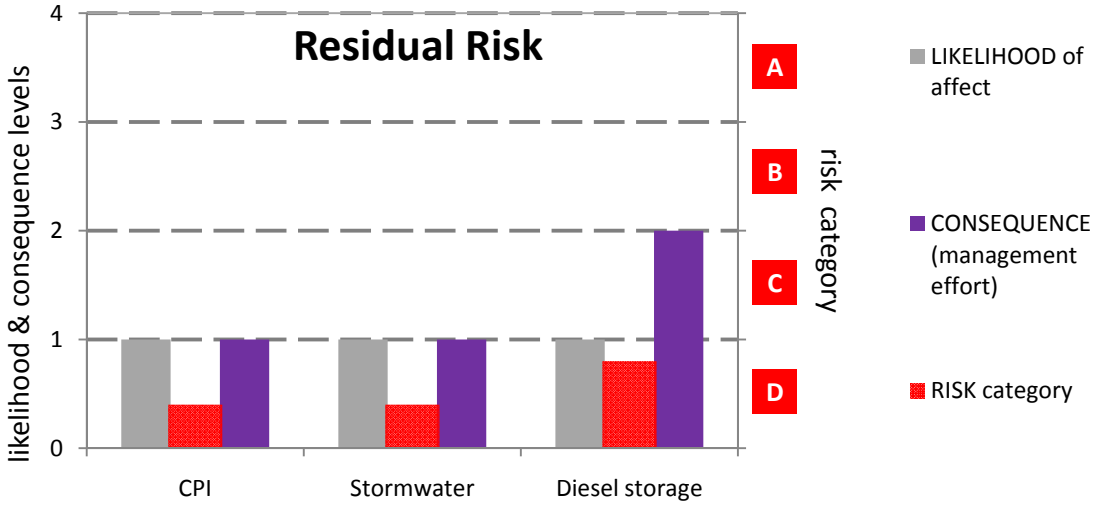
Saintary wastes: *medical & pharmaceuticals - source ceases with decommissioning*



CPI oil sump: *hydrocarbons - oil-water separator, onsite treatment with contamination of groundwater mitigated by clayey profile*

Stormwater system: *sediment and hydrocarbons - effluent treated onsite, volume of contaminant loading less than for drain system, greatest threat posed by hydrocarbons but mitigated by clayey profile*

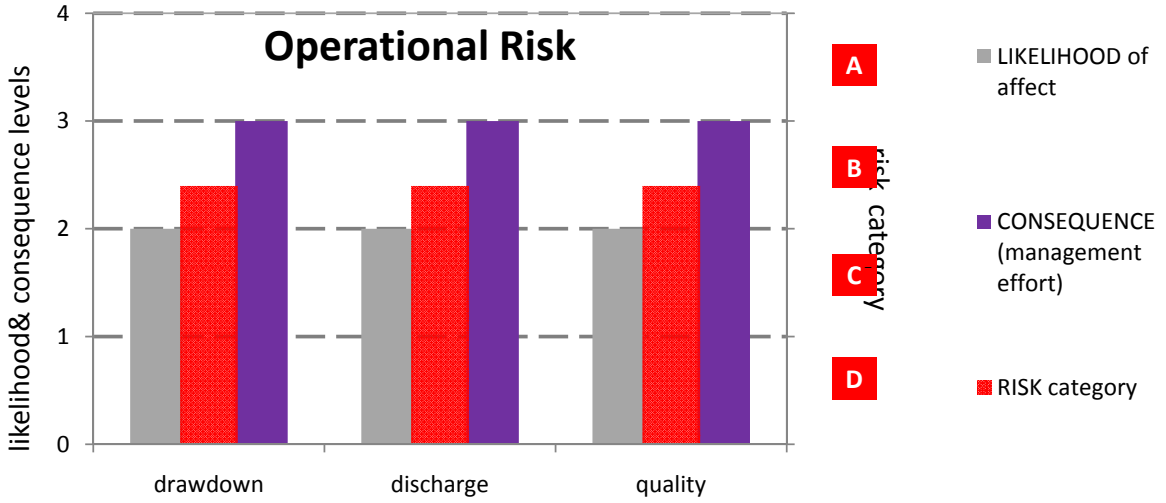
Diesel storage and transfer: *hydrocarbons - above ground storage and transfer, risk assessed on basis of volume*



CPI oil sump: *hydrocarbons - source ceases with decommissioning, threat mitigated by clayey soil profile*

Stormwater system: *sediment and hydrocarbons - source ceases with decommissioning, threat mitigated by clayey soil profile*

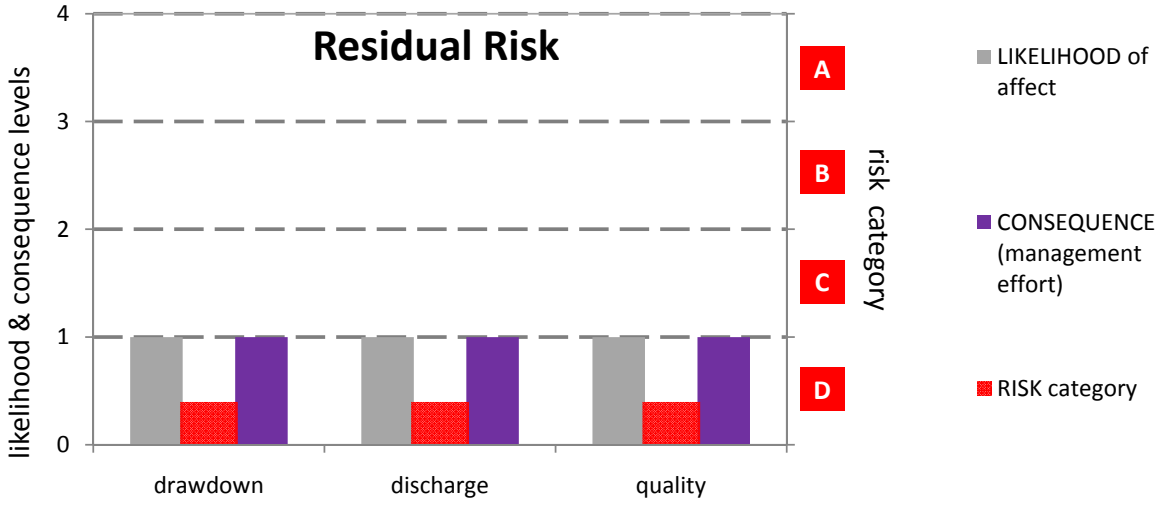
Diesel storage and transfer: *hydrocarbons - threat removed at decommissioning, residual contamination, if present, difficult to remediate particularly because of potential quantities*



Drawdown: *reduced groundwater levels - moderate potential for extensive zone of influence (beyond Portion 152), moderate management issues (reduce or cease pumping)*

Discharge: *from inland to coastal ecosystems - moderate change to coastal discharge, moderate management issues (reduce or cease pumping)*

Quality: *seawater intrusion - moderate potential for seawater intrusion, serious management issues (reduce or cease pumping, long term remediation)*



Drawdown: *reduced groundwater levels - full recovery of groundwater levels following cessation of abstraction*

Discharge: *from inland to coastal ecosystems - full recovery of 'normal' discharge following cessation of abstractions*

Quality: *seawater intrusion - 'normal' discharge will displace seawater intrusion*

APPENDIX D
MITIGATION MEASURES

Issues and Mitigation			Relevant Project Component			Relevant Phase			Responsibility	
No.	Impact/Risk	Recommended Mitigation Measure	Marine	Onshore	Both	Construction	Operations	Accept (1) / Reject (0)	Operator	Contractor
Accidental Releases to the Environment including Groundwater										
1	Accidental spill of fuels, oils and other chemicals from vehicles and machinery which could result in surface water and/or groundwater contamination.	Vehicles and machinery maintained to a high level of safety with respect to leaks. Drivers will be appropriately trained and have the required driving license.		X		X	X	1		X
2	Accidental release of fuels, oils and other chemicals that could result in surface water and/or groundwater contamination.	Fuel, lubricating oils and chemicals will be stored in appropriately designed and sized designated areas that have impervious liners and/or bunds as appropriate.		X		X	X	1	X	X
3	Accidental spill of fuels, oils and other chemicals from vehicles and machinery which could result in surface water and/or groundwater contamination.	Establish an onshore spill response plan appropriate to the project phase and include staff training at induction to inform workers of their responsibilities under the plan.		X		X	X	1	X	X
4	Acidification of Soil, surface and groundwater environments.	Develop and implement Acid Sulfate Soils management plan		X		X	X	1	X	X
6	Soil, surface and/or groundwater contamination	Suitable containment provided for all parts of the plant area where hazardous or dangerous goods are stored or used.		X		X	X	1	X	X
7	Groundwater contamination	Install a groundwater monitoring network within the LNG Facilities site and on the downstream hydraulic gradient side of potentially contaminating/impacting activities (e.g. the landfill site). This network would be designed to alert the operator to the need for remedial action to contain a leak/spill.		X		X	X	1	X	

Issues and Mitigation			Relevant Project Component			Relevant Phase			Responsibility	
No.	Impact/Risk	Recommended Mitigation Measure	Marine	Onshore	Both	Construction	Operations	Accept (1) / Reject (0)	Operator	Contractor
Accidental Releases to the Environment including Groundwater										
8	Heavy fraction hydrocarbon contamination from heating medium system	Interception and treatment of runoff potentially containing hydrocarbons.		X			X	1	X	
9	Contamination from effluents (i.e., stormwater and oily wastes)	Effluents treated to appropriate standard and disposed of to combined outfall. For example stormwater and oily wastes treated in CPI facility to appropriate standard prior to disposal in retention pond, in addition sufficient time is allowed for sediment and solids to settle within the pond prior to final offsite discharge in accordance with waste discharge permit.		X				1	X	
10	Hydrocarbon contamination (diesel storage and distribution system)	Diesel storage system will be purpose-built, above ground and within double-walled tanks or containment bunds. Oil spill prevention and response plans will be in place.		X		X	X	1	X	X
11	Hydrocarbon contamination due to condensate release (gas and condensate storage tanks and product transfer system)	MEG slop storage tanks will be purpose-built full-containment tanks and bunded. HC spill prevention and response plan will be in place.		X			X	1	X	
12	Biological and pharmaceutical contamination from office and camp facilities (sanitary sewage system)	Biological, pharmaceutical and medical wastes will be treated and disposed of using appropriate technologies which will be detailed in the environmental management plan.		X		X	X	1	X	