Transport for NSW



M1 Pacific Motorway extension to Raymond Terrace

Submissions Report - Appendix J

June 2022

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M1 Pacific Motorway extension to Raymond Terrace

Appendix J

Supplementary report - soils and contamination

June 2022

Executive summary

Transport for New South Wales (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). Approval is sought under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 19*99.

In accordance with the Secretary's Environmental Assessment Requirements (SEARs), an environmental impact statement (EIS) was prepared by Transport in July 2021 (*M1 Pacific Motorway extension to Raymond Terrace Environmental Impact Statement* (Transport for NSW 2021)) to assess the potential impacts of the project. The EIS was exhibited by the Department of Planning, Industry and Environment (DPIE) for 28 days from 28 July 2021 to 24 August 2021.

The *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs, 2021p) was prepared in support of the EIS for the project. The purpose of the assessment was to assess potential soils and contamination impacts from construction and operation of the project, and where required, identify mitigation measures. The assessment was prepared to address the SEARs issued by DPIE for the project.

Following exhibition of the EIS, receipt of submissions and further consultation with stakeholders, a number of refinements have been made to the publicly exhibited project. The main design refinement that potentially influences soil or contamination includes:

- Water quality basins – lining of temporary and permanent water quality basins which interface with ground water
- Extension of a minor underground utility near a service station at Hexham.

This supplementary soils and contamination report has been prepared to respond to the submissions received and to assess the potential impacts of the refinements made to the project following public exhibition of the EIS. The following points summarise the outcomes of this supplementary report:

- Extensive soil and surface water investigations and assessment completed throughout the project area during a multi-year program has demonstrated that the existing soil and surface water condition typically presents an acceptable risk to ecology and human health
- Groundwater investigations and assessment completed throughout the project area has demonstrated that the exceedance of relevant criteria across all areas is not considered to be attributable to any specific human activity and simply reflects the regional ground water condition
- The exception to the abovementioned acceptable soil and water condition is the Rutile Zircon Mining (RZM) site located within the project area. Extensive detailed investigation and assessment has resulted in confirmation by EPA that the RZM site poses an acceptable risk to ecological and human health
- Due to demonstrated impacts to soil, remediation within the project area would be limited to the RZM site. The RZM site would be remediated in accordance with the requirements of a NSW EPA accredited Site Auditor and in consultation with EPA. Other minor locations of contamination (asbestos) would be remediated in accordance with the requirements of a NSW EPA accredited Site Auditor. PFAS impacted groundwater (where intercepted) would be retained on site
- The proposed project and change of land use (to SP2) would not result in a significant change to existing soil or water conditions, would not increase the risk of contamination and would be compatible with the proposed land use.

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1 Introduction and background

1.1 The project

Transport for New South Wales (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). The project would connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas (LGAs). The project location is shown in **Figure 1-1**.

The project would include the following key features (see **Figure 1-2**):

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction)
- Motorway access from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive
  - Tomago: connection to the Pacific Highway and Old Punt Road
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River flood plain including new bridge crossings over the Hunter River, the Main North Rail Line, and the New England Highway
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae
- Connections and modifications to the adjoining local road network
- Traffic management facilities and features
- Roadside furniture including safety barriers, signage, fauna fencing and crossings and street lighting
- Adjustment of waterways, including Purgatory Creek at Tarro and a tributary of Viney Creek
- Environmental management measures including surface water quality control measures
- Adjustment, protection and/or relocation of existing utilities
- Walking and cycling considerations, allowing for existing and proposed cycleway route access
- Permanent and temporary property adjustments and property access refinements
- Construction activities, including establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls.

A more detailed description of the project incorporating the refinements identified in **Section 1.2** is presented in Appendix A of the *M1 Pacific Motorway extension to Raymond Terrace Submissions Report* (Transport for NSW, 2022).

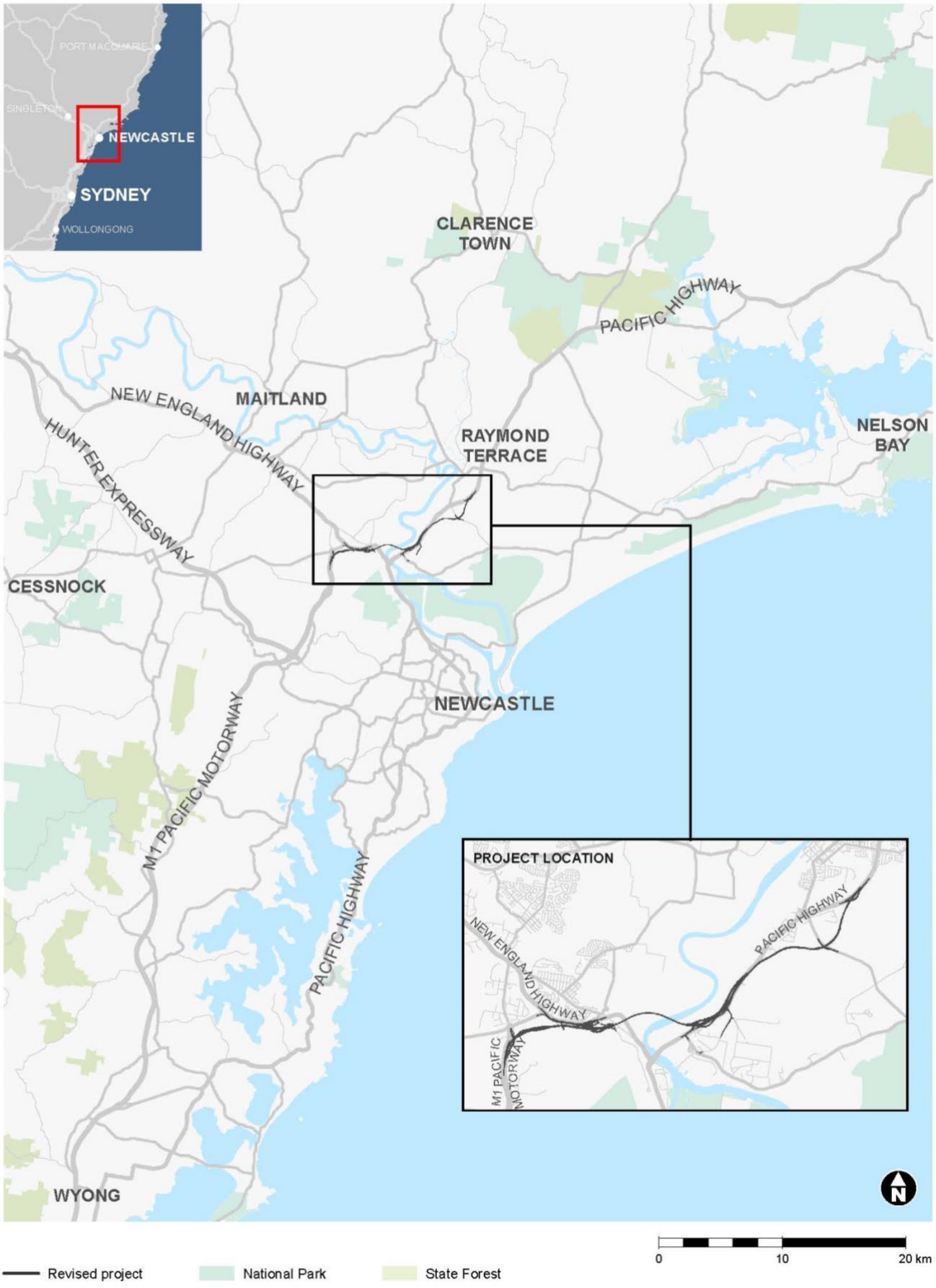
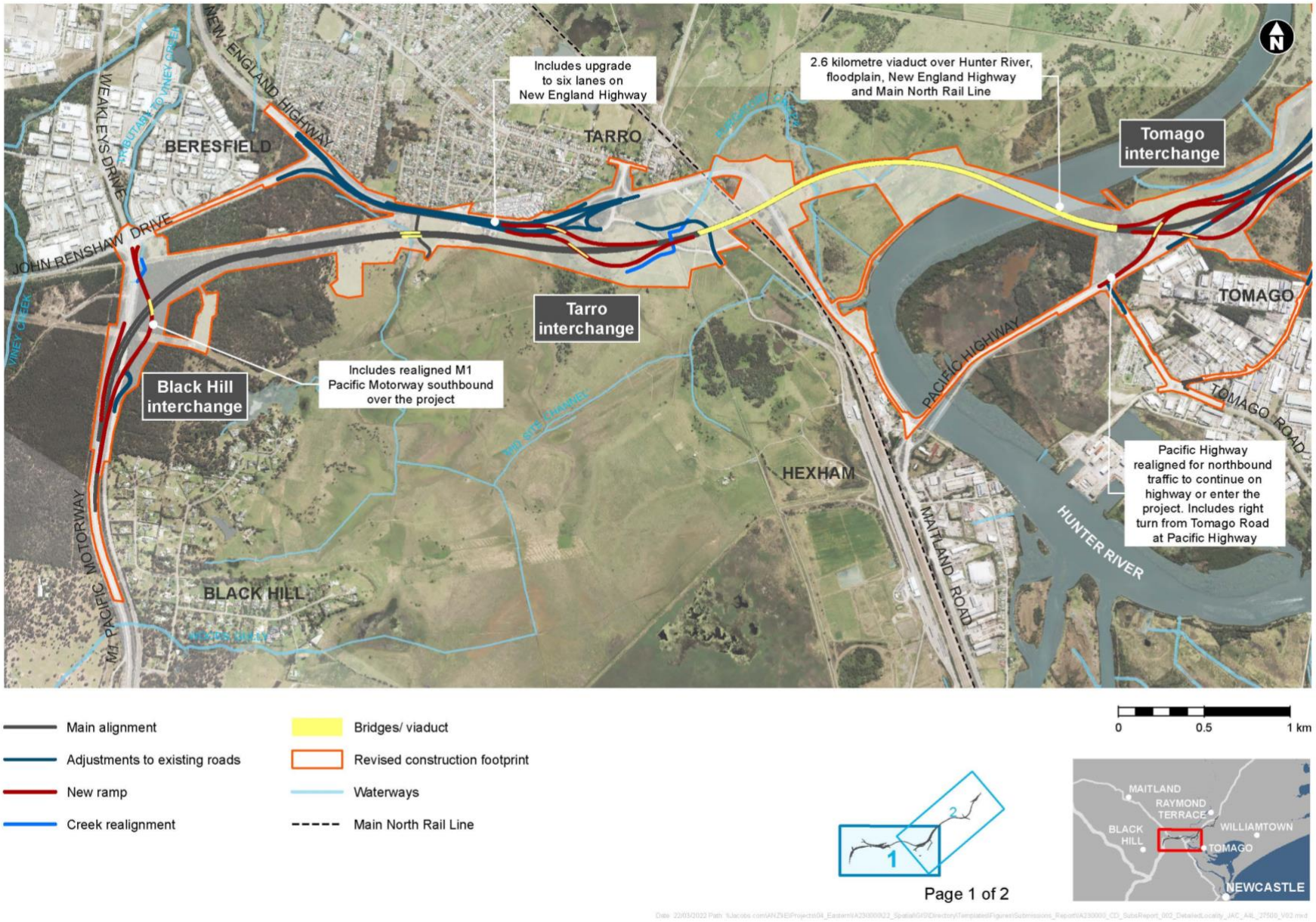
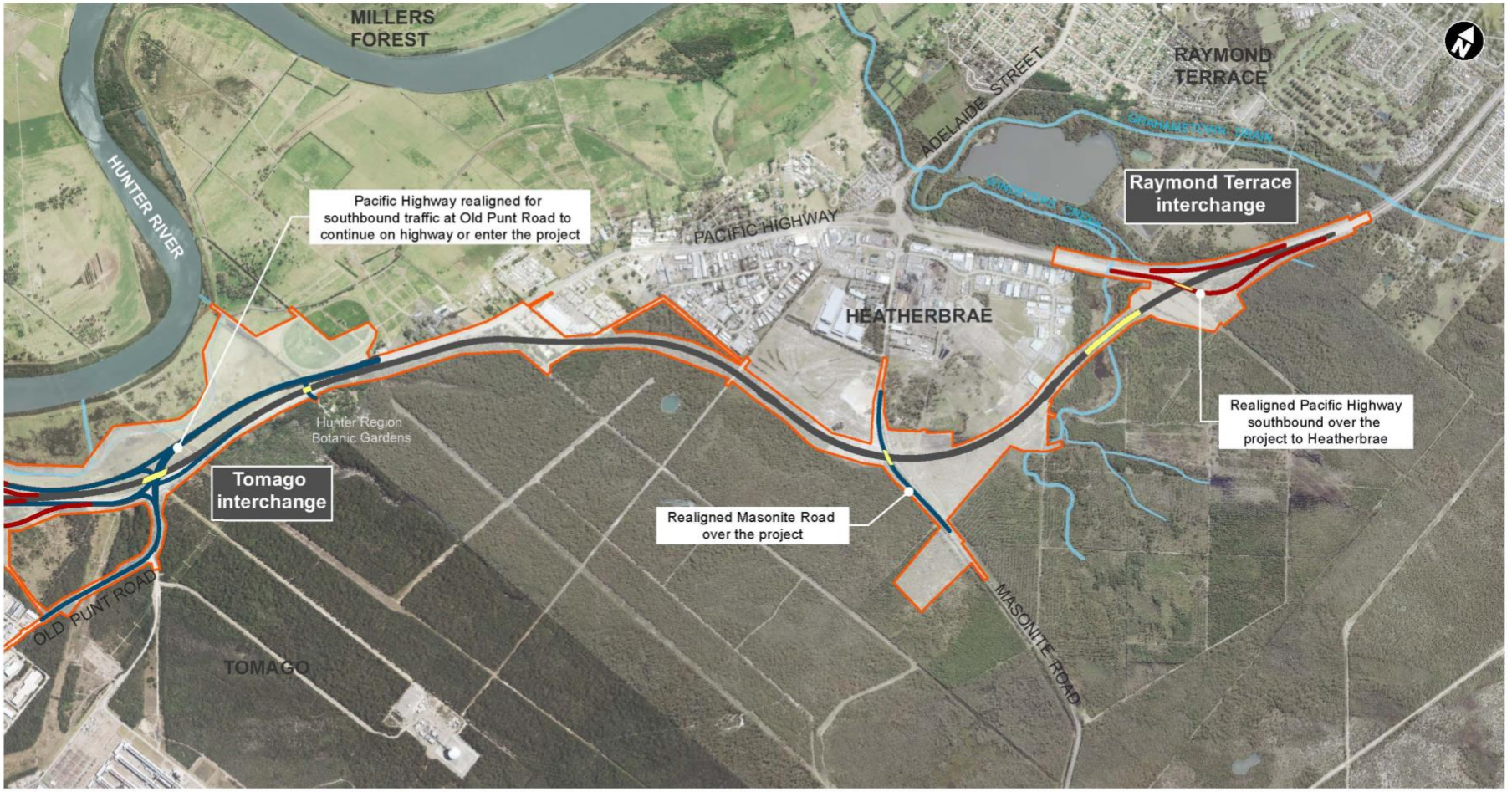


Figure 1-1 Regional context of project



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Figure 1-2 Project key features


MILLERS FOREST
HUNTER RIVER
RAYMOND TERRACE
ADELAIDE STREET
Pacific Highway realigned for southbound traffic at Old Punt Road to continue on highway or enter the project
PACIFIC HIGHWAY
Raymond Terrace interchange
HEATHERBRAE
Hunter Region Botanic Gardens
Realigned Pacific Highway southbound over the project to Heatherbrae
Tomago interchange
Realigned Masonite Road over the project
OLD PUNT ROAD
TOMAGO
MASONITE ROAD
Main alignment
Adjustments to existing roads
New ramp
Bridges/ viaduct
Revised construction footprint
Waterways
0
0.5
1 km
1
2
MAITLAND
RAYMOND TERRACE
BLACK HILL
WILLIAMTOWN
TOMAGO
NEWCASTLE

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1.2 Project refinements

Transport has refined a number of aspects of the project as exhibited in the environmental impact statement (EIS). These refinements have arisen through the ongoing review of the concept design and construction methodology, identification of opportunities to reduce environmental impact, consultation with landowners and government agencies, and in response to issues raised during the EIS exhibition period. The project refinements are described below.

Design refinements

- Southbound M1 Pacific Motorway merge – a 200 metre extension of the merge lane for southbound traffic from the John Renshaw Drive/Weakleys Drive intersection to allow for improved capacity and safety
- Utilities strategy – key changes include grouping of utilities at Tarro and Tomago into utility corridors and extension of the construction footprint at Beresfield and Hexham to accommodate utility relocations
- Cycleway strategy – improvements to facilitate incorporation with the Richmond Vale Rail Trail and removal of shared use path on the new Masonite Road bridge (bridge at Heatherbrae
- Drainage design at Heatherbrae – minor changes to basin locations and extension of drainage lines to minimise property and drainage impacts on adjacent properties
- Water quality basins – lining of temporary and permanent water quality basins which interface with ground water.

Construction refinements

- Ancillary facilities and site access – minor changes to the size, location and access arrangements of some ancillary facilities
- Earthworks management – identification of a borrow pit and sites for beneficial reuse of materials within the construction footprint.

Construction staging

- Staged project opening - the project would be delivered via two packages of work, the Southern (Black Hill to Tomago) and Northern (Heatherbrae bypass) works. The Northern section would likely have a shorter construction duration and could potentially be opened to traffic before the Southern section.

Project footprint refinements

- Consultation with landowners and the design and construction refinements to reduce property and biodiversity impacts have resulted in minor changes to the construction and operational project footprints.

1.3 Purpose of the document

The *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs, 2021p) was prepared to support of the EIS for the project. The purpose of the working paper was to provide an assessment of the impacts from the construction and operation of the project with regards to soils and contamination.

The assessment was prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and Supplementary SEARs as described in Section 1.4 of the *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs. 2021p).

During the exhibition of the EIS, two submissions were made in relation to soils and contamination matters. These submissions have been addressed in the *M1 Pacific Motorway extension to Raymond Terrace Submissions Report* (Transport for NSW, 2022).

This supplementary soils and contamination report has been prepared to provide additional information and assessment relevant to soils and contamination (refer **Chapter 3**). This supplementary report also assesses potential impacts from project refinements identified in **Section 1.2**. The project refinements affecting soils and contamination are presented in **Chapter 4** (Areas of Potential Contamination Risk) and **Chapter 6** (assessment of site investigations).

This supplementary report only includes additional detail or information that has changed since submission of the EIS and should be read in conjunction with the *M1 Pacific Motorway extension to Raymond Terrace Surface Soils and Contamination Working Paper* (Jacobs. 2021p) included in the EIS.

1.4 Objectives

The *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs, 2021p) included and addressed the following objectives in accordance with the SEARs:

- Protect the environmental values of land, including soils, subsoils and landforms
- Minimise risks arising from the disturbance and excavation of land and disposal of soil, including disturbance to acid sulphate soils and site contamination.

This supplementary report expands on the existing objectives to include an additional objective that is addressed in this report. The additional objective is:

- Assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, describe how the assessment and/or remediation would be undertaken in accordance with current guidelines.

2 Existing Environment

2.1 Overview

In accordance with the project SEAR's and as per *Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land, (DUAP & EPA, 1998)*, a desktop assessment of the existing environment was provided in Chapter 4 of the *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs. 2021p). This included details on:

- location and land use zones
- topography
- geology
- soil landscapes
- salinity, sodic soils, acid sulphate soils
- sensitive receiving environments

A detailed review of existing information is provided in Chapter 5 of the *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs. 2021p). This included:

- review of aerial photography
- review of historical maps and business directories
- review of EPA register(s)
- review of previous contamination assessments
- a preliminary Conceptual Site Model (CSM).

The outcomes of the previous assessment highlighted that the 15 kilometre lineal project extends over multiple soil types, land use zones and has included various land uses occurring over time. The greenfield condition of most of the project site reflects past, present and future zoning in the area that is predominately low intensity land uses including environmental conservation or living (E2, E4), rural landscape (RU2), special use (SP1 - drinking water catchment).

The project site does also contain lesser areas of land use zoning that supports development such as infrastructure (SP2 – for road and rail) or general industrial (IND1).

The existing surface water and groundwater environment was described and assessed in detail within the *M1 Pacific Motorway extension to Raymond Terrace Surface and Groundwater Quality Working Paper* (Jacobs, 2021k). This report included extensive surface water sampling, modelling and assessment and found that the water quality resulting from the project was able to work towards meeting the NSW Surface Water Quality Objectives (Hunter River) over time. Further sampling was completed and reported in the *M1 Pacific Motorway extension to Raymond Terrace Supplementary Surface and Groundwater Quality Report* (Jacobs. 2022) which supported the initial findings.

The existing hydrogeological environment was described and assessed in *M1 Pacific Motorway extension to Raymond Terrace Hydrology and Flooding Working Paper* (Jacobs, 2021 j).

This report clearly describes the groundwater patterns using onsite and sub-regional sampling data that informed a detailed hydrogeological model. The report (Jacobs. 2021 j) was used in this report to inform the Conceptual Site Model (CSM) and develop inferred risk ratings for AOPCRs.

In accordance with the SEARs and *SEPP 55 Guideline*, as the previous assessment (Jacobs. 2021 j) has shown that project site *is located is in the vicinity of, or identified to have contamination onsite*, further investigations were completed to inform a determination by the planning authority.

3 Submission and additional information

3.1 Submissions

Two submissions regarding soils and contamination matters were received during the exhibition of the EIS. A summary of those submission that require additional information or assessment are presented in **Table 3-1**.

Table 3-1 Response to EIS submission

Stakeholder	Issue	How addressed in this report
NSW EPA	**The EIS has not satisfactorily addressed the requirements of the SEARs** The NSW EPA stated the EIS has not satisfactorily addressed the SEAR for contamination since the nature and extent of contamination across the project site has not been fully assessed.	Section 5 of this report includes a summary of the detailed investigations completed for the project that characterise the nature and extent of contamination. Attachment A include detailed reports assessing the contamination on the project.
NSW EPA	**A NSW EPA accredited site auditor must be engaged throughout the duration of works** A NSW EPA accredited site auditor is recommended to be engaged for the entire project footprint and throughout the duration of works for this project to ensure that any work required in relation to contamination is appropriately managed.	Section 7 of this report includes a commitment for the engagement of a NSW EPA accredited Site Auditor throughout the entire footprint and duration of the works.
NSW EPA	**Recommend the proponent provide additional documents.** Provide a SAQP, Contaminated Land Management Plan, Sediment Management Plan, Acid Sulphate Soils Management Plan, Interim Audit Advice.	Section 7 of this report includes a commitment for the provision of the documents.
Community	**Disturbance of regulated site** Concerns raised regarding disturbance of existing contamination on a regulated site.	Section 8 of this report discusses management of the regulated site identified within the project area.

3.2 Additional information

3.2.1 Site investigations

In general accordance with the National Environmental Protection Measure (Assessment of Site contamination -1999 updated in 2013. Schedule B2) (NEPM 2013), a staged approach has been utilised to characterise the project site.

Previous site investigations completed for the project described in the *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Working Paper* (Jacobs. 2021 p) formalised and consolidated information in a Preliminary Site Investigation inclusive of a tabled Conceptual Site Model (CSM).

Further intrusive investigations have been completed by Transport over a period of multiple years to understand nature and extent of contamination across the project site and inform the consideration of whether the site is likely to be contaminated and further, whether it presents a risk to ecological or human health and also whether remediation is required.

3.2.2 Sampling methodology

The sampling methodology used during the extensive investigation program that commenced in 2017 was a *judgemental* methodology (*Sampling Design Guidelines. NSW EPA. 1995, NEPM Assessment of Contaminated sites 2013 (amended from 1999)*) based on the following project specific factors:

- project specific and additional targeted Preliminary Environmental Investigations
- the extensive lineal form of the project site
- consultation with landowner and stakeholders
- knowledge of the site based on decades of experience developing and operating the road network in the area
- consideration of access constraints including extensive Aboriginal and non-Aboriginal heritage sites, (listed) Coastal Wetlands, adverse vehicular access conditions in environmentally sensitive areas
- low risk land uses within the majority of the project site
- a prudent use of public funding.

The *judgemental* sampling methodology and data outcomes subsequently informed additional targeted investigation and sampling methodology where an increased / actual risk of contamination was observed.

3.2.3 Additional detailed soil and water investigations

The development and assessment of the project has included an extensive investigation program to determine the existing (pre-construction) nature and extent of contamination within or adjacent to the project area.

Transports detailed contamination investigations of existing soil, surface water and groundwater completed during the development of the proposed motorway is summarised in **Table 3-2** below.

Table 3-2 Transport detailed investigations

Monitoring date	Location	Number of investigation locations	Environmental soil tests	Environmental water tests
Geotechnical investigations				
2017	Various locations on 15km site	59 boreholes 38 test pits 20 piezometers	60	22 (gw)
2021	Various locations on 15km site	128 boreholes (including 12 marine) 36 test pits 7 piezometers	37	20 (gw)
RZM investigations				
2011	PSI. Various structures on the site	17 samples (asbestos) 13 samples (lead paints)	30	nil
2013	PSI. Various structures on the site	29 samples (metals)	29	nil
2015	Demolition of all above ground	7 clearance certificates (incl air monitoring	7	nil

Monitoring date	Location	Number of investigation locations	Environmental soil tests	Environmental water tests
	structures on site			
2016	DSI. Various locations on site	76 (including 27 test pits) 10 boreholes (radiological survey) 1600 approx. (surface monitoring radiological survey)	113 10 1600	13 (gw) 3 (sw)
2019	Additional DSI. Various locations	206	153	13 (gw) 40 (sw)
Targeted testing of visible surface contaminates				
2016	BlackHill. Various locations in bushland area	31	6	nil
2018	Tomago. Various locations within redundant structure	6	6	nil
Targeted potential PFAS				
2021	Heatherbrae Tarro	2 2	nil	2 (gw) 2 (gw)

3.2.4 Broad scale detailed site investigations

Intrusive investigations listed in **Table 3-2** benefited from a progressive process during two phases of extensive geotechnical investigations (2017, 2021).

A multimodal screening process along the 15 kilometre project area was completed by suitably experienced geotechnical engineers and environmental scientists that was comprised of 288 intrusive investigation locations (both terrestrial and aquatic) during the geotechnical investigations between 2017 and 2021. The multimodal process of assessing the borehole logs, test pits and peizometer well materials included visual, olfactory and field tests (photo-ionisation detector, pH) that informed a broadscale understanding of the site conditions. In parallel to this screening process, the detailed environmental sampling program was completed.

Groundwater quality across the site and its surrounds was sampled over an extended period (2017 – 2021) via the installation and monitoring of project specific piezometers, and also using third party wells and data. 20 wells were installed by Transport during 2017 and subsequently, an additional seven wells were installed in 2021.

Surface water quality in all ephemeral drainage lines, permanent creeks and drains, wetlands and tidal river were sampled over multiple years. Third party data was also otained to compliment the detailed Transport data set and used in the detailed assessment presented in the previous working paper (Jacobs. 2021 k).

3.2.5 Targeted detailed site investigations

In response to the high risk / relevant AOPCR's described in the previous contamination reporting (Jacobs. 2021 p) and outcomes from the broad scale intrusive investigations, Transport has completed further targeted detailed investigations to understand the risk to ecological or human health or whether remediation of a specific area is required.

4 Areas of Potential Contamination Risk (AOPCR)

In accordance with the project SEARs, submissions received by NSW EPA and as per *Planning Guidelines SEPP 55 –Remediation of Land*, detailed investigation of the project area has been completed to report data and assessment from various detailed site investigations for identified AOPCR.

The reporting of the detailed site investigations data is summarised in **section 5** of this report. However, it is also used in **Table 4-1** in this section to revise the AOPCR table and risk rating presented in previous reporting (Jacobs. 2021p) for the project.

The revised AOPCR in **Table 4-1** includes an expanded listing of AOPCR as compared to previous reporting (Jacobs. 2021 p) and utilises detailed site investigations data to revise and finalise risk ratings for the construction and operational phase of the project. The table also includes revised content informing the CSM (NEPM 2013. Schedule B2. Essential elements).

Table 4-1 Revised AOPCR

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
1	Service station	John Renshaw Drive, Beresfield. Not in construction footprint.	• Shallow excavations (~1 m depth) for installation of new Optus service on John Renshaw Drive (East bound) 20m south of AOPCR • Cut of up to about 10 m for the motorway alignment about 320 m to south	• Zone 1	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols	• Migration of hydrocarbon via groundwater into excavations • Inhalation of dust and/or vapours • Dermal contact and ingestion with impacted soil, surface water or groundwater • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Road users (vehicles/pedestrians/cyclists) • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well D-PZ-134 (~260 m south) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Cadmium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Low	Low	
2	Former sanitary depot	New England Highway, Tarro. Not in construction footprint	• Installation of water quality controls and surface drainage adjacent to AOPCR. • Bridge over wetlands about 200 m south east (B02) including pier excavations. • No substantial excavations	• Zone 1	• Hydrocarbons • Nitrates • Metals • Biological hazards	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well M-PZ-102 (~300 south) • GW Analysis: Metals, Biological, Inorganics (basic) • SW Analysis (Sample M12RT1): Metals TN, TP, NOx	Groundwater: Cadmium, Manganese, Nickel, Phosphorus, Zinc, Ammonia, pH, Sulphate Surface Water : Zinc, Copper, Cadmium TN, TP, NOx, DO	Low	Low	
3	Waste burial (asbestos)	Private residence. Woodlands Close Tarro. Within construction footprint.	• Viaduct construction including viaduct pier excavations directly within AOPCR. • No substantial excavations.	• Zone 3	• Asbestos (known)	• Inhalation of asbestos fibres	• Construction workers • Maintenance workers	No testing conducted within the property	Asbestos based on EPA regulatory notice	High	Low	• TfNSW have indicated that they shall remove asbestos containing fill prior to viaduct construction activities commencing.
4	Gravity trunk main (potable water supply)	Tarro, Black Hill. Within construction footprint.	• Relocation and/or connection to existing subsurface HDPE trunk main at Tarro.	• Zone 1 & 2	• Asbestos • Metals (lead jointing and paint on old water main)	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • GW Analysis: Metals, Biological, Inorganics (basic) • Wells D-PZ-223A & B (? m east), DP-PZ-134, DP-PZ-135 and DP-PZ-136 and Soil M-LDB-104	Soil: nil Groundwater: Aluminium, arsenic, copper, chromium, cadmium, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	Medium	Low	• Previous surface trunk main has been removed from proposal area and replaced by subsurface HDPE main. Source of CoPC removed, but residual CoPC may remain in localised surface soils. • Disturbance of residual CoPC during proposed utility work is therefore likely to be localised (if any).

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
5	Former mineral sands processing facility (RZM)	Tomago. Within construction footprint.	• RZM site remediation initially • M12RT construction including viaduct, temporary and permanent detention basins, earthworks fill etc post remediation	• Zone 4	• Naturally occurring radioactive materials • Heavy metals • Hydrocarbons • ASS • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Radiation exposure • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Road users (vehicles/pedestrians/cyclists) • Maintenance workers • Ecological receptors	• Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, gamma radiation • GW Analysis: Metals, TRH / BTEX, PAH, phenol, gamma radiation. • SW analysis Metals, TRH / BTEX, PAH, phenol, gamma radiation.	Soil: TRH, PAH, chromium, nickel, zinc, pH; radionuclides asbestos Groundwater : cadmium, copper, nickel, zinc Surface water : Zinc (dissolved and total), copper (dissolved and total)	High	Low	• EnRiskS HHRA indicates an acceptable health risk from radionuclides for workers under normal exposure scenarios and range of soil/sediment concentrations. Unacceptable risks scenarios were determined for continuous hotspot exposure and exposure to worst case concentrations. • Known asbestos impacts have been remediated.
6	Former coal loading facilities	New England Highway, Hexham Not in construction footprint.	• Installation of new optic fibre utility in shallow excavations (~1 m depth) • Ancillary facility AS8 to east on opposite side of Maitland Road.	• Zone 3	• Petroleum hydrocarbons • Heavy metals • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Aggressivity @ depth • BH106, BH107	Soil: nil	Low	Low	
7	Former dairy processing and wastewater irrigation	Waste water irrigation area is located about 280 m west of utility relocation and 200 m south of project alignment (western end of viaduct). Not in construction footprint	• Trenching works for optic fibre utility upgrade along Maitland Road / New England Highway • Fill embankment and Viaduct pier excavations.	• Zone 3	• Metals • Nutrients • Pathogens • Hydrocarbons	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Aggressivity • BH104, BH105	Soil : nil	Low to Medium	Low	
8	Railway	Between New England Highway and Woodlands Close, Tarro. Within construction footprint.	• Construction of bridge over railway for motorway. Design eliminates any intrusive work in railway corridor	• Zone 3	• Monocyclic aromatic hydrocarbons • Petroleum hydrocarbons • Heavy metals • Carbamates • Organochlorine pesticides • Organophosphate pesticides • PCBs • Phenols • Herbicides • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted within railway easement	Not Applicable	Low	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
9	Hunter River sediments	Hunter River channel. Within construction footprint	• Piling through sediments and pile caps for viaduct (B05) and bridge (B06) • Dredging of sediment for temporary access • RZM remediation located east (170m) of bridge work.	• Zone 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • Nutrients • Pathogens • PFAS • Naturally occurring radioactive materials	• Dermal contact and ingestion of Hunter River sediments • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Sediment (mid channel): M-BH-322, M-BH-323, M-BH-330, M-BH-331 • Sediment Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, PFAS. • Sediment (offsite - eastern bank) SED24 – 31, SEDB01-06 • Sediment analysis: Metals	Onsite sediment: Nickel Offsite sediment : Nickel Zinc	Low to Medium	Low	• TfNSW sampling of Hunter River Sediments at 4 locations within the construction footprint of the Hunter River (mid channel) present only minor nickel exceedances of sediment DGVs. • TfNSW sampling of Hunter River sediment (offsite) at the outlet of a drain from the RZM site showed exceedances of Nickel and Zinc. The construction footprint does extend to this area of the Hunter River and no disturbance of sediment shall occur in the location of the exceedances.
10	Asbestos waste (HazMat 2020)	Pacific Highway Lot 51, DP 739336, Tomago. Within proposal area.	• Ancillary facility AS11 • Installation of water quality control	• Zone 4	• Asbestos (known) • Other CoPC such as heavy metals, nutrients, hydrocarbons possible from former buildings which if present will add additional pathways/receptors	• Inhalation of asbestos fibres	• Construction workers • Maintenance workers	6 samples of potential ACM	3 samples asbestos (Chrysotile)	High	Low	
11	Industrial/ commercial operations	Adjacent to site, Tomago Road / Old Punt Road, Tomago. Not in construction footprint.	• Import / fill to construct new motorway • Culvert and drainage installation • Trenching for new services	• Zone 4	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors • Migration of hydrocarbon into trenches during excavation works	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well D-PZ-438(~100 m `north east of Tomago Industrial Estate) • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: Not Applicable • Groundwater: Aluminium, Copper, Iron, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Medium	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
12	Service station	Adjacent to site. Pacific Highway, Heatherbrae. Not in construction footprint.	• No substantial excavation area. • Adjustment of existing pavement • Installation of water quality controls about 60 m south west.	• Zone 5	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches or water quality controls during excavation works • Mobilisation of contaminants to sensitive ecological	• Construction workers • Maintenance workers • Ecological receptors	• Soil: D-TP-437 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos • Well D-PZ-440A/B (~350 m SW of property • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: B(a)P TEQ HILC • Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Medium to low	Low	• TfNSW indicate third party detailed contamination assessments (commercial in confidence) suggests that potential hydrocarbon impacts are not currently impacting the construction footprint. • Detentions basins proposed to be lined to prevent groundwater interaction.
13	Industrial/ commercial operations	Masonite Road, Heatherbrae. Partly within construction footprint.	• Imported fill formation for Masonite Road Bridge and motorway embankment. • Ancillary for construction support. AS14 next to site, AS15 south, and AS18 within site • Potential cutting of isolated hill for source of fill material	• Zone 5	• Solvents • Polyaromatic hydrocarbons • Organochlorine Pesticides • Aldrin and dieldrin • Metals • Boron • Ammonia • Cresols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches during excavation works • Migration of contaminants to nearby ecological receptors	• Construction workers • Maintenance workers • Ecological receptors at Windeyer's Creek and surroundings water bodies	• Soil: D-BH-519, D-BH-520,D-BH-601, BH 120, D-TP-506, D-BH-503 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, Aggressivity • Well D-PZ-614, D-PZ-615A, D-PZ-615B, D-BH-501 adjacent to or 300 m east of industrial estate , • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: nil • Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrate, Nitrogen (Total), pH	Medium	Low	
14	Wastewater treatment works	Raymond Terrace. Not in construction footprint.	• No substantial excavation area. • Piling for bridge over Windeyer's Creek about 370 m south of AOPCR • Ancillary facilities AS20 and AS21 about 200 m and 350 m south east	• Zone 6	• Nutrients • Metals • Phenols • Pathogens • PFAS	• Dermal contact and ingestion with impacted soil, sediment or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors at Windeyer's Creek and surrounding water bodies	• Soil Analysis: Nill • Well D-PZ-616, M-PZ-601 (~200 SE of WWTP) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH Soil: Not Applicable	Low to Medium	Low	• M12RT project groundwater model shows that the licensed WWTP is down gradient from construction footprint. • Dewatering during construction for proposed detention basins was predicted in the M12RT report to be minimal (0.4 m at basin extending to 0.2 m on the northern side of Pacific Highway but south of WWTP infrastructure.

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
15	Hazardous, industrial or Group A waste generation or storage	Masonite Road, Heatherbrae. Not in construction footprint.	• Fill embankments for Masonite Road Bridge and motorway formation. • Potential cut at local hill to source fill about 650m south of AOPCR	• Zone 5	• Solvents • Polyaromatic hydrocarbons • Organochlorine pesticides • Aldrin and dieldrin • Metals • Boron • Ammonia • Cresols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches during excavation works	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil: D-BH-519, D-BH-520,D-BH-601, BH 120 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, Aggressivity (BH120) • Well D-PZ-614, D-PZ-615A, D-PZ-615B adjacent to or 300 m east of industrial estate , • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrate, Nitrogen (Total), pH Soil: nil	Low to Medium	Low	
16	Historical herbicide application	Next to the Hunter River, Tomago and Tarro	• Piling through sediments and pile caps for viaduct (B05) and bridge (B06) • Access tracks and ancillary facility AS9	• Zone 3	• Organochlorine pesticides • Aldrin and dieldrin • Herbicides	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors • Runoff to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil/Sediment: M-BH-320, M-BH-322, M-BH-323, M-BH-330, M-BH-331 • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, PFAS	Soil : nil Sediment: nickel	Low to Medium	Low	
17	Historical rifle range	Heatherbrae. Possibly within construction footprint.	• Cutting of isolated hill to win sand fill material • Ancillary for construction support. AS18 and AS19	• Zone 4 / Zone 5	• Lead from bullets and shot • Copper casings	• Dermal contact and ingestion with impacted soil • Inhalation of dust and/or vapours • Migration of metals in surface water during excavation works	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil: D-BH-512 and D-TP-506 about 250 m east/west of the former shooting range • Soil: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Soil: nil Groundwater: Not applicable	Low	Low	
18	PFAS contamination	Tarro – 280m north of construction footprint. Heatherbrae – 250m west of construction footprint. Not in construction footprint.	• Tarro – Import fill for interchange ramps. • piling for interchange ramps • Heatherbrae – filling for motorway formation. • Ancillary facilities (various)	• Zone 5	• Per-and polyfluoroalkyl substances	• Dermal contact and ingestion with impacted soil, sediment or groundwater • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil Analysis: nil • Well M-PZ-301, M-PZ-201, M-PZ-501, D-PZ-614, D-PZ-221, D-PZ-222, D-PZ-223A/B, D-PZ-615 within 550 m to >2 km from the source sites, • GW Analysis: Metals, Biological, Inorganics (basic), PFAS	Groundwater: Aluminium, Boron, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate PFOS Soil: Not Applicable	Low to Medium	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
								(selected wells only) • Surface Water Analysis: nil	Surface Water: Not Applicable			
19	Former night soil disposal	Black Hill. Corner of John Renshaw drive and M1 Motorway. Within construction footprint.	• Temporary capping of AOPCR. • Ancillary for construction support. AS1 within the site. • 10m deep cut located 250m south east • Fill embankment over existing soils for motorway to west.	• Zone 1	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • Nutrients • Pathogens • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low to Medium	Low	• AS1 would not include disturbance of soils. Temporary placement of capping fill material over existing soils to stabilise area for use by vehicles, plant and equipment. Capping material to be removed during demobilisation.
20	Electrical Substation	Black Hill. Not within construction footprint.	• No excavation at AOPCR • 10m cut located 50 south of substation	• Zone 1	• PCB • Heavy metals • Solvents • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors • Cut material transferred to other locations on site.	• Construction workers • Maintenance workers • Ecological receptors	• Soil: M-LDB-104 (~ 100 m south) • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: D-PZ-135, D-PZ-136 (~250 south west and 100 m south east respectively) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Arsenic, Aluminium, Chromium, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH Soil: nil	Low to Medium	Low	
21	Former LTTSF Works Compounds	Tarro. Immediately south of the Tarro interchange. Within construction footprint Woodlands Close, Hexham. Adjacent to construction footprint.	• Viaduct construction 140m north • Adjustment of Aurizon access road adjacent. • Immediately adjacent earthworks fill at Tarro Interchange	• Zone 2 & 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Nutrients • Pathogens • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil: D-TP-214 (~50 west of AOPCR) • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: M-PZ-201 within AOPCR • GW Analysis: Metals, Biological, Inorganics (basic), PFAS	• Soil: nil • Groundwater: Manganese, Nickel, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate	Low to Medium	Low	• LTTSF project subject to regulatory oversight and spoil management was endorsed by regulatory processes.

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
22	Former works compound, former building/jetties, former overhead conveyor	New England Highway , Hexham including AS8 and land immediately north Purgatory Creek. Within construction footprint.	• No substantial excavation. • Ancillary for construction support. AS8 within the construction footprint.	• Zone 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Nutrients • Pathogens • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil: BH107 (southern corner) • Soil Analysis: Aggressivity	Not applicable	Low to Medium	Low	• TfNSW have indicated AS8 was used by TfNSW as an ancillary facility to construct the nearby Hexham Bridge and imported material that was used to cap the previous land uses complied with TfNSW EMS process and is free of harmful levels of contaminants. • AS8 would not include disturbance of soils. Temporary placement of capping fill material over existing soils to stabilise area for use by vehicles, plant and equipment.
23	Service Stations (notified sites)	Maitland Road, Hexham. Not within construction footprint.	• No substantial excavation. • Utility installation (~1m excavation) 320m north or AOPCR.	• Zone 3	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	
24	Former sand pit	Heatherbrae between AS18 and AS15. Within construction footprint.	• No substantial excavation • Imported fil for motorway formation.	• Zone 5	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Asbestos	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	
25	Former aircraft runway	Tomago, northern end of Old Punt Road. Within construction footprint.	• No substantial excavation. • Minor upgrades of Old Punt Road	• Zone 4	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Phenols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
26	Former works compound	Northern interchange. Within construction footprint.	• No substantial excavation. • Imported fill interchanges and ramps. • AS21 ancillary area	• Zone 6	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receivers	• Soil: D-BH-609, D-BH-610 • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: D-PZ-616, M-PZ-601 • GW Analysis: Metals, Biological, Inorganics (basic)	Soil: nil Groundwater: Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	Medium	Low	
27	Former service station	Near Hexham Bridge, Maitland Road, Hexham. Not within construction footprint.	• Utility installation (~1m excavation) adjacent to proposal.	• Zone 3	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols • PCB • Asbestos	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Medium	Low	
Various	Stockpiling and/or illegal dumping	General, within construction footprint.	• General construction	• Various	• Asbestos • Metals • Hydrocarbons • (subject to source)	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No Testing conducted to date	Not Applicable	Medium	Low	
Various	Imported Fill	General, within construction footprint including roads/embankments/ access tracks and reclamation of low lying land	• General construction	• Various	• Asbestos • Metals • Hydrocarbons • (subject to source)	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No targeted testing conducted to date, although fill materials have been tested.	Not Applicable	Low to Medium	Low	

Notes to Table B7:

- The basis for the determination of inferred contamination risk rankings is based on the weight of evidence gathered throughout the desktop assessment process, the results of previous contamination assessments and data, and professional judgement based on experience with numerous similar sites and projects. All risk rankings have been based on unmitigated project risks and have not considered the implementation of design or engineering controls.
- Where there is direct evidence or the combined weight evidence indicates a likely exposure scenario of workers to known contamination, the risk ranking potential has been considered 'High' as per Jacobs (2021).
- Post construction risk ratings are based on construction works being undertaken in accordance with an approved environmental management plan / remediation action plan (as required) to ensure contaminated soils are appropriately managed/disposed and validated.
- # Groundwater exceedances predominantly associated with ANZG (2018) DGVs for slightly to moderately disturbed systems in fresh water (or marine waters in some cases) and ANZECC (2000) DTVs for lowland rivers. Some groundwater exceedances also associated with NEPC (2013) GILs for drinking water (ie sulphate) (Refer to Table B6 in Appendix B for further details). Soil exceedances predominantly associated with NEPC (2013) HIL C (PAHs) and EIL for open space and commercial/industrial land use (Zinc). Sediment exceedances associated with ANZG (2018) DGVs for toxicants in sediments. Surface water exceedances taken from M12RT Surface and Groundwater Quality Working Paper (Appendix K of EIS) – refer to working paper for guidelines utilised and further details.
- * As advised by TfNSW

5 Detailed Site Investigation Results

5.1 Site assessment criteria

The site assessment criteria applied in the detailed site investigation was informed by the previous reporting (Jacobs, 2021p) and is presented in **Table 5-1**.

Table 5-1 Site Assessment Criteria

Site Assessment Criteria
NEPC National Environment Protection Measure (Assessment of Site Contamination) 1999 (as amended 2013) [NEPM] (NEPC, 2013) inclusive of relevant Schedules and Health Screening Levels (for human health assessment) and Ecological Investigation Levels (for ecological health screening)
CRC CARE (CRC CARE, 2011) Health screening levels for petroleum hydrocarbons in soil and groundwater
CRC CARE. Risk-based Management and Remediation Guidance for Benzo(a)pyrene. Technical Report no. 39 (CRC CARE, 2017)
HEPA PFAS National Environmental Management Plan (NEMP) (HEPA, 2020)
ANZG Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
NHMRC Guidelines for Managing Risks In Recreational Water (NHMRC, 2008)
NHMRC, NRMMC Australian Drinking Water Guidelines 6 2011, Version 3.2 (NHMRC, NRMMC, 2016)

Refer to **Attachment A** (Appendix C) for further information on Site Assessment Criteria and detailed analytical results tables in **Appendix B**.

5.2 Detailed site assessment results (excluding targeted or AOPCR results)

5.2.1 Broadscale field screening results

Field screening of the 280 geotechnical investigation locations (2017, 2021) using various field test revealed that the sampled locations did not contain gross contamination. Photo-ionisation detector (PID) for VOC's undertaken on recovered soil samples for contamination testing (2021) all returned results of <1 ppm.

A review of bore logs from the geotechnical program typically presents soil strata that reflects unmodified soil profiles.

The exception was the existing road network sampling locations and a localised area within the site identified at the northern interchange area at Raymond Terrace where infilling was identified at depths ranging between 200millimetres to 1.5 metres. The infilled material was sandy soil (typical of the surrounding area) with some *roadbase type gravel* that is thought to be associated with road infrastructure development in the immediate area.

5.2.2 Soil and aquatic sediment sampling results

Analysis of Transport's and third-party soil investigation samples obtained have been compared against the site assessment criteria listed in **Table 5-1**. The results of soil testing from the investigations are presented in **Attachment A** (Appendix B) and are summarised below.

The environmental soil sampling results show that analyte concentrations are within the adopted criteria across site with the exception of the following:

- Elevated B(a)P TEQ above HIL C criterion (however within HIL D criterion) at three locations (within the existing road network)
- Elevated zinc above the EIL-C and EIL-D criteria at one location (500 metres from the project across the flood plain)
- Elevated nickel above DGVs for toxicants in sediment at two locations (western side of Hunter River).

The very high levels of compliance with conservative investigative criteria across the site (excluding high risk AOPCRs and targeted testing locations) demonstrates that the soils and sediments across the site generally reflect the greenfield / low intensity land uses (historical and current) and present a low risk to ecological or human health and do not require remediation to facilitate the project.

5.2.3 Groundwater sampling results

Analysis of Transport's and third-party groundwater samples obtained have been compared against the site assessment criteria listed in **Table 4-1**. The results of environmental groundwater testing have been collated and are presented in **Attachment A** (Appendix B) and are summarised below.

The groundwater sampling results show that analyte concentrations across the project area exceed criteria (Default Guideline Values – DGVs, Default Threshold Values – DTVs, Health Investigation Levels – HILs) across site inclusive of the following:

- Aluminium concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems and DGVs for estuaries in 15 of the 26 wells sampled and tested
- Arsenic concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in two wells and drinking water GILs in four wells
- Boron concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in three wells
- Cadmium concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in three wells and marine DGVs for slightly to moderately disturbed systems in two wells
- Chromium concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in six wells and marine DGVs for slightly to moderately disturbed systems in two wells
- Copper concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in six wells
- Iron concentrations exceeded the ANZECC 2000 interim working level in the majority of wells
- Manganese exceeded the marine DGVs for slightly to moderately disturbed systems in the majority of wells and seven wells for fresh water DGVs for slightly to moderately disturbed systems. Manganese also exceeded the drinking water GILs in about half the wells
- Nickel concentrations exceeded the marine DGVs for slightly to moderately disturbed systems in 15 of the wells and 13 wells for fresh water DGVs for slightly to moderately disturbed systems. Nickel also exceeded the drinking water GILs in nine of the wells
- Zinc concentrations exceeded the marine and freshwater DGVs for slightly to moderately disturbed systems in the majority of wells
- Ammonia concentrations exceeded the ANZECC 2000 DTVs for estuaries in the majority of wells and DGVs for slightly to moderately disturbed systems in nine wells
- Nitrate concentrations exceeded the drinking water GILs in one well
- Nitrogen concentrations exceeded the DTVs for lowland river and estuaries in the majority of wells

- pH fell outside the DTVs for estuaries and to a lesser extent for lowland rivers in more than half the wells due to low pH values (acidic)
- Sulphate concentrations exceeded the drinking water GILs in 12 of the wells
- PFAS concentrations were detected in two of the four wells tested. The concentrations where generally low, with most analytes below the laboratory reporting limits. Detected PFAS concentrations were below the NEPC (2013) GILs for drinking water however exceeded the HEPA (2020) 99% LOP criteria for aquatic ecosystems for PFOS in two wells, which is noted in HEPA (2020) as the LOP to be used for slightly to moderately disturbed systems.

Groundwater impact has not identified specific gross contamination at any location. While elevated heavy metal and nutrient concentrations above the adopted criteria in groundwater have been identified, the elevated concentrations are widespread (identified in the majority of wells) and considered to be associated with regional groundwater quality and do not generally appear to be associated with point sources of contamination from particular AOPCR or previous land use. The groundwater is not considered to pose a specific risk to ecological or human health.

5.2.4 Surface water

Detailed surface water monitoring and assessment undertaken in previous reports (Jacobs. 2021 k) throughout the project site showed broad exceedances of relevant criteria prescribed in the NSW Surface Water Quality Objectives (Hunter River). The project wide exceedances (non AOPCR) across the 15 kilometre long project site suggests a lack of specific point source influence.

Further monitoring and assessment completed (Jacobs 2022) found similar broad exceedances across the project site and also suggest that the surface water quality does not suggest specific point sources of contamination. It is considered that the surface water quality does not poses an unacceptable risk to ecological or human health.

5.3 Detailed site assessment results (including targeted or AOPCR results)

Targeted detailed site investigations have been completed for AOPCR located within the project area that have an inferred high rating. The targeted site investigations provide understanding of the nature and extent of actual contamination identified on the site.

5.3.1 Asbestos

The previous contamination investigation completed (Jacobs, 2021p) identified potential (bonded) asbestos materials at three locations within the project. The potential asbestos was associated with agricultural land uses or illegal dumping.

Blackhill

During the 2016 detailed investigations program, dumped wastes that included potential asbestos containing material were observed at 31 discrete locations in bushland at Blackhill within the project area. Transport engaged a suitably qualified hygienist to sample the material to test and confirm the presences of asbestos fibres. All 31 locations were confirmed to contain (bonded) asbestos in the material.

In accordance with Transport's requirements to appropriately manage hazardous materials and also to facilitate project specific geotechnical investigation and Aboriginal cultural heritage investigations, the hygienist subsequently supervised a licensed waste removal contractor to remediate the 31 locations by removing and disposing of the asbestos containing material (wastes and soil) at an appropriately licensed waste facility. Soil validation samples and associated air monitoring filters were sent to a NATA accredited laboratory for testing and reporting. All post remediation sampling results showed no asbestos material present and no further remediation was warranted.

Transport completed an extensive program of permanent exclusion fencing in the area to prevent further illegal access to the bushland area at Blackhill.

Tarro – AOPCR 3

The previous contamination investigation (Jacobs. 2021 p) identified a regulated site located at 1 Woodlands Close Tarro. A publicly available Notice (s35 of the Environmentally Hazardous Chemicals Act (1985)) states that the land is *believed to be affected by asbestos*. Due to access constraints, Transport has not entered the land to confirm or remediate the location that may interact with the project.

Following an approval to access and prior to construction in the affected area, Transport would remediate the affected soils within the project site according to a Site Auditor endorsed Contamination Management Plan, regulatory requirements and industry guidance.

Tomago – AOPCR 10

The previous contamination investigations identified potential asbestos containing material in soil associated with a redundant agricultural structure within the project area at Tomago. Samples of the material were gained and tested for the presence of asbestos. Three of the six samples confirmed the presence of asbestos.

The redundant agricultural structure is located within a registered Aboriginal heritage site and accordingly, access to remediate the asbestos material is constrained by the potential risk of impact to Aboriginal cultural heritage artefacts. The asbestos impacted area was fenced to prevent access (livestock or pedestrian) in accordance with relevant statutory requirements.

Transport has described proposed asbestos remediation actions at the heritage site in the *M1 Pacific Motorway extension to Raymond Terrace Aboriginal Cultural Heritage Assessment Report (Jacobs, 2021).* In the case where the project gains relevant statutory approvals, Transport would enter the area and remediate it prior to construction works in the area in accordance with a Site Auditor endorsed Contamination Management Plan, regulatory requirements and industry guidance.

5.3.2 Per- and polyfluoroalkyl substances (PFAS)

The previous contamination investigations (Jacobs. 2021 p) included a review of the NSW Government PFAS investigation program register. Two registered sites were identified outside of the project area and subsequently included as an AOPCR (18).

Tarro and Heatherbrae – AOPCR 18

Due to the previous contamination assessment including PFAS as a Potential Contaminate of Concern (PCC) in the previously reported CSM, Transport installed additional groundwater monitoring wells in 2021 to investigate whether potentially affected groundwater from the source sites had presented within the project area. Transport's detailed groundwater data, modelling and mapping was used to place the additional wells in suitable locations down/cross gradient from the project where a receptor pathway may occur.

Samples taken from the AOPCR show that the PFAS concentrations where generally low, with most analytes below the laboratory reporting limits. Detected PFAS concentrations were below the NEPC (2013) GILs for drinking water however exceeded the HEPA (2020) 99% LOP criteria for aquatic ecosystems for PFOS in two wells, which is noted in HEPA (2020) as the LOP to be used for slightly to moderately disturbed systems.

Hunter River sediment - AOPCR 9

Due to the previous contamination investigations including PFAS in the previous CSM for Hunter River sediments and the various in-river works presenting a potential pathway in the CSM, Transport completed targeted in-river environmental sampling of Hunter River sediment and included PFAS as an analyte.

Samples taken from the Hunter River sediment found that PFAS levels were below the limit of reporting and compliant with the relevant criteria.

5.3.3 Naturally Occurring Radioactive Materials (NORM)

The *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Report (Jacobs, 2021*) described preliminary and detailed assessment of a discrete site within the project area that Transport purchased to facilitate the development of the project. The sites previous land use was a sand processing facility and this led to concerns about the potential for residual contaminates including Naturally Occurring Radioactive Material (NORM). The site is referred to as RZM (Rutile Zircon Mining) site and was described in the above mentioned report as an AOPCR.

RZM - AOPCR 5

The following information expands on the previous contamination reporting in the M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Report (Jacobs, 2021 p).

RZM - Hazardous Material Survey

In 2011 Transport completed a survey of above ground buildings and structures to determine whether the structures contained hazardous materials. The results of that survey confirmed the presence of asbestos, lead (paints), synthetic mineral fibres and a drum of oil.

No remediation of the site was completed in 2011, however a Hazardous Material Site Register was completed to satisfy regulatory requirements and assist planning for future site management actions.

RZM Preliminary Site Investigation

Transport completed a preliminary site investigation (PSI) in 2013 to assess the site's potential soil and water risk. In addition to typical desktop PSI research methods, the RZM PSI included reviews of previous third-party site remediation reports (completed by previous owners) that detailed NORM sampling results and also identified other potential contaminates of concern (PCC) such as metals and asbestos.

Outcomes of Transports RZM PSI confirmed levels of NORM above background levels and the presence of other PCC.

RZM - Engagement of NSW EPA accredited Site Auditor

Due to the identified NORM and other PCC at the RZM site, Transport voluntarily engaged a Site Auditor to independently review consultant reports to ensure the methods and interpretation of data are consistent with EPA guidance.

The Site Auditor has reviewed and endorsed subsequent RZM methodologies and reports described below and has been involved with the voluntary notification of the RZM site to EPA.

RZM - Remediation of above ground structures

To appropriately manage risk to ecological and human health regarding PCC identified by the 2011 report at the RZM site, Transport demolished and disposed of all above ground structures on the site. The structures included eight buildings used for various purposes such as a wash house, a laboratory, storage sheds and offices. The demolition was planned and supervised by a suitably qualified and experienced Occupational Hygienist. The redundant structures and materials were removed from site and disposed at an appropriately licensed facility.

Clearance certificates from the Hygienist based on validation dust samples and air monitoring samples demonstrated that the above ground PCC identified in the 2011 report were appropriately removed and the above ground site remediated so that it did not present a risk to ecological or human health.

RZM - Detailed Site Investigation Sampling, Analysis and Quality Plan (SAQP)

In accordance with the NEPM (2013), Transport developed a Sampling Analysis and Quality Plan (SAQP) (inclusive of Data Quality Objectives) to control future detailed site assessment and

reporting for RZM. The Site Auditor reviewed the draft SAQP and supported the document through various revisions based on progressive information (2013 - 2019).

The outcome of the SAQP development (and Site Auditor support) is that the framework for future investigations were deemed to be fit for purpose.

RZM - Detailed Site Investigations

In accordance with the projects SEARs, NEPM (2013) and *Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land, (DUAP & EPA, 1998),* Transport completed a Detailed Site Investigation (DSI) for the RZM site to understand ecological and human health risk due to previous land uses and develop an understanding for the need (or otherwise) of notification to EPA and remediation.

As described in previous reporting within the *M1 Pacific Motorway extension to Raymond Terrace Soils and Contamination Report (Jacobs, 2021*) Transport has completed a DSI for the RZM site. The DSI is provided in **Attachment A** and sampling scope is summarised in **Table 3-2**.

The outcomes of the DSI is reproduced below:

- localised hydrocarbons in soil exceeded management limits in surface soils at one location (former transformer location)
- nickel and zinc detected within the sediments of the Hunter River and drainage line exceeded the applied criteria
- dissolved cadmium, copper, nickel and zinc were detected in groundwater exceeding guideline values investigation levels in isolated locations within the site and drainage line
- Dissolved copper and zinc were detected in surface water exceeding guideline values within isolated locations within the site and drainage line
- Widespread distribution of naturally occurring radioactive materials (NORM) above background levels were identified across the site (at surface and at depth).

Additional RZM DSI sampling and reporting

Based on the recommendations of the RZM DSI, additional investigations were completed at the RZM site to address identified data gaps. The site SAQP was revised to ensure that additional investigations were compliant with relevant guidance.

The scope of the additional DSI is summarised in **Table 3-2** and the outcomes of the additional summarised below:

- no soil samples exceeded the adopted criteria
- arsenic, cadmium, copper, lead, mercury, nickel, zinc were detected in the drainage line sediment exceeding guideline values.
- Hunter River sediment samples all showed exceedances of nickel.

  Note that nickel exceedances were widespread (24 locations out of 42 locations) in areas subject to tidal water flows and eight of the exceedance locations where greater than the *DGV – High* threshold.
- dissolved arsenic, cadmium, copper, nickel, zinc were detected in groundwater exceeding guideline values within isolated locations within site and drainage line
- Dissolved cadmium, copper, zinc and nickel were detected in surface water exceeding guideline values within isolated locations within the site and drainage line

Ecological Risk Assessment

In accordance with the SEAR regarding assessing potential impacts to ecological health associated with the presence of radioactive material reported above background levels, Transport completed an ecological risk assessment (in 2016 and updated in 2019) to define potential risk to ecological health at the RZM site.

The quantitative assessment used the ERICA Assessment Tool (*Environmental Risk from Ionizing Contaminants – Assessment and Management*) and related NEPC Schedules.

The outcomes of the ecological risk assessment include:

- risks to various organisms in terrestrial systems due to exposure to soil at the site are acceptable (using ERICA model)
- risks to various organisms in terrestrial systems due to exposure to groundwater at the site are acceptable (using dose coefficients)
- risks to various organisms in terrestrial systems due to exposure to surface water at the site are acceptable (using dose coefficients)
- risks to various organisms in freshwater or marine systems due to exposure to river sediments at the site are acceptable (using ERICA model)

Human Health Risk assessment

In accordance with the SEAR regarding assessing potential impacts to human health associated with the presence of radioactive material reported above background levels, Transport completed a health risk assessment (in 2016 and updated in 2019) to define potential risk to human health at the RZM site.

The quantitative assessment used the Environmental Health Risk Assessment - Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth 2012a), the Australian Exposure Factor Guide (enHealth 2012b) and NEPM (2013) including various Schedules.

The outcomes of the human health risk assessment for direct exposure the residual materials include:

- risks are acceptable for soil exposure to visitors to the site
- risks are acceptable for indirect soil exposure
- risks are not acceptable for soil exposure for people to reside at the site for a full year
- risks are acceptable for use of the water for livestock and irrigation as concentrations of radionuclides in surface water and groundwater comply with all relevant guidelines for drinking water or guidelines for use of the water for livestock or irrigation. No water at the site would be used for drinking
- risks are acceptable for river/drain sediment for construction workers, commercial/industrial workers or for the general public
- risks are acceptable for incidental ingestion of sediment
- risks are acceptable for ingestion of sediment.

Notification to EPA

As described in the previous reporting (Jacobs, 2021 p), due to contamination identified at the site through the extensive detailed site investigations and as per recommendations of the Site Auditor, Transport voluntarily notified NSW EPA of the contaminated condition of the site in accordance with s60 of the Contaminated Land Management Act (CLM Act).

NSW EPA have advised that regulation of the site under the CLM Act is not required and the risk to ecological and human health is acceptable

6 Assessment of site investigations

Detailed site investigations have been completed to meet the SEARs, project objectives and EPA submission to the EIS.

The investigations completed by Transport during previous reporting (Jacobs 2021 p), summarised above and contained in **Attachment A** assess the existing condition of the site with regards to past, existing and future land uses.

Broad scale (non AOPCR) soil testing resulted in three isolated exceedances (only) of adopted site criteria in the 15 kilometre site. The trivial exceedances are reflective of past and present open space land uses and demonstrate that the soils across the site do not pose an unacceptable risk to ecological or human health. The general condition of soils across the site is compatible with the proposed land use (SP2).

Extensive groundwater testing has shown that while there are exceedances of criteria across the site, the exceedances do not present a pattern that correlates with any specific AOPCR or point source of contamination. The general condition of ground water across the site is compatible with the proposed land use (SP2).

Surface water monitoring and assessment across the project (Jacobs 2021 k, Jacobs. 2022) has shown exceedances across all waterways on the project, however the exceedances are at levels that do not pose a risk to ecological or human health. The general condition of surface water across the site is compatible with the proposed land use (SP2).

Sediments in aquatic areas show exceedances of one metal (Nickel) in most samples from various areas across the tidally influenced Hunter River that suggests that it is not linked to a point source or AOPCR. The general condition of aquatic sediments across the site is compatible with the proposed land use (SP2).

NORM identified at the RZM site above background levels and other metals have been demonstrated to be contained to the RZM site (or immediate adjoining properties) however EPA have considered that the level of risk is acceptable for ecological and human health.

PFAS have been identified at two groundwater wells that is above the adopted criteria. Following consultation with DPE (Water) regarding management of extracted groundwater, Transport has revised the water re-use strategy to prevent offsite discharge of groundwater. Extracted groundwater shall be re-infiltrated into the same onsite area from where it was extracted.

Operational stage design features such as the operational surface water quality treatment system (described in the *Supplementary Report - Surface and Groundwater. Jacobs. 2022*) that captures and treats operational surface water sourced from the motorway pavement would control the ongoing potential risk of contamination sourced from the project (such as sediment and spills). Lining of the surface water treatment system (basins, swales etc) to isolate the untreated sections of the surface water treatment system from the groundwater would also effectively control potential operational impacts to groundwater.

7 Site Auditor and Sampling and Quality Plan

As described in previous contamination reporting for the project, the project has voluntarily engaged the services of NSW EPA accredited site auditor for the investigations and assessment of the RZM site. Transport would continue to voluntarily utilise the Site Auditor for all aspects on the remediation and validation of the RZM in the case where the project received approval by the Minister for Planning.

The contamination assessment completed for the project was scoped and completed in accordance with the SEARs and the required *SEPP 55 Remediation of Land* guideline. The guideline does not prescribe the use of a Site Auditor and suggests that they may be used *as necessary*. As the extensive detailed site investigations completed for the project area (excluding RZM) have demonstrated that the project area includes trivial levels of contamination (excluding RZM) and poses an acceptable level of risk to ecological and human health, a Site Auditor was not utilised during the project assessment. Isolated contamination in high risk AOPCRs (asbestos) shall be remediated according to relevant industry and regulatory guidance and also as per project specific management plans.

As demonstrated in **Section 4** and **Section 5** of this report and in accordance with the *SEPP 55 Remediation of Land Guideline,* the lack of unacceptable contamination risk across the project did not necessitate the services of a Site Auditor during the investigation phase for the project (excluding RZM).

In response to the EPA submission to the EIS, Transport would engage a NSW EPA accredited site auditor for the entire extent and duration of the works required to construct the project. The auditor would advise on procedures or processes for the management of contaminated material found during work (including unexpected finds). Where requirements for notification under the *Contaminated Land Management Act 1997* are triggered, the auditor would certify any necessary remediation or subsequent validation reporting.

To support the assessment and management of potential contamination within the project area during construction, a Sampling and Quality Plan would be developed and implemented during construction in accordance with the *Consultant Reporting on Contaminated Land Guidelines (NSW EPA, 2020)*.

8 Remediation

Table 4-1 of this report lists a number of locations within the project area that have a high inferred risk rating. These sites are the source site of the identified PCC. These sites where located in the project boundary would be remediated to ensure that Transport complies with environmental and WHS statutory requirements while constructing the project.

Remediation of the areas within the project site that contain asbestos (inclusive of the regulated site located at 1 Woodlands Close, Tarro) would comply with the Regulatory Notice applied to that land, the Site Auditor endorsed Contamination Management Plan, regulatory requirements and industry guidance.

Specific remediation methodologies for the RZM are not prescribed at the time of writing this report, however the planning and completion of the remediation of the RZM site would be completed in consultation with NSW EPA, an endorsed by the Site Auditor and would be suitable to achieve the proposed land use.

Contamination that is sourced offsite would be managed during construction. Any offsite contaminants that migrate onto the site would be a managed via a Site Auditor endorsed Contamination Management Plan, regulatory requirements and industry guidance. Any impacted material management would not focus on remediation due to ongoing post-construction influence of that contamination into the site. The goal for management of offsite sourced contamination during construction would include:

- Appropriate identification via the Site Auditor endorsed Contamination Management Plan, SAQP and Unexpected Finds Procedure
- Re-use onsite in areas with existing similar impacts
- Ensuring that works do not materially alter receptor pathways or expand the extent of contamination onsite.

9 Revised environmental management measures

The *M1 Pacific Motorway extension to Raymond Terrace Environmental Impact Statement* (Transport for NSW 2021) identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions and the changes to the project, the environmental management measures for the project (refer to Chapter 24 of the EIS) have been revised.

Additional and/or modified environmental management measures to those presented in the environmental impact statement are in ***italics*** and deleted measures, or parts of measures, have been struck out.

Table 9-1 presents the proposed changes to the soils and contamination mitigation measures.

Table 9-1 Summary of revised environmental management measures – Soils and Contamination

Soils and contamination				
Soil and groundwater contamination	SC01	A Contaminated Land Management Plan (CLMP) and procedures prepared in accordance with TfNSW's Guideline for the Management of Contamination (Roads and Maritime Services 2013c) willbe developed and will include: • Control measures to manage identified areas of potential contamination risk (AOPCRs), where the risk has been assessed as being medium or high and is confirmed within the construction footprint • Procedures for managing unexpected contamination (including buried waste, illegal dumping and asbestos) • Requirements for the disposal of contaminated waste in accordance with the *Protection of the Environment Operations Act 1997* and the Protection of the Environment Operations (Waste) Regulation 2014.	Contractor	Prior to construction/ construction
Salinity	SC02	A Salinity Management Plan will be prepared and implemented as part of the CSWMP and in accordance with the NSW Department of Primary Industries (2014) Salinity Training Handbook. Theplan will include (but not be limited to): • Identification and management of saline groundwater discharge sites • Identification of areas sensitive to salinity and subject to saline soil import limitations (such as theTomago Sandbeds Catchment Area) • Testing and reuse conditions of saline soils • Requirements for reuse of saline water.	Contractor	Prior to construction/ construction
Acid sulfate soils	SC03	An Acid Sulfate Soils Management Plan (ASSMP) will be prepared and implemented as part of the CSWMP and in accordance with TfNSW's Guidelines for the Management of Acid Sulfate Materials (RTA 2005c) and the Acid Sulfate Soil Manual (ASSMAC 1998). The ASSMP will outline how potential ASS within sediments of the waterways and soils that will be disturbed within the construction footprint will be handled, tested, treated ***disposed or*** ~~and~~ reused during construction.	Contractor	Prior to construction/ construction
Former mineral sands processing facility	SC04	A Remediation Action Plan ***will be*** prepared and implemented in accordance with TfNSW Guideline for the Management of Contamination (Roads and Maritime Services 2013c), in consultation with NSW EPAand approved by a NSW EPA accredited site auditor for the former mineral sands processing facility.	Contractor	Prior to construction/ construction
Engagement of NSW EPA accredited auditor	***SC05***	***A NSW EPA accredited site auditor will be engaged for the entire extent and duration of the works. The auditor will advise on procedures or processes for the management of contaminated material found during work (including unexpected finds). Where requirements for notification under the Contaminated Land***	***Transport/ Contractor***	***Prior to construction/ construction***

Soils and contamination				
		Management Act 1997 are triggered, the auditor would certify any necessary remediation or subsequent validation reporting.		
Soil contamination	***SC06***	***A Sampling and Quality Plan would be developed and implemented during construction in accordance with the Consultant Reporting on Contaminated Land Guidelines (NSW EPA, 2020)***	***Transport/ Contractor***	***Prior to construction/ construction***

10 Conclusion

Transport have completed extensive investigations and assessment work to satisfy the project SEARs and EPA submissions on the EIS.

The nature and extent of three high risk areas of potential contamination risk have been confirmed based on detailed investigations. Detailed intrusive investigations have captured surface water, groundwater, soils and aquatic sediment.

The outcome of investigations of both the broader site (excluding AOPCR) is that the existing site does not pose an unacceptable risk to ecological or human health.

Remediation of the high risk AOPCR would be completed prior to construction works occurring in the subject area.

A NSW EPA accredited site auditor would be engaged for the entire duration and extent of the project to ensure that the assessment, remediation, reporting and validation would be completed in accordance with EPA guidance.

Remediation of AOPCR and unexpected finds would be in accordance with a Site Auditor endorsed Contamination Management Plan, regulatory requirements and industry guidance.

Following the remediation of the high risk AOPCR, the site would not pose an unacceptable risk to ecological or human health and would be suitable for the proposed land use (SP2 Infrastructure).

Attachment A. Supplementary Report Soils and Water – Douglas Partners. 2022

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Supplementary Report - Soils and Contamination

M1 Pacific Motorway Extension to Raymond Terrace, Hexham to Raymond Terrace

Prepared for
Transport for NSW

Project 81641.03
June 2022



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Supplementary Report - Soil and Contamination

M1 Pacific Motorway Extension to Raymond Terrace, Hexham to Raymond Terrace

1. Introduction

1.1 General

Douglas Partners Pty Ltd (DP) has been engaged by Transport for NSW (TfNSW) to complete this supplementary report - soils and contamination for the M1 Pacific Motorway Extension to Raymond Terrace, Hexham to Raymond Terrace .

The work was commissioned in an email dated 21 December 2021 by Brett Hoad of TfNSW and was undertaken with reference to Douglas Partners Pty Ltd (DP) proposal 81641.03.P.013.Rev0 dated 19 November 2021.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013);
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: (ANZG, 2018); and
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

1.2 Aims, Objectives and Methodology

Previously Jacobs has prepared a Soils and Contamination Working Paper (Jacobs, 2021) which was submitted as part of the Environmental Impact Statement (EIS). Since the date of reporting of Jacobs (2021) an additional geotechnical investigation including soil and groundwater contamination testing, as instructed by TfNSW, has been undertaken by DP. Additional reports have also been provided to DP by TfNSW for this supplementary report. The aim of this report is to provide a summary of the contamination testing findings from the additional geotechnical investigation, and to provide inferred soil contamination risk ratings based on the currently available data (refer Section 6.1 for a list). It is understood the report will be included as a Supplementary Contamination Report as an attachment to the Soils and Contamination Working Paper (Appendix P) section of the Response to Submissions (RtS) report which is being prepared by TfNSW in response to Environment Protection Authority (EPA) feedback regarding the Jacobs (2021) EIS report.

The objectives of this report are to:

- Collate and provide an updated summary of the current data available to DP for the M12RT project (refer Section 6.1 for a list), including comparison of the testing results against current relevant guidelines, and incorporating the current DP investigation findings which were not available at the time of preparing Jacobs (2021);
- Prepare an areas of potential contamination risk (AOPCR) inferred risk ratings table (based on Table 6-1 provided in Jacobs (2021)) based on this updated summary.

The methodology undertaken by DP to achieve the above aims and objectives in order to allow preparation of an AOPCR table included:

- Conducting a desktop review of previous interpretative and factual reports nominated by TfNSW;
- Conducting additional limited site history searches to assess other potential AOPCR given the updated site area provided by TfNSW;
- Preparation of a conceptual site model and site assessment criteria (SAC) for the project and comparison of results of previous testing against the SAC;
- Correspondence/liaison/meetings with TfNSW as required.

Further details regarding the scope of works conducted for this supplementary report are provided in Section 4.

2. Proposed Development

TfNSW proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). The project would connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas (LGAs). The project location and alignment is shown in Figure 1 and Drawing R.010.D.001.Rev0 in Appendix D.

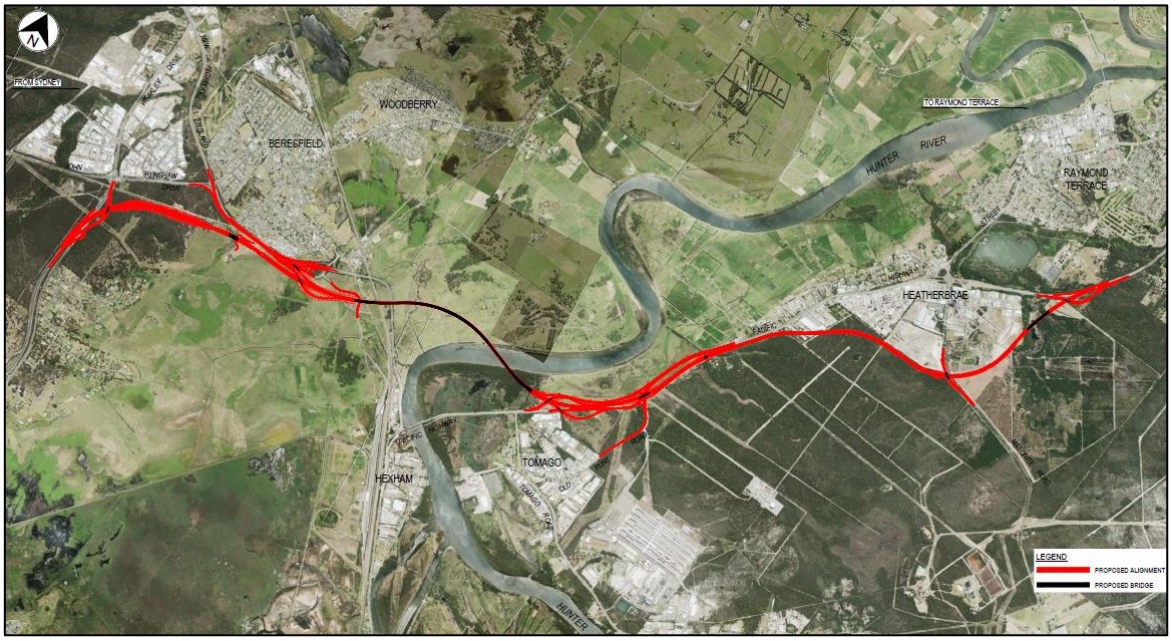


Figure 1: Location and Alignment of M12RT Project

The project would include the following key features (see Drawing R.010.D.001.Rev0 in Appendix D):

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction);
- Motorway access from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway;
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive;
  - Tomago: connection to the Pacific Highway and Old Punt Road;
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River flood plain including new bridge crossings over the Hunter River, the Main North Rail Line, and the New England Highway;
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae;
- Connections and modifications to the adjoining local road network;
- Traffic management facilities and features;
- Roadside structures including safety barriers, signage, fauna fencing and crossings and street lighting;
- Adjustment of waterways, including Purgatory Creek at Tarro and a tributary of Viney Creek;
- Environmental management measures including surface water quality control measures;
- Adjustment, protection and/or relocation of existing utilities;
- Walking and cycling considerations, allowing for existing and proposed cycleway route access;
- Permanent and temporary property adjustments and property access refinements;

- Construction activities, including establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls;
- Construction of embankments over flat flood plains and soft soil areas; and
- A cutting at Black Hill.

It is understood that ancillary facilities, where used, would minimise disturbance to existing subsurface conditions through the placement of a geotextile fabric layer across the area and importation of a clean granular working platform, which would be removed following the completion of construction.

It is noted that limited details regarding construction activities outside the immediate design alignment were available at the time of preparing this report. For reporting purposes it has been assumed that construction works along existing road networks would involve limited cuts for installation of shallow services, upgrade of existing pavements (where required) and installation of minor utilities (ie no major cuts, dewatering or alteration to drainage networks required).

A more detailed description of the project is found in the M1 Pacific Motorway extension to Raymond Terrace Environmental Impact Statement (EIS) prepared by TfNSW in July 2021. Since the exhibition of the EIS some refinements and amendments have been included in the project.

3. Site Description

The site for the purposes of this supplementary report is considered to be 'the construction footprint' which comprises the following as shown in Drawing R.010.D.001.Rev0 in Appendix D:

- The TfNSW Design Alignment (The Project) including the proposed road alignment, associated interchanges, bridges, viaduct, embankments and cuttings;
- The Revised Ancillary Facilities (which will potentially be utilised as temporary works depots during construction); and
- Existing roads within the Revised Construction Boundary which require minor upgrades/service installation .

The terms 'the site' and 'the construction footprint' are used interchangeably in this report as they refer to the same area.

The site includes public roads, and a mixture of rural and commercial/industrial properties within the suburbs of Black Hill, Beresfield, Hexham, Tarro, Tomago, Heatherbrae and Raymond Terrace.

The site traverses multiple properties. The land uses associated with adjacent sites were also considered during the assessment due to the potential for adjacent sites to impact or constrain the development.

4. Scope of Work

The scope of work conducted for this supplementary assessment comprised the following, as instructed by TfNSW:

- Review of existing relevant reports as nominated by TfNSW and recent sampling and testing conducted by DP which has yet to be reported;
- Review of supplementary information from TfNSW including:
  - Rationale for contamination testing conducted;
  - Additional general information regarding the Shell Service Station at Heatherbrae;
  - Additional information regarding the former rifle range adjacent to The Botanic Gardens;
  - Additional information regarding the former mineral sands processing facility (RZM) at Tomago;
  - Updated ancillary areas, construction boundary and the project footprint.
- Review of 1941 NSW Newcastle Topography plan and 1944 historical aerial photographs (where available) to confirm potential historical land uses in targeted areas of the site (former historical rifle range (location ambiguous), former aircraft runway and former structures/buildings in the vicinity of AS8 for clarification given minor inconsistencies with previous reports);
- Collation of relevant factual data including borehole/test pit logs, soil and groundwater contamination testing from the above review;
- Review of the proposed development along the project alignment (including locations of cut / fill / bridges) which are relevant to the assessment of contamination risk;
- Summary of a generalised interpreted geotechnical model for the proposed alignment based on the results of the current and previous investigations by DP, and with reference to geological mapping for input in the conceptual site model (CSM) development;
- Summary of soil, sediment and groundwater contamination sampling and testing conducted for the site based on the review;
- Collation and preparation of summary tables of soil, sediment and groundwater contamination results relevant to the site (with the exception of the former mineral sands processing (RZM) site and results of water analysis, conducted by others, which were presented in the Surface Water and Groundwater Quality Working Paper (Appendix K of the EIS)) and comparison to the relevant guidelines (ie NEPC (2013), ANZG (2018), HEPA (2020)), based on review of the existing data collated from the above review of M12RT documents;
- Preparation of drawings showing current project alignment (as provided by TfNSW), AOPCR, inferred geotechnical zones for the purposes of contamination risk, locations of testing based on the above data review and locations where exceedances of relevant criteria (adopted site assessment criteria) have been identified;
- Preparation of a CSM and SAC for the project to aid in the above AOPCR Table B7 preparation;
- Preparation of inferred risk ratings based on Table 6-1 of the Soils and Contamination Working Paper, which was prepared by Jacobs (2021), based on the above review;

- Preparation of this supplementary report presenting the results of the desktop review along with drawings, tables.[1]

5. Environmental Setting

5.1 General

The environmental setting for the project has been outlined in detail in Jacobs (2021) and DP (2020). Pertinent information for this supplementary report from these documents is provided below for context and updated, where relevant, based on recent geotechnical investigations by DP (2021).

5.2 Topography

The topography along the M12RT corridor varies from flat floodplains associated with the Hunter River, stabilised sand dunes associated with Tomago sand beds, and rolling hills to the north and south. The elevation across the study area is variable, however can be broadly separated into three key areas (refer to Figure 4-2 of Jacobs (2021)):

- Western portion (between Tarro and Black Hill): Comprising gently sloping ground between reduced level (RL) four metres Australian height datum (AHD) and RL 30 AHD (with a ridgeline oriented north to south);
- Central portion (between Tarro and Heatherbrae): Comprising low lying, gently undulating flood plains at below RL 3 AHD;
- Eastern portion (generally between Raymond Terrace and Heatherbrae, as well part of Tomago): Comprising mildly undulating terrain between RL 2 AHD and RL 10 AHD.

5.3 Geology

The regional geology along the M12RT corridor is based on the 1:100 000 scale regional geology map for Newcastle (Newcastle Coalfield Regional Geology, Sheet 9321, NSW Department of Mineral Resources). The regional geology is shown below in Figure 2. The stratigraphic table is presented in Table 1.

- The south western end of the corridor near John Renshaw Drive at Black Hill is underlain by the Tomago Coal Measures, which consists of shale, siltstone, fine sandstone, coal and carbonaceous mudstones, and minor tuffaceous claystone;
- The Tomago Coal Measures also sub-crop about 2 km north of the Hexham Bridge and also in the Tomago Industrial area in the vicinity of the proposed Tomago Interchange;
- The geology mapping suggests that the Mulbring Siltstone and the Murree Sandstone of the Maitland Group, which consist of siltstone, sandstone, conglomerate and minor clay, are exposed near the northern end of the alignment;

[1] It is noted that the scope of work did not include comments on data gaps or recommendations for additional investigation.

- Quaternary aged sediments are located elsewhere along the corridor, comprising Quaternary Alluvium (Qa) and Quaternary Coastal Sand (Qs).

Table 1: Generalised Regional Geology

Period	Group	Subgroup	Lithology
Quaternary	-	Holocene deposits	Gravel, sand, silt and clay
		Pleistocene estuary deposits	
Permian	Tomago Coal Measures	Dempsey Formation	Siltstone, Sandstone coal, tuff, minor carbonaceous claystone
		Four Mile Creek Formation	Sandstone, minor siltstone, claystone, coal and tuff. Coal seams includes: - Upper and Lower Buttai Seam; - Donaldson Seam; - Big Ben Seam; and - Tomago Thin Seam.
		Wallis Creek Formation	Laminated sandstone, claystone, siltstone, coal and tuff. Coal seams includes: - Scotch Dairy Seam; - Upper Rathluba Seam; - Upper Rathluba Seam; and - Morpeth Seam.
	Maitland Group	Mulbring Siltstone	Relatively uniform lithology consisting of predominately dark grey siltstone with minor claystone
		Murree Sandstone	Sandstone, conglomerate, siltstone and coal

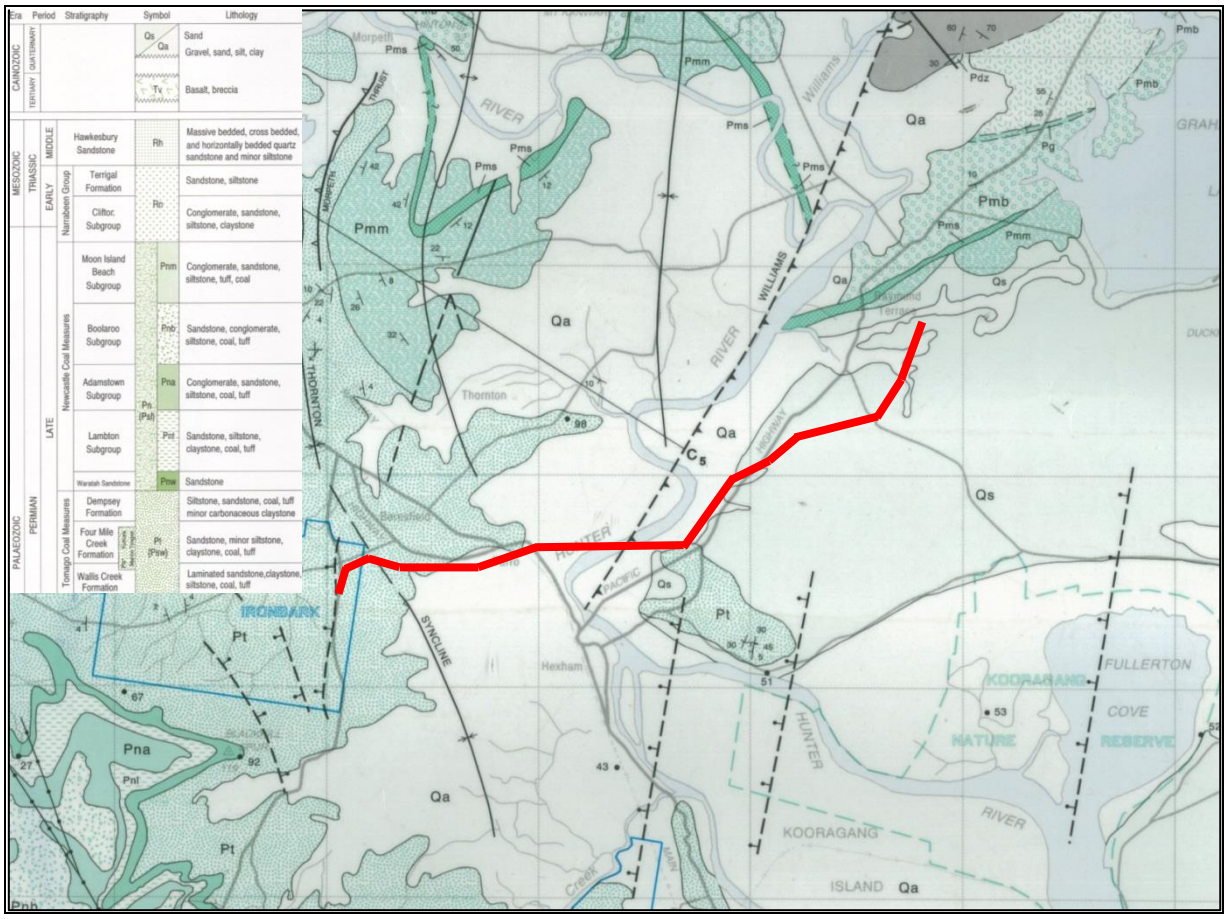


Figure 2: Regional Geology in the Vicinity of the Site
(Newcastle Coalfield Regional Geology, Sheet 9321, NSW Department of Mineral Resources)

5.4 Soil Landscapes

The 1:100,000 Newcastle soil landscape map was reviewed and summarised in DP (2015) and further presented in Jacobs (2021 – Section 4.4 and Figure 4-5) and indicates that the M12RT corridor traverses a number of soil landscapes including:

- Residual soils of the Beresfield and Hamilton landscapes (located in the western portion of the site and elevated areas of Tomago industrial area);
- Estuarine soils of the Millers Forest, Fullerton Cove and Bobs Farm Beach landscapes (located within lower lying areas in Black Hill, Hexham and Tomago and within the Windeyers Creek alignment);
- Swamp deposits of the Hexham Swamp and Blind Harrys Swamp landscapes between Hunter River and Tomago Road and creeks/swampy areas near the Botanic Gardens at Tomago;
- Aeolian soils of the Tea Gardens landscape variant north of the former RZM mineral sands processing facility.

Groundwater pollution hazard is identified as a limitation for the Hamilton landscape, Hexham Swamp, Tea Gardens and Bobs Farm Beach landscapes.

Strongly and/or extremely acidic soils is identified as a limitation for the Hamilton landscape, Tea Gardens and the Blind Harry Swamp landscapes.

Flood hazard and/or permanently high water tables/saturated soils is identified as a limitation for the Millers Forest, Hexham Swamp, Fullerton Cove, Tea Gardens, Blind Harry Swamp and Bobs Farm Beach landscapes.

Further details are provided in Jacobs (2021) and DP (2015).

5.5 Groundwater

Anticipated groundwater conditions and registered groundwater bores within the potential M12RT project alignments (with Alignment Option 2 broadly matching the current alignment shown in Figure 1 above) were outlined in DP (2015). It is understood further details regarding groundwater and surface water conditions are provided in The Surface Water and Groundwater Quality Working Paper (App K of the EIS)(TfNSW, 2021c).

Based on the topography and geology, groundwater is anticipated to be present at relatively shallow depths within alluvial soils and aeolian soils (subject to elevation) and potentially present as perched waters within areas of fill or at the interface of fill, clay soils and / or the weathered rock interface. Deeper confined aquifers are anticipated in underlying bedrock including coal seams.

DP (2015) included a review of registered bores (Figure 8, DP (2015)). A review of the current registered bores through the Australian Government Bureau of Meteorology Australian Groundwater Explorer website Australian Groundwater Explorer: Water Information: Bureau of Meteorology (bom.gov.au) was also undertaken for the supplementary report. The review identified three areas where groundwater monitoring well clusters have subsequently been installed/registered since the previous search (DP, 2015) as follows:

- Shell Service Station (Heatherbrae);
- BP Truckstop (Beresfield); and
- Former Boral Asphalt Plant (Black Hill).

The Shell service station at Heatherbrae had a total of 17 registered groundwater monitoring wells installed within and to the west of the property as shown in Figure 3 below. The registered wells were generally installed between 2010 and 2015 to depths of 0.75 m to 7 m and were registered and intended for monitoring purposes. Subsurface conditions typically comprised shallow fill in the vicinity of the service station underlain by sands. Lower lying areas to the west of the service station also comprise surficial clays / sandy clays overlying clayey sand and sands. Standing water levels were encountered from approximately RL 1 AHD (within the service station) to RL 0.5 AHD in the lower lying areas to the west of the service station indicating groundwater levels are likely migrating to the west towards the Hunter River.



Figure 3 – Registered Bores in the vicinity of the Shell Service Station (Heatherbrae)

The BP Truckstop had a total of 28 registered groundwater monitoring wells installed within and to the west/south west of the property as shown in Figure 4 below. The registered wells were installed in October 2012 to depths of between 4.2 m and 15.8 m, but generally 12 m to 13 m depth, and were registered and intended for monitoring purposes. Subsurface conditions typically comprised shallow fill, underlain by shallow clays and sand, overlying bedrock (sandstone, siltstone and coal). Water bearing bedrock was generally encountered at depths of between 7 m and 13 m, typically in the coal seam and siltstone/sandstone immediately overlying/underlying the coal seam. Standing water levels were generally encountered from 8 m to 10 m depth (approximately RL 9.5 AHD) within the service station to RL 8.5 AHD to the west/south west of the service station (road reserve on the western side of Kinta Drive) indicating groundwater levels are likely migrating to the west/south west and possibly following the dipping coal seam to the west/south west.



Figure 4 – Registered Bores in the vicinity of the BP Truck Stop (John Renshaw Drive, Heatherbrae)

The former Boral Asphalt Plant at Black Hill situated to the west of Lenaghans Drive/M1 Motorway, had a total of 14 registered groundwater monitoring wells installed at the site as shown in Figure 5 below. The registered wells were installed in September 2014 to depths of between 5.8 m and 12.6 m and were registered and intended for monitoring purposes. Subsurface conditions, standing water levels and water bearing zones were not available through the BOM website, however, based on the topography of the site, the likely dip of the coal seam and location of Viney Creek to the west of the well network it is considered likely that groundwater flows would be to the north-west to west.



Figure 5 – Registered Bores in the vicinity of the Former Boral Asphalt Plant (Black Hill)

6. Review of Site History

6.1 Previous Investigations

- Review of existing relevant reports as nominated by TfNSW as follows:
  1. "M1 Pacific Motorway extension to Raymond Terrace, Soils and Contamination Working Paper", Jacobs (2021);
  2. "M1 Pacific Motorway extension to Raymond Terrace, Environmental impact statement – Chapter 16: Soils and contamination", TfNSW (2021a);
  3. "Report on Preliminary Site Investigation Contamination and Acid Sulphate Soil Assessment, Proposed M1 Extension to Raymond Terrace (M12RT), Black Hill to Raymond Terrace", Douglas Partners (2015);
  4. "Geotechnical Investigation Factual Report, M1 Pacific Motorway Extension to Raymond Terrace Black Hill to Raymond Terrace", Douglas Partners (2018);
  5. "Geotechnical Concept Design Report, Embankments on Soft Soils, M1 Pacific Motorway Extension to Raymond Terrace", Douglas Partners (2019);
  6. "Geotechnical Concept Investigation Interpretive Report, M1 Pacific Motorway Extension to Raymond Terrace Black Hill to Raymond Terrace", Douglas Partners (2020a);
  7. Updated soft soils report titled "Geotechnical Concept Design Report, Embankments on Soft Soils, M1 Pacific Motorway Extension to Raymond Terrace", Douglas Partners (2020b);

8. "Interim Draft Data Report on Geotechnical Investigation, M1 Motorway Extension to Raymond Terrace (M12RT), Black Hill to Raymond Terrace", Douglas Partners (2021);
9. Investigation and contamination testing data from the current geotechnical investigation, which has been conducted by Douglas Partners, which is not included in the "Interim Draft Data Report" (ie report pending);
10. "M1 Pacific Motorway extension to Raymond Terracey, Hydrology and Flooding Working Paper", TfNSW (2021b); and
11. "M1 Pacific Motorway extension to Raymond Terracey, Surface Water and Groundwater Quality Working Paper", TfNSW (2021c).

- Brief review of relevant documentation specific to the former RZM mineral sands processing facility as follows:

1. Letter dated 24 September 2021 titled, "Auditor's Interim Opinion of the Detailed Site Investigation Report, RZM Site, Tomago, NSW" from Mr Ross McFarland of AECOM (AECOM, 2021);
2. "HHRA – Former RZM Site, Tomago, NSW", EnRiskS (2021a);
3. "ERA – Former RZM Site, Tomago, NSW", EnRiskS (2021b)
4. "Summary Analytical Resuts for Metals Samples", Former RZM Site DSI Recommendations Project, Jacobs (2019a);
5. "Former Rutile Zircon Mine Site: Detailed Site Investigation, NSW Roads and Maritime Services, Former RZM Site: Detailed Site Investigation", Jacobs (2019b);
6. "Former RZM Site DSI Recommendations Project, NSW Roads and Maritime Services, Former RZM Site – Sampling, Analysis and Quality Plan", Jacobs (2019c).

Pertinent details and comments based on the review of Jacobs (2021) , TfNSW (2021b and 2021c) and the RZM reports are provided below. Investigations conducted by DP subsequent to these reports (ie DP, 2021) are incorporated into the following sections.

Jacobs (2021):
The Jacobs (2021) report included the presentation of findings from their desktop review which included review of historical aerial imagery, historical maps and historical business directories, review of current NSW EPA Registers (regulated/notified sites, PFAS investigation areas, Environmental Protection Licences (EPLs)). Pertinent comments are provided below:

- Jacobs (2021) identified the following potential contamination issues: Widespread agricultural use of the site;
- Former mineral sands processing facility at Tomago (RZM);
- Former dairy processing and wastewater treatment works at Hexham;
- Former and current coal loading facilities and railways at Hexham;
- Wastewater treatment works at Raymond Terrace and commercial/industrial land uses at Hexham, Tomago and Heatherbrae.

Review of historical business directories between the years 1950 to 1991 (at roughly 10 year intervals) and historical maps (1913, 1941, 1981 and 2015) indicated a crematorium at Tarro (north of site), former rifle range at Motto Farm (adjacent Botanic Gardens entry based on the 1913 map – refer to Section 7.3 for likely alternative location), former sanitary depot at Tarro (north of site), petrol stations (outside site) at Beresfield, Tarro and Heatherbrae, former coal loading facilities and railway at Hexham (noted as 150 m south of ancillary facility AS8 and outside the site - refer to Section 7.3 for further details), former butter factory (Oak Factory) south of AS8, steel fabricators, chemical manufacturers, scrap metal merchants within Tomago and the site and several other industrial sites within the Tomago industrial area outside the site.

Review of the NSW EPA regulated/notified sites also identified the Hunter Water Chichester Trunk Gravity Main (regulated by NSW EPA) within the site (Note Jacobs Figure 6-1 did not show the southern extend of the gravity main along Pipeline Road and through ancillary facility AS5 or the pipeline alignment located immediately north of the site at Black Hill which crosses the New England Highway at Christie Road Tarro and proceeds east along the north boundary of ancillary facility AS4. While these pipelines appear to be below ground now they have historically comprised above ground pipelines as evidenced in historical aerial photographs).

Review of the NSW EPA PFAS investigation sites (sites with the potential for large quantities of PFAS use) identified the presence of two properties within the broader catchment area of the site. These included former firefighting training at Our Lady of Lourdes Primary School, Anderson Drive, Tarro (north of the site) and the former use of fire-fighting foams at Heatherbrae Total Fire Solutions, Griffiths Road, Heatherbrae (located north of the site).

Jacobs note no specific data is available in the public domain for these two sites, and indicates the PFAS is unlikely to reach the site due to the north-eastern hydraulic gradients anticipated at each site. Jacobs also indicated groundwater drawdown would not reach these areas based on the Surface Water and Groundwater Quality Paper (Appendix K of the EIS) (TfNSW, 2021c) and as such PFAS should not migrate as a result of the M12RT project. Given the persistent and high solubility of PFAS these sources were included as an area of potential contamination risk by Jacobs (refer to Section 13). Review of the NSW EPA POEO Public Register conducted in June 2020 (Refer Table 5-4 of Jacobs (2021)) indicated numerous industrial sites with EPL in the vicinity of the site. Sites within the superseded construction boundary were noted by Jacobs to include Hunter River waterways (herbicide application), 12 Old Punt Road (General, Chemical Storage) – Note: located immediately west of Old Punt Road and therefore outside the site, 25-27 Kennington Drive, Tomago (Bitumen pre-mix or hot-mix production) – Note: located within the Tomago industrial estate and not within the site.

Jacobs (2021) provides a broad summary of previous investigation findings. The more recent geotechnical investigations by DP in 2021 were not available for review at the time of issue (July 2021). Pertinent comments are provided below:

Jacobs review of DP (2012) PCA for the LTTSF, which is located to the west of Maitland Road at Hexham and predominantly outside the site, indicated the presence of widespread elevated levels of nutrient and faecal coliforms in groundwater and surface water within the investigation area, which may be attributed to infiltration of treated effluent. It is noted that elevated heavy metals (Cu, Fe, Ni, Zn and to a lesser extent Cr, Cd and As) were also identified in groundwater/surface water testing which could be attributed to irrigation of effluent, leaching from fill materials or more broadly associated with the development of the Hexham area (ie regional groundwater quality based on experience in

surrounding areas). It is also noted that irrigation of effluent extended to approximately Purgatory Creek (approximately 250 m south of the M12RT site).

DP (2012) PCA for the LTTSF briefly discusses the replacement of the Hunter Water Corporation Trunkmain Pipeline upgrade by Diona Pty Ltd which involved removal of the former above ground pipeline and excavation and burial of the new pipeline through Hexham. Drawing 2a (DP, 2012) shows the alignment running approximately north to south along the HWC easement which crosses the M12RT alignment. It is not known whether the former above-ground pipeline included lead jointing or whether this was removed and validated by Diona during upgrade works. The DP report raises this along with imported fill used within the easement as potential contamination sources.

Jacobs review of DP (2015) PSI for the M12RT project presented the potential sources identified by DP based on a desktop review of previous reports and site history. The potential contaminants were summarised in Appendix B (Jacobs, 2021) and included the general and localised potential contaminant sources identified by DP along the project alignment. It is noted that Jacobs did not include imported fill which DP indicated is likely present across developed areas of the site (particularly low-lying areas) along service easements, access roads/tracks, former building areas or construction compounds. Table 6-1 AOPCR in the Jacobs report while listing stockpiling and/or illegal dumping does not specifically address imported fill as a general AOPCR. It is also noted that a former night soil disposal area identified by DP (2015) at the corner of John Renshaw Drive and the M1 Motorway at Black Hill (which was outside the project alignment) is within the site and should be included as an AOPCR for the project. It is noted that DP (2015) also identified a former overhead conveyor, former works compound and former building/jetties within the current ancillary facility (AS8) which should also be included in the AOPCR table. DP report also identified former works compounds at the northern end of the M12RT site (including AS21 (northern portion) and land to the north west to the existing Pacific Highway (works compound for the Pacific Highway upgrade in 1996)), and also shows (Drawing 1A of DP (2015)) the location of the two site compounds used during the construction of the LTTSF, located within the site (south west of AS5) and immediately south (south west of AS6) of the site. These areas should also be considered as potential contamination sources in the absence of additional reporting validating the clean-up of these areas post construction.

Jacobs review of investigations (PSI/DSI) conducted at the RZM site in 2013 and 2016 (Jacobs, 2019b) indicated the presence of some metal exceedances within sediments in the Hunter River and drainage line exceeding the adopted criteria. While localised hydrocarbon impacts and widespread distribution of naturally occurring radioactive materials (NORM – areas of elevated dose rates relative to surrounds) were noted across the site, no indication was given that other contaminants were elevated within Hunter River sediments. Further investigations by Jacobs in 2019 (Jacobs 2020) under an Auditor approved SAQP which included sampling and analysis of sediments across the RZM site for priority contaminants of concern including metals and radionuclides indicated a very low risk to ecosystems from impacted soil, groundwater and surface water and sediments on the site. It is understood that an interim site management plan (ISMP) is currently in place to manage contamination impacts in the RZM site (including NORM impacts) and further remediation will be undertaken under an Auditor approved remediation action plan (RAP) to follow.

DP (2017) geotechnical investigation included collection and analysis of limited soil and groundwater samples at locations of medium contamination risk where they coincided with geotechnical test locations as instructed by TfNSW. Testing included analysis for heavy metals, total recoverable hydrocarbons (TRH), benzene/toluene/ethylbenzene/xylene (BTEX), herbicides/pesticides (organochlorine pesticides (OCP) and organophosphorus pesticides (OPP)), phenols and asbestos

(Note polycyclic aromatic hydrocarbons (PAH) were also included). A total of 60 soil samples were analysed. A total of seven shallow soil samples were identified with slightly elevated nickel concentrations above the ecological investigation levels (EIL) for open space (parkland) criteria. Jacobs concluded that these minor exceedances present a low contamination risk given the proposed development and references further RZM site investigations undertaken post 2017. It is noted that the EIL derived for the DP (2017/2018) utilised conservative soil parameters for derivation.

Based on the above review, Jacobs (2021) indicates the site includes areas of historical and current potentially contaminating activities which may require further investigation prior to construction and management during construction of the project. These include agricultural and rural land use, former mineral sands processing facility (RZM), areas of fill material and industrial land use. Areas of potential contamination risk (AOPCR) within and next to the site were listed in Table 6-1 of Jacobs (2021), which also provided details of their associated potential contaminants of concern (COPC), risk to environmental receivers; and limitation on construction and site users within the context of the potential for contamination and proposed construction activities. The assessment identified five high risk, six medium risk and seven low risk AOPCR. It is understood the risk ratings were based on the weight of evidence gathered throughout the desktop assessment process, the results of previous contamination assessments and data, and professional judgement based on experience with numerous similar sites and projects. All risk rankings were based on unmitigated project risks and did not consider the implementation of design or engineering controls. Where Jacobs considered there was direct evidence or the combined weight evidence indicated a likely exposure scenario of workers to known contamination, the risk ranking potential was considered 'High'.

TfNSW (2021):
TfNSW (2021) EIS Chapter 16: Soils and Contamination report issued in July 2021 has considered the AOPCR identified in Jacob (2021) and further assessed potential soil and contamination impacts from construction and operation of the project and proposed environmental measures to mitigate impacts associated with these potential impacts.

The report indicates that '*construction will require areas of existing contamination to be disturbed. The highest risk construction activities include vegetation removal (grubbing), topsoil stripping, excavations, earthwork or demolition work in identified AOPCR sites. The greatest risk is where the construction activities coincide with contaminated soils, asbestos, potentially contaminated demolition waste and NORM at the former mineral sands processing facility. These high-risk construction activities would present the following potential impacts during project construction:*

- *Human health risks (to construction workers): Construction workers are most at risk from contaminated land impacts due to the potentially complete exposure pathways including dermal contact (contaminated soil and water) and inhalation/ingestion (impacted dusts/soils);*
- *Risks to the receiving environment (waters and soils): Construction work may create exposure pathways through (for example) disturbance, removal of vegetation and topsoil and dewatering*.'

It is noted that other potential receptors may exist for some AOPCR depending on the works conducted if not managed appropriately/remediated (as required) during project works (ie exposure to pedestrians (including cyclists) along pathways where contaminated soils are left exposed at the ground surface or exposure to maintenance workers undertaking routine maintenance (ie lawn mowing) or installation/repairs of underground services)).

TfNSW notes that '*the identified contaminated material from the former mineral sands processing facility would be remediated, in accordance with a Remediation Action Plan that would be approved by a NSW EPA accredited site auditor, representing beneficial protection of the environment both in the short and long term*.'.

6.2 TfNSW (2021b)

The TfNSW (2021b) EIS Appendix J - Hydrology and Flooding Working Paper provides an assessment of potential hydrology and flooding impacts from the project, including impacts on surface water and groundwater hydrology and outlines management measures to be implemented to mitigate or manage hydrological impacts.

Appendix A of the working paper contains a groundwater modelling report by TfNSW which includes numerical groundwater modelling results for the project. The modelling predicts likely groundwater drawdown at temporary detention basins, permanent detention basins, the proposed Black Hill cutting and existing composite groundwater levels across the broader site area (Fig 3-9 of TfNSW (2021b)) based on four references dated between 2006 and 2012. Based on the modelled existing composite groundwater levels, groundwater flows directions have been estimated, with flows in the vicinity of the Black Hill cutting predicted in an north east to south eastern direction, flow in the vicinity of the Shell Service Station at Heatherbrae predicted in an south westernly direction and flow at Heatherbrae in the vicinity of the project alignment typically in a north westerly to north easterly direction.

Modelled existing groundwater elevations at the proposed Black Hill cutting (Fig 4-20 of TfNSW (2021b)), which includes cuts in the order of 10 m to 12 m depth, suggests groundwater levels (~RL 6 to ~RL 10) will be at least 3 m below proposed minimum cut levels (~RL 9.7 to ~RL 13). TfNSW therefore concludes negligible groundwater drawdown will occur at road cut areas.

Temporary drawdown during construction (dewatering) of proposed detention basins indicates a maximum drawdown of 2.4 m bgl at the southern end of the project. A 1.2 m drawdown is predicted at the detention basin located approximately 75 m south west of the Shell Service Station at Heatherbrae (refer Fig 4-17 of TfNSW (2021b)).

6.3 TfNSW (2021c)

The TfNSW (2021c) EIS Appendix K - Surface Water and Groundwater Quality Working Paper outlines surface water and groundwater sampling and analysis undertaken by Jacobs and other parties (ie HWC, DPIE, ARTC) for the project. The report concludes that surface waters are impacted by nutrients and heavy metals from urbanisation, industrial and commercial land use, and land clearing, and that groundwater quality is highly variable, ranging from fresh potable waters in the Tomago Sandbeds through to saline groundwater beneath low lying floodplains of the Hunter River.

Jacobs conducted three rounds of groundwater sampling and analysis from the 20 monitoring bores installed at 13 locations for the project between September 2016 and July 2017. The groundwater samples were analysed for field paramaters, major cations and anions, heavy metals, total disolved solis (TDS), nutrients, fluoride and faecal coliforms. The results were compared against ANZG (2018), ANZECC (2000) and ADWG (2018) guidelines and indicated widespread heavy metals and nutrient impacts, which is generally commensurate with groundwater analysis by DP.

6.4 RZM Documentation

A brief review of the relevant documentation provided by TfNSW and listed in Section 6.1 for the former mineral sands processing facility (RZM site) indicated the following:

- A Sampling, Analysis and Quality Plan (Jacobs, 2019c), DSI (Jacobs , 2019b), Human Health Risk Assessment (EnRiskS, 2021a) and Ecological Risk Assessment (EnRiskS, 2021b) have been produced for the property;
- The DSI (Jacobs, 2019b) identified:
    - TPH concentrations in soil above management limits in surface soils surrrounding a former transformer. The remainder of soil samples analysed were within the adopted assessment criteria;
    - River and drainage sediment samples tested were generally within the adopted assessment criteria with the exception of elevated nickel concentrations above ecological investigation levels in shallow sediments along the river foreshore and in the lower portions of the off-site drainage line (which Jacobs indicated may not be attricbuted to the RZM site and may require furter investigation to assess the nature and extent of impact);
    - Heavy metal concentrations (namely cadmium, copper, nickel and zinc) in groundwater exceeding the adopted criteria were found at all locations monitored within the RZM site. The remainder of groundwater analytes tested were within the adopted assessment criteria;
    - Heavy metal concentrations (namely copper and zinc) in surface water exceeding the adopted criteria were found within the RZM site. The remainder of surface water analytes tested were within the adopted assessment criteria;
    - Radiological contaminants (including localised hotspots) were present across a broad portion of the RZM site and varied with depth and mineralogy. Groundwater testing for radionuclides indicated low level impact (within Australian Drinking Water Guidelines);
- The DSI (Jacobs, 2019b) recommended an interim site management plan to control access to the site and establish other controls as necessary. The report concludes that subject to further data gap analysis the RZM site can be successfully managed and remediation to a standard suitable for the highway upgrade;
- Jacobs (2019c) SAQP summarises previous investigation works undertaken including asbestos removal following building demolition works and draft ecological risk assessment (ERA) and human health risk assessment (HHRA) for radionuclides and subsequently recommends additional investigations of shallow soils at three hotspot locations containing elevated radionuclides and heavy metals, additional groundwater sampling and analysis at existing wells, additional surface water and sediment sampling and analysis to fill in data gaps and feed into updated ERA and HHRA models and reports;
- EnRiskS (2021b) conducted an ecological risk assessment to assess naturally occurring radiological contamination risks to organisms based on the current situation where the site is vegetated or covered with hardstands and used for industrial purposes. The risk assessment used a conservative screening guideline (ERICA Model) and concluded risks to various organisms in terrestrial systems due to exposure to soil in hot spots, groundwater, surface water and sediments at the RZM site are acceptable;

- EnRiskS (2021b) conducted a human health risk assessment to assess naturally occurring radiological contamination risks to humans based on the current situation where the site is vegetated or covered with hardstands and used for industrial purposes. The risk assessment concluded that the screening assessment indicated direct exposure to residual soil materials at the RZM site were acceptable for construction or future industrial users for all hotspots, visitors to the site, although not acceptable for people who spend time at hot spot 3 continuously all year round. Further consideration of dose constraints (yearly recommended dose rates) for soils indicated acceptable risks for visitors to the site and construction and future industrial users who spend time across the entire RZM site not just a hotspot (which was deemed an unacceptable risk). Similar risks were found for sediments with acceptable risks for direct exposure, incidental ingestion and indirect exposures with the exception of consideration of dose constraints (yearly recommended dose rates) for sediments for direct exposure using the worst case concentrations;
- AECOM (2021) reviews Jacobs (2019b) DSI and concludes:
    - The DSI is sufficient for preparation of a RAP;
    - The identified contamination triggers the Duty to Report notification requirements;
    - An Interim Management Plan should be established to manage current risks at the property;
    - At the completion of remediation and validation works the Auditor expects he will be able to provide a site audit statement concluding the suitability of the site for its intended purpose.

TfNSW have indicated the Site Auditor has endorsed the current DSI, SAQP, HHRA and ERA and has also indicated that the RZM site will be remediated under an Auditor approved RAP prior to (where possible) the commencement of construction for the M12RT development.

6.5 Supplementary Information from TfNSW

An email from Jacobs dated 1 February 2022 forwarded to DP on 2 February 2022 indicates that the former rifle range noted in Jacobs (2021) Figure 6-1 adjacent to the Botanic Gardens entrance is at the incorrect location. Further checking of the 1913 map, 1941 topographic plan (see section 7.3 and Figure 6 below) and the 1954 aerial photograph by Jacobs indicates the actual rifle range was located to the south west of Masonite Road, potentially encroaching into the site and the formerly proposed ancillary facility AS16 (now excluded from the project). Jacobs indicates that the area has been already disturbed by the Masonite Factory development on the land to the south of the Sandvik site, making remediation (if required) difficult and suggests that based on the construction activities outlined in the EIS, that the risk should be minimal.

Discussions with TfNSW indicate that they have been in consultation with NSW EPA regarding the Heatherbrae Shell Service Station and have subsequently reviewed associated third party DSI reports. Based on this discussion/review, TfNSW indicates that this information has demonstrated that the adjacent service station site poses a low risk to the proposed motorway development and land use. Due to legal obligations TfNSW were not able to provide the DSI reports or information from EPA discussions with DP for review. TfNSW have also indicated that all temporary and permanent detention basins to be constructed for the project (including those immediately south west of the Shell Service Station) will be lined to prevent infiltration to groundwater and groundwater ingress.

It is also understood TfNSW was unable to obtain PSI/DSI reports from Newcastle City Council in relation to the former night soil disposal area adjacent to John Renshaw Drive and M1 Motorway.

6.6 Additional Searches

Subsequent to the above historical information DP has subsequently reviewed the following:

- 1941 Topographic Plan printed by AHQ Cartographic Company;
- 1944 Aerial Photography Layer from the NSW Spatial Collaboration Portal (which covers part of the project area);
- NSW EPA Contaminated Sites register in the vicinity of the newly added sections of the construction footprint (site) at John Renshaw Drive Beresfield (section between 1 Kinta Drive and 40 Enterprise Drive Beresfield), Maitland Road/Pacific Highway (south of AS8 and west of AS10) near the Hexham Bridge (refer to Drawing R.010.D.001, Appendix D).

Pertinent information from the review is provided below:

- A former rifle range was located at Heatherbrae to the west of Masonite Road and South of the Pacific Highway as shown in Figure 6. The former rifle range appears to extend into the site to the west of Masonite Road;
- A former 'Sand Pit' (sand quarry) is present to the south east of Jura Street, Heatherbrae and potentially located within the project alignment immediately west of an unnamed road/track as shown in Figure 6. While water is not present within the former sand pit as seen in current aerial photography to the south/south east for other sand pits, the NSW LiDAR contours suggest that at least part or the former sand pit may be present directly west of the unnamed access track as a small localised depression;
- An elevated area adjacent to Masonite Road south of the Masonite Factory and within the site is present in 1941 (note contours in 1941 topography plan are in feet) indicating the elevated area is not associated with more recent industrial activities;
- The former Sanitary Depot at Beresfield (AOPCR 2 in Jacobs Fig 6-1) appears to comprise a building to the west of Ruby Close and a disturbed area to the south of this building (eastern portion of Pasadena Crescent Park) which appears to be trenched/ploughed in an east/west direction (possibly night soil dumping area). A creek runs south approximately 80 m to the east of the sanitary depot and likely cross the Hunter Water pipeline and enters the surface water body/creek immediately east of ancillary facility AS3;
- A former aircraft runway (Figure 7) is present at Tomago running north west to south east. The runway is situated approximately 150 m south of the Old Punt Road/Pacific Highway intersection and stops in the central portion of the Tomago Aluminium factory. Roads are evident off the runway to the north east, however, the aerial imagery does not extend east/north of the runway. No aircraft hangers or associated buildings are evident in the image. Given the runway is not located in the 1941 topographic plan it is possible this runway was constructed during WWII;
- Former coal loading facilities, residential and potentially commercial buildings/structures in the vicinity of ancillary facility AS8 and Purgatory Creek (refer to Figure 8);

- Three service stations within 350 m to 550 m of the site near the Hexham Bridge which are listed as notified contaminated sites on the NSW EPA register (refer to Drawing R.010.D.003.Rev0 in Appendix D) as follows:
  - BP Service Station - Cnr Pacific Hwy and Old Maitland Rd – Regulation under CLMA not required;
  - Caltex Diesel Stop – 360 Maitland Road - Regulation under CLMA not required;
  - Caltex Bogas Warehouse – 239 Old Maitland Road - Regulation under CLMA not required.

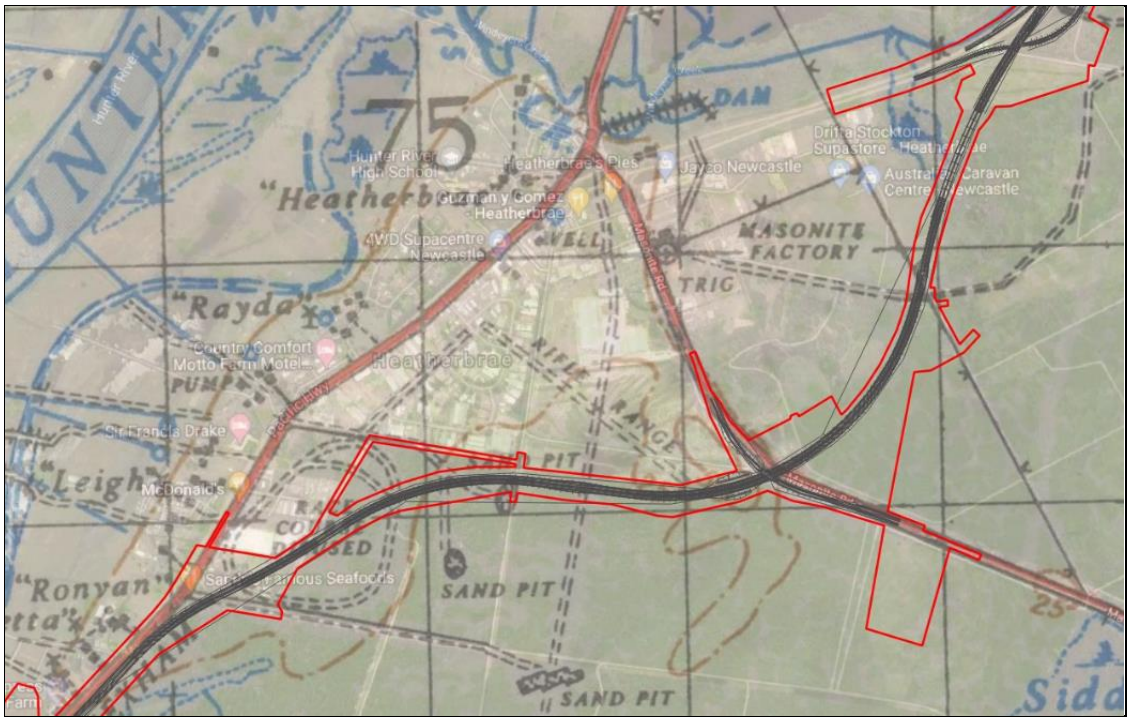


Figure 6 – 1941 Topographic Plan and current aerial underlay showing former rifle range, former sand pits and ground elevations in the area

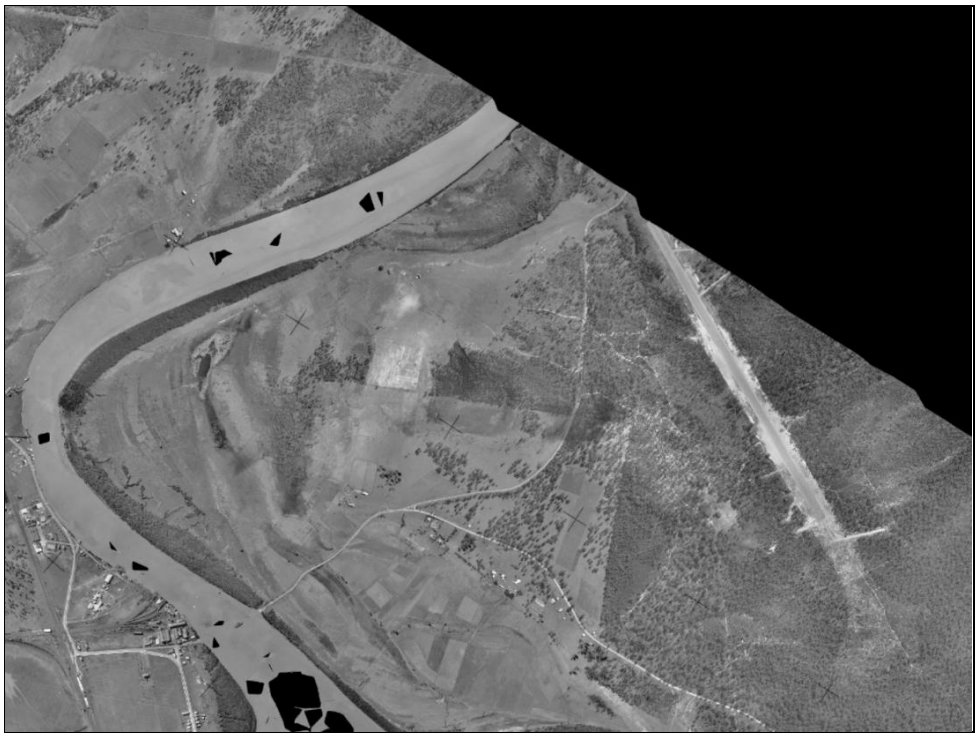


Figure 7 – 1944 Aerial photograph showing location of former runway south east of Old Punt Road Tomago.



Figure 8 – 1944 Aerial photograph showing coal load facilities, jetties, buildings/structures in the vicinity of ancillary facility AS8

7. Summary of Previous Sampling and Analysis

Table 2 provides a summary of previous geotechnical investigations in connection with the M12RT project, based on the information which has been provided to DP by Jacobs and TfNSW during the previous (Project No. 81641.00) and current DP investigations.

Table 2: Summary of Investigations and Contamination Testing

Investigation	Type	Tests and Contamination Testing Completed			
		Quantity	Max Depth (m)	Quantity of Soil and Sediment Contamination Tests	Quantity of Groundwater Contamination Tests
GHD (2005 to 2008)[1]	Borehole on land	48	59.55	35 (at 19 test locations)	0
	Cone Penetration Test	9	39.21		
	Test Pit	20	2.5		
Coffey (2007)[1]	Borehole on land	19	65.7	0	8
	Cone Penetration Test	18	20.84		
	Test Pit	9	2.5		
DP (2018)	Borehole on land	59	65.0	60 (at 28 locations)	22 (at 12 locations)
	Cone Penetration Test	17	48.6		
	Test Pit	38	3.1		
	Standpipe for water levels	41	21.7		
	Piezometer	20	18.0		
DP (2021) (current investigation)	Borehole on land	116	83.6	37 (at 20 locations) including 4 sediment samples	20 (at 19 locations
	Borehole over water	12	48.65		
	Cone Penetration Test	74	60.34		
	Test Pit	36	5.0		
	Standpipe for water levels	7	25.45		
	Piezometer	7	25.45		

Notes to Table 2:
1. DP does not have a record of the quantity of standpipes / piezometers installed during previous investigations by GHD and Coffey.
2. Table excludes groundwater and surface water testing conducted by Jacobs in 2016/2017 as outlined in TfNSW (2021c)

The results of the soil and groundwater testing conducted for contamination purposes in the above investigations are summarised in Tables B3 (soil), B4 (Sediment) and B6 (groundwater) in Appendix B. Soil testing generally comprised the following:

- GHD (2005/2006) – Metals, TRH, BTEX, PAH, OCP, polychlorinated biphenyls (PCB) (all samples);
- Coffey (2007) – Aggressivity and acid sulfate soil (ASS) testing only;
- DP (2018) – Metals, TRH, BTEX, PAH, PCB, OCP, OPP, phenols (all samples);
- DP (2021) – Metals, TRH, BTEX, PAH, OCP, OPP, PCB (all samples), per- and poly-fluoroalkyl substances (PFAS) (four sediment samples).

Groundwater testing generally comprised the following:

- Coffey (2007) – Aggressivity testing only;
- DP (2018) – Metals, microbiological (ie coliforms, E.coli) and inorganics (ie TN, TP, ammonia, TDS, alkalinity, cations/anions) (all samples);
- DP (2021) – Metals, microbiological (ie coliforms, E.coli) and inorganics (ie TN, TP, ammonia, TDS, alkalinity, cations/anions) (all samples), (PFAS) (four samples).

Previous test locations from the GHD, Coffey and DP investigations are shown on Drawing R.010.D.001.Rev0 in Appendix D. Test locations with soil, sediment and groundwater contaminant testing are shown on Drawing R.010.D.002.Rev0, in Appendix D. Note Project 81641.03 (DP, 2021) and Project 81641.00 (DP, 2018) are referred to by their project numbers only on Drawing R.010.D.001.Rev0.

Information regarding the rationale and methodology for the sampling and testing regime undertaken by TfNSW for the investigations conducted to date by DP, GHD and Coffey was provided by TfNSW as part of this desktop review in a briefing note titled M12RT Contamination Soil and Water Sampling Strategy from TfNSW on 17 February 2022. TfNSW indicated the following in the briefing note:

- The strategy for contamination investigations and sampling follows the guideline “Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of land” that prescribes a progressive investigative process that includes a PSI and where required, a DSI. Detailed site investigations completed for the proposal have been complimented by detailed consultation with EPA, landholders and Site Auditor over multiple years;
- A desktop PSI was completed in 2015 to assess the risk of contamination (DP, 2015). The report highlighted that the site is generally greenfield with low risk of contamination, however there are a small number of isolated areas of potential contamination risk (AOPCR) related to previous land uses (industry, utility, etc);
- To confirm general PSI findings across the wider proposed motorway site, a significant soil and water sampling program was completed in 2016 and 2020 (in conjunction with geotechnical investigations programs) (Refer Section 9 for details). The outcomes of the geotechnical investigations confirmed the PSI findings that the proposed motorway is generally a greenfield site that does not contain significant contamination risk;
- The PSI APOCRs informed further investigations that included targeted detailed site investigation and targeted remediation that has been completed for the proposed motorway project:
    - The APOCR that identified potential harm to human and ecological health was the RZM site. A Site Auditor was engaged to oversee further DSI activities. An SAQP was developed and endorsed for the RZM site in accordance with the CLM Act and SEPP 55. Soil and groundwater sampling was completed within and adjacent to the premises to prescribe the extent of contamination. Environmental and human risk modelling and reporting was completed for key contaminants. A draft notification as per the CLM act was provided to EPA and based on the DSI outcomes EPA confirmed that potential risk to human heath and ecological receptors is low and acceptable and that regulation is not required. The site Auditor has not provided a Site Audit Report to date, however has provided written advice that the DSI is appropriate for the site. TfNSW shall prepare and gain Site Auditor endorsement for a RAP. The RZM site shall be remediated in accordance with the RAP and a Site Audit Statement shall be prepared by the Site Auditor.

- Further targeted detailed site investigations were completed for isolated AOPCRs that included isolated asbestos. Observed areas of suspected asbestos at Black Hill and at Tomago were sampled and confirmed to contain asbestos. Isolated asbestos at Black Hill was remediated to the satisfaction of a hygienist. Suspected asbestos observed at Tomago was sampled and confirmed to be asbestos, however as the asbestos was distributed within the topsoil within an Aboriginal cultural heritage site, the area was delineated and secured with fencing until relevant statutory approvals are gained before the material is managed further. A registered asbestos contaminated site within the construction footprint at Hexham was not sampled due its known contaminants and extent.
- The AOPCRs included PFAS investigation sites in the surrounding area. Targeted sampling of ground water was completed and consultation with the relevant water supply authority was undertaken. The consultation and sampling demonstrated that PFAS is not above the laboratory limits of reporting (LOR) conducted within the construction footprint (Note: trace LOR were not adopted by the laboratory for PFAS – as such the LOR were above the 99% protection levels for fresh/marine waters. Detectable concentrations were recorded in two of the four wells tested for PFAS in July 2021 – Refer to Table B6, Appendix B and discussion below).
- The AOPCRs also included Hunter River sediment. Additional targeted sampling from within the river channel was completed to assess and characterise the river sediments (refer to Section 12 below).

It is noted that the briefing note did not address all identified AOPCR and did not include details regarding the test location selection or analytical testing regime.

8. Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future, ie it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

Based on the current desktop review including review of the potential areas of environmental concern in DP (2015), AOPCR identified in Jacobs (2021) – Fig 6-1, subsequent site history review conducted by DP for the current assessment and review of the site, DP has prepared an AOPCR drawing (Drawing R.010.D.003.Rev0 - Areas of Potential Contamination Risk (based on of Figure 6-1)) which is presented in Appendix D. The drawing includes several additional AOPCR not previously identified in Figure 6-1 (Jacobs, 2021) including:

- No 4 – Gravity truck main – extension of alignment through and adjacent to the site;
- No 17 – Historical rifle range – location moved north adjacent to Masonite Road, Heatherbrae close to or possible extending into the construction footprint at the NE corner of the rifle range;
- No 19 – Former night soil disposal near the corner of John Renshaw Drive and the M1 Motorway at Black Hill encompassing ancillary facility AS1;
- No 20 – Electrical substation present adjacent to the Hunter Water Pipeline at Black Hill;

- No 21 – Former LTTSF Works Compounds south west of AS5 (within site) and west of AS6 (outside site);
- No 22 – Former works compound, former building/jetties, former overhead conveyor in the AS8 ancillary facility and the former buildings/structures in the area immediately north of Purgatory Creek / South of the unnamed access road;
- No 23 – Service stations at Hexham (outside site) which are listed as notified contaminated sites with NSW EPA;
- No 24 – Former Sand Pit south east of Jura Street (within site);
- No 25 – Former Aircraft Runway (1944) at northern end of Old Punt Road (within site);
- No 26 - Former works compound (1996) within/adjacent to AS21 (within site);
- No 27 – Former service station at 187 Maitland Road, Hexham (immediately adjacent site).

Based on the above Table B7 has been prepared (Appendix B) which is based on Table 6-1 (Jacobs, 2021) and includes the additional AOPCR and associated pathways and receptors.

It is noted that an updated site history review has not been conducted to assess potentially contaminating industries in the vicinity of the additional road alignments which have been added to the M12RT construction footprint at John Renshaw Drive, Beresfield and Maitland Road/Pacific Highway at Hexham since issue of Jacobs (2021) report. DP understands only minor utility upgrades (ie optic fibre at Hexham and telecommunications at John Renshaw Drive) are proposed requiring shallow trench excavations and installation of services in the road reserve. While additional potentially contaminating activities within adjacent industries are expected, it is considered, given the shallow depth of excavation proposed, that these risks are unlikely to create a significant risk to human health or the environment when typical construction management practices and associated environmental management practices are implemented.

Inferred risk ratings in Table B7, Appendix B have considered the general subsurface conditions along the alignment (including fill depths, soil types, groundwater depths etc) which affect the potential mode of transport (pathways) between the contaminant sources and receptors. Based on a review of data from the current and previous geotechnical investigations at the site, the project alignment can be divided into six broad conceptual / geotechnical 'zones' as described below. These conceptual / geotechnical zones are presented graphically on Drawing R.0010.D.001.Rev0, Appendix D and are also included in Drawing R.010.D.003.Rev0.

Zone 1: Black Hill, Link Road / Ramps

The western region of the M12RT alignment and major link roads are located over residual soils over rock. The topography is undulating with moderate to dense vegetation cover. Surface water typically flows away from this zone to lower lying areas (ie Zone 2). Groundwater is typically encountered at depth within bedrock (generally within or above coal/carbonaceous seams).

Zone 2: Hexham Swamp

The Hexham Swamp region of the alignment is located west of the viaduct. The subsurface conditions comprise compressible soils of less than 10 m thick, but generally less than 3 m thick, overlying stiff clays and bedrock. Groundwater is relatively shallow and after prolonged rainfall the area may become inundated in areas not already built up. This zone contains Purgatory Creek and an unnamed creek between Zones 1 and 2 which flow to the lower lying lands to the south and east.

Zone 3: Hunter River Viaduct (Long Bridge)

The viaduct is located over compressible soils of more than 10 m thickness. The topography is generally flat. The eastern abutment is located near the RZM office and separation plant site. Groundwater is relatively shallow and after prolonged rainfall the area may become inundated. Surface waters in the zone include Purgatory Creek and The Hunter River which is the likely receptor for surface water runoff along most of the site alignment.

Zone 4: Tomago

The region between the eastern abutment of the viaduct and the south-western limits of Heatherbrae is underlain by variable conditions including residual clays over bedrock in the elevated sections. The lower parts of the site consist of one or a combination of aeolian sand soils and alluvial compressible soils. The topography is flat to undulating. Groundwater is generally at shallow depth but likely to be deeper along the more elevated sections of the alignment. Surface water within the zone comprise a shallow creek between the Hunter River and the Pacific Highway and a minor creek to the south of The Botanic Gardens which flows to the west into this creek prior to discharge into the Hunter River.

Zone 5: Heatherbrae

This region is underlain by deep quaternary sand deposits namely the Tomago Sand Beds. The surface elevation is higher than region 3 and 4, being typically RL 4 m to 8 m AHD, with a locally higher dune near Masonite Road that is up RL 19 AHD. The depth to groundwater is correspondingly deeper. Surface waters in this area are largely anticipated to infiltrate into the underlying sands although a minor creek/drainage path is present to the east of the Pacific Highway north of the Botanic Gardens which flows west into the shallow surface water creeks/drains west of the Pacific Highway which would eventually feed into the Hunter River.

Zone 6: Windeyer's Creek

This region includes Windeyer's Creek where compressible soils are present over a short distance (about 320 m) at the creek alignment with Aeolian sand either side of the creek. These sandy soils are present over the final section of the road until it re-joins the Pacific Highway at the northern end of the alignment. Groundwater in this area is relatively shallow. Surface waters in this area would generally flow into Windeyers Creek which flows into the Hunter River west of the site.

As outlined in Section 1.2, for the purposes of this supplementary report and presentation of inferred contamination risk in areas of interest, the site has been further categorised into the following broad representative areas as nominated by TfNSW, which broadly align with the above conceptual geotechnical zones as noted below:

1. Elevated Area at Black Hill (Geotechnical Zone 1);
2. Floodplain west of the Hunter River (Geotechnical Zones 2 and 3);
3. Floodplain east of the Hunter River (Geotechnical Zones 3 and 4);
4. Sandy soils within the Tomago and Heatherbrae Areas (Geotechnical Zones 5 and 6).

Note: Zone 4 also includes the elevated residual profile in the Tomago area.

9. Site Assessment Criteria

The site assessment criteria (SAC) applied for the current assessment are informed by the CSM (Section 8) which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for generic open space/ recreational and commercial / industrial land use scenarios which are considered applicable for the proposed M12RT project. The derivation of the SAC is included in Appendix C and the adopted SAC are listed on the summary analytical results tables (Tables B3 to B5) in Appendix B.

It is noted that the previous SAC in the DP (2015) report utilised conservatively derived ecological investigation levels and was issued prior to the CRC CARE 2017 Technical Report No 39 (CRC CARE, 2017) and ANZG (2018). The EIL have been reviewed for the current assessment and have utilised site-specific soil parameters where available (ie pH values) and published soil parameters (ie CEC values) where site-specific testing has not been conducted. The EIL have been derived separately for the four broad representative areas described in Section 6 as an initial screening tool. Where the EIL are exceeded site specific soil testing and EIL derivation would be recommended to confirm EIL and associated risk. Refer to the SAC in Appendix C for further details.

10. Summary of Previous Field Work Results

Previous field work methodologies and results have been presented in detail in DP (2018) and DP (2021).

For the purpose of this assessment geotechnical data (including depth of fill, top of rock and groundwater depths and well construction details) from these investigations (including data from previous assessment by DP, Coffey and GHD) have been collated and summarised in Table B1- Geotechnical Data Summary in Appendix B.

Based on the Table B1, fill materials were encountered varying from 0.1 m to 7 m depth, however on average approximately 1.1 m in depth. The top of rock varied from about 0.15 m to 67 m, however, on average about 13 m in depth.

No visual or olfactory signs of gross contamination were observed in the boreholes and test pits during the current investigation by DP (2021). Furthermore, photo-ionisation detector (PID) measurement which were undertaken on recovered soil samples for contamination testing all returned results of <1 ppm.

Groundwater was encountered from above the ground surface to depths of about 14.9 m, and on average at depths of about 1.4 m. It is noted that wells screened within bedrock were typically found to be artesian (under pressure) with an average piezometric head of about RL 6.2 AHD, while wells screened with the unconfined soil aquifer had an average piezometric head of about RL 1.0 AHD. It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

No visual or olfactory signs of gross contamination (ie floating product, hydrocarbon odour) were observed at the time of groundwater monitoring and sampling during the current investigation by DP (2021).

11. Summary of Previous Laboratory Testing for Contamination

11.1 Soil & Sediment

The results of contaminant soil and sediment testing from the GHD, Coffey and DP investigations have been collated and are presented in Tables B3 and B4 (Appendix B) respectively. The results have been compared against the adopted SAC presented in Appendix C.

Table B2 in Appendix B also lists the analytes exceeding the adopted SAC at each test location. The table indicates the majority of soil and sediment samples tested had contaminant concentrations within the adopted SAC, with the exception of the following:

- Elevated B(a)P TEQ above HIL C criterion (however within HIL D criterion) at three locations;
- Elevated zinc above the EIL-C and EIL-D criteria at one location;
- Elevated nickel above DGVs for toxicants in sediment at two locations.

Soil and sediment samples exceeding the adopted SAC are shown in Drawing R.010.D.004.Rev0 – Soil & Sediment Exceedances in Appendix D.

11.2 Groundwater

The results of contaminant groundwater testing have been collated and are presented in Table B6 (Appendix B). The results have been compared against the adopted SAC presented in Appendix C.

Table B5 in Appendix B also lists the analytes exceeding the adopted SAC for each groundwater sample tested. The table indicates that all groundwater samples had some metals or inorganics concentrations above the adopted SAC as follows:

- Aluminium concentrations exceeded the freshwater default trigger values (DGVs) for slightly to moderately disturbed systems and DGVs for estuaries in 15 of the 26 wells sampled and tested;

- Arsenic concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in two wells and drinking water GILs in four wells;
- Boron concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in three wells;
- Cadmium concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in three wells and marine DGVs for slightly to moderately disturbed systems in two wells;
- Chromium concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in six wells and marine DGVs for slightly to moderately disturbed systems in two wells;
- Copper concentrations exceeded the freshwater DGVs for slightly to moderately disturbed systems in six wells;
- Iron concentrations exceeded the ANZECC 2000 interim working level in the majority of wells;
- Manganese exceeded the marine DGVs for slightly to moderately disturbed systems in the majority of wells and seven wells for fresh water DGVs for slightly to moderately disturbed systems. Manganese also exceeded the drinking water GILs in about half the wells;
- Nickel concentrations exceeded the marine DGVs for slightly to moderately disturbed systems 15 of the wells and 13 wells for fresh water DGVs for slightly to moderately disturbed systems. Nickel also exceeded the drinking water GILs in nine of the wells;
- Zinc concentrations exceeded the marine and freshwater DGVs for slightly to moderately disturbed systems in the majority of wells;
- Ammonia concentrations exceeded the ANZECC 2000 DTVs for estuaries in the majority of wells and DGVs for slightly to moderately disturbed systems in nine wells;
- Nitrate concentrations exceeded the drinking water GILs in one well;
- Nitrogen concentrations exceeded the DTVs for lowland river and estuaries in the majority of wells;
- pH fell outside the DTVs for estuaries and to a lesser extent for lowland rivers in more than half the wells due to low (acidic pH values);
- Sulphate concentrations exceeded the drinking water GILs in 12 of the wells.

PFAS concentrations were detected in two of the four wells tested. The concentrations where generally low, with most analytes below the laboratory reporting limits. Detected PFAS concentrations were below the NEPC (2013) GILs for drinking water however exceeded the HEPA (2020) 99% LOP criteria for aquatic ecosystems for PFOS in two wells, which is noted in HEPA (2020) as the LOP to be used for slightly to moderately disturbed systems.

Groundwater samples exceeding the adopted land use SAC are shown in Drawing R.010.D.005.Rev0 – Groundwater Exceedances in Appendix D.

12. Areas of Potential Contamination Risk

Based on the findings of the desktop review Table B7 in Appendix B has been prepared (based on Table 6-1 in Jacobs (2021)) which includes the additional AOPCR identified in the vicinity of the site and considers the currently available data .

Table B7 includes a summary of soil, sediment and groundwater test locations, analytic testing and soil / sediment / groundwater exceedances of the adopted SAC (where applicable), and provides comments regarding risk categorisation for each AOPCR.

Inferred risk ratings, as per Jacobs (2021):

- Is based on the weight of evidence gathered throughout the desktop assessment process, the results of previous contamination assessments and data, and professional judgement based on experience with numerous similar sites and projects. All risk rankings have been based on unmitigated project risks and have not considered the implementation of design or engineering controls;
- Where there is direct evidence or the combined weight evidence indicates a likely exposure scenario of workers to known contamination, the risk ranking potential has been considered 'High'.

The risk ratings were reviewed based on consideration of the results of the currently available data and any associated data gaps, the likely construction works required for the proposed project (where known), the environmental setting including geology, topography and groundwater depths across the site and the current geological model for the site.

The inferred risk ratings have been further categorised into construction and post construction risks to differentiate between potential risks during construction for each AOPCR and long-term post construction risks.

For reporting purposes it has been assumed that construction works along existing road networks would involve limited cuts for installation of shallow services, upgrade of existing pavements (where required) and installation of minor utilities (ie no major cuts, dewatering or alteration to drainage networks required).

13. Comments

The AOPCR outlined in Table B7, Appendix B include potential contamination sources within and in close proximity to the site. A total of 27 AOPCR and two general contamination sources have been identified including additional AOPCR outlined in the CSM in Section 8. The majority of these AOPCR are considered to have a low inferred risk rating post construction on the assumption that the works are undertaken in accordance with an approved environmental management plan or RAP (as required). Inferred construction risks at AOPCR, however, have been assigned a range from low to high risk based on a weight of evidence approach as follows:

- A total of eight low risk AOPCR;
- A total of 18 medium risk / low to medium risk AOPCR including service stations at Heatherbrae, Hunter River Sediments, Tomago and Heatherbrae industrial/commercial operations, former night soil disposal, electrical substation, gravity trunk mains, former works compounds at Hexham and Tarro, dairy processing and wastewater irrigation, Tomago and Heatherbrae industrial/commercial operations, former service station at Hexham, WWTW at Raymond Terrace and PFAS investigation sites and former works compound at AS21;
- A total of three high risk / medium to high risk AOPCR comprising Tarro Waste Burial, RZM mineral sands processing, Tomago Asbestos Waste.

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15. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at the proposed M1 Pacific Motorway Extension to Raymond Terrace with reference to DP's proposal dated 19 November 2021 and acceptance received from Mr Brett Hoad of Transport for NSW (TfNSW) via email dated 21 December 2021. The work was carried out under TfNSW Professional Services Contract No. 20.303652.0358 dated 19 February 2021. This report is provided for the exclusive use of TfNSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during the previous investigations conducted by DP and others that have been reviewed. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations or data gaps associated with investigations conducted to date. The advice may also be limited by constraints imposed by others, or by site accessibility or by instructions provided by the client.

The assessment of atypical safety hazards arising from this advice is restricted to the (environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by laboratory analysis, either on the surface of the site, or in fill materials at the test locations sampled and analysed. Building demolition materials, such as concrete, plastic, metal were, however, located in previous below-ground fill and/or above-ground stockpiles, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Table B1 – Geotechnical Data Summary
Table B2 – M12RT Sampling and Testing Schedule (Soil and Sediment)
Table B3 – Results of Soil Testing Compared Against SAC
Table B4 – Results of Sediment Testing Compared Against SAC
Table B5 – M12RT Sampling and Testing Schedule (Groundwater)
Table B6 – Results of Groundwater Testing Compared Against SAC
Table B7 – Areas of Potential Contamination Risk (Update of Table 6-1 Jacobs (2021))

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

M12RT	GEOTECHNICAL DATA		ALL DATA	Project 81641.03						

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
18457	CPT 1A	CPT	377319.0	6366748.7	3.00	22.00	Sand	1.00	NE	2.00	-				
31531	6	Bore	377418.3	6367165.4	-5.90	7.15	Sandstone	NE	6.50	-	-12.40				
31531	7	Bore	377490.2	6367205.5	-4.20	10.00	Clay	NE	NE	-	-				
31531	8	Bore	377538.9	6367241.5	-3.80	8.00	Clay	NE	NE	-	-				
31531	9	Bore	377560.0	6367131.5	-3.70	11.03	Sandstone	NE	10.70	-	-14.40				
31531	CPT 1	CPT	377244.9	6367040.6	1.71	8.00	Clayey Silt / Sandy Silt	0.95	NE	0.76	-				
31531	CPT 10	CPT	377686.9	6367201.3	1.17	12.24	Sandy Clay (probable bedrock)	0.70	12.20	0.47	-11.03				
31531	CPT 2	CPT	377314.7	6367112.5	1.26	8.00	Clayey Silt	0.71	NE	0.55	-				
31531	CPT 3	CPT	377631.9	6367362.0	0.98	5.92	Sandy Clay	1.35	NE	-0.37	-				
31531	CPT 4	CPT	377670.0	6367230.9	1.18	8.00	Sand	2.74	NE	-1.56	-				
31531	CPT 5	CPT	377684.8	6367395.9	1.24	6.98	Sandy Clay (probable bedrock)	0.6	6.9	0.64	-5.66				
39762	1	Pit	379064.2	6368819.5	9.64	0.95	Sandstone	NE	0.8	-	8.84				
39762	2	Pit	379070.6	6368715.5	12.35	1.05	Claystone	NE	0.8	-	11.55				
39762	3	Pit	379045.3	6368598.8	13.77	0.75	Sandstone	NE	0.7	-	13.07				
39762	4	Pit	378979.4	6368682.4	15.66	0.30	Sandstone	NE	0.25	-	15.41				
39762	5	Pit	378964.0	6368797.8	12.95	0.95	Claystone	NE	0.9	-	12.05				
39762	6	Pit	378903.0	6368791.0	14.65	0.60	Sandstone	NE	0.55	-	14.10				
39762	7	Pit	378903.2	6368699.7	16.73	3.00	Silty Sandy Clay	0.7	NE	16.03	-				
39762	8	Pit	378876.0	6368619.4	14.89	1.45	Claystone	NE	1.4	-	13.49				
39762	9	Pit	378960.7	6368610.4	15.02	1.05	Claystone	NE	0.8	-	14.22				
39762	10	Pit	379058.6	6368481.0	11.75	0.95	Claystone	NE	0.7	-	11.05				
39762	11	Pit	379067.1	6368378.1	8.16	1.35	Sandstone	NE	1.3	-	6.86				
39762	12	Pit	378977.5	6368488.8	10.99	0.60	Sandstone	NE	0.5	-	10.49				
39762	13	Pit	378885.6	6368496.8	9.86	1.60	Sandstone	NE	1.4	-	8.46				
39762	14	Pit	379033.3	6368859.6	8.50	1.70	Siltstone	NE	1.6	-	6.90				
39762	15	Pit	379041.0	6368764.9	12.39	0.85	Siltstone / Sandstone	NE	0.8	-	11.59				
39762	16	Pit	379071.9	6368657.7	12.56	0.80	Sandstone	NE	0.75	-	11.81				
39762	17	Pit	378930.5	6368730.6	16.06	1.50	Claystone / Siltstone	NE	1.05	-	15.01				
39762	18	Pit	378843.5	6368660.7	15.56	3.00	Silty Clay	NE	NE	-	-				
39762	19	Pit	379016.5	6368546.8	13.28	0.75	Claystone	NE	0.6	-	12.68				
39762	20	Pit	378929.7	6368547.6	12.65	1.60	Claystone	NE	1	-	11.65				
39762	21	Pit	378836.4	6368570.7	12.31	1.90	Claystone	NE	1.6	-	10.71				
39762	22	Pit	378929.3	6368461.3	9.11	0.95	Sandstone	NE	0.85	-	8.26				
39762	23	Pit	378904.6	6368422.9	7.01	2.05	Sandstone	NE	1.9	-	5.11				
39762	24	Pit	378975.6	6368388.7	6.77	1.10	Sandstone	NE	1.09	-	5.68				
39762	25	Pit	379003.9	6368436.0	9.27	1.55	Sandstone	NE	0.95	-	8.32				
39762	101	Bore	378962.0	6368770.0	14.3	15.00	Laminite	NE	0.45	-	13.85				
39762	102	Bore	378883.0	6368685.0	16.5	20.55	Sandstone	0.2	1.9	16.30	14.60				
39762	103	Bore	378986.0	6368596.0	14.8	15.00	Laminite	NE	0.5	-	14.30				
39798	CPT 10	CPT	376592.0	6367173.3	0.67	26.78	Clay	NE	NE	-	-				
39798	CPT 11	CPT	376609.9	6367125.7	1.53	25.00	Clay and Silty Clay	1	NE	0.53	-				
39798	CPT 12	CPT	376706.8	6366916.5	1.30	32.90	Sand	1.2	NE	0.10	-				
39798	CPT 2	CPT	376625.3	6367261.9	0.69	17.99	Sand	NE	NE	-	-				
39798	CPT 3	CPT	376644.3	6367209.3	0.68	24.76	Clay	NE	NE	-	-				
39798	CPT 4	CPT	376632.5	6367198.1	0.73	24.99	Sand and Silty Sand	NE	NE	-	-				
39798	CPT 5	CPT	376647.2	6367163.4	0.72	27.00	Sand	NE	NE	-	-				
39798	CPT 6	CPT	376581.9	6367285.1	0.72	20.16	Sand	NE	NE	-	-				
39798	CPT 7	CPT	376591.5	6367251.3	0.58	19.35	Sand	NE	NE	-	-				
39798	CPT 8	CPT	376609.5	6367199.6	0.67	23.82	Clay and Silty Clay	NE	NE	-	-				
39798	CPT 9	CPT	376563.8	6367236.8	0.56	24.82	Sand	NE	NE	-	-				
39798	CPT TP13	CPT	377318.8	6365543.1	1.89	29.00	Silty Sand	1.14	NE	0.75	-				
39798	CPT TP15	CPT	377135.1	6365897.6	2.64	20.00	Silty Sand	2.15	NE	0.49	-				
39798	CPT TP17	CPT	377189.0	6366223.5	2.59	21.00	Silty Sand and Clay	2.5	NE	0.09	-				
39798	CPT TP19	CPT	377243.0	6366647.5	1.50	20.00	Silty Sand	NE	NE	-	-				
39798.03	CPT 402	CPT	375119.1	6368706.3	1.10	4.78	Sandy Clay (probable bedrock)	0.4	4.7	0.70	-3.60				
39798.03	CPT 403	CPT	375129.3	6368740.2	1.10	7.22	Sandy Clay (probable bedrock)	0.45	7.2	0.65	-6.10				
39798.03	CPT 406	CPT	375353.7	6368752.6	1.20	5.78	Sandy Clay (probable bedrock)	0.8	5.7	0.40	-4.50				
39798.03	CPT 407	CPT	375433.9	6368793.7	1.00	2.00	Sandy Clay (probable bedrock)	0.3	1.9	0.70	-0.90				
39798.11 Hexham Dairy Farmers	BH01	Bore	377218.0	6365705.0	1.79	30.00	Bedrock (sandstone?)	1.15	29.9	0.64	-28.11				
39798.11	BH02	Bore	376649.0	6367119.0	1.51	28.42	Claystone	0.7	28.35	0.81	-26.84				

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
39798.11	CPT 503	CPT	376810.0	6366642.0	3.30	32.96	Silty Clay / Weathered Bedrock(?)	1.15	32.9	2.15	-29.60				
39798.11	CPT 504	CPT	376651.0	6367027.0	1.43	33.54	Sand / Silty Sand (weathered bedrock?)	1	NE	0.43	-				
39798.11	CPT 506	CPT	376541.0	6367168.0	1.03	27.46	Clay and silty clay (weatheed bedrock?)	0.45	NE	0.58	-				
39798.11	CPT 507	CPT	376798.0	6366564.0	4.02	30.30	Bedrock (sandstone?)	1.6	30	2.42	-25.98				
39798.11	CPT 508	CPT	376519.0	6367182.0	1.10	26.40	Silty Sand and Sand	NE	NE	-	-				
39798.11	CPT 509	CPT	376498.0	6367234.0	0.87	26.14	Clay and silty clay (weatheed bedrock?)	NE	26	-	-25.13				
39798.11	CPT 510	CPT	376642.0	6367355.0	1.28	28.28	Clay (weatheed bedrock?)	0.7	26.2	0.58	-24.92				
39798.11	CPT 513	CPT	376482.0	6367512.0	0.96	29.14	Silty Clay / Weathered Bedrock(?)	NE	29.1	-	-28.14				
39798.11	CPT 514	CPT	376520.0	6367548.0	1.05	14.00	Silty Sand and Sand	NE	NE	-	-				
39798.11	CPT 514A	CPT	376520.0	6367549.0	1.05	30.26	Sand / Bedrock?	NE	30.2	-	-29.15				
39798.11	CPT 515	CPT	376483.0	6367547.0	1.35	29.22	Clay (weatheed bedrock?)	0.4	29.2	0.95	-27.85				
39798.11	CPT 516	CPT	376494.0	6367593.0	1.06	13.94	Sand and Silty Sand	NE	NE	-	-				
39798.11	CPT 516A	CPT	376494.0	6367593.0	1.06	27.44	Silty Clay / Weathered Bedrock(?)	NE	27.4	-	-26.34				
39798.11	CPTu 501	CPT	377292.0	6365627.0	1.07	30.36	Sand / Bedrock?	1.25	30.3	-0.18	-29.23				
39798.11	CPTu 502	CPT	376871.0	6366537.0	2.77	30.46	Clay / Bedrock?	3.15	30.4	-0.38	-27.63				
39798.11	CPTu 505	CPT	376676.0	6367075.0	1.97	32.32	Clay / Bedrock?	1	32.3	0.97	-30.33				
39798.11	CPTu 511	CPT	376561.0	6367478.0	1.17	31.22	Sand / Silty Sand (weathered bedrock?)	NE	31.2	-	-30.03				
39798.11	CPTu 512	CPT	376528.0	6367503.0	1.12	29.54	Sand / Silty Sand (weathered bedrock?)	0.55	29.5	0.57	-28.38				
39798.11	CPTu 517	CPT	376432.0	6367762.0	1.47	22.08	Clay and silty clay (weathered bedrock?)	NE	22	-	-20.53				
39798.11	CPTu 518	CPT	376417.0	6367890.0	1.51	19.54	Clay and silty clay (weathered bedrock?)	NE	19.5	-	-17.99				
39798.11	CPTu 519A	CPT	376343.0	6368061.0	1.77	22.26	Sand / Bedrock?	0.7	22.2	1.07	-20.43				
49636	CPT 1	CPT	382007.0	6371811.0	7.40	10.00	Sand	NE	NE	-	-				
49636	CPT 2	CPT	382044.0	6371767.0	6.35	10.00	Sand	NE	NE	-	-				
49760	106	Pit	371766.7	6368337.4	25.00	1.40	Claystone	0.15	1.2	24.85	23.80				
49769	BH1	Bore	380733.0	6371004.0	8.10	2.50	Sand	NE	NE	-	-				
49769	CPT-1	CPT	380567.0	6370966.0	10.00	18.51	Sandy Clay	NE	NE	-	-				
49769	CPT-3	CPT	380696.0	6370966.0	10.00	13.19	Sand	NE	NE	-	-				
49769	CPT-6	CPT	380832.0	6370992.0	10.00	19.51	Silty Clay and Clay	NE	NE	-	-				
49775	330DC-05	CPT	379264.0	6368702.0	6.00	4.27	Clay / Weathered Rock	NE	4.2	-	1.80				
49775	330DC-07	CPT	379016.0	6369098.0	1.50	10.05	Silt Sand (weathered rock?)	NE	10	-	-8.50				
49775	330DC-11	CPT	378247.0	6369711.0	1.50	15.09	Silty Sand / Sandy Silt	NE	NE	-	-				
49775	330SC-11	CPT	377381.0	6371973.0	1.50	16.01	Clay and Organic Clay	NE	NE	-	-				
49775	CPT A	CPT	379458.0	6367951.0	19.00	1.30	Clayey Sand (possible bedrock)	NE	0.85	-	18.15				
49775	CPT B	CPT	378730.0	6369293.0	1.50	25.00	Clay	0.3	NE	1.20	-				
49775	CPT C	CPT	378472.0	6369475.0	1.50	25.00	Clay	NE	NE	-	-				
49775	CPT D	CPT	378318.0	6369602.0	1.50	25.00	Sand	NE	NE	-	-				
49775	CPT E	CPT	377407.0	6370871.0	1.50	36.00	Silty Sand / Sandy Silt	NE	NE	-	-				
49775	CPT F	CPT	377340.0	6371119.0	1.50	17.80	Silty Clay (posible bedrock)	NE	17.8	-	-16.30				
49775	CPT G/H	CPT	377408.0	6371800.0	1.50	30.00	Clay and Silty Clay	NE	NE	-	-				
49832	CPT 1	CPT	378510.0	6368441.0	9.00	7.42	Sand / Bedrock (?)	1.3	7.4	7.70	1.60				
49832	CPT 2	CPT	378537.0	6368428.0	9.00	7.02	Sand / Clayey Sand / Bedrock (?)	0.35	7	8.65	2.00				
49832	CPT 3	CPT	378531.0	6368410.0	9.00	8.66	Silty Clay / Bedrock (?)	1.85	8.6	7.15	0.40				
49832	CPT 4	CPT	378556.0	6368392.0	9.00	9.64	Clay / Bedrock (?)	0.3	9.6	8.70	-0.60				
49927	1	Bore	375492.0	6368899.0	4.69	1.40	Sandstone	0.75	0.75	3.94	3.94				
49927	2	Bore	375547.0	6368914.0	6.87	12.43	Sandstone	5.5	12.1	1.37	-5.23				
49927	3	Bore	375587.0	6368926.0	8.09	17.23	Sandstone	7	11.5	1.09	-3.41				
49927	4	Bore	375648.0	6368944.0	8.27	17.49	Laminite	6	10.92	2.27	-2.65				
49927	6	Bore	375675.0	6368936.0	7.49	10.20	Sandstone	7	10.1	0.49	-2.61				
49927	8	Bore	375604.0	6368915.0	8.34	15.88	Sandstone	6.5	10.24	1.84	-1.90				
49927	10	Bore	375541.0	6368950.0	1.40	1.10	Sandstone (probable)	NE	1.1	-	0.30				
49974	4	Bore	374926.0	6368582.0	1.50	3.95	Sandstone	NE	1.4	-	0.10				
49974	5	Bore	374767.0	6368586.0	1.50	3.95	Clay	NE	NE	-	-				
49974	6	Bore	374495.0	6368582.0	2.20	1.75	Clay	NE	NE	-	-				
49974	7	Bore	374337.0	6368622.0	6.60	3.95	Clayey Sand	0.4	NE	6.20	-				
49974	8	Bore	374166.0	6368640.0	6.80	3.95	Clay	NE	NE	-	-				
49974	9	Bore	374006.0	6368668.0	8.00	3.95	Clay	NE	NE	-	-				
49974	10	Bore	373837.0	6368687.0	7.00	2.55	Silty Clay	NE	NE	-	-				
49974	11	Bore	373656.0	6368657.0	6.00	3.70	Siltstone	NE	1.6	-	4.40				
49974	12	Bore	373470.0	6368619.0	13.00	3.73	Siltstone	NE	2.7	-	10.30				
49974	13	Bore	373281.0	6368590.0	19.00	3.88	Siltstone	NE	2.8	-	16.20				
49974	3A	Bore	375094.0	6368598.0	1.50	4.00	Sandstone	NE	1.8	-	-0.30				
81382	407A	Bore	378884.0	6369517.0	1.10	41.60	Sandstone	0.6	13.4	0.50	-12.30				
81382	408A	Bore	379176.0	6369309.0	0.80	17.72	Siltstone	NE	9.4	-	-8.60				
81382	CPT407	CPT	378884.0	6369518.0	1.01	13.36	Clay	1	NE	0.01	-				

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81382	CPT408	CPT	379171.0	6369301.0	0.78	8.48	Overconsolidated Clay / Cemented Sand	0.25	NE	0.53	-				
81382	CPT409	CPT	379351.0	6369196.0	2.58	8.22	Clay	0.8	NE	1.78	-				
81382	CPT416	CPT	379068.0	6369402.0	0.70	10.10	Cemented Sand / Clayey Sand	NE	NE	-	-				
81382.01	501	Bore	378793.0	6369581.0	-2.50	46.20	Laminite	NE	28.5	-	-31.00				
81382.01	502	Bore	378815.0	6369555.0	-6.10	41.10	Laminite	NE	15.5	-	-21.60				
81498	DP1	Bore	379423.0	6368974.0	2.76	5.00	Sand	0.5	NE	2.26	-				
81499	DP2	Bore	380580.0	6368997.0	4.90	5.00	Sand	NE	NE	-	-				
81500	DP3	Bore	381617.0	6368433.0	7.85	5.00	Sand	NE	NE	-	-				
81501	DP7	Bore	381911.0	6367434.0	4.01	5.00	Sand	NE	NE	-	-				
81502	DP8	Bore	379704.0	6368509.0	3.07	5.00	Sand	0.2	NE	2.87	-				
81503	DP9	Bore	380256.0	6368621.0	2.45	4.45	Sandstone	NE	2	-	0.45				
81641.00	D-TP-102	Pit	372193.5	6367832.7	18.94	3	Siltstone	1.3	2.2	17.64	16.74	-	-	No	-
81641.00	D-TP-103	Pit	372299.8	6367882.9	14.14	3.1	Clay	NE	NE	-	-	-	-	No	-
81641.00	D-TP-104	Pit	372310.0	6368041.6	13.76	2.5	Siltstone	NE	1.4	-	12.36	-	-	No	-
81641.00	D-TP-105	Pit	372280.0	6368347.0	11.79	2.8	Silty Clay	0.8	NE	10.99	-	-	-	No	-
81641.00	D-BH-106	Bore	372382.6	6368011.2	16.43	10	Siltstone	0.3	6.2	16.13	10.23	3.98	12.45	No	-
81641.00	D-BH-108	Bore	372393.8	6368171.4	15.29	25	Sandstone	NE	5.5	-	9.79	3.85	11.44	No	-
81641.00	D-BH-109	Bore	372331.7	6368327.2	10.62	10	Sandstone	0.3	5.2	10.32	5.42	2.76	7.86	No	-
81641.00	D-BH-110	Bore	372608.6	6368334.9	22.54	15.04	Siltstone	NE	2.25	-	20.29	7.60	14.94	No	-
81641.00	D-BH-112	Bore	372884.3	6368448.9	17.97	12.2	Sandstone	NE	1.2	-	16.77	-	-	No	-
81641.00	D-BH-115	Bore	373186.3	6368546.8	21.28	13.96	Sandstone	0.4	2.3	20.88	18.98	13.00	8.28	No	-
81641.00	D-BH-116	Bore	373386.0	6368527.9	15.94	15	Claystone	1	4	14.94	11.94	7.70	8.24	No	-
81641.00	D-BH-117	Bore	373490.0	6368536.3	12.61	3.05	Siltstone	0.6	2.97	12.01	9.64	-	-	No	-
81641.00	D-BH-119	Bore	373624.7	6368578.9	8.28	15.16	Siltstone	0.4	4	7.88	4.28	4.07	4.21	No	-
81641.00	D-BH-120	Bore	373709.2	6368573.5	7.19	2.75	Siltstone	0.4	2.7	6.79	4.49	-	-	No	-
81641.00	D-BH-121	Bore	373851.9	6368590.0	4.25	31.38	Siltstone	0.4	2.2	3.85	2.05	0.00	4.25	No	-
81641.00	D-BH-122	Bore	373962.8	6368587.3	4.97	29.98	Siltstone	0.4	9	4.57	-4.03	1.10	3.87	No	-
81641.00	D-BH-123	Bore	374194.4	6368574.6	7.38	3.00	Sand	0.6	NE	6.78	-	-	-	No	-
81641.00	D-TP-127	Pit	372257.7	6368087.0	14.37	3.00	Siltstone	0.4	1.8	13.97	12.57	-	-	No	-
81641.00	D-TP-128	Pit	372264.0	6368215.0	12.35	3.00	Siltstone	NE	1.9	-	10.45	-	-	No	-
81641.00	D-TP-129	Pit	372481.7	6368240.4	17.51	3.10	Clay	NE	NE	-	-	-	-	No	-
81641.00	D-BH-130	Bore	373840.0	6368734.0	7.30	3.00	Silty Clay	0.4	NE	6.90	-	-	-	No	-
81641.00	D-TP-131	Pit	373522.5	6368871.3	14.10	2.55	Sandstone	1.4	2.4	12.70	11.70	-	-	No	-
81641.00	D-TP-132	Pit	373174.2	6368920.2	17.00	3.00	Siltstone	0.45	0.45	16.55	16.55	-	-	No	-
81641.00	D-TP-133	Pit	373278.1	6369140.2	13.79	3.00	Siltstone	0.4	0.55	13.39	13.24	-	-	No	
81641.00	D-PZ-134	Bore	372643.4	6368469.9	22.48	24.80	Sandstone	NE	1.2	-	21.28	13.12	9.36	Yes	11.8 - 17.8
81641.00	D-PZ-135	Bore	372854.7	6368497.6	16.05	20.50	Sandstone	0.55	2.4	15.50	13.65	6.84	9.21	Yes	6.1 - 12.1
81641.00	D-PZ-136	Bore	373181.3	6368558.2	21.44	25.00	Sandstone	NE	3.3	-	18.14	14.86	6.58	Yes	12.0 - 18.0
81641.00	D-BH-201	Bore	374383.7	6368541.1	1.88	7.23	Claystone	NE	2.6	-	-0.72	0.84	1.04	No	-
81641.00	D-CT-203	CPT	374487.3	6368522.8	1.36	8.78	Silty Clay (probable bedrock)	NE	8.78	-	-7.42	-	-	No	-
81641.00	D-TP-203	Pit	374487.4	6368522.6	1.37	3.00	Clay	0.2	NE	1.17	-	-	-	No	-
81641.00	D-BH-204	Bore	374742.8	6368636.6	1.26	22.40	Carbonaceous siltstone	NE	4	-	-2.74	-	-	No	-
81641.00	D-BH-205	Bore	374814.5	6368618.2	0.99	23.27	Sandstone	NE	1.6	-	-0.61	0.05	0.94	No	-
81641.00	D-BH-206	Bore	374559.3	6368531.1	1.07	11.64	Sandstone	NE	8.6	-	-7.53	0.00	1.07	No	-
81641.00	D-BH-207	Bore	374830.5	6368565.1	0.71	22.25	Carbonaceous siltstone	NE	3.2	-	-2.49	0.34	0.37	No	-
81641.00	D-CT-208	CPT	374661.5	6368520.1	0.78	11.12	Clay / Clayey Sand (probable bedrock)	NE	11.12	-	-10.34	-	-	No	-
81641.00	D-TP-208	Pit	374661.4	6368519.8	0.75	0.90	Clay	NE	NE	-	-	-	-	No	-
81641.00	D-TP-209	Pit	374706.9	6368602.8	1.17	2.45	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-BH-211	Bore	374762.5	6368536.5	1.00	11.23	Carbonaceous siltstone	0.7	8.3	0.30	-7.30	0.00	1.00	No	-
81641.00	D-BH-212	Bore	374920.2	6368494.9	0.61	20.97	Siltstone	NE	2.4	-	-1.79	0.85	-0.24	No	-
81641.00	D-CT-213	CPT	374875.8	6368521.4	0.62	4.60	Sandy clay / Clayey sand (probable weathered rock)	NE	4.6	-	-3.98	-	-	No	-
81641.00	D-TP-213	Pit	374875.9	6368521.4	0.63	1.40	Clay	NE	NE	-	-	-	-	No	-
81641.00	D-TP-214	Pit	374997.4	6368557.3	0.83	2.50	Sandstone	NE	1.9	-	-1.07	-	-	No	-
81641.00	D-CT-215	CPT	375161.0	6368570.2	0.89	4.64	Clayey sand (probable bedrock)	NE	4.64	-	-3.75	-	-	No	-
81641.00	D-CT-216	CPT	375071.1	6368458.8	0.68	5.24	Cemented sand / clayey sand (probable bedrock)	NE	5.24	-	-4.56	-	-	No	-
81641.00	D-BH-217	Bore	375210.8	6368506.4	0.83	6.07	Siltstone	NE	2.3	-	-1.47	1.49	-0.66	No	-
81641.00	D-CT-218	CPT	375326.4	6368591.2	1.88	0.12	Filling	NE	NE	-	-	-	-	No	-
81641.00	D-BH-219	Bore	375444.0	6368654.9	0.60	6.10	Sandstone	NE	2.8	-	-2.20	4.55	-3.95	No	-
81641.00	D-CT-220	CPT	375525.4	6368689.6	0.51	4.00	Clayey sand (probable bedrock)	NE	4	-	-3.49	-	-	No	-
81641.00	D-PZ-221B	Bore	374771.9	6368470.4	0.60	15.48	Siltstone	NE	8.5	-	-7.90	-0.30	0.90	Yes	11.5 - 14.5
81641.00	D-PZ-222A	Bore	374908.7	6368426.6	0.77	2.70	Clay	NE	NE	-		0.18	0.59	Yes	0.5 - 2.7
81641.00	D-PZ-222B	Bore	374909.0	6368425.1	0.80	15.15	Sandstone	NE	2.7	-	-1.90	0.08	0.72	Yes	9.5 - 12.5
81641.00	D-PZ-223A	Bore	375478.5	6368560.8	0.71	5.00	Clay	NE	5.2	-	-4.49	-0.08	0.79	Yes	2.0 - 5.0

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.00	D-PZ-223B	Bore	375478.5	6368560.8	0.71	15.37	Sandstone	NE	5.2	-	-4.49	0.42	0.29	Yes	7.0 - 13.0
81641.00	D-BH-301	Bore	375608.1	6368694.9	0.98	21.12	Sandstone	0.6	7.5	0.38	-6.52	1.79	-0.81	No	-
81641.00	D-BH-303	Bore	375815.4	6368808.2	0.79	18.15	Laminite	NE	4.95	-	-4.16	-	-	No	-
81641.00	D-CT-304	CPT	375920.9	6368845.5	0.87	2.72	Silty sand / Gravelly sand (probable bedrock)	NE	2.72	-	-1.85	-	-	No	-
81641.00	D-BH-305	Bore	376039.4	6368873.0	1.11	18.18	Siltstone	NE	5.1	-	-3.99	-	-	No	-
81641.00	D-CT-306	CPT	376136.4	6368894.8	0.43	19.32	Clay (probable bedrock)	NE	19.2	-	-18.77	-	-	No	-
81641.00	D-BH-322	Bore	378037.3	6368633.1	3.09	22.58	Sandstone	0.2	5.8	2.89	-2.71	3.02	0.07	No	-
81641.00	D-BH-323	Bore	378132.0	6368649.8	2.75	9.25	Claystone	0.4	4.2	2.35	-1.45	-	-	No	-
81641.00	D-PZ-324A	Bore	378085.6	6368698.0	1.89	10.45	Clay / Sandstone	0.3	2.4	1.59	-0.51	0.59	1.30	Yes	1.0 - 2.5
81641.00	D-PZ-324B	Bore	378085.6	6368698.0	1.89	10.45	Sandstone	0.3	2.4	1.59	-0.51	0.73	1.16	Yes	6.0 - 9.0
81641.00	D-BH-401	Bore	378348.3	6368713.2	6.46	6.10	Sandstone	NE	2.85	-	3.61	4.21	2.25	No	-
81641.00	D-CT-402	CPT	378265.7	6368674.4	3.76	7.36	Cemented Sand / Clayey Sand (probable bedrock)	NE	7.36	-	-3.60	-	-	No	-
81641.00	D-BH-403	Bore	378451.5	6368754.6	8.74	5.48	Sandstone	NE	1.5	-	7.24	-	-	No	-
81641.00	D-BH-404	Bore	378534.7	6368761.4	9.86	14.82	Sandstone laminite	NE	0.6	-	9.26	6.27	3.59	No	-
81641.00	D-BH-405	Bore	378625.8	6368732.0	11.26	16.14	Sandstone	NE	0.9	-	10.36	5.10	6.16	No	-
81641.00	D-BH-406	Bore	378460.9	6368712.4	8.36	4.27	Sandstone	NE	1.2	-	7.16	-	-	No	-
81641.00	D-BH-407	Bore	378678.8	6368692.0	12.96	22.00	Sandstone	0.1	2.5	12.86	10.46	6.59	6.37	No	-
81641.00	D-BH-408	Bore	378481.2	6368580.1	4.42	17.76	Sandstone	NE	3.2	-	1.22	1.01	3.41	No	-
81641.00	D-BH-409	Bore	378609.4	6368570.9	7.60	3.00	Silty Clay	0.6	NE	7.00	-	-	-	No	-
81641.00	D-BH-410	Bore	378731.8	6368586.8	11.18	7.49	Siltstone	0.3	4	10.88	7.18	4.25	6.93	No	-
81641.00	D-TP-412	Pit	379149.7	6368356.6	9.62	2.80	Sandstone	0.45	1.8	9.17	7.82	-	-	No	-
81641.00	D-TP-414	Pit	379210.0	6368461.0	11.52	2.55	Sandstone	0.3	0.9	11.22	10.62	-	-	No	-
81641.00	D-BH-415	Bore	379316.2	6368190.0	12.38	5.10	Sandstone / Siltstone	NE	1.1	-	11.28	4.78	7.60	No	-
81641.00	D-TP-416	Pit	379295.7	6367853.9	16.37	2.10	Sandstone / Siltstone	NE	0.9	-	15.47	-	-	No	-
81641.00	D-BH-417	Bore	379246.0	6367550.0	7.85	5.00	Sandstone	0.3	3.2	7.55	4.65	0.53	7.32	No	-
81641.00	D-TP-418	Pit	379235.8	6367350.7	7.51	1.90	Siltstone	0.3	1.9	7.21	5.61	-	-	No	-
81641.00	D-TP-419	Pit	379167.7	6367141.6	6.88	3.00	Sandstone	NE	2.7	-	4.18	-	-	No	-
81641.00	D-BH-420	Bore	378409.8	6368602.5	4.13	23.50	Sandstone	NE	5.8	-	-1.67	1.19	2.94	No	-
81641.00	D-BH-421	Bore	378663.3	6368796.8	2.55	1.35	Sandstone	1	1.2	1.55	1.35	-	-	No	-
81641.00	D-BH-422	Bore	378814.8	6368839.6	7.77	6.78	Sandstone	NE	0.75	-	7.02	-	-	No	-
81641.00	D-CT-423	CPT	379077.9	6369062.8	1.50	0.64	Gravelly sand (probable bedrock)	NE	0.56	-	0.94	-	-	No	-
81641.00	D-TP-423	Pit	379077.9	6369062.8	1.50	1.05	Sandstone	NE	0.35	-	1.15	-	-	No	-
81641.00	D-TP-425	Pit	379265.1	6369320.8	1.01	2.30	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-CT-426	CPT	379382.7	6369605.0	0.83	27.11	Sand (probable bedrock)	NE	27.11	-	-26.28	-	-	No	-
81641.00	D-BH-427	Bore	379383.0	6369703.9	0.52	59.92	Sandstone	NE	55.1	-	-54.58	0.41	0.11	No	-
81641.00	D-BH-428	Bore	379503.2	6369742.2	1.20	59.78	Sandstone	NE	53.1	-	-51.90	1.12	0.08	No	-
81641.00	D-CT-429	CPT	379462.9	6369865.1	0.88	21.58	Sand (probable bedrock)	NE	21.58	-	-20.70	-	-	No	-
81641.00	D-TP-429	Pit	379462.5	6369862.4	0.55	1.60	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-BH-430	Bore	379629.1	6369987.5	1.47	29.95	Sand	NE	>29.95	-	-	0.94	0.53	No	-
81641.00	D-BH-431	Bore	379393.0	6369509.0	1.23	17.87	Sandstone	NE	9.4	-	-8.17	0.63	0.60	No	-
81641.00	D-TP-432	Pit	379794.9	6370100.8	3.46	2.60	Sand	0.8	NE	2.66	-	-	-	No	-
81641.00	D-BH-433	Bore	379618.3	6369885.6	1.68	65.92	Laminite	NE	58.95	-	-57.27	0.94	0.74	No	-
81641.00	D-TP-434	Pit	379848.1	6370172.2	3.60	3.00	Sandy clay	1.7	NE	1.90	-	-	-	No	-
81641.00	D-CT-435	CPT	378266.0	6368620.4	4.19	9.72	Clayey sand (probable bedrock)	NE	9.72	-	-5.53	-	-	No	-
81641.00	D-BH-436	Bore	378764.2	6368639.2	13.65	24.90	Sandstone	NE	4.6	-	9.05	-	-	No	-
81641.00	D-TP-437	Pit	379939.2	6370279.2	6.69	2.60	Sand	0.4	NE	6.29	-	-	-	No	-
81641.00	D-PZ-438	CPT	378542.6	6368610.4	6.93	10.14	Carbonaceous Siltstone	NE	2.2	-	4.73	1.70	5.23	Yes	7.0 - 10.0
81641.00	D-PZ-439A	Bore	379347.9	6369742.6	0.55	3.00	Clayey Silt	NE	NE	-		0.45	0.10	Yes	2.0 - 3.0
81641.00	D-PZ-439B	Bore	379348.4	6369741.8	0.60	10.00	Silty clay	NE	NE	-	-	0.39	0.21	Yes	4.0 - 10.0
81641.00	D-PZ-440A	Bore	379575.2	6370012.6	1.00	3.00	Clayey Sand	NE	NE	-	-	0.55	0.45	Yes	0.5 -3.0
81641.00	D-PZ-440B	Bore	379575.5	6370011.5	1.04	10.00	Sandy clay	NE	NE	-	-	0.34	0.70	Yes	5.0 - 8.0
81641.00	D-BH-501	Bore	380187.8	6370484.8	6.67	15.00	Sand	NE	NE	-	-	5.74	0.93	No	-
81641.00	D-TP-503	Pit	380682.8	6370817.5	7.97	1.70	Sand	0.25	NE	7.72	-	-	-	No	-
81641.00	D-TP-504	Pit	381108.9	6371057.3	7.07	2.10	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-BH-505	Bore	381573.7	6371135.7	3.49	12.00	Sand	NE	NE	-	-	1.62	1.87	No	-
81641.00	D-TP-506	Pit	381795.8	6371118.4	3.57	1.70	Sand	0.1	NE	3.47	-	-	-	No	-
81641.00	D-BH-507	Bore	382140.5	6371086.2	4.15	12.00	Sand	NE	NE	-	-	2.40	1.75	No	-
81641.00	D-TP-510	Pit	382245.8	6371420.7	4.28	2.20	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-CT-511	CPT	382321.2	6371271.9	7.96	15.00	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-BH-512	Bore	382485.9	6371145.9	3.62	57.20	Gravel	NE	>57.2	-	-	2.07	1.55	No	-
81641.00	D-CT-513	CPT	382585.3	6371099.2	3.50	15.00	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-TP-514	Pit	382749.3	6371036.4	3.24	2.30	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-TP-517	Pit	382766.8	6371392.4	2.06	1.50	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-BH-518	Bore	382766.8	6371392.3	2.07	15.10	Sand	NE	NE	-	-	0.62	1.45	No	-

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.00	D-BH-519	Bore	382912.4	6371674.6	4.42	20.00	Sand	0.2	NE	4.22	-	-	-	No	-
81641.00	D-BH-520	Bore	382965.8	6371801.2	5.66	20.00	Sand	0.8	NE	4.86	-	-	-	No	-
81641.00	D-BH-601	Bore	383035.2	6372133.4	3.49	68.00	Siltstone	1.5	67.2	1.99	-63.71	2.30	1.19	No	-
81641.00	D-BH-604	Bore	383177.5	6372448.9	3.85	59.00	Gravel	NE	>59	-	-	2.80	1.05	No	-
81641.00	D-BH-605	Bore	383233.6	6372544.2	3.21	25.00	Sand	NE	NE	-	-	2.25	0.96	No	-
81641.00	D-BH-607	Bore	383280.0	6372650.8	3.25	53.50	Gravel	NE	>53.5	-	-	-	-	No	-
81641.00	D-CT-608	CPT	383350.6	6372664.1	3.74	48.62	Sand and Gravel	NE	>48.62	-	-	-	-	No	-
81641.00	D-TP-609	Pit	383397.0	6372763.8	2.24	2.10	Sand	0.2	NE	2.04	-	-	-	No	-
81641.00	D-TP-610	Pit	383471.4	6372727.1	3.01	2.80	Sand	1.5	NE	1.51	-	-	-	No	-
81641.00	D-TP-611	Pit	383575.3	6372900.5	1.53	2.00	Sand	NE	NE	-	-	-	-	No	-
81641.00	D-TP-612	Pit	383656.8	6373062.2	4.66	3.00	Filling: gravelly sand	>3.0	NE	-	-	-	-	No	-
81641.00	D-TP-613	Pit	383780.0	6373191.9	4.20	3.00	Sand	2.7	NE	1.50	-	-	-	No	-
81641.00	D-PZ-614	Bore	382955.2	6372018.2	3.63	10.45	Sand	NE	NE	-	-	1.83	1.80	Yes	3.5 - 5.0
81641.00	D-PZ-615A	Bore	383108.6	6372473.4	3.56	4	Sand	NE	NE	-	-	1.95	1.61	Yes	2.5 - 4.0
81641.00	D-PZ-615B	Bore	383109.2	6372474.8	3.54	10	Sand	NE	NE	-	-	1.93	1.61	Yes	5.0 - 8.0
81641.00	D-PZ-616	Bore	383271.4	6372687.3	2.14	10.45	Sand	2	NE	0.14	-	-	-	Yes, Piezo de	7.0 - 10.0
Coffey (2007)	BH101	Bore	372653.4	6368405.8	22.92	15.47	Coal	NE	2.00	-	20.92	11.30	11.62	No	-
Coffey (2007)	BH102	Bore	373252.5	6368474.3	20.56	15.41	Sandstone	NE	2.60	-	17.96	11.10	9.46	No	-
Coffey (2007)	BH103	Bore	375115.3	6368158.8	0.77	14.25	Siltstone	NE	11.15	-	-10.38	0.50	0.27	No	-
Coffey (2007)	BH104	Bore	376103.1	6367912.5	0.15	65.70	Sandstone	NE	65.65	-	-65.50	0.10	0.05	No	-
Coffey (2007)	BH105	Bore	376333.7	6367854.5	1.37	19.00	Sandstone	NE	12.25	-	-10.88	1.70	-0.33	No	-
Coffey (2007)	BH106	Bore	376553.9	6367819.6	3.53	36.44	Sandstone	3.00	32.55	0.53	-29.02	1.80	1.73	No	-
Coffey (2007)	BH107	Bore	376618.2	6367906.4	3.30	30.45	Sandstone	3.20	25.65	0.10	-22.35	3.20	0.10	No	-
Coffey (2007)	BH108	Bore	376721.9	6367825.2	-8.33	27.43	Mudstone	NE	22.60	-	-30.93	-	-	No	-
Coffey (2007)	BH109	Bore	376796.0	6367822.0	-2.16	30.10	Mudstone	NE	26.85	-	-29.01	-	-	No	-
Coffey (2007)	BH110	Bore	376831.2	6367832.0	-1.79	31.62	Mudstone	NE	28.20	-	-29.99	-	-	No	-
Coffey (2007)	BH113	Bore	377398.7	6367998.8	1.36	25.00	Mudstone	0.50	20.50	0.86	-19.14	0.75	0.61	No	-
Coffey (2007)	BH114	Bore	377725.1	6368186.2	1.49	13.85	Sandstone	0.80	10.80	0.69	-9.31	0.40	1.09	No	-
Coffey (2007)	BH115	Bore	382369.1	6371191.6	10.28	20.75	Sand	NE	NE	-	-	7.00	3.28	No	-
Coffey (2007)	BH116	Bore	379296.7	6369428.4	1.05	11.61	Shale	NE	4.80	-	-3.75	11.20	-10.15	No	-
Coffey (2007)	BH117	Bore	379590.3	6369910.9	2.00	60.45	Sandstone	NE	58.45	-	-56.45	1.50	0.50	No	-
Coffey (2007)	BH118	Bore	379991.2	6370274.8	5.22	49.25	Sandstone	NE	49.05	-	-43.83	3.50	1.72	No	-
Coffey (2007)	BH119	Bore	381095.8	6371081.7	7.64	53.15	Gravel	NE	NE	-	-	4.50	3.14	No	-
Coffey (2007)	BH120	Bore	382447.3	6371238.6	2.99	20.40	Sand	NE	NE	-	-	0.40	2.59	No	-
Coffey (2007)	BH121	Bore	382969.5	6372153.1	3.76	57.70	Sandy Gravel	NE	NE	-	-	0.70	3.06	No	-
Coffey (2007)	BH122	Bore	383134.8	6372503.2	3.18	20.55	Sand	NE	NE	-	-	1.10	2.08	No	-
Coffey (2007)	CPTu101	CPT	373919.0	6368250.0	1.84	4.04	Clay and Cemented Sand / Clayey Sand	NE	NE	-	-	0.50	1.34	No	-
Coffey (2007)	CPTu102	CPT	374881.7	6368180.8	0.33	9.06	Clay	NE	NE	-	-	0.00	0.33	No	-
Coffey (2007)	CPTu103	CPT	375325.6	6368131.6	0.42	7.07	Clay	NE	NE	-	-	0.50	-0.08	No	-
Coffey (2007)	CPTu104	CPT	375767.6	6368029.2	0.38	16.93	Clay and Silty Clay	NE	NE	-	-	0.10	0.28	No	-
Coffey (2007)	CPTu105	CPT	376342.3	6367853.0	1.24	12.02	Organic Clay / Peat	NE	NE	-	-	1.65	-0.41	No	-
Coffey (2007)	CPTu106	CPT	377396.2	6367996.9	1.35	9.91	Sand	NE	NE	-	-	0.70	0.65	No	-
Coffey (2007)	CPTu108	CPT	379169.1	6369186.3	0.90	8.70	Clay / Silty Clay	NE	NE	-	-	0.10	0.80	No	-
Coffey (2007)	CPTu109	CPT	379931.1	6370225.3	2.70	20.84	Sand	NE	NE	-	-	3.50	-0.80	No	-
Coffey (2007)	CPTu110	CPT	380422.5	6370678.9	8.30	6.37	Sand	NE	NE	-	-	4.50	3.80	No	-
Coffey (2007)	CPTu111	CPT	381507.9	6371134.8	4.19	18.37	Sand	NE	NE	-	-	7.00	-2.81	No	-
Coffey (2007)	CPTu112	CPT	381976.3	6371094.0	6.03	16.66	Sand	NE	NE	-	-	2.00	4.03	No	-
Coffey (2007)	CPTu113	CPT	382583.3	6371272.3	2.60	18.91	Sand	NE	NE	-	-	2.00	0.60	No	-
Coffey (2007)	CPTu114	CPT	382818.6	6371546.1	4.15	17.62	Sand	NE	NE	-	-	0.50	3.65	No	-
Coffey (2007)	CPTu115	CPT	382918.1	6371931.0	3.54	8.46	Sand	NE	NE	-	-	2.00	1.54	No	-
Coffey (2007)	CPTu116	CPT	383255.4	6372641.5	3.28	9.98	Sand	NE	NE	-	-	1.20	2.08	No	-
Coffey (2007)	CPTu117	CPT	379449.8	6369658.6	0.99	17.70	Clay	NE	NE	-	-	1.00	-0.01	No	-
Coffey (2007)	CPTu118	CPT	377885.4	6368277.1	1.36	6.22	Cemented Sand / Weathered bedrock?	NE	6.20	-	-4.84	0.70	0.66	No	-
Coffey (2007)	CPTu119	CPT	378045.2	6368394.7	2.63	20.51	Clay	NE	NE	-	-	1.90	0.73	No	-
Coffey (2007)	TP101	Pit	372525.2	6368115.1	21.60	1.20	Clayey Sand	NE	NE	-	-	-	-	No	-
Coffey (2007)	TP102	Pit	372546.1	6368328.4	19.65	1.00	Sandstone	NE	0.90	-	18.75	-	-	No	-
Coffey (2007)	TP103	Pit	372850.2	6368475.2	16.42	1.00	Tuff	NE	0.90	-	15.52	-	-	No	-
Coffey (2007)	TP104	Pit	378361.0	6368656.7	4.69	2.50	Sandstone	NE	2.30	-	2.39	-	-	No	-
Coffey (2007)	TP105	Pit	378652.4	6368805.7	2.16	1.10	Sandstone	NE	0.90	-	1.26	-	-	No	-
Coffey (2007)	TP106	Pit	378901.1	6368939.0	1.73	1.50	Sandstone	NE	0.70	-	1.03	-	-	No	-
Coffey (2007)	TP107	Pit	380432.4	6370677.9	8.22	1.60	Indurated Sand	NE	NE	-	-	-	-	No	-
Coffey (2007)	TP108	Pit	380855.8	6370940.5	7.82	2.50	Sand	NE	NE	-	-	-	-	No	-
Coffey (2007)	TP109	Pit	382446.8	6371248.5	2.73	1.90	Sand	NE	NE	-	-	1.90	0.83	No	-
GHD (2005/2006)	B1-T43B	Bore	373323.3	6367861.7	2.00	10.02	Claystone	NE	4.60	-	-2.60		2.00		

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

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M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
GHD (2005/2006)	B1-T44B	Bore	373657.6	6367944.5	2.00	8.55	Claystone	NE	2.95	-	-0.95		2.00		
GHD (2005/2006)	B1-T45B	Bore	374058.5	6368057.8	2.00	16.07	Core Loss (Claystone?)	NE	11.12	-	-9.12		2.00		
GHD (2005/2006)	B1-T46B	Bore	374395.4	6368121.3	2.00	10.08	Claystone	NE	4.11	-	-2.11		2.00		
GHD (2005/2006)	B1-T47B	Bore	374754.3	6368209.6	2.00	13.90	Core Loss (Siltstone?)	NE	5.40	-	-3.40		2.00		
GHD (2005/2006)	B1-T48B	Bore	375082.9	6368300.7	2.00	12.40	Claystone	NE	3.50	-	-1.50		2.00		
GHD (2005/2006)	B1-T49B	Bore	375448.3	6368391.7	2.00	14.45	Claystone	NE	6.10	-	-4.10		2.00		
GHD (2005/2006)	B1-T50B	Bore	375741.8	6368468.2	2.00	14.54	Sandstone	NE	6.40	-	-4.40		2.00		
GHD (2005/2006)	B1-T51	Bore	375992.1	6368531.1	2.00	22.10	Core Loss (Claystone?)	NE	14.80	-	-12.80		2.00		
GHD (2005/2006)	B1-T52	Bore	376166.0	6368623.5	2.00	16.10	Core Loss (Claystone?)	NE	9.50	-	-7.50	1.82	0.18		
GHD (2005/2006)	B1-T53B	Bore	376427.5	6368751.7	2.00	47.10	Shale	NE	40.00	-	-38.00	-	-		
GHD (2005/2006)	B1-T54B	Bore	376709.8	6368889.0	2.00	32.60	Sandstone	NE	26.45	-	-24.45	-	-		
GHD (2005/2006)	B1-T55B	Bore	377038.9	6369054.6	2.00	41.69	Siltstone	NE	38.27	-	-36.27	-	-		
GHD (2005/2006)	B1-T57/56B	Bore	377367.6	6369209.3	2.00	35.60	Claystone	NE	29.10	-	-27.10	-	-		
GHD (2005/2006)	B1-T57B	Bore	377698.9	6369366.0	2.00	37.06	Siltstone	NE	32.20	-	-30.20	-	-		
GHD (2005/2006)	B1-T58	Bore	378011.9	6369507.6	2.00	33.05	Siltstone	NE	28.48	-	-26.48	-	-		
GHD (2005/2006)	B1-T61	Bore	378225.9	6369605.8	2.00	45.70	Sandstone	NE	44.00	-	-42.00	-	-		
GHD (2005/2006)	B1-T62	Bore	378451.7	6369452.7	2.00	40.31	Silty Clay	NE	NE	-	-	-	-		
GHD (2005/2006)	B1-T63	Bore	378685.2	6369254.7	2.00	36.94	Carbonaceous Siltstone	NE	33.05	-	-31.05	-	-		
GHD (2005/2006)	B1-T64	Bore	378988.1	6369036.9	2.00	11.55	Claystone	NE	1.8	-	0.20	-	-		
GHD (2005/2006)	B3-BH2	Bore	382977.9	6372549.9	1.06	9.40	Sand	NE	NE	-	-	-	-		
GHD (2005/2006)	B3-W1	Bore	383015.2	6372599.6	1.50	25.45	Sand	NE	NE	-	-	-	-		
GHD (2005/2006)	B3-WC3	Bore	382891.0	6372563.3	1.10	15.75	Sand	NE	NE	-	-	-	-		
GHD (2005/2006)	B3-WC4	Bore	382812.7	6372534.7	1.10	15.20	Sand	NE	NE	-	-	-	-		
GHD (2005/2006)	B5-BH2	Bore	376747.7	6367311.4	1.50	31.20	Siltstone	0.60	29.60	0.90	-28.10	-	-		
GHD (2005/2006)	B5-H0/P3	Bore	376835.9	6367450.4	1.50	38.90	Siltstone	NE	32.50	-	-31.00	-	-		
GHD (2005/2006)	B5-HB1	Bore	376897.5	6367524.5	-6.90	29.80	Sandstone	NE	24.00	-	-30.90	-	-		
GHD (2005/2006)	B5-HB2	Bore	376916.1	6367546.9	-6.70	25.60	Sandstone	NE	23.60	-	-30.30	-	-		
GHD (2005/2006)	B5-HB3	Bore	376937.6	6367571.3	-5.00	34.10	Sandstone	NE	27.00	-	-32.00	-	-		
GHD (2005/2006)	B5-HB7	Bore	377033.4	6367685.1	1.30	35.60	Sandstone	NE	26.50	-	-25.20	-	-		
GHD (2005/2006)	B5-HB8	Bore	377059.9	6367715.6	1.30	55.60	Sandstone	0.60	24.20	0.70	-22.90	-	-		
GHD (2005/2006)	B5-HB9	Bore	377091.2	6367748.2	1.30	29.90	Siltstone	0.60	23.90	0.70	-22.60	-	-		
GHD (2005/2006)	B5-HR4	Bore	376765.9	6367609.0	2.90	34.60	Sandstone	1.80	30.30	1.10	-27.40	-	-		
GHD (2005/2006)	B9-BL502	Bore	380131.7	6370137.8	5.70	37.50	Sandstone	NE	36.00	-	-30.30	-	-		
GHD (2005/2006)	BH01	Bore	372774.0	6368228.0	23.92	18.00	Shale	NE	0.85	-	23.07	-	-	Yes	14.0 - 17.0
GHD (2005/2006)	BH02	Bore	373674.0	6368247.0	10.84	9.00	Shale	NE	4.60	-	6.24	-	-	Yes	3.0 - 9.0
GHD (2005/2006)	BH03	Bore	375575.0	6368704.0	0.59	10.37	Sandstone	NE	5.90	-	-5.31	-	-	No	-
GHD (2005/2006)	BH04	Bore	376030.0	6368875.0	1.11	10.50	Sandstone	NE	5.87	-	-4.76	-	-	No	-
GHD (2005/2006)	BH05	Bore	377472.0	6370159.0	1.45	34.50	Sandstone / Shale	NE	30.70	-	-29.25	-	-	Yes	0.50 - 3.0
GHD (2005/2006)	BH06	Bore	378240.0	6370367.0	0.97	40.30	Sandstone	NE	37.30	-	-36.33	-	-	Yes	0.50 - 3.0
GHD (2005/2006)	BH07	Bore	378713.0	6370566.0	1.00	59.55	Sandstone	NE	56.55	-	-55.55	-	-	Yes	0.50 - 3.0
GHD (2005/2006)	BH08	Bore	379815.0	6370586.0	0.99	10.85	Sand	NE	NE	-	-	-	-	Yes	14.0 - 17.0
GHD (2005/2006)	BH09	Bore	379534.0	6370711.0	0.59	22.45	Sand	1.10	NE	-0.51	-	-	-	Yes	14.0 - 17.0
GHD (2005/2006)	BH10	Bore	379030.0	6370905.0	0.90	24.45	Clayey Sand	0.70	NE	0.20	-	-	-	No	-
GHD (2005/2006)	BH11	Bore	380175.0	6371783.0	0.56	49.55	Sandstone	1.00	46.20	-0.44	-45.64	-	-	No	-
GHD (2005/2006)	BH12	Bore	380599.0	6371515.0	2.68	24.00	Sand	NE	NE	-	-	-	-	Yes	0.5 - 3.0
GHD (2005/2006)	BH13	Bore	375501.0	6368012.0	1.00	9.90	Sandstone	NE	6.10	-	-5.10	-	-	Yes	0.5 - 3.0
GHD (2005/2006)	CPTu1	CPT	374503.3	6368395.5	1.8	2.72	Clay	NE	NE	-	-	1.00	0.80	No	-
GHD (2005/2006)	CPTu2	CPT	375334.6	6368761.1	1.2	3.31	Gravelly Sand / Clay	NE	NE	-	-	1.00	0.20	No	-
GHD (2005/2006)	CPTu3	CPT	376191.6	6368987.0	1.5	39.21	Clay	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu4	CPT	376764.5	6369904.6	1.5	14.90	Silty Clay / Silty Sand	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu5	CPT	377891.6	6370498.4	1.5	18.44	Sand / Silty Sand	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu6	CPT	378716.0	6370586.9	1.5	18.38	Silty Sand / Sandy Silt	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu7	CPT	379542.7	6371496.3	1.5	20.16	Silty Sand / Sandy Silt	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu8	CPT	379985.1	6371002.6	1.5	15.79	Silty Clay / Silty Sand	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	CPTu9	CPT	380935.2	6372118.0	1.5	11.57	Silty Sand / Sandy Silt	NE	NE	-	-	1.00	0.50	No	-
GHD (2005/2006)	TP01	Pit	372209.0	6367601.0	18.75	1.50	Clay	1.30	NE	17.45	-	-	-	No	-
GHD (2005/2006)	TP02	Pit	372707.0	6368089.0	26.89	2.00	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP03	Pit	373121.0	6367880.0	12.41	0.90	Siltstone	NE	0.70	-	11.71	-	-	No	-
GHD (2005/2006)	TP04	Pit	373488.0	6368337.0	15.34	1.80	Siltstone	NE	1.30	-	14.04	-	-	No	-
GHD (2005/2006)	TP05	Pit	374141.0	6368336.0	1.34	2.50	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP06	Pit	374587.0	6368506.0	0.80	2.50	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP07	Pit	375295.0	6368605.0	0.70	2.00	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP08	Pit	375999.0	6368858.0	1.13	2.00	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP10	Pit	377453.0	6369996.0	0.81	2.20	Clay	NE	NE	-	-	-	-	No	-

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GHD (2005/2006)	TP11	Pit	377820.0	6370053.0	0.89	2.20	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP12	Pit	378580.0	6370077.0	0.95	2.20	Peaty Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP13	Pit	378994.0	6370325.0	0.41	1.70	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP14	Pit	378639.0	6370696.0	0.68	1.80	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP15	Pit	378437.0	6370876.0	0.48	1.90	Peaty Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP16	Pit	379419.0	6371282.0	1.01	1.70	Clayey Sand	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP17	Pit	379983.0	6370944.0	0.89	2.00	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP18	Pit	380377.0	6372162.0	1.30	2.00	Clay	NE	NE	-	-	-	-	No	-
GHD (2005/2006)	TP19	Pit	380271.0	6371293.0	1.04	1.70	Clayey Sand	0.25	NE	0.79	-	-	-	No	-
GHD (2005/2006)	TP21	Pit	380945.0	6372031.0	1.05	2.00	Clay	0.25	NE	0.80	-	-	-	No	-
81641.03	M-BH-102	Bore	372245.6	6367991.6	17.00	6.00	Silty Clay	3.90	NE	13.10	-	NE	-	No	-
81641.03	M-BH-103	Bore	372400.3	6368127.0	16.10	24.52	Sandstone/Siltstone	NE	5.95	-	10.15	NE	-	No	-
81641.03	M-BH-104	Bore	372387.2	6368197.8	14.00	28.00	Sandstone	NE	19.50	-	-5.50	NE	-	No	-
81641.03	M-BH-107	Bore	373806.3	6368785.5	6.90	4.91	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-BH-110	Bore	373921.7	6368704.9	5.70	10.21	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-BH-111	Bore	373921.7	6368704.9	5.70	27.30	Siltstone	NE	7.68	-	-1.98	0.50	5.20	No	-
81641.03	M-BH-112	Bore	373877.7	6368596.4	1.70	27.50	Sltstone	NE	6.10	-	-4.40	0.50	1.20	No	-
81641.03	M-BH-113	Bore	373886.5	6368576.4	2.30	24.22	Sandstone	NE	4.40	-	-2.10	0.90	1.40	No	-
81641.03	M-BH-114	Bore	373925.3	6368598.5	2.10	25.43	Siltstone	NE	9.00	-	-6.90	NE	-	No	-
81641.03	M-BH-115	Bore	373936.5	6368578.0	2.10	27.00	Siltstone	0.40	7.50	1.70	-5.40	0.40	1.70	No	-
81641.03	M-BH-116	Bore	373912.0	6368577.6	2.00	27.17	Siltstone	0.30	7.50	1.70	-5.50	0.30	1.70	No	-
81641.03	M-BH-201	Bore	374603.4	6368601.6	1.60	11.60	Silty Clay	0.60	NE	1.00	-	0.30	1.30	No	-
81641.03	M-BH-202	Bore	374657.8	6368582.0	1.40	10.40	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-BH-204	Bore	374727.4	6368628.1	1.30	30.13	Laminite	0.70	8.42	0.60	-7.12	0.50	0.80	No	-
81641.03	M-BH-205	Bore	374768.0	6368616.4	1.10	30.34	Sandstone	NE	8.75	-	-7.65	NE	-	No	-
81641.03	M-BH-206	Bore	374806.9	6368600.0	0.90	24.33	Sandstone/Siltstone	NE	2.70	-	-1.80	NE	-	No	-
81641.03	M-BH-207	Bore	374797.9	6368485.6	0.50	7.95	Sandy Silty Clay	NE	NE	-	-	2.00	-1.50	No	-
81641.03	M-BH-209	Bore	374834.6	6368651.6	1.70	5.78	Gravelly Clay	0.40	NE	1.30	-	0.30	1.40	No	-
81641.03	M-BH-210	Bore	374903.3	6368683.7	2.10	4.43	Silty Clay	2.50	NE	-0.40	-	NE	-	No	-
81641.03	M-BH-212	Bore	374904.2	6368628.4	1.30	4.80	Silty Clay	0.70	NE	0.60	-	0.20	1.10	No	-
81641.03	M-BH-213	Bore	374903.9	6368555.7	0.70	2.95	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-BH-214	Bore	374855.2	6368514.3	0.60	21.26	Sandstone/Siltstone	NE	3.50	-	-2.90	NE	-	No	-
81641.03	M-BH-215	Bore	374885.3	6368493.5	0.50	24.52	Siltstone	NE	2.45	-	-1.95	1.00	-0.50	No	-
81641.03	M-BH-216	Bore	374912.9	6368473.5	0.60	21.27	Claystone/Sandstone/Siltstone	NE	2.63	-	-2.03	1.00	-0.40	No	-
81641.03	M-BH-218	Bore	374992.6	6368535.3	1.00	2.65	Carbonaceous Clay	NE	NE	-	-	1.10	-0.10	No	-
81641.03	M-BH-219	Bore	375030.8	6368504.5	0.80	2.47	Silty Clay	NE	NE	-	-	-	-	No	-
81641.03	M-BH-220	Bore	375004.7	6368417.6	0.60	4.17	Silty Clay	NE	NE	-	-	0.60	0.00	No	-
81641.03	M-BH-221	Bore	375101.6	6368521.5	0.90	1.75	Silty Clay	NE	NE	-	-	0.60	0.30	No	-
81641.03	M-BH-222	Bore	375096.1	6368403.8	0.80	2.70	Silty Clay	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-BH-223	Bore	375182.5	6368501.1	0.80	3.00	Silty Clay	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-BH-224	Bore	375213.1	6368423.4	0.90	3.00	Silty Clay	NE	NE	-	-	0.50	0.40	No	-
81641.03	M-BH-226	Bore	375347.4	6368549.7	0.80	4.20	Silty Clay	NE	NE	-	-	0.40	0.40	No	-
81641.03	M-BH-227	Bore	375291.9	6368464.4	0.80	3.44	Silty Clay	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-BH-301	Bore	375589.8	6368602.1	1.20	24.64	Sandstone	0.70	6.70	0.50	-5.50	0.70	0.50	No	-
81641.03	M-BH-302	Bore	375667.9	6368512.8	0.80	8.80	Silty Clay	NE	NE	-	-	1.00	-0.20	No	-
81641.03	M-BH-303	Bore	375689.5	6368626.8	0.80	30.80	Sandstone	NE	13.12	-	-12.32	0.60	0.20	No	-
81641.03	M-BH-304	Bore	375871.9	6368714.0	1.00	30.83	Sandstone/Siltstone	NE	10.90	-	-9.90	1.50	-0.50	No	-
81641.03	M-BH-305	Bore	375959.0	6368744.7	0.90	27.24	Sandstone	NE	5.95	-	-5.05	0.80	0.10	No	-
81641.03	M-BH-306	Bore	376032.5	6368799.5	1.00	21.28	Sandstone	NE	2.50	-	-1.50	0.60	0.40	No	-
81641.03	M-BH-307	Bore	376116.6	6368830.4	0.90	27.22	Sandstone	NE	5.30	-	-4.40	NE	-	No	-
81641.03	M-BH-308	Bore	376222.4	6368899.3	0.30	76.97	Siltstone	NE	62.90	-	-62.60	0.90	-0.60	No	-
81641.03	M-BH-309	Bore	376286.6	6368912.9	0.10	80.10	Coal	NE	63.10	-	-63.00	0.40	-0.30	No	-
81641.03	M-BH-310	Bore	376373.2	6368955.5	0.20	64.12	Siltstone	NE	56.15	-	-55.95	0.60	-0.40	No	-
81641.03	M-BH-311	Bore	376468.5	6368970.4	0.50	53.50	Siltstone	NE	41.10	-	-40.60	0.70	-0.20	No	-
81641.03	M-BH-312	Bore	376560.3	6368998.8	0.70	38.60	Sandstone	NE	25.00	-	-24.30	1.60	-0.90	No	-
81641.03	M-BH-313	Bore	376656.9	6368998.6	0.80	39.26	Siltstone	NE	25.55	-	-24.75	1.11	-0.31	No	-
81641.03	M-BH-314	Bore	376752.4	6369013.0	0.40	50.30	Siltstone/Sandstone	NE	35.90	-	-35.50	0.80	-0.40	No	-
81641.03	M-BH-315	Bore	376847.3	6368999.0	0.80	42.95	Siltstone	NE	35.00	-	-34.20	0.15	0.65	No	-
81641.03	M-BH-316	Bore	376851.2	6368972.6	0.80	47.07	Siltstone	NE	34.30	-	-33.50	0.70	0.10	No	-
81641.03	M-BH-317	Bore	376904.0	6369007.0	1.00	50.00	Coal	NE	34.80	-	-33.80	1.70	-0.70	No	-
81641.03	M-BH-318	Bore	377029.4	6368972.3	0.90	53.50	Laminite	NE	38.10	-	-37.20	0.50	0.40	No	-
81641.03	M-BH-319	Bore	377124.8	6368959.1	0.90	44.50	Sandstone	NE	31.20	-	-30.30	NE	-	No	-
81641.03	M-BH-320	Bore	377211.9	6368917.0	1.70	41.30	Siltstone	NE	20.80	-	-19.10	3.50	-1.80	No	-
81641.03	M-BH-322	Bore	377324.5	6368866.3	-2.00	37.75	Sandstone/Siltstone	NE	22.10	-	-24.10	NE	-	No	-

SHADING KEY:
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TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.03	M-BH-323	Bore	377344.9	6368873.1	-2.40	38.95	Siltstone	NE	21.77	-	-24.17	NE	-	No	-
81641.03	M-BH-324	Bore	377367.3	6368847.7	-2.90	48.45	Sandstone	NE	31.95	-	-34.85	NE	-	No	-
81641.03	M-BH-325	Bore	377386.4	6368855.0	-2.70	48.65	Sandstone/Siltstone	NE	31.35	-	-34.05	NE	-	No	-
81641.03	M-BH-326	Bore	377432.8	6368816.8	-3.70	45.00	Siltstone	NE	25.40	-	-29.10	NE	-	No	-
81641.03	M-BH-327	Bore	377453.3	6368825.5	-3.90	41.52	Sandstone	NE	25.30	-	-29.20	NE	-	No	-
81641.03	M-BH-328	Bore	377499.1	6368787.7	-4.50	38.45	Sandstone/Siltstone	NE	16.80	-	-21.30	NE	-	No	-
81641.03	M-BH-329	Bore	377519.0	6368795.5	-3.80	35.45	Sandstone/Siltstone	NE	17.15	-	-20.95	NE	-	No	-
81641.03	M-BH-330	Bore	377566.3	6368758.2	-5.50	37.25	Sandstone/Siltstone	NE	16.70	-	-22.20	NE	-	No	-
81641.03	M-BH-331	Bore	377586.0	6368763.8	-5.80	39.70	Sandstone/Siltstone	NE	20.23	-	-26.03	NE	-	No	-
81641.03	M-BH-332	Bore	377607.4	6368739.7	-3.90	41.20	Siltstone	NE	20.10	-	-24.00	NE	-	No	-
81641.03	M-BH-333	Bore	377626.4	6368745.7	-3.20	44.85	Siltstone	NE	25.00	-	-28.20	NE	-	No	-
81641.03	M-BH-339	Bore	376251.8	6368912.8	0.20	83.60	Sandstone	NE	63.42	-	-63.22	0.30	-0.10	No	-
81641.03	M-BH-340	Bore	376199.3	6368873.6	0.00	69.15	Sandstone	NE	50.20	-	-50.20	0.15	-0.15	No	-
81641.03	M-BH-341	Bore	376164.6	6368871.7	0.20	45.26	Sandstone	NE	30.47	-	-30.27	0.10	0.10	No	-
81641.03	M-BH-342	Bore	376142.8	6368844.6	0.40	27.28	Sandstone	NE	12.75	-	-12.35	0.70	-0.30	No	-
81641.03	M-BH-343	Bore	376316.3	6368923.3	0.10	79.06	Sandstone	NE	61.05	-	-60.95	0.45	-0.35	No	-
81641.03	M-BH-344	Bore	376341.8	6368946.9	0.10	78.07	Coal	NE	59.04	-	-58.94	0.25	-0.15	No	-
81641.03	M-BH-345	Bore	376406.5	6368952.6	0.30	66.11	Laminite	NE	48.24	-	-47.94	0.45	-0.15	No	-
81641.03	M-BH-346	Bore	376434.3	6368974.3	0.50	62.68	Laminite	NE	48.21	-	-47.71	0.50	0.00	No	-
81641.03	M-BH-401	Bore	378194.7	6368653.7	3.20	10.23	Sandy Clay	NE	NE	-	-	1.30	1.90	No	-
81641.03	M-BH-402	Bore	378282.4	6368648.6	3.70	27.31	Sandstone	NE	10.25	-	-6.55	NE	-	No	-
81641.03	M-BH-404	Bore	378253.0	6368603.4	4.10	27.32	Siltstone/Claystone	0.90	11.55	3.20	-7.45	0.90	3.20	No	-
81641.03	M-BH-405	Bore	378238.6	6368578.6	4.70	28.81	Sandstone	2.40	12.80	2.30	-8.10	0.90	3.80	No	-
81641.03	M-BH-406	Bore	378197.2	6368478.2	4.30	11.50	Silty Clay	0.90	NE	3.40	-	1.00	3.30	No	-
81641.03	M-BH-408	Bore	378462.7	6368574.7	4.40	21.24	Sandstone	NE	4.17	-	0.23	2.60	1.80	No	-
81641.03	M-BH-409	Bore	378824.8	6368882.7	2.40	4.18	Sandstone	NE	4.10	-	-1.70	NE	-	No	-
81641.03	M-BH-410	Bore	378989.7	6368996.9	1.40	4.10	Sandstone	NE	3.90	-	-2.50	NE	-	No	-
81641.03	M-BH-411	Bore	379095.9	6368935.1	3.40	2.55	Sandy Clay	0.11	NE	3.29	-	NE	-	No	-
81641.03	M-BH-412	Bore	379188.0	6369106.0	1.10	10.10	Sandy Clay	NE	NE	-	-	0.30	0.80	No	-
81641.03	M-BH-413	Bore	379225.6	6369045.4	3.40	14.95	Clay	2.10	NE	1.30	-	2.30	1.10	No	-
81641.03	M-BH-415	Bore	379226.6	6369177.3	1.30	28.60	Sandstone/Siltstone	NE	9.15	-	-7.85	0.50	0.80	No	-
81641.03	M-BH-416	Bore	379230.2	6369161.7	1.40	32.50	Siltstone	NE	10.30	-	-8.90	0.50	0.90	No	-
81641.03	M-BH-417	Bore	379256.0	6369191.2	1.30	29.60	Sandstone	NE	10.05	-	-8.75	-	-	No	-
81641.03	M-BH-418	Bore	379276.7	6369238.7	1.10	27.20	Carbonaceous Siltstone	NE	4.14	-	-3.04	1.80	-0.70	No	-
81641.03	M-BH-419	Bore	379303.4	6369253.7	1.30	23.50	Sandstone/Siltstone	NE	4.25	-	-2.95	1.50	-0.20	No	-
81641.03	M-BH-420	Bore	379299.8	6369270.0	1.20	25.84	Sandstone	NE	9.00	-	-7.80	1.50	-0.30	No	-
81641.03	M-BH-421	Bore	379337.9	6369108.0	2.70	11.95	Sand	NE	NE	-	-	2.10	0.60	No	-
81641.03	M-BH-422	Bore	379253.2	6369410.2	1.50	7.45	Silty Clay	NE	NE	-	-	1.30	0.20	No	-
81641.03	M-BH-425	Bore	379506.6	6369634.1	2.70	19.00	Silty Clay	1.20	NE	1.50	-	1.60	1.10	No	-
81641.03	M-BH-427	Bore	379601.5	6369834.1	2.00	19.45	Sand	NE	NE	-	-	0.60	1.40	No	-
81641.03	M-BH-428	Bore	379673.3	6369880.3	2.70	17.90	Sand	2.00	NE	0.70	-	1.60	1.10	No	-
81641.03	M-BH-429	Bore	379653.7	6369924.9	1.50	8.95	Sand	NE	NE	-	-	0.45	1.05	No	-
81641.03	M-BH-432	Bore	379709.2	6370059.4	1.30	4.45	Sand	NE	NE	-	-	1.50	-0.20	No	-
81641.03	M-BH-501	Bore	379873.1	6370185.7	3.70	11.95	Sand	2.00	NE	1.70	-	3.10	0.60	No	-
81641.03	M-BH-502	Bore	382416.5	6371179.3	6.90	76.42	Sandstone	NE	64.18	-	-57.28	NE	-	No	-
81641.03	M-BH-503	Bore	382439.4	6371160.3	5.80	77.07	Sandstone	NE	63.45	-	-57.65	NE	-	No	-
81641.03	M-BH-504	Bore	382470.1	6371142.8	5.10	77.15	Sandstone	NE	61.75	-	-56.65	1.70	3.40	No	-
81641.03	M-BH-601	Bore	383090.3	6372254.4	1.80	74.20	Sandstone	1.20	60.90	0.60	-59.10	0.30	1.50	No	-
81641.03	M-BH-602	Bore	383125.3	6372311.1	2.40	70.25	Sandstone	0.50	61.50	1.90	-59.10	0.60	1.80	No	-
81641.03	M-BH-603	Bore	383141.8	6372376.1	1.90	72.26	Sandstone	2.50	60.49	-0.60	-58.59	0.40	1.50	No	-
81641.03	M-BH-604	Bore	383181.0	6372430.0	2.40	75.04	Siltstone	NE	61.66	-	-59.26	1.20	1.20	No	-
81641.03	M-BH-605	Bore	383346.0	6372667.2	3.60	80.70	Sandstone	NE	66.00	-	-62.40	1.90	1.70	No	-
81641.03	M-BH-606	Bore	383556.2	6372909.4	2.40	7.45	Sand	0.60	NE	1.80	-	0.60	1.80	No	-
81641.03	M-BH-607	Bore	383546.3	6372917.6		76.20	Sandstone	NE	61.70	-	-61.70	NE	-	No	-
81641.03	M-BH-608	Bore	383071.9	6372190.8	2.30	76.60	Sandstone	NE	61.70	-	-59.40	NE	-	No	-
81641.03	M-BH-609	Bore	383083.1	6372222.2	2.00	74.00	Sandstone	2.00	61.05	0.00	-59.05	0.30	1.70	No	-
81641.03	M-BH-610	Bore	383107.1	6372283.0	2.40	74.43	Sandstone	1.10	61.20	1.30	-58.80	0.50	1.90	No	-
81641.03	M-BH-611	Bore	383134.1	6372343.6	2.20	74.40	Sandstone	0.70	61.00	1.50	-58.80	0.70	1.50	No	-
81641.03	M-BH-612	Bore	383162.1	6372402.9	2.10	72.33	Sandstone	2.20	60.70	-0.10	-58.60	0.40	1.70	No	-
81641.03	M-CT-404	Bore	378416.4	6368583.1	5.50	5.50	Sandy Clay	2.50	NE	3.00	-	1.40	4.10	No	-
81641.03	M-CT-424	Bore	379407.2	6369450.3	3.40	3.40	Sand	1.10	NE	2.30	-	NE	-	No	-
81641.03	M-CT-436	Bore	379703.5	6369978.4	3.20	3.20	Sand	1.20	NE	2.00	-	NE	-	No	-
81641.03	M-CT-437	Bore	379729.8	6369990.6	3.30	3.30	Sand	1.20	NE	2.10	-	NE	-	No	-
81641.03	M-EP-101	Pit	372624.8	6368285.1	23.30	1.50	Conglomerate	NE	1.40	-	21.90	NE	-	No	-

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M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.03	M-EP-102	Pit	372668.8	6368412.8	23.80	1.90	Conglomerate	NE	1.70	-	22.10	NE	-	No	-
81641.03	M-EP-103	Pit	372829.7	6368410.8	18.90	4.10	Sandstone	NE	3.70	-	15.20	NE	-	No	-
81641.03	M-EP-104	Pit	372962.6	6368502.0	18.60	1.20	Sandstone	NE	1.00	-	17.60	NE	-	No	-
81641.03	M-EP-105	Pit	373071.0	6368446.7	20.50	5.30	Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-EP-106	Pit	373211.6	6368528.4	21.20	5.00	Claystone	NE	3.00	-	18.20	NE	-	No	-
81641.03	M-EP-107	Pit	373317.7	6368496.2	18.50	5.00	Siltstone	NE	3.20	-	15.30	NE	-	No	-
81641.03	M-EP-108	Pit	373464.4	6368519.4	13.50	5.00	Siltstone	NE	4.60	-	8.90	NE	-	No	-
81641.03	M-HA-201	Bore	374651.8	6368500.7	0.70	2.00	Sandy Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-HA-401	Bore	378131.6	6368696.6	2.10	2.00	Sandy Clay	NE	NE	-	-	0.40	1.70	No	-
81641.03	M-HA-402	Bore	379046.2	6369288.1	0.40	2.00	Clay	0.40	NE	0.00	-	0.10	0.30	No	-
81641.03	M-HA-403	Bore	379341.0	6369519.0	7.00	2.00	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-HA-601	Bore	382598.2	6371211.3	2.25	1.10	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-HA-602	Bore	382716.1	6371394.9	1.98	0.80	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-LDB-101	Bore	372695.9	6368357.0	23.00	18.19	Sandstone	NE	1.10	-	21.90	NE	-	No	-
81641.03	M-LDB-102	Bore	372776.3	6368446.5	19.80	18.24	Tuffaceous Sandstone/Siltstone	NE	1.82	-	17.98	NE	-	No	-
81641.03	M-LBD-103	Bore	372974.1	6368432.4	20.70	18.22	Siltstone	NE	1.15	-	19.55	NE	-	No	-
81641.03	M-LDB-104	Bore	373062.8	6368492.2	20.60	18.33	Sandstone/Siltstone	NE	3.88	-	16.72	NE	-	No	-
81641.03	M-LDB-105	Bore	373275.1	6368491.1	19.80	18.47	Sandstone	NE	3.05	-	16.75	NE	-	No	-
81641.03	M-PZ-101	Bore	372233.7	6367837.1	17.80	10.00	Siltstone	1.70	7.20	16.10	10.60	3.64	14.16	Yes	6.5 - 9.5
81641.03	M-PZ-101S	Bore	372233.7	6367837.1	17.80	10.00	Siltstone	1.70	7.20	16.10	10.60	3.64	14.16	Yes	6.5 - 9.5
81641.03	M-PZ-102	Bore	373883.4	6368504.7	4.80	7.30	Siltstone	NE	7.25	-	-2.45	2.80	2.00	Yes	3.35 - 6.35
81641.03	M-PZ-102S	Bore	373883.4	6368504.7	4.80	7.30	Siltstone	NE	7.25	-	-2.45	2.91	1.89	Yes	3.35 - 6.35
81641.03	M-PZ-201	Bore	375114.7	6368625.3	1.20	3.00	Silty Clay	0.50	NE	0.70	-	0.29	0.91	Yes	0.8 - 3.0
81641.03	M-PZ-201S	Bore	375114.7	6368625.3	1.20	3.00	Silty Clay	0.50	NE	0.70	-	0.33	0.87	Yes	0.8 - 3.0
81641.03	M-PZ-301	Bore	376287.7	6368814.4	0.30	6.00	Sandy Clay	NE	NE	-	-	0.48	-0.18	Yes	1.5 - 6.0
81641.03	M-PZ-301S	Bore	376287.7	6368814.4	0.30	6.00	Sandy Clay	NE	NE	-	-	0.48	-0.18	Yes	1.5 - 6.0
81641.03	M-PZ-302	Bore	377028.6	6369081.9	0.90	25.45	Sandy Gravel	NE	NE	-	-	0.51	0.39	Yes	18.15 - 24.15
81641.03	M-PZ-302S	Bore	377028.6	6369081.9	0.90	25.45	Sandy Gravel	NE	NE	-	-	0.51	0.39	Yes	18.15 - 24.15
81641.03	M-PZ-501	Bore	380671.9	6370706.9	8.20	9.00	Sand	NE	NE	-	-	6.47	1.73	Yes	6.0 - 9.0
81641.03	M-PZ-501S	Bore	380671.9	6370706.9	8.20	9.00	Sand	NE	NE	-	-	6.48	1.72	Yes	6.0 - 9.0
81641.03	M-PZ-601	Bore	383559.9	6372764.0	2.50	14.95	Sand	NE	NE	-	-	0.74	1.76	Yes	11.5 - 14.5
81641.03	M-PZ-601S	Bore	383559.9	6372764.0	2.50	14.95	Sand	NE	NE	-	-	0.73	1.77	Yes	11.5 - 14.5
81641.03	M-TP-101	Pit	372160.9	6367600.4	20.20	2.00	Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-102	Pit	372222.7	6367683.2	17.80	2.00	Clay	0.90	NE	16.90	-	NE	-	No	-
81641.03	M-TP-103	Pit	373588.7	6368572.3	8.20	2.20	Silty Clay	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-105	Pit	373788.1	6368728.7	4.50	1.30	Clay	0.70	NE	3.80	-	0.00	4.50	No	-
81641.03	M-TP-202	Pit	373392.7	6368951.2	18.20	0.20	Sandstone	NE	0.15	-	18.05	NE	-	No	-
81641.03	M-TP-204	Pit	375001.0	6368481.8	1.60	2.00	Silty Clay	0.90	NE	0.70	-	1.90	-0.30	No	-
81641.03	M-TP-205	Pit	375394.1	6368520.4	0.70	2.00	Shelly Clay	NE	NE	-	-	1.80	-1.10	No	-
81641.03	M-TP-206	Pit	375500.4	6368559.3	0.70	2.10	Shelly Clay	NE	NE	-	-	1.60	-0.90	No	-
81641.03	M-TP-301	Pit	376787.8	6368969.6	0.90	2.00	Silty Sand	NE	NE	-	-	1.70	-0.80	No	-
81641.03	M-TP-302	Pit	378039.8	6368607.6	3.30	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-403	Pit	378544.5	6368790.9	7.80	2.10	Sandstone	NE	1.20	-	6.60	NE	-	No	-
81641.03	M-TP-404	Pit	378868.0	6368774.2	14.80	1.20	Sandstone	NE	1.00	-	13.80	NE	-	No	-
81641.03	M-TP-405	Pit	379087.0	6369095.3	0.90	0.85	Sandstone	NE	0.80	-	0.10	NE	-	No	-
81641.03	M-TP-501	Pit	379952.9	6370243.1	3.70	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-502	Pit	380081.3	6370381.4	6.50	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-503	Pit	380222.7	6370516.8	6.90	2.20	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-504	Pit	380372.3	6370670.2	9.30	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-505	Pit	380537.6	6370741.1	5.30	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-506	Pit	380814.8	6370893.1	8.00	2.10	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-507	Pit	380972.9	6370989.6	7.90	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-508	Pit	381277.6	6371128.4	5.10	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-509	Pit	381451.5	6371135.3	5.50	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-510	Pit	381731.4	6371116.5	4.40	1.00	Sand	NE	NE	-	-	0.60	3.80	No	-
81641.03	M-TP-511	Pit	381999.3	6371098.3	6.20	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-512	Pit	382593.0	6371090.8	3.90	2.00	Sand	NE	NE	-	-	1.60	2.30	No	-
81641.03	M-TP-513	Pit	382620.5	6371252.9	2.40	1.50	Sand	NE	NE	-	-	NE	-	No	-
81641.03	M-TP-514	Pit	382870.8	6371556.4	2.90	2.00	Sand	NE	NE	-	-	1.30	1.60	No	-
81641.03	M-TP-601	Pit	383283.2	6372630.9	4.00	2.00	Sand	NE	NE	-	-	NE	-	No	-
81641.03	W1 (Access Track)	Pit	383183.9	6372434.5	3.04	0.40	Cobbles	0.40	NE	2.64	-	NE	-	No	-
81641.03	W2 (Access Track)	Pit	383179.2	6372428.4	2.62	0.40	Cobbles	0.40	NE	2.22	-	NE	-	No	-
81641.03	W3 (Access Track)	Pit	383175.4	6372423.2	2.40	0.40	Cobbles	0.40	NE	2.00	-	NE	-	No	-
81641.03	W4 (Access Track)	Pit	383078.8	6372210.2	2.04	0.40	Cobbles	0.40	NE	1.64	-	NE	-	No	-

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.03	W5 (Access Track)	Pit	383073.9	6372198.7	1.93	0.40	Cobbles	0.40	NE	1.53	-	NE	-	No	-
81641.03	W6 (Access Track)	Pit	383070.9	6372188.8	1.89	0.40	Cobbles	0.40	NE	1.49	-	NE	-	No	-
81641.03	W7 (Access Track)	Pit	383067.4	6372178.7	1.92	0.40	Cobbles	0.40	NE	1.52	-	NE	-	No	-
81641.03	W8 (Access Track)	Pit	383064.4	6372171.3	1.86	0.40	Cobbles	0.40	NE	1.46	-	NE	-	No	-
81641.03	W9 (Access Track)	Pit	383060.6	6372163.0	1.90	0.40	Cobbles	0.40	NE	1.50	-	NE	-	No	-
81641.03	W10 (Access Track)	Pit	383058.9	6372154.6	1.88	0.40	Cobbles	0.40	NE	1.48	-	NE	-	No	-
81641.03	M-CT-201	CPT	374600.6	6368600.8	1.66	0.70	Sensitive fine grained soil	0.60	NE	1.06	-	0.30	1.36	No	-
81641.03	M-CT-201A	CPT	374600.6	6368600.8	1.66	11.66	Sand and silty sand	NE	11.60	-	-9.94	0.30	1.36	No	-
81641.03	M-CT-201B	CPT	374600.6	6368600.8	1.66	5.70	Clay	NE	NE	-	-	0.30	1.36	No	-
81641.03	M-CT-202	CPT	374725.1	6368629.2	1.11	8.56	Silty sand and sandy silt	NE	8.56	-	-7.45	0.20	0.91	No	-
81641.03	M-CT-203	CPT	374803.7	6368601.0	0.97	2.03	Clay and clayey sand	0.42	NE	0.55	-	0.40	0.57	No	-
81641.03	M-CT-203A	CPT	374803.7	6368601.0	0.97	3.53	Sand with clay (probable rock)	NE	3.53	-	-2.56				
81641.03	M-CT-205	CPT	374837.8	6368651.3	1.50	7.56	Sand	0.40	7.58	1.10	-6.08	0.30	1.20	No	-
81641.03	M-CT-206	CPT	374905.9	6368683.6	2.56	5.72	Sand and silty sand	0.60	5.74	1.96	-3.18	1.60	0.96	No	-
81641.03	M-CT-208	CPT	374901.0	6368629.5	1.29	6.60	Very dense/stiff soil	0.72	6.62	0.57	-5.33	0.30	0.99	No	-
81641.03	M-CT-209	CPT	374900.9	6368556.4	0.67	2.69	Very dense/stiff soil	NE	2.69	-	-2.02	0.00	0.67	No	-
81641.03	M-CT-209A	CPT	374900.9	6368556.4	0.67	2.64	Sand and silty sand	NE	2.64	-	-1.97	0.00	0.67	No	-
81641.03	M-CT-210	CPT	374916.3	6368471.9	0.63	3.37	Very dense/stiff soil	NE	3.20	-	-2.57	0.10	0.53	No	-
81641.03	M-CT-210A	CPT	374916.3	6368471.9	0.63	1.41	Sensitive fine grained soil	NE	NE	-	-	0.10	0.53	No	-
81641.03	M-CT-212	CPT	374992.1	6368532.2	0.97	2.11	Very dense/stiff soil	NE	2.11	-	-1.15	0.40	0.57	No	-
81641.03	M-CT-213	CPT	375030.6	6368501.6	0.86	1.73	Sand and silty sand	NE	NE	-	-	0.50	0.36	No	-
81641.03	M-CT-213A	CPT	375030.6	6368501.6	0.86	2.42	Silty sand and sandy silt	NE	2.42	-	-1.56	0.00	0.86	No	-
81641.03	M-CT-213B	CPT	375030.6	6368501.6	0.86	2.38	Very dense/stiff soil	NE	2.38	-	-1.52	0.40	0.46	No	-
81641.03	M-CT-214	CPT	374997.3	6368479.7	1.46	2.51	Silty sand and sandy silt	0.79	NE	0.67	-	1.10	0.36	No	-
81641.03	M-CT-215	CPT	375005.3	6368420.6	0.72	3.29	Clay and silty clay	NE	NE	-	-	0.25	0.47	No	-
81641.03	M-CT-215A	CPT	375005.3	6368420.6	0.72	3.88	Very dense/stiff soil	NE	3.88	-	-3.16	0.25	0.47	No	-
81641.03	M-CT-215B	CPT	375005.3	6368420.6	0.72	3.08	Clay and silty clay	NE	NE	-	-	0.30	0.42	No	-
81641.03	M-CT-216	CPT	375101.5	6368524.7	0.88	1.29	Sand and silty sand	NE	NE	-	-	1.29	-0.41	No	-
81641.03	M-CT-217	CPT	375097.9	6368406.7	0.76	2.34	Silty sand and sandy silt	NE	NE	-	-	0.40	0.36	No	-
81641.03	M-CT-218	CPT	375179.3	6368501.8	0.80	1.82	Silty sand and sandy silt	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-CT-219	CPT	375212.4	6368426.1	0.86	2.83	Sand and silty sand	NE	NE	-	-	0.50	0.36	No	-
81641.03	M-CT-219A	CPT	375212.4	6368426.1	0.86	3.29	Silty sand and sandy silt	NE	3.29	-	-2.43	0.50	0.36	No	-
81641.03	M-CT-219B	CPT	375212.4	6368426.1	0.86	2.56	Silty sand and sandy silt	NE	NE	-	-	0.60	0.26	No	-
81641.03	M-CT-220	CPT	375329.4	6368532.6	0.82	2.99	Silty sand and sandy silt	NE	NE	-	-	0.60	0.22	No	-
81641.03	M-CT-220A	CPT	375329.4	6368532.6	0.82	4.73	Silty sand and sandy silt	NE	4.73	-	-3.91	0.50	0.32	No	-
81641.03	M-CT-221	CPT	375292.5	6368467.8	0.80	2.00	Sand and silty sand	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-CT-221A	CPT	375292.5	6368467.8	0.80	1.77	Clay	NE	NE	-	-	0.60	0.20	No	-
81641.03	M-CT-222	CPT	375356.7	6368500.1	0.81	4.96	Very dense/stiff soil	NE	NE	-	-	0.50	0.31	No	-
81641.03	M-CT-222A	CPT	375356.7	6368500.1	0.81	2.27	Sensitive fine grained soil	NE	NE	-	-	0.50	0.31	No	-
81641.03	M-CT-222B	CPT	375356.7	6368500.1	0.81	4.23	Sand and silty sand	NE	4.23	-	-3.42	0.50	0.31	No	-
81641.03	M-CT-223	CPT	375490.3	6368556.5	0.71	7.46	Sand and silty sand	NE	NE	-	-	0.40	0.31	No	-
81641.03	M-CT-224	CPT	375289.1	6368388.1	0.90	2.74	Sand and silty sand	NE	2.74	-	-1.84	0.40	0.50	No	-
81641.03	M-CT-225	CPT	375075.9	6368331.1	0.50	7.02	Very dense/stiff soil	NE	7.02	-	-6.52	0.20	0.30	No	-
81641.03	M-CT-226	CPT	374659.2	6368444.0	0.50	8.51	Silty sand and sandy silt	NE	8.51	-	-8.01	0.00	0.50	No	-
81641.03	M-CT-227	CPT	374328.3	6368512.0	1.80	3.49	Silty sand and sandy silt	NE	3.49	-	-1.69	0.00	1.80	No	-
81641.03	M-CT-301	CPT	375584.9	6368601.4	1.20	0.54	Fill / clay and clayey sand	0.39	NE	0.81	-	0.60	0.60	No	-
81641.03	M-CT-301A	CPT	375584.9	6368601.4	1.20	4.23	Silty Clay	NE	NE	-	-	0.60	0.60	No	
81641.03	M-CT-301B	CPT	375584.9	6368601.4	1.20	5.48	Silty clay / clayey silt	NE	5.48	-	-4.28	0.60	0.60	No	
81641.03	M-CT-302	CPT	375663.7	6368512.4	0.78	7.22	Sand and silty sand	NE	NE	-	-	0.50	0.28	No	-
81641.03	M-CT-302A	CPT	375663.7	6368512.4	0.78	10.36	Clayey Sand (extremely weathered rock)	NE	8.80	-	-8.02	0.50	0.28	No	
81641.03	M-CT-303	CPT	375692.5	6368624.5	0.82	13.16	Clay / silty clay	NE	13.16	-	-12.34	0.10	0.72	No	-
81641.03	M-CT-303A	CPT	375692.5	6368624.5	0.82	13.17	Clay / silty clay	NE	13.16	-	-12.34	0.10	0.72	No	-
81641.03	M-CT-304	CPT	375956.6	6368742.8	0.93	6.36	Clay / clayey sand	NE	NE	-	-	0.60	0.33	No	-
81641.03	M-CT-304A	CPT	375956.6	6368742.8	0.93	4.12	Clay and silty clay	NE	NE	-	-	0.60	0.33	No	-
81641.03	M-CT-306	CPT	376119.3	6368832.0	0.85	9.94	Probable Rock	NE	5.30	-	-4.45	1.00	-0.15	No	-
81641.03	M-CT-307	CPT	376289.8	6368912.9	0.11	43.02	Clay	NE	NE	-	-	0.00	0.11	No	-
81641.03	M-CT-307A	CPT	376289.8	6368912.9	0.11	56.64	Sand and silty sand	NE	NE	-	-	0.50	-0.39	No	-
81641.03	M-CT-307B	CPT	376289.8	6368912.9	0.11	20.25	Clay	NE	NE	-	-	0.00	0.11	No	
81641.03	M-CT-307C	CPT	376289.8	6368912.9	0.11	8.78	Silty clay	NE	NE	-	-	0.00	0.11	No	
81641.03	M-CT-308	CPT	376472.0	6368970.1	0.53	11.68	Clay	NE	NE	-	-	0.20	0.33	No	-
81641.03	M-CT-308A	CPT	376472.0	6368970.1	0.53	41.20	Silty clay with silty sand	NE	NE	-		0.40	0.13	No	
81641.03	M-CT-309	CPT	376660.5	6368999.2	0.84	24.27	Sand and silty sand	NE	NE	-	-	0.60	0.24	No	-
81641.03	M-CT-310	CPT	376843.8	6368999.6	0.82	5.06	Silty sand with silty clay	NE	NE	-	-	0.00	0.82	No	-
81641.03	M-CT-310A	CPT	376843.8	6368999.6	0.82	34.70	Clay and silty sand (probable bedrock)	NE	34.69	-	-33.87	0.00	0.82	No	

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

TABLE B1 - GEOTECHNICAL DATA SUMMARY

M12RT PROJECT

DP Project No. /Source	Test Number	Test Type	MGA Easting	MGA Northing	Ground Level	End Depth (m)	Material at Termination Depth	Base of Fill (m)	Top of Rock (m)	Base of Fill (AHD)	Top of Rock (AHD)	Depth to GW (m)	GW RL (AHD)	GW Well Installed?	Screen Range (m)
81641.03	M-CT-311	CPT	377032.7	6368971.8	0.86	38.48	Silty sand and sandy silt (probable bedrock)	NE	38.48	-	-37.62	0.25	0.61	No	-
81641.03	M-CT-311A	CPT	377032.7	6368971.8	0.86	11.48	Clay and silty clay	NE	NE	-	-	0.40	0.46	No	-
81641.03	M-CT-311B	CPT	377032.7	6368971.8	0.86	37.68	Sand and silty sand	NE	NE	-	-	0.25	0.61	No	-
81641.03	M-CT-312	CPT	377210.7	6368919.6	1.47	10.48	Silty sand and sandy silt	0.60	NE	0.87	-	0.40	1.07	No	-
81641.03	M-CT-312A	CPT	377210.7	6368919.6	1.47	22.00	Silty clay (probable rock)	NE	20.80	-	-19.33	0.40	1.07	No	
81641.03	M-CT-313	CPT	378032.1	6368624.2	2.91	6.10	Silty sand and sandy silt (probable bedrock)	0.20	6.10	2.71	-3.19	1.10	1.81	No	-
81641.03	M-CT-314	CPT	375708.8	6368486.0	0.90	7.62	Silty sand and sandy silt (probable bedrock)	NE	7.62	-	-6.72	0.00	0.90	No	-
81641.03	M-CT-401	CPT	378194.7	6368653.7	3.24	8.80	Sand and silty sand	NE	NE	-	-	0.90	2.34	No	-
81641.03	M-CT-402	CPT	378285.7	6368647.6	3.76	8.58	Sand and silty sand	NE	NE	-	-	1.20	2.56	No	-
81641.03	M-CT-403	CPT	378236.3	6368581.3	4.44	11.32	Silty sand and sandy silt (probable bedrock)	2.38	11.32	2.06	-6.88	0.80	3.64	No	-
81641.03	M-CT-404	CPT	378416.4	6368583.1	5.46	5.90	Clay and clayey sand (probable bedrock)	NE	5.90	-	-0.44	1.30	4.16	No	-
81641.03	M-CT-405	CPT	378480.6	6368572.0	4.33	3.64	Silty sand and sandy silt (probable bedrock)	NE	3.64	-	0.69	0.60	3.73	No	-
81641.03	M-CT-406	CPT	378635.8	6368808.0	2.10	1.52	Sand (probable rock)	NE	1.52	-	0.58	NE	-	No	-
81641.03	M-CT-407	CPT	378737.6	6368843.6	1.74	1.60	Silty sand and sandy silt (probable (probable bedrock)	NE	1.60	-	0.14	0.10	1.64	No	-
81641.03	M-CT-407A	CPT	378737.6	6368843.6	1.74	0.78	Silty sand and sandy silt	NE	NE	-	-	0.10	1.64	No	-
81641.03	M-CT-408	CPT	378827.7	6368884.3	2.32	1.62	Clay and clayey sand	NE	1.62	-	0.70	1.00	1.32	No	-
81641.03	M-CT-410	CPT	378927.2	6368947.4	1.76	1.20	Sand	NE	1.20	-	0.56	1.10	0.66	No	-
81641.03	M-CT-411	CPT	378992.5	6368972.1	2.08	0.42	Clay	NE	0.42	-	1.66	NE	-	No	-
81641.03	M-CT-412	CPT	378992.3	6368998.9	1.32	3.82	Clay with clayey sand (probable (probable bedrock)	NE	3.82	-	-2.50	0.30	1.02	No	-
81641.03	M-CT-413	CPT	379085.9	6369017.0	2.21	1.46	Silty sand and sandy silt (probable bedrock)	NE	1.46	-	0.75	0.50	1.71	No	-
81641.03	M-CT-414	CPT	379187.1	6369103.2	1.28	9.05	Silty clay / clayey silt (probable bedrock)	NE	9.05	-	-7.77	0.30	0.98	No	-
81641.03	M-CT-414A	CPT	379187.1	6369103.2	1.28	0.30	Silty clay / clayey silt (probable bedrock)	NE	9.94	-	-8.66	0.30	0.98	No	-
81641.03	M-CT-415	CPT	379129.2	6369147.1	0.77	4.34	Gravelly sand	NE	NE	-	-	0.20	0.57	No	-
81641.03	M-CT415A	CPT	379129.2	6369147.1	0.80	10.37	Sand / clayey sand (probable bedrock)	NE	10.37	-	-9.57	0.25	0.55	No	-
81641.03	M-CT-416	CPT	379226.0	6369174.5	1.36	7.69	Sand / gravelly sand	NE	NE	-	-	0.10	1.26	No	-
81641.03	M-CT-416A	CPT	379226.0	6369174.5	1.36	12.39	Sand and silty sand	NE	9.15	-	-7.79	0.20	1.16	No	-
81641.03	M-CT-417	CPT	379209.8	6369240.1	0.84	4.62	Silty sand and sandy silt	NE	NE	-	-	0.20	0.64	No	-
81641.03	M-CT-417A	CPT	379209.8	6369240.1	0.84	4.75	Sand / clayey sand	NE	NE	-	-	0.20	0.64	No	-
81641.03	M-CT-420	CPT	379302.2	6369251.1	1.25	3.59	Silty sand and sandy silt	NE	NE	-	-	0.20	1.05	No	-
81641.03	M-CT-420A	CPT	379302.2	6369251.1	1.25	3.80	Sand and silty sand	NE	NE	-	-	0.20	1.05	No	-
81641.03	M-CT-421	CPT	379250.0	6369334.8	0.98	6.47	Very dense/stiff soil	NE	6.47	-	-5.49	0.10	0.88	No	-
81641.03	M-CT-421A	CPT	379250.0	6369334.8	0.98	11.12	Very dense/stiff soil	NE	7.20	-	-6.22	0.20	0.78	No	-
81641.03	M-CT-422	CPT	379357.1	6369373.2	1.37	5.70	Clay and silty clay	NE	NE	-	-	0.10	1.27	No	-
81641.03	M-CT-422A	CPT	379357.1	6369373.2	1.37	6.58	Very dense/stiff soil	NE	6.58	-	-5.21	0.20	1.17	No	-
81641.03	M-CT-423	CPT	379305.9	6369449.1	0.89	4.18	Sand and silty sand (probable bedrock)	NE	4.18	-	-3.29	0.00	0.89	No	-
81641.03	M-CT-423A	CPT	379305.9	6369449.1	0.89	4.33	Sand and silty sand (probable bedrock)	NE	4.33	-	-3.44	0.20	0.69	No	-
81641.03	M-CT-424	CPT	379407.2	6369450.3	3.36	12.10	Clay (probable bedrock)	NE	11.80	-	-8.44	2.00	1.36	No	-
81641.03	M-CT-425	CPT	379337.8	6369517.4	0.93	6.48	Sand and silty sand	NE	NE	-	-	0.00	0.93	No	-
81641.03	M-CT-425A	CPT	379337.8	6369517.4	0.93	0.86	Clay with sand	NE	NE	-	-	0.00	0.93	No	-
81641.03	M-CT-425B	CPT	379337.8	6369517.4	0.93	9.85	Sand / gravelly sand	NE	NE	-	-	0.00	0.93	No	-
81641.03	M-CT-426	CPT	379430.4	6369554.1	1.39	13.02	Clay and silty clay	NE	NE	-	-	0.10	1.29	No	-
81641.03	M-CT-426A	CPT	379430.4	6369554.1	1.39	18.46	Silty sand and sandy silt	NE	NE	-	-	0.10	1.29	No	-
81641.03	M-CT-426B	CPT	379430.4	6369554.1	1.39	17.76	Sand and gravelly sand	NE	NE	-	-	0.10	1.29	No	-
81641.03	M-CT-427	CPT	379505.4	6369631.2	2.73	21.70	Silty clay	1.21	NE	1.52	-	1.40	1.33	No	-
81641.03	M-CT-428	CPT	379429.4	6369703.1	0.83	17.82	Sand	NE	NE	-	-	0.10	0.73	No	-
81641.03	M-CT-428A	CPT	379429.4	6369703.1	0.83	23.00	Sand and silty sand	NE	NE	-	-	0.05	0.78	No	-
81641.03	M-CT-429	CPT	379527.9	6369738.4	1.72	17.45	Clay	NE	NE	-	-	1.00	0.72	No	-
81641.03	M-CT-429A	CPT	379527.9	6369738.4	1.72	23.62	Sand with gravelly sand	NE	NE	-	-	1.00	0.72	No	-
81641.03	M-CT-430	CPT	379487.5	6369802.7	0.66	13.72	Clay and silty clay	NE	NE	-	-	0.60	0.06	No	-
81641.03	M-CT-430A	CPT	379487.5	6369802.7	0.66	20.47	Sand	NE	NE	-	-	0.80	-0.14	No	-
81641.03	M-CT-431	CPT	379599.5	6369830.7	2.02	37.00	Sand	NE	NE	-	-	0.60	1.42	No	-
81641.03	M-CT-431A	CPT	379599.5	6369830.7	2.02	11.00	Sensitive fine grained soil	NE	NE	-	-	0.60	1.42	No	-
81641.03	M-CT-431B	CPT	379599.5	6369830.7	2.02	14.84	Clay	NE	NE	-	-	0.60	1.42	No	-
81641.03	M-CT-432	CPT	379652.2	6369921.6	1.47	31.42	Sand and silty sand	NE	NE	-	-	0.00	1.47	No	-
81641.03	M-CT-433	CPT	379600.7	6369951.3	1.39	36.40	Sand	NE	NE	-	-	0.10	1.29	No	-
81641.03	M-CT-433A	CPT	379600.7	6369951.3	1.39	9.70	Sand	NE	NE	-	-	0.60	0.79	No	-
81641.03	M-CT-434	CPT	379706.3	6370058.6	1.25	50.42	Very dense/stiff soil	NE	NE	-	-	0.40	0.85	No	-
81641.03	M-CT-436	CPT	379703.5	6369978.4	3.20	60.34	Sand	NE	NE	-	-	1.90	1.30	No	-
81641.03	M-CT-437	CPT	379729.8	6369990.6	3.30	27.24	Sand	NE	NE	-	-	2.00	1.30	No	-
81641.03	M-CT-501	CPT	382418.8	6371177.4	6.75	52.62	Sand	NE	NE	-	-	4.00	2.75	No	-
81641.03	M-CT-502	CPT	382474.5	6371143.7	3.90	50.44	Sand and silty sand	NE	NE	-	-	1.20	2.70	No	-
81641.03	M-CT-601	CPT	383179.5	6372427.5	2.33	47.20	Sand and silty sand	NE	NE	-	-	1.10	1.23	No	-
81641.03	M-CT-602	CPT	383270.1	6372655.7	2.74	35.18	Sand and silty sand	NE	NE	-	-	1.50	1.24	No	-

SHADING KEY:
Grey - Ground level approximate, interpolated from topographic mapping

Table B2 - M12RT Sampling and Testing Schedule (Soil & Sediment)

Project Number / Source	Test Location	Sample Depth Tested (m)	Sampling Date	Envirolab Report Number	Duplicate Sample	Testing Suite	Exceedances (Yes/No)	Analytes Exceeded	Criteria Exceeded
81641.00	D-BH-123	0.2, 0.5	25/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-211	0.5, 1 - 1.45	16/09/2016		D3_KMF (0.5m)	Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-BH-212	0.1, 0.5	15/09/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-BH-301	0.1, 1.0	20/09/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-BH-322	0.1, 1.0	11/03/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-417	0.2, 0.4-0.9	26/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-501	0.1, 1.0	11/02/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-503	0.2, 0.5	27/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-512	0.1, 0.5	25/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-519	0.1, 0.5	11/09/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-520	0.1, 1.0	13/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-601	0.5, 2.0	24/11/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-605	0.1, 1.0	22/09/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-609	0.1, 0.3	10/05/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-BH-610	0.1, 0.5, 1.3, 1.6	10/05/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-TP-102	0.5, 1.5	27/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-131	0.2, 1.0, 1.5	19/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-133	0.2, 0.5, 1.0	19/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-TP-208	0.1, 1.0	17/11/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.00	D-TP-214	0.2, 0.5	21/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-414	0.2, 0.4	20/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-416	0.2, 0.5	27/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-418	0.1, 0.4	11/03/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-419	0.2, 0.5	20/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-423	0.2	21/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.00	D-TP-432	0.5, 1.0	20/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes	Benzo(a)pyrene TEQ	HIL C
81641.00	D-TP-437	0.2, 0.5	20/10/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes	Benzo(a)pyrene TEQ	HIL C
81641.00	D-TP-506	0.1, 0.2	11/03/2016			Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes		
81641.03	M-BH-104	0.2, 1.0		27043		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-BH-202	0.2, 0.5		275396		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-BH-210	0.2, 0.5		275396		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Yes	Benzo(a)pyrene TEQ	HIL C
81641.03	M-BH-301	0.2, 0.5		269373-A		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-BH-307	0.2, 0.5		272652		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	No		
81641.03	M-BH-320	0.2, 0.5		272652		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	Yes		
81641.03	M-BH-322	0 - 0.5		269373		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, PFAS	No	Nickel	ANZG DGV (Sediment)
81641.03	M-BH-323	0.7		270432-A		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, PFAS	No	Nickel	ANZG DGV (Sediment)
81641.03	M-BH-330	0 - 0.1		269373		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, PFAS	No		
81641.03	M-BH-331	0 - 0.4		269373		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, PFAS	No		
81641.03	M-BH-403	0.2, 0.5		281886		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-BH-409	0.2, 0.5		271847		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-BH-427	0.2, 0.5		272652		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	No		
81641.03	M-BH-429	0.2, 0.5		272652		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	No		
81641.03	M-HA-403	0.2, 0.5		281886		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-LDB-101	0.2, 0.5, 1.0		272652 / 275396		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	No		
81641.03	M-LDB-104	0.2, 1.0		270432		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-TP-102	0.2, 0.5		272652		Metals, TRH, BTEX, PAH, PCB, OCP, Phenols, Asbestos	Yes		
81641.03	M-TP-301	0.2, 0.5		275396		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
81641.03	M-TP-404	0.2, 0.5		266420		Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	No		
Coffey (2007)	BH103	2.4 - 2.5				Aggressivity	No		
Coffey (2007)	BH104	2.5 - 2.95				Aggressivity	No		
Coffey (2007)	BH105	1.0 - 1.45				Aggressivity	No		
Coffey (2007)	BH106	6.4 - 6.85, 29.2 - 29.65				Aggressivity	No		
Coffey (2007)	BH107	5.2 - 5.65				Aggressivity	No		
Coffey (2007)	BH109	3.0 - 3.45				Aggressivity	No		
Coffey (2007)	BH110	28.95 - 29.0				Aggressivity	No		
Coffey (2007)	BH117	5.15 - 5.6				Aggressivity	No		
Coffey (2007)	BH118	5.2 - 5.65				Aggressivity	No		
Coffey (2007)	BH120	3.6 - 4.05				Aggressivity	No		
Coffey (2007)	BH122	1.0 - 1.45				Aggressivity	No		
GHD (2005/06)	TP1	0.1, 0.9	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP2	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP3	0.3, 1.0	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP4	0.3, 1.0	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP5	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP6	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP7	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP8	0.1, 0.3, 1.0	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes		

Table B2 - M12RT Sampling and Testing Schedule (Soil & Sediment)

Project Number / Source	Test Location	Sample Depth Tested (m)	Sampling Date	Envirolab Report Number	Duplicate Sample	Testing Suite	Exceedances (Yes/No)	Analytes Exceeded	Criteria Exceeded
GHD (2005/06)	TP10	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP11	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP12	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP13	0.1	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes		
GHD (2005/06)	TP14	0.1	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes		
GHD (2005/06)	TP15	0.1	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes		
GHD (2005/06)	TP16	0.1	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes		
GHD (2005/06)	TP17	0.1	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP18	0.1, 1.0	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		
GHD (2005/06)	TP19	0.1, 0.3	-			Metals, TRH, BTEX, PAH, OCP, PCB	Yes	Zinc	EIL Open Space
GHD (2005/06)	TP21	0.1, 0.3, 1.0	-			Metals, TRH, BTEX, PAH, OCP, PCB	No		

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 ESLs Res/Open Space Aged 2'≤[2-3]≤3-4]25-6	NEPM 2013 ESLs Comm/Ind Aged 2'≤[2-3]≤3-4]25-6	NEPM 2013 Table 18(6) ESLs for Res/Open Space (Coarse/Fine) 0-2m	NEPM 2013 Table 18(6) ESLs for Comm/Ind (Coarse/Fine) 0-2m	NEPM 2013 Table 18(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 18(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
Inorganics																					
pH 1:5 soil:water	pH Units																				
pH (Field)	pH Units																				
Electrical Conductivity (Non Compensated)	µS/cm	1																			
Chloride	mg/kg	10																			
Electric resisitivity	ohm m	1																			
Sulphate	mg/kg	10																			
Metals																					
Arsenic	mg/kg	4	3000	300									100	160							
Cadmium	mg/kg	0.4	900	90																	
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/320							
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160							
Iron	mg/kg	10																			
Lead	mg/kg	1	1500	600									1100	1800							
Manganese	mg/kg	1	60000	19000																	
Mercury	mg/kg	0.1	730	80																	
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90							
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360							
TRH																					
C6-C10	mg/kg	25															800	800	5100	26000	82000
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215					
C10-C16	mg/kg	50															1000	1000	3800	20000	62000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170					
C16-C34	mg/kg	100													300/1300	1700|2500	5000	3500	5300	27000	85000
C34-C100	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000	120000
C10-C40 (Sum of total)	mg/kg	50																			
C6-C9	mg/kg	25																			
C10-C14	mg/kg	50																			
C15-C28	mg/kg	100																			
C29-C36	mg/kg	100																			
C10-C36	mg/kg	50																			
BTEX																					
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430	1100
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000	85000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000	120000
Xylene (m & p)	mg/kg	2																			
Xylene (o)	mg/kg	1																			
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000	130000
PAH																					
Acenaphthene	mg/kg	0.1																			
Acenaphthylene	mg/kg	0.1																			
Anthracene	mg/kg	0.1																			
Benz(a)anthracene	mg/kg	0.1																			
Benzo(a)pyrene	mg/kg	0.05													33	33					
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																	
Benzo(b+j+k)fluoranthene	mg/kg	0.2																			
Benzo(g,h,i)perylene	mg/kg	0.1																			
Chrysene	mg/kg	0.1																			
Dibenz(a,h)anthracene	mg/kg	0.1																			
Fluoranthene	mg/kg	0.1																			
Fluorene	mg/kg	0.1																			
Hexachlorobenzene	mg/kg	0.1	80	10																	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																			
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000	29000
Phenanthrene	mg/kg	0.1																			
Pyrene	mg/kg	0.1																			
PAHs (Sum of positives)	mg/kg	0.05																			
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.1																			
a-BHC	mg/kg	0.1																			
Aldrin	mg/kg	0.1																			
b-BHC	mg/kg	0.1																			
Chlordane (cis)	mg/kg	0.1																			
Chlordane (trans)	mg/kg	0.1																			
d-BHC	mg/kg	0.1																			
DDD	mg/kg	0.1																			
DDT	mg/kg	0.1											180	640							
DDT+DDE+DDD	mg/kg	0.1	3600	400																	
Dieldrin	mg/kg	0.1																			
Endosulfan I	mg/kg	0.1																			
Endosulfan II	mg/kg	0.1																			
Endosulfan sulphate	mg/kg	0.1																			
Endrin	mg/kg	0.1	100	20																	
Endrin aldehyde	mg/kg	0.1																			
g-BHC (Lindane)	mg/kg	0.1																			
Heptachlor	mg/kg	0.1	50	10																	
Heptachlor epoxide	mg/kg	0.1																			
Methoxychlor	mg/kg	0.1	2500	400																	
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.1																			
Bromophos-ethyl	mg/kg	0.1																			
Chlorpyrifos	mg/kg	0.1	2000	250																	
Chlorpyrifos-methyl	mg/kg	0.1																			
Diazinon	mg/kg	0.1																			
Dichlorvos	mg/kg	0.1																			
Dimethoate	mg/kg	0.1																			
Ethion	mg/kg	0.1																			
Fenitrothion	mg/kg	0.1																			
Malathion	mg/kg	0.1																			
Parathion	mg/kg	0.1																			
Ronnel	mg/kg	0.1																			
PCBs																					
Aroclor 1016	mg/kg	0.1																			
Aroclor 1221	mg/kg	0.1																			
Aroclor 1232	mg/kg	0.1																			
Aroclor 1242	mg/kg	0.1																			
Aroclor 1248	mg/kg	0.1																			
Aroclor 1254	mg/kg	0.1																			
Aroclor 1260	mg/kg	0.1																			
PCBs (Sum of total)	mg/kg	0.1	7	1																	
Phenols																					
Phenolics Total	mg/kg	5																			
PFOS/PFOA																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																			
8:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.1																			
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																			
N-methylperfluorooctane sulfonamidoaacetic acid	µg/kg	0.2																			
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																			
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																			
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																			
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																			
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																			
Sum of PFAS	µg/kg	0.1																			
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																	
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																			
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																			
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																			
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																			
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																			
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																			
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001													0.01/10						
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																			
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																			
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																			
Perfluorononanoic acid (PFNA)	µg/kg	0.1																			
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																			
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																			
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																			
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																			
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10											NC/10						
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																			
Asbestos																					
Asbestos Identification	Detect		D	D																	

| Project No/Source | | | | | | | | | | | | | | | | | | |

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 EILs Res/Open Space Aged Zn(22-3)23-4)25-6	NEPM 2013 EILs Comm/Ind Aged Zn(22-3)23-4)25-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
Project No/Source			81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00
Field ID			D-BH-601	D-BH-605	D-BH-605	D-BH-609	D-BH-609	D-BH-610	D-BH-610	D-BH-610	D-BH-610	D-BH-610	D-TP-102	D-TP-102	D-TP-131	D-TP-131	D-TP-133	D-TP-133	D-TP-133	D-TP-208	D-TP-208
Sample Depth			2	0.1	1	0.1	0.3	0.1	0.5	1.3	1.6	0.5	1.5	0.2	1	1.5	0.2	0.5	1	0.1	1
Sample Date			########	22/09/2016	22/09/2016	10/05/2016	10/05/2016	10/05/2016	10/05/2016	10/05/2016	10/05/2016	27/10/2016	27/10/2016	########	########	########	########	########	########	########	########
Geotechnical Zone			6	6	6	6	6	6	6	6	6	6	1	1	1	1	1	1	1	2	2
AOPCR			13,			26,	26,	26,	26,	26,	26,										
Inorganics																					
pH 1:5 soil:water	pH Units		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Field)	pH Units		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (Non Compensated)	µS/cm	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electric resisitivity	ohm m	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																					
Arsenic	mg/kg	4	3000	300									100	160							
Cadmium	mg/kg	0.4	900	90																	
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/120							
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160							
Iron	mg/kg	10																			
Lead	mg/kg	1	1500	600									1100	1800							
Manganese	mg/kg	1	60000	19000																	
Mercury	mg/kg	0.1	730	80																	
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90							
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360							
TRH																					
C6-C10	mg/kg	25																			
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215					
C10-C16	mg/kg	50															800	800	5100	26000	82000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170	1000	1000	3800	20000	62000
C16-C34	mg/kg	100													300/1300	1700|2500	5000	3500	5300	27000	85000
C34-C40	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000	120000
C10-C40 (Sum of total)	mg/kg	50																			
C6-C9	mg/kg	25																			
C10-C14	mg/kg	50																			
C15-C28	mg/kg	100																			
C29-C36	mg/kg	100																			
C10-C36	mg/kg	50																			
BTEX																					
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430	1100
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000	85000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000	120000
Xylene (m & p)	mg/kg	2																			
Xylene (o)	mg/kg	1																			
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000	130000
PAH																					
Acenaphthene	mg/kg	0.1																			
Acenaphthylene	mg/kg	0.1																			
Anthracene	mg/kg	0.1																			
Benz(a)anthracene	mg/kg	0.1																			
Benzo[a] pyrene	mg/kg	0.05													33	33					
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																	
Benzo(b+j+k)fluoranthene	mg/kg	0.2																			
Benzo(g,h,i)perylene	mg/kg	0.1																			
Chrysene	mg/kg	0.1																			
Dibenz(a,h)anthracene	mg/kg	0.1																			
Fluoranthene	mg/kg	0.1																			
Fluorene	mg/kg	0.1																			
Hexachlorobenzene	mg/kg	0.1	80	10																	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																			
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000	29000
Phenanthrene	mg/kg	0.1																			
Pyrene	mg/kg	0.1																			
PAHs (Sum of positives)	mg/kg	0.05																			
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.1																			
a-BHC	mg/kg	0.1																			
Aldrin	mg/kg	0.1																			
b-BHC	mg/kg	0.1																			
Chlordane (cis)	mg/kg	0.1																			
Chlordane (trans)	mg/kg	0.1																			
d-BHC	mg/kg	0.1																			
DDD	mg/kg	0.1																			
DDT	mg/kg	0.1											180	640							
DDT+DDE+DDD	mg/kg	0.1	3600	400																	
Dieldrin	mg/kg	0.1																			
Endosulfan I	mg/kg	0.1																			
Endosulfan II	mg/kg	0.1																			
Endosulfan sulphate	mg/kg	0.1																			
Endrin	mg/kg	0.1	100	20																	
Endrin aldehyde	mg/kg	0.1																			
g-BHC (Lindane)	mg/kg	0.1																			
Heptachlor	mg/kg	0.1	50	10																	
Heptachlor epoxide	mg/kg	0.1																			
Methoxychlor	mg/kg	0.1	2500	400																	
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.1																			
Bromophos-ethyl	mg/kg	0.1																			
Chlorpyrifos	mg/kg	0.1	2000	250																	
Chlorpyrifos-methyl	mg/kg	0.1																			
Diazinon	mg/kg	0.1																			
Dichlorvos	mg/kg	0.1																			
Dimethoate	mg/kg	0.1																			
Ethion	mg/kg	0.1																			
Fenitrothion	mg/kg	0.1																			
Malathion	mg/kg	0.1																			
Parathion	mg/kg	0.1																			
Ronnel	mg/kg	0.1																			
PCBs																					
Arochlor 1016	mg/kg	0.1																			
Arochlor 1221	mg/kg	0.1																			
Arochlor 1232	mg/kg	0.1																			
Arochlor 1242	mg/kg	0.1																			
Arochlor 1248	mg/kg	0.1																			
Arochlor 1254	mg/kg	0.1																			
Arochlor 1260	mg/kg	0.1																			
PCBs (Sum of total)	mg/kg	0.1	7	1																	
Phenols																					
Phenolics Total	mg/kg	5																			
PFOS/PFOA																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																			
8:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.1																			
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																			
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																			
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																			
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																			
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																			
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																			
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																			
Sum of PFAS	µg/kg	0.1																			
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																	
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																			
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																			
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																			
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																			
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																			
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																			
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001														0.01/10					
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																			
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																			
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																			
Perfluorononanoic acid (PFNA)	µg/kg	0.1																			
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																			
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																			
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																			
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																			
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10												NC/10					
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																			
Asbestos																					
Asbestos Identification	Detect		D	D																	

Analyte	Units	PQL	D-TP-214	D-TP-214	D-TP-414	D-TP-414	D-TP-416	D-TP-416	D-TP-418	D-TP-418	D-TP-419	D-TP-419	D-TP-423	D-TP-432	D-TP-432	D-TP-437	D-TP-437
Project No/Source			81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00	81641.00
Field ID			D-TP-214	D-TP-214	D-TP-414	D-TP-414	D-TP-416	D-TP-416	D-TP-418	D-TP-418	D-TP-419	D-TP-419	D-TP-423	D-TP-432	D-TP-432	D-TP-437	D-TP-437
Sample Depth			0.2	0.5	0.2	0.4	0.2	0.5	0.1	0.4	0.2	0.5	0.2	0.5	1	0.2	0.5
Sample Date			########	########	20/10/2016	20/10/2016	27/10/2016	27/10/2016	########	########	20/10/2016	20/10/2016	########	20/10/2016	20/10/2016	20/10/2016	20/10/2016
Geotechnical Zone			2	2	4	4	4	4	4	4	4	4	4	4	4	4	4
AOPCR			21,	21,											12,	12,	
Inorganics																	
pH 1:5 soil:water	pH Units		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Field)	pH Units		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (Non Compensated)	µS/cm	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electric resisitivity	ohm m	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/kg	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																	
Arsenic	mg/kg	4	<4	<4	<4	<4	<4	5	<4	<4	12	15	5	6	7	<4	6
Cadmium	mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium (III+VI)	mg/kg	1	2	2	6	4	6	14	12	7	3	6	6	16	13	24	10
Copper	mg/kg	1	<1	2	<1	1	3	3	4	3	<1	14	12	10	2	<1	19
Iron	mg/kg	10	470	1700	1200	7200	2200	17000	18000	6100	820	22000	10000	15000	17000	36000	12000
Lead	mg/kg	1	<1	2	2	13	4	11	11	10	1	8	17	66	14	10	220
Manganese	mg/kg	1	1	37	8	110	29	300	340	190	5	490	4	340	50	27	310
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1	<1	2	2	<1	2	4	4	2	1	14	1	5	3	3	11
Zinc	mg/kg	1	<1	7	3	28	40	23	25	26	<1	46	7	76	9	3	93
TRH																	
C6-C10	mg/kg	25															
C6-C10 (F1 minus BTEX)	mg/kg	25															
C10-C16	mg/kg	50															
C10-C16 (F2 minus Naphthalene)	mg/kg	50															
C16-C34	mg/kg	100															
C34-C40	mg/kg	100															
C10-C40 (Sum of total)	mg/kg	50															
C6-C9	mg/kg	25															
C10-C14	mg/kg	50															
C15-C28	mg/kg	100															
C29-C36	mg/kg	100															
C10-C36	mg/kg	50															
BTEX																	
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene (m & p)	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Xylene Total	mg/kg	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
PAH																	
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.2
Benz(a)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.5	1.1	0.4	<0.1	<0.1	<0.1	<0.1	0.6	0.1	<0.1	1.1
Benzo[a] pyrene	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	0.69	1	0.4	<0.05	<0.05	<0.05	<0.05	0.7	0.08	<0.05	1.2
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.6	0.6	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.9
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.6	0.6	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.9
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	0.9	1.6	0.6	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.9
Benzo(b+j+k)fluoranthene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	1	2.1	0.8	<0.2	<0.2	<0.2	<0.2	0.9	<0.2	<0.2	2.2
Benzo(g,h,i)perylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.9	0.4	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	1.1
Chrysene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.6	1.1	0.5	<0.1	<0.1	<0.1	<0.1	0.4	0.1	<0.1	1.3
Dibenz(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	1.6	3	1.3	<0.1	<0.1	<0.1	<0.1	1.5	0.4	<0.1	3
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	mg/kg	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.9	0.4	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	0.8
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
Phenanthrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.8	0.5	<0.1	<0.1	<0.1	<0.1	0.8	0.2	<0.1	0.4
Pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	1.5	2.5	1.1	<0.1	<0.1	<0.1	<0.1	1.2	0.3	<0.1	2.5
PAHs (Sum of positives)	mg/kg	0.05	0	0	0	0	7.4	14	5.6	0	0	0	7.6	1.3	0	13	2.3
Organochlorine Pesticides																	
4,4-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
b-BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane (cis)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane (trans)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
d-BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT+DDE+DDD	mg/kg	0.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Dieldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
g-BHC (Lindane)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organophosphorous Pesticides																	
Azinophos methyl	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 EILs Res/Open Space Aged Zn(22-3)23-4(25-6	NEPM 2013 EILs Comm/Ind Aged Zn(22-3)23-4(25-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
Inorganics																				
pH 1:5 soil:water	pH Units																			
pH (Field)	pH Units																			
Electrical Conductivity (Non Compensated)	µS/cm	1																		
Chloride	mg/kg	10																		
Electric resisitivity	ohm m	1																		
Sulphate	mg/kg	10																		
Metals																				
Arsenic	mg/kg	4	3000	300									100	160						
Cadmium	mg/kg	0.4	900	90																
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/320						
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160						
Iron	mg/kg	10																		
Lead	mg/kg	1	1500	600									1100	1800						
Manganese	mg/kg	1	60000	19000																
Mercury	mg/kg	0.1	730	80																
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90						
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360						
TRH																				
C6-C10	mg/kg	25															800	800	5100	26000
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215				
C10-C16	mg/kg	50															1000	1000	3800	20000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170				
C16-C34	mg/kg	100													300/1300	1700|2500	5000	3500	5300	27000
C34-C40	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000
C10-C40 (Sum of total)	mg/kg	50																		
C6-C9	mg/kg	25																		
C10-C14	mg/kg	50																		
C15-C28	mg/kg	100																		
C29-C36	mg/kg	100																		
C10-C36	mg/kg	50																		
BTEX																				
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000
Xylene (m & p)	mg/kg	2																		
Xylene (o)	mg/kg	1																		
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000
PAH																				
Acenaphthene	mg/kg	0.1																		
Acenaphthylene	mg/kg	0.1																		
Anthracene	mg/kg	0.1																		
Benz(a)anthracene	mg/kg	0.1																		
Benzo(a) pyrene	mg/kg	0.05													33	33				
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																
Benzo(b+j+k)fluoranthene	mg/kg	0.2																		
Benzo(g,h,i)perylene	mg/kg	0.1																		
Chrysene	mg/kg	0.1																		
Dibenz(a,h)anthracene	mg/kg	0.1																		
Fluoranthene	mg/kg	0.1																		
Fluorene	mg/kg	0.1																		
Hexachlorobenzene	mg/kg	0.1	80	10																
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																		
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000
Phenanthrene	mg/kg	0.1																		
Pyrene	mg/kg	0.1																		
PAHs (Sum of positives)	mg/kg	0.05																		
Organochlorine Pesticides																				
4,4-DDE	mg/kg	0.1																		
a-BHC	mg/kg	0.1																		
Aldrin	mg/kg	0.1																		
b-BHC	mg/kg	0.1																		
Chlordane (cis)	mg/kg	0.1																		
Chlordane (trans)	mg/kg	0.1																		
d-BHC	mg/kg	0.1																		
DDD	mg/kg	0.1																		
DDT	mg/kg	0.1											180	640						
DDT+DDE+DDD	mg/kg	0.1	3600	400																
Dieldrin	mg/kg	0.1																		
Endosulfan I	mg/kg	0.1																		
Endosulfan II	mg/kg	0.1																		
Endosulfan sulphate	mg/kg	0.1																		
Endrin	mg/kg	0.1	100	20																
Endrin aldehyde	mg/kg	0.1																		
g-BHC (Lindane)	mg/kg	0.1																		
Heptachlor	mg/kg	0.1	50	10																
Heptachlor epoxide	mg/kg	0.1																		
Methoxychlor	mg/kg	0.1	2500	400																
Organophosphorous Pesticides																				
Azinophos methyl	mg/kg	0.1																		
Bromophos-ethyl	mg/kg	0.1																		
Chlorpyrifos	mg/kg	0.1	2000	250																
Chlorpyrifos-methyl	mg/kg	0.1																		
Diazinon	mg/kg	0.1																		
Dichlorvos	mg/kg	0.1																		
Dimethoate	mg/kg	0.1																		
Ethion	mg/kg	0.1																		
Fenitrothion	mg/kg	0.1																		
Malathion	mg/kg	0.1																		
Parathion	mg/kg	0.1																		
Ronnel	mg/kg	0.1																		
PCBs																				
Aroclor 1016	mg/kg	0.1																		
Aroclor 1221	mg/kg	0.1																		
Aroclor 1232	mg/kg	0.1																		
Aroclor 1242	mg/kg	0.1																		
Aroclor 1248	mg/kg	0.1																		
Aroclor 1254	mg/kg	0.1																		
Aroclor 1260	mg/kg	0.1																		
PCBs (Sum of total)	mg/kg	0.1	7	1																
Phenols																				
Phenolics Total	mg/kg	5																		
PFOS/PFOA																				
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg	0.1																		
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																		
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																		
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																		
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																		
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																		
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																		
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																		
Sum of PFAS	µg/kg	0.1																		
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																		
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																		
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																		
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																		
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																		
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																		
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																		
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001													0.01/10					
Perfluorododecanoic acid (PFODoDA)	µg/kg	0.5																		
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																		
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																		
Perfluorononanoic acid (PFNA)	µg/kg	0.1																		
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																		
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																		
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																		
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																		
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10											NC/10					
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																		
Asbestos																				
Asbestos Identification	Detect		D	D																

Project No/Source																				
Field ID	D-TP-506	D-TP-506	M-BH-104	M-BH-104	M-BH-202	M-BH-202	M-BH-210	M-BH-210	M-BH-301	M-BH-301	M-BH-307	M-BH-307	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310
Sample Depth	0.1	0.2	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.5	11.6-12.05	16.1-16.55	17.6-18.05	2.5-2.95	22.1-22.55	26.6-27.05	32.6-33.05
Sample Date	########	########							10/05/2021	10/05/2021										
Geotechnical Zone	4	5	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
AOPCR																				

Project No/Source																				
Field ID	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310
Sample Depth	34.5-35.05	3.5-4.55	41.6-42.05	47.6-48.05	50.6-51.05	7.1-7.55	8.6-9.05	1-1.18	2.5-2.7	4.2-4.4	8.7-8.9	11.7-11.9	13.2-13.4	16.2-16.4						
Sample Date																				
Geotechnical Zone	3	3	3	3	3	3	3	3	3	3	3	3	3	3						
AOPCR																				

Analyte	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310	M-BH-310
Inorganics																				
pH 1:5 soil:water	-	-	6.8	-	8.8	-	-	8.8	-	8.8	-	8.7	8.8	-	9.4	-	9	5.5	-	8.8
pH (Field)	-	-	6.5	8.3	8.3	8.3	7.8	8.4	8.7	8.5	8.3	7.3	8.1	7.7	8	8.5	8.5	5.3	7.7	8.2
Electrical Conductivity (Non Compensated)	-	-	1600	-	5500	-	-	5800	-	5000	-	2700	2900	-	580	-	2500	2300	-	2100
Chloride	-	-	1900	-	9600	-	-	10,000	-	7400	-	3500	3700	-	520	-	3200	1900	-	2700
Electric resisitivity	-	-	2	-	1.8	-	-	1.7	-	2	-	3.7	3.5	-	17	-	4	4.3	-	4.7
Sulphate	-	-	930	-	230	-	-	270	-	69	-	410	110	-	46	-	120	2500	-	360
Metals																				
Arsenic	<4	<4	<4	5	5	15	4	5	<4	4	<4	<4	-	-	-	-	-	-	-	-
Cadmium	<0.4	<0.4	<0.4	<0.4	<0.4	0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	-	-	-	-	-	-	-
Chromium (III+VI)	3	<1	14	21	32	28	35	10	26	22	34	33	-	-	-	-	-	-	-	-
Copper	43	<1	2	2	23	13	9	9	25	12	26	17	-	-	-	-	-	-	-	-
Iron	2400	210	18,000	33,000	52,000	130,000	15,000	13,000	26,000	29,000	35,000	28,000	-	-	-	-	-	-	-	-
Lead	3	<1	15	10	12	10	17	12	25	7	15	11	-	-	-	-	-	-	-	-
Manganese	5	1	22	7	210	75	1100	270	300	430	1600	45	-	-	-	-	-	-	-	-
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Nickel	9	<1	4	3	40	22	12	16	30	22	65	19	-	-	-	-	-	-	-	-
Zinc	17	<1	11	6	63	41	35	34	100	28	57	33	-	-	-	-	-	-	-	-
TRH																				
C6-C10	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	-	-	-	-	-	-	-
C6-C10 (F1 minus BTEX)	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	-	-	-	-	-	-	-
C10-C16	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-	-	-	-
C10-C16 (F2 minus Naphthalene)	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-	-	-	-
C16-C34	<100	<100	110	<100	<100	<100	100	<100	<100	<100	<100	<100	-	-	-	-	-	-	-	-
C34-C40	<100	<100	110	<100	<100	<100	100	<100	<100	<100	<100	<100	-	-	-	-	-	-	-	-
C10-C40 (Sum of total)	-	-	220	<50	<50	<50	210	<50	<50	<50	<50	<50	-	-	-	-	-	-	-	-
C6-C9	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	-	-	-	-	-	-	-
C10-C14	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-	-	-	-
C15-C28	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	-	-	-	-	-	-	-
C29-C36	<100	<100	130	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	-	-	-	-	-	-	-
C10-C36	<250	<250	-	-	<50	<50	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-
BTEX																				
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-
Xylene (m & p)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	-	-	-	-
Xylene (o)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
Xylene Total	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	-	-	-	-	-	-	-	-
PAH																				
Acenaphthene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Acenaphthylene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Anthracene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Benz(a)anthracene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.2	2.6	0.2	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Benzo(a) pyrene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2.4	2.4	0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Benzo(a)pyrene TEQ calc (Zero)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	3.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-
Benzo(a)pyrene TEQ calc (Half)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	3.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-
Benzo(a)pyrene TEQ (LOR)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	3.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-
Benzo(b+j+k)fluoranthene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3.9	4.1	0.5	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.6	1.4	0.2	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Chrysene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.8	2.2	0.3	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Dibenz(a,h)anthracene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.3	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Fluoranthene	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.7	4.4	0.6	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Fluorene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.4	1.3	0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Phenanthrene	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5	0.2	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Pyrene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.4	4.1	0.6	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
PAHs (Sum of positives)	0.25	0	<0.05	<0.05	<0.05	<0.05	21	23	3.2	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Organochlorine Pesticides																				
4,4-DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
a-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
b-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Chlordane (cis)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Chlordane (trans)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
d-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
DDT	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
DDT+DDE+DDD	<0.3	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Endosulfan I	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Endosulfan II	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Endosulfan sulphate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Endrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Endrin aldehyde	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
g-BHC (Lindane)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Heptachlor epoxide	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Methoxychlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Organophosphorous Pesticides																				
Azinophos methyl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Bromophos-ethyl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Chlorpyrifos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Chlorpyrifos-methyl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Diazinon	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Dichlorvos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Dimethoate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Ethion	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-
Fenitrothion	<0.1	<0.1

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 ESLs Res/Open Space Aged Z1|2-3|2-3|2-4|2.5-6	NEPM 2013 ESLs Comm/Ind Aged Z1|2-3|2-3|2-4|2.5-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine)	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine)	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
					0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m			0-2m	0-2m					
Inorganics																					
pH 1:5 soil:water	pH Units																				
pH (Field)	pH Units																				
Electrical Conductivity (Non Compensated)	µS/cm	1																			
Chloride	mg/kg	10																			
Electric resisitivity	ohm m	1																			
Sulphate	mg/kg	10																			
Metals																					
Arsenic	mg/kg	4	3000	300									100	160							
Cadmium	mg/kg	0.4	900	90																	
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/320							
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160							
Iron	mg/kg	10																			
Lead	mg/kg	1	1500	600									1100	1800							
Manganese	mg/kg	1	60000	19000																	
Mercury	mg/kg	0.1	730	80																	
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90							
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360							
TRH																					
C6-C10	mg/kg	25															800	800	5100	26000	82000
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL				180	215					
C10-C16	mg/kg	50																1000	1000	3800	20000	62000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL				120	170					
C16-C34	mg/kg	100														300/1300	1700|2500	5000	3500	5300	27000	85000
C34-C40	mg/kg	100														2800/5600	3300|6600	10000	10000	7400	38000	120000
C10-C40 (Sum of total)	mg/kg	50																				
C6-C9	mg/kg	25																				
C10-C14	mg/kg	50																				
C15-C28	mg/kg	100																				
C29-C36	mg/kg	100																				
C10-C36	mg/kg	50																				
BTEX																					
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL				50/65	75|95			120	430	1100
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL				70/125	165|185			5300	27000	85000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL				85/105	135			18000	99000	120000
Xylene (m & p)	mg/kg	2																				
Xylene (o)	mg/kg	1																				
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL				105/45	95|180			15000	81000	130000
PAH																					
Acenaphthene	mg/kg	0.1																			
Acenaphthylene	mg/kg	0.1																			
Anthracene	mg/kg	0.1																			
Benz(a)anthracene	mg/kg	0.1																			
Benzo(a) pyrene	mg/kg	0.05														33	33					
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																		
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																		
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																		
Benzo(b+j+k)fluoranthene	mg/kg	0.2																				
Benzo(g,h,i)perylene	mg/kg	0.1																				
Chrysene	mg/kg	0.1																				
Dibenz(a,h)anthracene	mg/kg	0.1																				
Fluoranthene	mg/kg	0.1																				
Fluorene	mg/kg	0.1																				
Hexachlorobenzene	mg/kg	0.1	80	10																		
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																				
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370						1900	11000	29000
Phenanthrene	mg/kg	0.1																				
Pyrene	mg/kg	0.1																				
PAHs (Sum of positives)	mg/kg	0.05																				
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.1																			
a-BHC	mg/kg	0.1																			
Aldrin	mg/kg	0.1																			
b-BHC	mg/kg	0.1																			
Chlordane (cis)	mg/kg	0.1																			
Chlordane (trans)	mg/kg	0.1																			
d-BHC	mg/kg	0.1																			
DDD	mg/kg	0.1																			
DDT	mg/kg	0.1											180	640							
DDT+DDE+DDD	mg/kg	0.1	3600	400																	
Dieldrin	mg/kg	0.1																			
Endosulfan I	mg/kg	0.1																			
Endosulfan II	mg/kg	0.1																			
Endosulfan sulphate	mg/kg	0.1																			
Endrin	mg/kg	0.1	100	20																	
Endrin aldehyde	mg/kg	0.1																			
g-BHC (Lindane)	mg/kg	0.1																			
Heptachlor	mg/kg	0.1	50	10																	
Heptachlor epoxide	mg/kg	0.1																			
Methoxychlor	mg/kg	0.1	2500	400																	
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.1																			
Bromophos-ethyl	mg/kg	0.1																			
Chlorpyrifos	mg/kg	0.1	2000	250																	
Chlorpyrifos-methyl	mg/kg	0.1																			
Diazinon	mg/kg	0.1																			
Dichlorvos	mg/kg	0.1																			
Dimethoate	mg/kg	0.1																			
Ethion	mg/kg	0.1																			
Fenitrothion	mg/kg	0.1																			
Malathion	mg/kg	0.1																			
Parathion	mg/kg	0.1																			
Ronnel	mg/kg	0.1																			
PCBs																					
Aroclor 1016	mg/kg	0.1																			
Aroclor 1221	mg/kg	0.1																			
Aroclor 1232	mg/kg	0.1																			
Aroclor 1242	mg/kg	0.1																			
Aroclor 1248	mg/kg	0.1																			
Aroclor 1254	mg/kg	0.1																			
Aroclor 1260	mg/kg	0.1																			
PCBs (Sum of total)	mg/kg	0.1	7	1																	
Phenols																					
Phenolics Total	mg/kg	5																			
PFOS/PFOA																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/kg	0.1																			
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																			
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																			
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																			
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																			
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																			
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																			
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																			
Sum of PFAS	µg/kg	0.1																			
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																	
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																			
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																			
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																			
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																			
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																			
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																			
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001																			
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																			
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																			
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																			
Perfluorononanoic acid (PFNA)	µg/kg	0.1																			
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																			
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																			
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																			
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																			
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10												NC/10					
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																			
Asbestos																					
Asbestos Identification	Detect		D	D																	

| Project No/Source | | | | | | | | | | | | | | | | | | |

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 ESLs Res/Open Space Aged 2'≤[2-3]≤3-4]25-6	NEPM 2013 ESLs Comm/Ind Aged 2'≤[2-3]≤3-4]25-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
Inorganics																					
pH 1:5 soil:water	pH Units																				
pH (Field)	pH Units																				
Electrical Conductivity (Non Compensated)	µS/cm	1																			
Chloride	mg/kg	10																			
Electric resisitivity	ohm m	1																			
Sulphate	mg/kg	10																			
Metals																					
Arsenic	mg/kg	4	3000	300									100	160							
Cadmium	mg/kg	0.4	900	90																	
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/120							
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160							
Iron	mg/kg	10																			
Lead	mg/kg	1	1500	600									1100	1800							
Manganese	mg/kg	1	60000	19000																	
Mercury	mg/kg	0.1	730	80																	
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90							
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360							
TRH																					
C6-C10	mg/kg	25															800	800	5100	26000	82000
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215					
C10-C16	mg/kg	50															1000	1000	3800	20000	62000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170					
C16-C34	mg/kg	100													300/1300	1700|2500	5000	3500	5300	27000	85000
C34-C40	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000	120000
C10-C40 (Sum of total)	mg/kg	50																			
C6-C9	mg/kg	25																			
C10-C14	mg/kg	50																			
C15-C28	mg/kg	100																			
C29-C36	mg/kg	100																			
C10-C36	mg/kg	50																			
BTEX																					
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430	1100
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000	85000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000	120000
Xylene (m & p)	mg/kg	2																			
Xylene (o)	mg/kg	1																			
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000	130000
PAH																					
Acenaphthene	mg/kg	0.1																			
Acenaphthylene	mg/kg	0.1																			
Anthracene	mg/kg	0.1																			
Benz(a)anthracene	mg/kg	0.1																			
Benzo(a) pyrene	mg/kg	0.05													33	33					
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																	
Benzo(b+j+k)fluoranthene	mg/kg	0.2																			
Benzo(g,h,i)perylene	mg/kg	0.1																			
Chrysene	mg/kg	0.1																			
Dibenz(a,h)anthracene	mg/kg	0.1																			
Fluoranthene	mg/kg	0.1																			
Fluorene	mg/kg	0.1																			
Hexachlorobenzene	mg/kg	0.1	80	10																	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																			
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000	29000
Phenanthrene	mg/kg	0.1																			
Pyrene	mg/kg	0.1																			
PAHs (Sum of positives)	mg/kg	0.05																			
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.1																			
a-BHC	mg/kg	0.1																			
Aldrin	mg/kg	0.1																			
b-BHC	mg/kg	0.1																			
Chlordane (cis)	mg/kg	0.1																			
Chlordane (trans)	mg/kg	0.1																			
d-BHC	mg/kg	0.1																			
DDD	mg/kg	0.1																			
DDT	mg/kg	0.1											180	640							
DDT+DDE+DDD	mg/kg	0.1	3600	400																	
Dieldrin	mg/kg	0.1																			
Endosulfan I	mg/kg	0.1																			
Endosulfan II	mg/kg	0.1																			
Endosulfan sulphate	mg/kg	0.1																			
Endrin	mg/kg	0.1	100	20																	
Endrin aldehyde	mg/kg	0.1																			
g-BHC (Lindane)	mg/kg	0.1																			
Heptachlor	mg/kg	0.1	50	10																	
Heptachlor epoxide	mg/kg	0.1																			
Methoxychlor	mg/kg	0.1	2500	400																	
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.1																			
Bromophos-ethyl	mg/kg	0.1																			
Chlorpyrifos	mg/kg	0.1	2000	250																	
Chlorpyrifos-methyl	mg/kg	0.1																			
Diazinon	mg/kg	0.1																			
Dichlorvos	mg/kg	0.1																			
Dimethoate	mg/kg	0.1																			
Ethion	mg/kg	0.1																			
Fenitrothion	mg/kg	0.1																			
Malathion	mg/kg	0.1																			
Parathion	mg/kg	0.1																			
Ronnel	mg/kg	0.1																			
PCBs																					
Arochlor 1016	mg/kg	0.1																			
Arochlor 1221	mg/kg	0.1																			
Arochlor 1232	mg/kg	0.1																			
Arochlor 1242	mg/kg	0.1																			
Arochlor 1248	mg/kg	0.1																			
Arochlor 1254	mg/kg	0.1																			
Arochlor 1260	mg/kg	0.1																			
PCBs (Sum of total)	mg/kg	0.1	7	1																	
Phenols																					
Phenolics Total	mg/kg	5																			
PFOS/PFOA																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																			
8:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.1																			
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																			
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																			
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																			
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																			
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																			
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																			
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																			
Sum of PFAS	µg/kg	0.1																			
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																	
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																			
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																			
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																			
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																			
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																			
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																			
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001													0.01/10						
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																			
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																			
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																			
Perfluorononanoic acid (PFNA)	µg/kg	0.1																			
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																			
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																			
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																			
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																			
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10											NC/10						
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																			
Asbestos																					
Asbestos Identification	Detect		D	D																	

| Project No/Source | | | | | | | | | | | | | | | | | | |

Table B3 - Results of Soil Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand 0-1m	1-2m	2-4m	>4m	NEPM 2013 EILs Res/Open Space Aged Zn|2-3|23-4|25-6	NEPM 2013 EILs Comm/Ind Aged Zn|2-3|23-4|25-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine) 0-2m	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker
Inorganics																					
pH 1:5 soil:water	pH Units																				
pH (Field)	pH Units																				
Electrical Conductivity (Non Compensated)	µS/cm	1																			
Chloride	mg/kg	10																			
Electric resisitivity	ohm m	1																			
Sulphate	mg/kg	10																			
Metals																					
Arsenic	mg/kg	4	3000	300									100	160							
Cadmium	mg/kg	0.4	900	90																	
Chromium (III+VI)	mg/kg	1											410/410/410/200	680/680/680/120							
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160							
Iron	mg/kg	10																			
Lead	mg/kg	1	1500	600									1100	1800							
Manganese	mg/kg	1	60000	19000																	
Mercury	mg/kg	0.1	730	80																	
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90							
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360							
TRH																					
C6-C10	mg/kg	25															800	800	5100	26000	82000
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215					
C10-C16	mg/kg	50															1000	1000	3800	20000	62000
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170					
C16-C34	mg/kg	100													300|300	1700|2500	5000	3500	5300	27000	85000
C34-C40	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000	120000
C10-C40 (Sum of total)	mg/kg	50																			
C6-C9	mg/kg	25																			
C10-C14	mg/kg	50																			
C15-C28	mg/kg	100																			
C29-C36	mg/kg	100																			
C10-C36	mg/kg	50																			
BTEX																					
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430	1100
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000	85000
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000	120000
Xylene (m & p)	mg/kg	2																			
Xylene (o)	mg/kg	1																			
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000	130000
PAH																					
Acenaphthene	mg/kg	0.1																			
Acenaphthylene	mg/kg	0.1																			
Anthracene	mg/kg	0.1																			
Benz(a)anthracene	mg/kg	0.1																			
Benzo(a) pyrene	mg/kg	0.05													33	33					
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																	
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																	
Benzo(b+j+k)fluoranthene	mg/kg	0.2																			
Benzo(g,h,i)perylene	mg/kg	0.1																			
Chrysene	mg/kg	0.1																			
Dibenz(a,h)anthracene	mg/kg	0.1																			
Fluoranthene	mg/kg	0.1																			
Fluorene	mg/kg	0.1																			
Hexachlorobenzene	mg/kg	0.1	80	10																	
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																			
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000	29000
Phenanthrene	mg/kg	0.1																			
Pyrene	mg/kg	0.1																			
PAHs (Sum of positives)	mg/kg	0.05																			
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.1																			
a-BHC	mg/kg	0.1																			
Aldrin	mg/kg	0.1																			
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Chlordane (cis)	mg/kg	0.1																			
Chlordane (trans)	mg/kg	0.1																			
d-BHC	mg/kg	0.1																			
DDD	mg/kg	0.1																			
DDT	mg/kg	0.1											180	640							
DDT+DDE+DDD	mg/kg	0.1	3600	400																	
Dieldrin	mg/kg	0.1																			
Endosulfan I	mg/kg	0.1																			
Endosulfan II	mg/kg	0.1																			
Endosulfan sulphate	mg/kg	0.1																			
Endrin	mg/kg	0.1	100	20																	
Endrin aldehyde	mg/kg	0.1																			
g-BHC (Lindane)	mg/kg	0.1																			
Heptachlor	mg/kg	0.1	50	10																	
Heptachlor epoxide	mg/kg	0.1																			
Methoxychlor	mg/kg	0.1	2500	400																	
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.1																			
Bromophos-ethyl	mg/kg	0.1																			
Chlorpyrifos	mg/kg	0.1	2000	250																	
Chlorpyrifos-methyl	mg/kg	0.1																			
Diazinon	mg/kg	0.1																			
Dichlorvos	mg/kg	0.1																			
Dimethoate	mg/kg	0.1																			
Ethion	mg/kg	0.1																			
Fenitrothion	mg/kg	0.1																			
Malathion	mg/kg	0.1																			
Parathion	mg/kg	0.1																			
Ronnel	mg/kg	0.1																			
PCBs																					
Arochlor 1016	mg/kg	0.1																			
Arochlor 1221	mg/kg	0.1																			
Arochlor 1232	mg/kg	0.1																			
Arochlor 1242	mg/kg	0.1																			
Arochlor 1248	mg/kg	0.1																			
Arochlor 1254	mg/kg	0.1																			
Arochlor 1260	mg/kg	0.1																			
PCBs (Sum of total)	mg/kg	0.1	7	1																	
Phenols																					
Phenolics Total	mg/kg	5																			
PFOS/PFOA																					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/kg	0.1																			
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																			
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																			
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																			
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																			
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																			
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																			
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																			
Sum of PFAS	µg/kg	0.1																			
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																	
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																			
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																			
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																			
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																			
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																			
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																			
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001														0.01/10					
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																			
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																			
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																			
Perfluorononanoic acid (PFNA)	µg/kg	0.1																			
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																			
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																			
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																			
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																			
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10												NC/10					
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																			
Asbestos																					
Asbestos Identification	Detect		D	D																	

Project No/Source	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD	GHD
Field ID	TP6	TP7	TP7	TP8	TP8	TP8	TP8	TP10	TP10	TP10	TP11	TP11	TP12	TP12	TP12	TP13	TP14	TP15	TP16	TP17	TP18	TP18	TP19	TP19	TP20	TP21	TP21
Sample Depth	0.3	0.1	0.3	0.1	0.3	1	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.3	0.1	0.3	0.1	1
Sample Date																											
Geotechnical Zone	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5
AOPCR																											
Inorganics																											
pH 1:5 soil:water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Field)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical Conductivity (Non Compensated)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electric resisitivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																											
Arsenic	11	5	14	6	<4	<4	4	6	4	6	4	6	3	3	4	4	4	4	6	3	9	17	4	8	8	24	
Cadmium	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	4	<0.4	<0.4	<0.4	<0.4	
Chromium (III+VI)	38	33	42	33	28	11	38	34	37	36	35	23	44	41	46	39	36	37	37	10	25	15	31	33			
Copper	21	21	21	21	11	4	32	23	29	28	24	16	33	31	34	29	27	27	27	53	22	12	23	12			
Iron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Lead	12	15	11	19	6	3	15	10	17	10	11	7	11	13	8	8	12	12	240	9	24	17	11				
Manganese	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	<0.1	<0.1	<0.1	<0.1		
Nickel	23	37	29	41	46	15	40	35	39	29	37	25	41	45	49	50	28	38	14	31	23	5	28	11			
Zinc	43	71	43	71	27	29	83	37	76	35	63	36	64	67	59	51	50	67	39	490	39	80	72	27			
TRH																											
C6-C10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C6-C10 (F1 minus BTEX)	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	
C10-C16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C10-C16 (F2 minus Naphthalene)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C16-C34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C34-C40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
C10-C40 (Sum of total)	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
C6-C9	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	
C10-C14	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
C15-C28	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
C29-C36	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
C10-C36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BTEX																											
Benzene	<0.2	<0.2	-	-	-	-	<0.2	-	<0.2	-	<0.2	-	<0.2	-	-	<0.2	-	<0.2	-	-	<0.2	<0.2	<0.2	-	-		
Ethylbenzene	<1	<1	-	-	-	-	<1	-	<1	-	<1	-	<1	-	-	<1	-	<1	-	-	<1	<1	<1	-	-		
Toluene	<0.5	<0.5	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	-	<0.5	-	<0.5	-	-	<0.5	<0.5	<0.5	-	-		
Xylene (m & p)	<2	<2	-	-	-	-	<2	-	<2	-	<2	-	<2	-	-	<2	-	<2	-	-	<2	<2	<2	-	-		
Xylene (o)	<1	<1	-	-	-	-	<1	-	<1	-	<1	-	<1	-	-	<1	-	<1	-	-	<1	<1	<1	-	-		
Xylene Total	<3	<3	-	-	-	-	<3	-	<3	-	<3	-	<3	-	-	<3	-	<3	-	-	<3	<3	<3	-	-		
PAH																											
Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benz(a)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Benzo(a) pyrene	<0.05	<0.05	-	-	-	-	<0.05	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	1.4	<0.05	<0.05	-	-			
Benzo(a)pyrene TEQ calc (Zero)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.112	<0.5	<0.5	<0.5	<0.5			
Benzo(a)pyrene TEQ calc (Half)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Benzo(a)pyrene TEQ (LOR)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Benzo(b+j+k)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Chrysene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Dibenz(a,h)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Naphthalene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Phenanthrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
PAHs (Sum of positives)	<0.05	<0.05	-	-	-	-	<0.05	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	-	-	-	17	<0.05	<0.05	-	-			
Organochlorine Pesticides																											
4,4-DDE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
a-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
b-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane (cis)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chlordane (trans)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
d-BHC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DDT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DDT+DDE+DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Endosulfan I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan sulphate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Endrin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Endrin aldehyde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
g-BHC (Lindane)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Heptachlor epoxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Methoxychlor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Organophosphorous Pesticides																											
Azinophos methyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bromophos-ethyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chlorpyrifos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chlorpyrifos-methyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Diazinon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dichlorvos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dimethoate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ethion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fenitrothion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Malathion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Parathion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ronnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PCBs																											
Arochlor 1016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1242	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1248	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1254	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arochlor 1260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PCBs (Sum of total)	<0.1	<0.1	-	-	-	-	<0.1	-	<0.1	-	<0.1	-	-	<0.1	<0.1	-	-	-	-	-	-	-	<0.1	-	-		
Phenols					

Table B4 - Results of Sediment Testing compared against SAC

Analyte	Units	PQL	NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil	NEPM 2013 Table 1A(1) HILs Rec C Soil	NEPM 2013 Table 1A(3) Comm/Ind D Soil HSL for Vapour Intrusion, Sand				NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand				NEPM 2013 EILs Res/Open Space Aged Z1|Z2-3|Z3-4|Z5-6	NEPM 2013 EILs Comm/Ind Aged Z1|Z2-3|Z3-4|Z5-6	NEPM 2013 Table 1B(6) ESLs for Res/Open Space (Coarse/Fine)	NEPM 2013 Table 1B(6) ESLs for Comm/Ind (Coarse/Fine)	NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil	NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil	CRC Care Direct Contact HSL-C	CRC Care Direct Contact HSL-D	CRC Care Direct Contact Intrusive Maintenance Worker	ANZECC 2000 ISQV for Sediment Quality - Low	ANZECC 2000 ISQV for Sediment Quality - High	ANZG DGV for toxicant in sediment	ANZG GV-High for toxicants in sediment
					0-1m	1-2m	2-4m	>4m	0-1m	1-2m	2-4m	>4m			0-2m	0-2m									
Inorganics																									
pH 1:5 soil:water	pH Units																								
pH (Field)	pH Units																								
Electrical Conductivity (Non Compensated)	µS/cm	1																							
Chloride	mg/kg	10																							
Electric resisitivity	ohm m	1																							
Sulphate	mg/kg	10																							
Metals																									
Arsenic	mg/kg	4	3000	300									100	160									20	70	20	70
Cadmium	mg/kg	0.4	900	90																			1.5	10	1.5	10
Chromium (III+VI)	mg/kg	1											410/410/200	680/680/680/320									80	370	80	370
Copper	mg/kg	1	240000	17000									110/180/160/110	160/250/220/160									65	270	65	270
Iron	mg/kg	10																								
Lead	mg/kg	1	1500	600									1100	1800									50	220	50	220
Manganese	mg/kg	1	60000	19000																						
Mercury	mg/kg	0.1	730	80																			0.15	1	0.15	1
Nickel	mg/kg	1	6000	1200									170|100|75|55	290|170|130|90									21	52	21	52
Zinc	mg/kg	1	400000	30000									310/460/430/270	410/650/590/360									200	410	200	410
TRH																										
C6-C10	mg/kg	25															800	800	5100	26000	82000					
C6-C10 (F1 minus BTEX)	mg/kg	25			260	370	630	NL	NL	NL	NL	NL			180	215										
C10-C16	mg/kg	50															1000	1000	3800	20000	62000					
C10-C16 (F2 minus Naphthalene)	mg/kg	50			NL	NL	NL	NL	NL	NL	NL	NL			120	170										
C16-C34	mg/kg	100													300/1300	1700|2500	5000	3500	5300	27000	85000					
C34-C40	mg/kg	100													2800/5600	3300|6600	10000	10000	7400	38000	120000					
C10-C40 (Sum of total)	mg/kg	50																							280	550
C6-C9	mg/kg	25																								
C10-C14	mg/kg	50																								
C15-C28	mg/kg	100																								
C29-C36	mg/kg	100																								
C10-C36	mg/kg	50																								
BTEX																										
Benzene	mg/kg	0.2			3	3	3	3	NL	NL	NL	NL			50/65	75|95			120	430	1100					
Ethylbenzene	mg/kg	1			NL	NL	NL	NL	NL	NL	NL	NL			70/125	165|185			5300	27000	85000					
Toluene	mg/kg	0.5			NL	NL	NL	NL	NL	NL	NL	NL			85/105	135			18000	99000	120000					
Xylene (m & p)	mg/kg	2																								
Xylene (o)	mg/kg	1																								
Xylene Total	mg/kg	3			230	NL	NL	NL	NL	NL	NL	NL			105/45	95|180			15000	81000	130000					
PAH																										
Acenaphthene	mg/kg	0.1																					0.016	0.5		
Acenaphthylene	mg/kg	0.1																								
Anthracene	mg/kg	0.1																					0.085	1.1		
Benz(a)anthracene	mg/kg	0.1																					0.261	1.6		
Benzo(a) pyrene	mg/kg	0.05													33	33							0.43	1.6		
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	0.5	40	3																						
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	40	3																						
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5	40	3																						
Benzo(b+j+k)fluoranthene	mg/kg	0.2																								
Benzo(g,h,i)perylene	mg/kg	0.1																								
Chrysene	mg/kg	0.1																					0.384	2.8		
Dibenz(a,h)anthracene	mg/kg	0.1																					0.063	0.26		
Fluoranthene	mg/kg	0.1																					0.6	5.1		
Fluorene	mg/kg	0.1																					0.019	0.54		
Hexachlorobenzene	mg/kg	0.1	80	10																						
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1																								
Naphthalene	mg/kg	0.1			NL	NL	NL	NL	NL	NL	NL	NL	170	370					1900	11000	29000		0.16	2.1		
Phenanthrene	mg/kg	0.1																					0.24	1.5		
Pyrene	mg/kg	0.1																					0.665	2.6		
PAHs (Sum of positives)	mg/kg	0.05																					4	45	10	50
Organochlorine Pesticides																										
4,4-DDE	mg/kg	0.1																								
a-BHC	mg/kg	0.1																								
Aldrin	mg/kg	0.1																								
b-BHC	mg/kg	0.1																								
Chlordane (cis)	mg/kg	0.1																								
Chlordane (trans)	mg/kg	0.1																								
d-BHC	mg/kg	0.1																								
DDD	mg/kg	0.1																								
DDT	mg/kg	0.1											180	640									0.0016	0.046	0.0012	0.005
DDT+DDE+DDD	mg/kg	0.1	3600	400																						
Dieldrin	mg/kg	0.1																					0.00002	0.008	0.0028	0.007
Endosulfan I	mg/kg	0.1																								
Endosulfan II	mg/kg	0.1																								
Endosulfan sulphate	mg/kg	0.1																								
Endrin	mg/kg	0.1	100	20																			0.00002	0.008	0.0027	0.06
Endrin aldehyde	mg/kg	0.1																								
g-BHC (Lindane)	mg/kg	0.1																								
Heptachlor	mg/kg	0.1	50	10																						
Heptachlor epoxide	mg/kg	0.1																								
Methoxychlor	mg/kg	0.1	2500	400																						
Organophosphorous Pesticides																										
Azinophos methyl	mg/kg	0.1																								
Bromophos-ethyl	mg/kg	0.1																								
Chlorpyrifos	mg/kg	0.1	2000	250																						
Chlorpyrifos-methyl	mg/kg	0.1																								
Diazinon	mg/kg	0.1																								
Dichlorvos	mg/kg	0.1																								
Dimethoate	mg/kg	0.1																								
Ethion	mg/kg	0.1																								
Fenitrothion	mg/kg	0.1																								
Malathion	mg/kg	0.1																								
Parathion	mg/kg	0.1																								
Ronnel	mg/kg	0.1																								
PCBs																										
Arochlor 1016	mg/kg	0.1																								
Arochlor 1221	mg/kg	0.1																								
Arochlor 1232	mg/kg	0.1																								
Arochlor 1242	mg/kg	0.1																								
Arochlor 1248	mg/kg	0.1																								
Arochlor 1254	mg/kg	0.1																								
Arochlor 1260	mg/kg	0.1																								
PCBs (Sum of total)	mg/kg	0.1	7	1																			0.023		0.034	0.28
Phenols																										
Phenolics Total	mg/kg	5																								
PFOS/PFOA																										
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/kg	0.2																								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/kg	0.1																								
N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/kg	0.2																								
N-methylperfluorooctane sulfonamidoacetic acid	µg/kg	0.2																								
Perfluorobutanoic acid (PFBA)	µg/kg	0.2																								
Perfluorodecanesulfonic acid (PFDS)	µg/kg	0.2																								
Perfluoroheptane sulfonic acid (PFHpS)	µg/kg	0.1																								
Perfluoropentane sulfonic acid (PFPeS)	µg/kg	0.1																								
Perfluoropentanoic acid (PFPeA)	µg/kg	0.2																								
Sum of PFAS	µg/kg	0.1																								
Sum of PFHxS and PFOS	µg/kg	0.1	20,000	1000																						
N-Methylperfluorooctanesulfonamidoethanol	mg/kg	0.001																								
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002																								
Perfluorodecanoic acid (PFDA)	µg/kg	0.5																								
Perfluorohexanoic acid (PFHxA)	µg/kg	0.1																								
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/kg	1																								
N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/kg	5																								
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/kg	1																								
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001																								
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001													0.01/10											
Perfluorododecanoic acid (PFDoDA)	µg/kg	0.5																								
Perfluoroheptanoic acid (PFHpA)	µg/kg	0.1																								
Perfluorohexane sulfonic acid (PFHxS)	µg/kg	0.1																								
Perfluorononanoic acid (PFNA)	µg/kg	0.1																								
Perfluorooctane sulfonamide (PFOSA)	µg/kg	1																								
Perfluorotetradecanoic acid (PFTeDA)	µg/kg	5																								
Perfluorotridecanoic acid (PFTrDA)	µg/kg	0.5																								
Perfluoroundecanoic acid (PFUnDA)	µg/kg	0.5																								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001																								
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	50	10											NC/10											
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1																								
Asbestos																										
Asbestos Identification	Detect		D	D																						

Project No/Source	81641.03	81641.03	81641.03	81641.03
Field ID	M-BH-322	M-BH-323	M-BH-330	M-BH-331
Sample Depth	0.5	0.7	1	0.4
Sample Date	14/05/2021		5/05/2021	11/05/2021
Geotechnical Zone	3	3	3	3
AOPCR	9,16	9,16	9,16	9,16
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	-	-	-	-
	6	5	<4	5
	<0.4	<0.4	<0.4	<0.4
	30	31	18	10
	19	20	11	3
	37,000	36,000	21,000	18,000
	9	8	5	3
	240	280	230	800
	<0.1	<0.1	<0.1	<0.1
	28	28	17	8
	55	43	32	24
	<25	<25	<25	<25
	<25	<25	<25	<25
	<50	<50	<50	<50
	<50	<50	<50	<50
	<100	<100	<100	<100
	<100	<100	<100	<100
	<50	<50	<50	<50
	<25	<25	<25	<25
	<50	<50	<50	<50
	<100	<100	<100	<100
	<100	<100	<100	<100
	-	-	-	-
	<0.2	<0.2	<0.2	<0.2
	<1	<1	<1	<1
	<0.5	<0.5	<0.5	<0.5
	<2	<2	<2	<2
	<1	<1	<1	<1
	<3	<3	<3	<3
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.05	<0.05	<0.05	<0.05
	<0.5	<0.5	<0.5	<0.5
	<0.5	<0.5	<0.5	<0.5
	<0.5	<0.5	<0.5	<0.5
	<0.2	<0.2	<0.2	<0.2
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1
	<0.1	<0.1	<0.1	<0.1

Table B5 - M12RT Sampling and Testing Schedule (Groundwater)

Project Number / Source	Test Location	Sampling Date	Envirolab Report Number	Duplicate Sample	Testing Suite	Exceedances (Yes/No)	Analytes Exceeded	Criteria Exceeded
81641.00	D-PZ-134	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen, pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-134	20/07/2021	274522		Metals, Micro, Inorganics	Yes	Aluminium, Cadmium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-135	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-135	20/07/2021	274522		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Iron, Manganese, Nickel, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-136	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	D-PZ-136	20/07/2021	274522		Metals, Micro, Inorganics	Yes	Arsenic, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-221B	20/07/2021	274522		Metals, Micro, Inorganics	Yes	Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-222A	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-222A	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Iron, Arsenic, Manganese, Phosphorus, Ammonia, Nitrogen (Total), Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinkning Water
81641.00	D-PZ-222B	25/01/2017	160947	D1-TAC	Metals, Micro, Inorganics	Yes	Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total)	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-222B	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Copper, Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH , Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-222B	20/07/2021	274522		Metals, Micro, Inorganics, PFAS	Yes	Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-223A	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Iron, Manganese, Nickel, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-223A	22/07/2021	274644		Metals, Micro, Inorganics, PFAS	Yes	Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-223B	24/01/2017	160878		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-324A	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Arsenic, Chromium, Iron, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-324A	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-324B	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Arsenic, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-438	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Phosphorus, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	D-PZ-438	22/07/2021	274644		Metals, Micro, Inorganics	Yes	Aluminium, Copper, Iron, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-439A	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Boron, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-439B	25/01/2017	160947	D2-TAC	Metals, Micro, Inorganics	Yes	Iron, Manganese, Phoisphorus, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	D-PZ-439B	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-440A	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Phosphorus, Zinc, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	D-PZ-440B	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-440B	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Copper, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-614	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Copper, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	D-PZ-614	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Copper, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrate, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.00	D-PZ-615A	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Iron, Phosphorus, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-615B	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Iron, Manganese, Phosphorus, Zinc, Ammoina, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	D-PZ-615B	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Aluminium, Iron, Phosphorus, Zinc, Ammonia, pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.00	D-PZ-616	25/01/2017	160947		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine
81641.03	M-PZ-101	19/07/2021	274447		Metals, Micro, Inorganics	Yes	Cadmium, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	M-PZ-102	20/07/2021	274522		Metals, Micro, Inorganics	Yes	Cadmium, Manganese, Nickel, Phosphorus, Zinc, Ammonia, pH, Sulphate	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine, Drinking Water
81641.03	M-PZ-201	20/07/2021	274522		Metals, Micro, Inorganics, PFAS	Yes	Manganese, Nickel, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate, PFOS	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine. Drinking Water. HEPA (2020) 99% LOP for fresh/marine waters for PFOS
81641.03	M-PZ-301	19/07/2021	274447	D1/CJB	Metals, Micro, Inorganics	Yes	Boron, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine. Drinking Water
81641.03	M-PZ-302	19/07/2021	274447		Metals, Micro, Inorganics	Yes	Boron, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	ANZG (2018) Marine 95%, Freshwater 95%, ANZECC (2000) Lowland River/Estuarine. Drinking Water
81641.03	M-PZ-501	22/07/2021	274644		Metals, Micro, Inorganics, PFAS	Yes	Aluminium, Copper, Zinc, Ammonia, Nitrogen (Total), pH, PFOS	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine. HEPA (2020) 99% LOP for fresh/marine waters for PFOS
81641.03	M-PZ-601	21/07/2021	274584		Metals, Micro, Inorganics	Yes	Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	ANZG (2018) Freshwater 95%, ANZECC (2000) Lowland River/Estuarine

Table B6 - Results of Groundwater Testing compared against SAC

Chem_Group	ChemName	Units	PQL	ANZG (2018) Freshwater 95% toxicant DGVs	ANZG (2018) Freshwater 99% toxicant DGVs	ANZG (2018) Freshwater toxicant DGVs Slightly to Moderately Disturbed Systems	ANZG (2018) Marine water 95% toxicant DGVs	ANZG (2018) Marine water 99% toxicant DGVs	ANZG (2018) Marine water toxicant DGVs Slightly to Moderately Disturbed Systems	ANZECC (2000) DTVs for Lowland Rivers	ANZECC (2000) DTVs for Estuaries	PFAS HEPA (2020) Drinking Water	PFAS HEPA (2020) Interim Marine / fresh water 95%	PFAS HEPA (2020) Interim Marine / Fresh Water 99%	NEPM 2013 Table 1C GILs, Drinking Water	NEPM 2013 Table 1C GILs, Fresh Waters	NEPM 2013 Table 1C GILs, Marine Waters
	Field ID																
	LocCode																
	Sample Date																
	AOPCR																
Metals (Dissolved)	Aluminium	mg/L	0.01	0.0008 [1]/0.055 [2]	0.027	0.0008 [1]/0.055 [2]					0.0005 [4]					0.055	
	Arsenic	mg/L	0.001	0.013	0.0008	0.013									0.01		
	Boron	mg/L	0.02	0.94	0.34	0.94									4	0.37	
	Cadmium	mg/L	0.0001	0.0002	0.00006	0.0002	0.0055	0.0007	0.0007						0.002	0.0002	0.0007
	Calcium	mg/L	0.5	-	-	-	-	-	-						-	-	
	Chromium (III+VI)	mg/L	0.001	0.001 [3]	0.00001	0.001 [3]	0.0044	0.00014	0.0044						0.05		
	Copper	mg/L	0.001	0.0014	0.001	0.0014	0.0013	0.0003	0.0013						2	0.0014	0.0013
	Iron	mg/L	0.01	-	-	-	-	-	-		0.3 [5]				-	-	
	Lead	mg/L	0.001	0.0034	0.001	0.0034	0.0044	0.0022	0.0044						0.01	0.0034	0.0044
	Magnesium	mg/L	0.5	-	-	-	-	-	-						-	-	
	Manganese	mg/L	0.005	1.9	1.2	1.9	0.08		0.08						0.5	1.9	
	Mercury	mg/L	0.00005	0.0006	0.00006	0.00006	0.0004	0.0001	0.0001						0.001	0.00006	0.0001
	Nickel	mg/L	0.001	0.011	0.008	0.011	0.07	0.007	0.007						0.02	0.011	0.007
	Phosphorus	mg/L	0.05	-	-	-	-	-	-	0.025	0.03				-	-	
	Potassium	mg/L	0.5	-	-	-	-	-	-						-	-	
	Zinc	mg/L	0.001	0.008	0.0024	0.008	0.008	0.0033	0.008							0.008	0.015
Biological	Total Coliforms by MF	CFU/100mL	-	-	-	-	-	-	-						-	-	
	Faecal Coliforms	CFU/100mL	1	-	-	-	-	-	-						-	-	
	E.Coli	MPN/100mL	1	-	-	-	-	-	-						-	-	
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/L	5	-	-	-	-	-	-						-	-	
	Alkalinity (Carbonate)	mg/L	5	-	-	-	-	-	-						-	-	
	Alkalinity (Carbonate as CaCO3)	mg/L	5	-	-	-	-	-	-						-	-	
	Alkalinity (Hydroxide) as CaCO3	mg/L	5	-	-	-	-	-	-						-	-	
	Alkalinity (total)	mg/L	5	-	-	-	-	-	-						-	-	
	Alkalinity (total) as CaCO3	mg/L	5	-	-	-	-	-	-						-	-	
	Ammonia as N	mg/L	0.005	0.9	0.32	0.9	0.91	0.5	0.91	0.02 [5]	0.015 [5]				0.9	0.91	
	Chloride	mg/L	1	-	-	-	-	-	-						-	-	
	Fluoride	mg/L	0.1	-	-	-	-	-	-						-	-	
	Hydroxide	µg/L	5000	-	-	-	-	-	-						-	-	
	Ionic Balance	%		-	-	-	-	-	-						-	-	
	Nitrate (as N)	mg/L	0.005	-	-	-	-	-	-						11.3	-	
	Nitrogen (Total)	µg/L	100	-	-	-	-	-	-	350	300				500	-	
	pH (Lab)	pH Units		-	-	-	-	-	-	6.5-8.5	7.0-8.5				-	-	
	Sodium (Filtered)	mg/L	0.5	-	-	-	-	-	-						-	-	
	Sulphate	mg/L	1	-	-	-	-	-	-						500	-	
	TDS	mg/L	5	-	-	-	-	-	-						-	-	
PFOS/PFOA	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	N-methylperfluorooctane sulfonamidoacetic acid	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	N-Methylperfluorooctanesulfonamidoethanol	µg/L	0.005	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorobutanoic acid (PFBA)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorodecanesulfonic acid (PFDS)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluoropentanoic acid (PFPeA)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	Sum of PFAS	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Sum of PFHxS and PFOS	µg/L	0.001	-	-	-	-	-	-			0.07	-	-	-	-	-
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/L	0.000002	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorodecanoic acid (PFDA)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorohexanoic acid (PFHxA)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/L	0.01	-	-	-	-	-	-			-	-	-	-	-	-
	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/L	0.05	-	-	-	-	-	-			-	-	-	-	-	-
	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/L	0.005	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorooctanesulfonic acid (PFOS)	mg/L	0.000001	-	-	-	-	-	-			-	0.00013	0.0000023	-	-	-
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.005	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorononanoic acid (PFNA)	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorooctane sulfonamide (PFOSA)	µg/L	0.01	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.002	-	-	-	-	-	-			-	-	-	-	-	-
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/L	0.000001	-	-	-	-	-	-			-	-	-	-	-	-
	Perfluorooctanoic acid (PFOA)	mg/L	0.000001	-	-	-	-	-	-			0.00056	0.22	0.019	-	-	-
	Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.001	-	-	-	-	-	-			-	-	-	-	-	-

Field ID	D-PZ-134	D-PZ-134	D-PZ-135	D-PZ-135	D-PZ-136	D-PZ-136	D-PZ-221B	D-PZ-222A	D-PZ-222A	D-PZ-222B	D-PZ-222B	D1-TAC	D-PZ-222B	D-PZ-223A	D-PZ-223A	D-PZ-223B	D-PZ-324A	D-PZ-324A	D-PZ-324B	D-PZ-438
LocCode	D-PZ-134	D-PZ-134	D-PZ-135	D-PZ-135	D-PZ-136	D-PZ-136	D-PZ-221B	D-PZ-222A	D-PZ-222A	D-PZ-222B	D-PZ-222B	D-PZ-222B	D-PZ-222B	D-PZ-223A	D-PZ-223A	D-PZ-223A	D-PZ-324A	D-PZ-324A	D-PZ-324B	D-PZ-438
Sample Date	25/01/2017	20/07/2021	24/01/2017	20/07/2021	24/01/2017	20/07/2021	20/07/2021	24/01/2017	25/01/2017	24/01/2017	25/01/2017	25/01/2017	20/07/2021	24/01/2017	22/07/2021	24/01/2017	25/01/2017	21/07/2021	25/01/2017	25/01/2017
AOPCR	1, 4, 19	1, 4, 19	1, 4, 20	1, 4, 20	4, 20,	4, 20,	18,	18,	18,	18,	18,	18,	18,	18, 4	18, 4	18, 4	5,	5,	5,	5, 11
Metals (Dissolved)	0.51	0.39	0.05	0.58	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.23	10	0.04
	0.008	0.009	0.003	0.004	0.008	0.003	0.002	<0.001	0.002	0.005	0.003	0.003	0.005	0.003	<0.001	<0.001		<0.001	0.01	<0.001
	0.06	0.03	0.06	0.06	0.07	0.05	0.05	0.72	0.67	0.04	0.05	0.05	0.05	0.82	<0.02	<0.02	0.57	0.58	0.1	0.09
	<0.0001	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0003	<0.0001
	27	28	4.9	1	8.4	18	68	780	300	320	64	61	290	1100	500	460	21	41	260	1.7
	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003	0.001	<0.001
	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001
	9.7	9.6	29	2.1	4.1	3.2	0.48	0.23	9.7	7.9	0.75	0.72	5.9	4.5	54	25	56	12	140	0.049
	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	120	140	44	3	48	60	100	680	260	420	96	91	370	1100	510	460	63	97	850	5.2
	0.24	0.17	0.08	0.023	0.31	0.27	0.25	0.08	0.08	0.08	0.25	0.24	0.08	0.06	0.04	0.04	0.47	0.02	0.07	0.01
	<0.00005	-	<0.00005	-	<0.00005	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005
	0.001	0.001	0.006	0.013	0.017	0.001	0.001	0.009	0.004	0.006	0.001	0.001	0.008	0.008	0.001	0.005	0.009	0.001	0.001	0.003
	0.08	<0.05	0.8	0.5	0.7	0.3	0.2	3.7	3.1	0.3	0.3	0.3	1.6	3.7	0.5	0.1	1.4	0.4	0.9	0.3
	19	15	8.3	2	9	8.5	11	90	55	28	12	12	24	100	30	39	29	25	100	2.3
	0.13	0.11	0.086	0.007	0.045	0.016	0.003	0.01	0.007	0.025	0.003	0.003	0.012	0.005	0.012	0.012	0.037	0.064	0.29	0.008
	-	<20	-	50	-	20	4700	-	-	-	-	-	330	-	-	-	<1000	-	-	-
	<200	-	<20	-	<20	-	-	<20	<200	<20	<200	<200	-	<20	-	<20	<200	-	<200	<200
	<200	<20	<20	<20	<20	<20	<10	<20	<200	<20	<200	<200	<20	<20	<10	<20	<200	<10	<200	<200
	70	8	<5	51	53	260	540	660	660	440	620	610	430	740	240	370	34	10	<5	14
	<5	-	<5	-	<5	-	-	<5	<5	<5	<5	<5	-	<5	-	<5	<5	-	<5	<5
	-	<5	-	<5	-	<5	<5	-	-	-	-	-	<5	-	<5	-	-	<5	-	-
	-	<5	-	<5	-	<5	<5	-	-	-	-	-	<5	-	<5	-	-	<5	-	-
	70	-	<5	-	53	-	-	660	660	440	620	610	-	740	-	370	34	-	<5	14
	-	8	-	51	-	260	540	-	-	-	-	-	430	-	240	-	-	10	-	-
	0.91	0.67	0.79	0.26	0.19	0.21	0.95	0.2	0.49	1	0.53	0.53	0.94	0.91	0.4	0.4	2.5	4.1	0.22	0.008
	2200	2200	650	57	590	630	1400	4000	2000	4400	1200	1400	4100	7700	5600	5300	1600	1200	7700	190
	0.3	0.4	0.3	<0.1	0.2	0.4	0.6	0.4	0.3	0.9	0.5	0.3	0.9	0.5	0.4	3	<0.1	<0.1	0.7	<0.1
	<5000	-	<5000	-	<5000	-	-	<5000	<5000	<5000	<5000	<5000	-	<5000	-	<5000	<5000	-	<5000	<5000
	11	1	14	5	15	5	-2	10	1.1	10	13	8.1	2	12	2	7.1	13	-2	13	19
	0.03	0.29	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	0.05	0.08	0.02	<0.005	0.16	<0.005	<0.005	<0.005	<0.005	0.27
	4500	900	9100	900	4800	100	900	8100	6800	2200	1700	1600	1000	10,000	900	1500	13,000	5500	15,000	7100
	5.9	4.7	3.8	5.8	5.9	6.3	6.9	7.1	7	6.7	7.1	7.2	6.6	6.9	6.2	6.4	5.4	4.8	4	5.5
	1500	1200	490	61	470	470	980	3100	2000	2800	1300	1200	2200	5300	2700	3000	1400	1100	5600	260
	30	56	41	4	52	61	270	2100	2100	510	260	210	1700	2800	760	760	380	1400	1800	120
	4500	4000	1300	180	1300	1400	3400	13,000	9700	8700	3400	3500	9300	20,000	13,000	11,000	3600	4100	17,000	780
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	<0.005	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
0.07	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.000002	-	<0.000002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	<0.05	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	<0.005	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.000001	-	<0.000001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	<0.005	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	<0.05	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	<0.002	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.000001	-	<0.000001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.000001	-	<0.000001	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	<0.001	-	-	-	-	-

Notes to Table:

(1) - Trigger Values for Fresh Water pH<6.5
(2) - Trigger Values for Fresh Water pH>6.5
(3) - Chromium (VI) Criteria Used to Assess Total Chromium
(4) - Freshwater Interim Indicative Working Level (ANZECC 2000)
(5) - Ammonium Trigger Values for Chemical and Physical Stressors (ANZECC 2000) Used to Assess Ammonia (Conservative)

Table B6 - Results of Groundwater Testing compared against SAC

Field ID				D-PZ-438	D-PZ-439A	D-PZ-439B	D2-TAC	D-PZ-439B	D-PZ-440A	D-PZ-440B	D-PZ-440B	D-PZ-614	D-PZ-614	D-PZ-615A	D-PZ-615B	D-PZ-615B	D-PZ-616	M-PZ-101	M-PZ-102	M-PZ-201	M-PZ-301	D1/CIB	M-PZ-302	M-PZ-501
LocCode				D-PZ-438	D-PZ-439A	D-PZ-439B	D-PZ-439B	D-PZ-439B	D-PZ-440A	D-PZ-440B	D-PZ-440B	D-PZ-614	D-PZ-614	D-PZ-615A	D-PZ-615B	D-PZ-615B	D-PZ-616	M-PZ-101	M-PZ-102	M-PZ-201	M-PZ-301	M-PZ-301	M-PZ-302	M-PZ-501
Sample Date				22/07/2021	25/01/2017	25/01/2017	25/01/2017	21/07/2021	25/01/2017	25/01/2017	21/07/2021	25/01/2017	21/07/2021	25/01/2017	25/01/2017	21/07/2021	25/01/2017	19/07/2021	20/07/2021	20/07/2021	19/07/2021	19/07/2021	19/07/2021	22/07/2021
AOPCR				5,11								12,	12,	12,	12,	12,	14,		2,	18, 21	18,	18,	18,	18,
Chem_Group	ChemName	Units	PQL	ANZG (2018) Freshwater 95% toxicant DGVs	ANZG (2018) Freshwater 99% toxicant DGVs	ANZG (2018) Freshwater toxicant DGVs Slightly to Moderately Disturbed Systems	ANZG (2018) Marine water 95% toxicant DGVs	ANZG (2018) Marine water 99% toxicant DGVs	ANZG (2018) Marine water toxicant DGVs Slightly to Moderately Disturbed Systems	ANZECC (2000) DTVs for Lowland Rivers	ANZECC (2000) DTVs for Estuaries	PFAS HEPA (2020) Drinking Water	PFAS HEPA (2020) Interim Marine / Fresh water 95%	PFAS HEPA (2020) Interim Marine / Fresh Water 99%	NEPM 2013 Table 1C GILs, Drinking Water	NEPM 2013 Table 1C GILs, Fresh Waters	NEPM 2013 Table 1C GILs, Marine Waters								
Metals (Dissolved)	Aluminium	mg/L	0.01	0.0008 [1]/0.055 [2]	0.027	0.0008 [1]/0.055 [2]					**0.0005** [4]				0.055			**0.38**	<0.01	<0.01	<0.01	<0.01	**0.05**	**0.3**	**0.03**	**8.3**	**0.44**	**0.2**	**0.11**	**0.09**	**0.47**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.06**
	Arsenic	mg/L	0.001	0.013	0.0008	0.013									0.01			0.002	0.004	0.006	0.005	0.002	0.001	<0.001	<0.001	0.003	<0.001	<0.001	0.003	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.005	<0.001
	Boron	mg/L	0.02	0.94	0.34	0.94									4	0.37		0.04	1.3	0.53	0.71	0.53	0.03	0.03	0.03	0.03	0.34	0.1	0.03	0.04	0.03	0.06	0.04	0.2	0.64	2.4	2.3	1.2	<0.02
	Cadmium	mg/L	0.0001	0.0002	0.00006	0.0002	0.0055	0.0007	0.0007						0.002	0.0002	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0009**	**0.0009**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Calcium	mg/L	0.5	-	-	-	-	-	-	-					-	-	-	4	580	62	61	290	4	2.3	3	3	9.6	33	2.1	5.9	1	4.7	120	170	590	360	380	310	9.8
	Chromium (III+VI)	mg/L	0.001	0.001 [3]	0.00001	0.001 [3]	0.0044	0.00014	0.0044						0.05			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.037	0.003	0.002	0.002	0.001	0.006	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
	Copper	mg/L	0.001	0.0014	0.001	0.0014	0.0013	0.0003	0.0013						2	0.0014	0.0013	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005
	Iron	mg/L	0.01								0.3 [5]							0.65	20	9.7	9.9	13	3	1.9	1.9	1.8	8.8	0.27	0.92	3.3	0.51	1.5	0.02	0.06	0.17	7.5	9.5	38	0.02
	Lead	mg/L	0.001	0.0034	0.001	0.0034	0.0044	0.0022	0.0044						0.01	0.0034	0.0044	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Magnesium	mg/L	0.5															5.3	480	88	86	110	8.1	8.2	10	2.4	15	1.7	1.8	1	3.4	840	690	340	1400	1400	1100	3
	Manganese	mg/L	0.005	1.9	1.2	1.9	0.08		0.08						0.5	1.9		0.025	1.9	0.88	0.88	0.88	0.042	0.016	0.018	0.23	0.21	0.007	0.14	<0.005	0.084	0.6	1.2	0.6	1.2	1.2	1.2	0.024
	Mercury	mg/L	0.00005	0.0006	0.00006	0.00006	0.0004	0.0001	0.0001						0.001	0.00006	0.0001	-	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	-	-	-	-	-	-	-	-
	Nickel	mg/L	0.001	0.011	0.008	0.011	0.07	0.007	0.007						0.02	0.011	0.007	0.003	0.002	0.007	0.006	0.003	0.002	<0.001	<0.001	<0.001	0.007	0.016	<0.001	<0.001	0.006	<0.001			0.014	0.014	0.008		0.008
	Phosphorus	mg/L	0.05							0.025	**0.03**							**0.1**	**2**	**2.5**	**2.2**	**0.5**	**0.8**	**2**	**0.1**	<0.05	**1.2**	**0.5**	**0.3**	**0.2**	**0.06**	**0.2**	**0.5**	**0.1**	**0.9**	**3.9**	**3.7**	**2.9**	<0.05
	Potassium	mg/L	0.5															0.9	92	48	47	46	5.1	1.8	2	7.4	7.7	1.5	3	2	2.4	33	37	24	310	310	180	3
	Zinc	mg/L	0.001	0.008	0.0024	0.008	0.008	0.0033	0.008							0.008	0.015	**0.012**	0.007	0.003	0.004	0.007	**0.01**	0.007	0.002	0.005	**0.12**	0.004	**0.019**	**0.012**	0.002	**0.11**	**0.02**	0.008	**0.081**	**0.02**	**0.017**	**0.018**
Biological	Total Coliforms by MF	CFU/100mL																10,000	-	-	-	-	-	-	-	-	<10	-	-	<10	-	220	<20	1300	<20	<20	20	-
	Faecal Coliforms	CFU/100mL	1															-	<200	200	<200	-	200	<200	-	<200	-	<200	<200	-	<200	-	-	-	-	-	-	-
	E.Coli	MPN/100mL	1															100	<200	<200	<200	<10	200	<200	<10	<200	<10	<200	<200	<10	<200	<20	<20	20	<20	<20	<20	<10
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/L	5															60	800	540	560	520	75	5	19	190	44	12	73	9	45	280	360	610	900	910	400	30
	Alkalinity (Carbonate)	mg/L	5															-	<5	<5	<5	<5	-	<5	<5	-	<5	-	<5	<5	-	<5	-	-	-	-	-	-
	Alkalinity (Carbonate as CaCO3)	mg/L	5															-	-	-	-	-	-	-	-	<5	-	<5	-	-	<5	<5	<5	<5	<5	<5	<5	<5
	Alkalinity (Hydroxide) as CaCO3	mg/L	5															<5	-	-	-	<5	-	-	<5	-	<5	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Alkalinity (total)	mg/L	5															-	800	540	560	-	75	5	-	190	-	12	73	-	45	-	-	-	-	-	-	-
	Alkalinity (total) as CaCO3	mg/L	5															60	-	-	-	520	-	-	19	-	44	-	-	9	-	280	360	610	900	910	400	30
	Ammonia as N	mg/L	0.005	0.9	0.32	0.9	0.91	0.5	0.91	0.02 [5]	**0.015** [5]					0.9	0.91	**0.046**	**0.74**	**1**	**1**	**0.84**	0.014	**0.33**	**0.34**	**2.7**	**0.12**	0.011	**0.069**	**0.036**	**0.41**	**0.42**	**0.22**	**0.14**	**5.1**	**5.8**	**13**	**0.3**
	Chloride	mg/L	1															52	2400	1600	1800	1400	38	48	50	15	8	7	12	9	26	6900	3700	720	12,000	12,000	14,000	20
	Fluoride	mg/L	0.1															<0.1	0.3	0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.7	0.6	0.4	0.3	0.3	0.2	0.2
	Hydroxide	µg/L	5000															-	<5000	<5000	<5000	-	<5000	<5000	-	<5000	-	<5000	<5000	-	<5000	-	-	-	-	-	-	-
	Ionic Balance	%																0	11	7.3	3.5	0	8	2.7	-1	18	24	30	7.8	-2	13	1	14	6	19	19	7.3	16	3	0
	Nitrate (as N)	mg/L	0.005												11.3			0.06	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.5	1.8	<0.05	0.45	0.01	<0.05	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.82
	Nitrogen (Total)	µg/L	100							350	**300**							**400**	**5100**	**3600**	**4000**	**1200**	**10,000**	**2200**	**400**	**25,000**	**17,000**	**4500**	**2000**	200	**6400**	**500**	300	**400**	**5700**	**5900**	**13,000**	**1800**
	pH (Lab)	pH Units								6.5-8.5	**7.0-8.5**							**6.4**	**6.9**	**6.7**	**6.8**	**6.7**	**6.4**	**4.9**	**5.7**	**6.3**	**5.6**	**5.7**	**6.2**	**5.2**	**6.1**	**6.6**	**6.5**	**6.7**	**6.5**	**6.5**	**6.3**	**6.3**
	Sodium (Filtered)	mg/L	0.5															70	2500	1800	1700	1200	67	37	34	140	11	16	38	6.8	37	3800	4200	830	9800	9700	10,000	16
	Sulphate	mg/L	1												100			50	2200	330	330	1300	37	41	39	31	51	5	3	6	4	3800	3400	2500	4800	4700	4200	17
	TDS	mg/L	5															260	11,000	5400	5600	4500	930	200	230	880	200	230	210	45	550	11,000	13,000	5600	24,000	23,000	26,000	150
PFOS/PFOA	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	<0.001
	N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	N-methylperfluorooctane sulfonamidoacetic acid	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	N-Methylperfluorooctanesulfonamidoethanol	µg/L	0.005															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	<0.005
	Perfluorobutanoic acid (PFBA)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	<0.002
	Perfluorodecanesulfonic acid (PFDS)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	<0.001
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006	-	-	-	<0.001
	Perfluoropentanoic acid (PFPeA)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	Sum of PFAS	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.066	-	-	-	0.034
	Sum of PFHxS and PFOS	µg/L	0.001									0.07						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	-	0.026
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/L	0.000002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000002	-	-	-	<0.000002
	Perfluorodecanoic acid (PFDA)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	Perfluorohexanoic acid (PFHxA)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	0.001
	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/L	0.01															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	<0.01
	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/L	0.05															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	<0.05
	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/L	0.005															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	<0.005
	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.012	-	-	-	<0.001
	Perfluorooctanesulfonic acid (PFOS)	mg/L	0.000001															-	-	-	-	-	-	-	-	0.00013	0.00000023	-	-	-	-	-	-	0.000029	-	-	-	0.000023
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.005															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	<0.005
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	0.002
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.021	-	-	-	0.003
	Perfluorononanoic acid (PFNA)	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	<0.001
	Perfluorooctane sulfonamide (PFOSA)	µg/L	0.01															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	<0.01
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-	-	-	<0.05
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	<0.01
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.002															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	<0.002
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/L	0.000001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000001	-	-	-	<0.000001
	Perfluorooctanoic acid (PFOA)	mg/L	0.000001															-	-	-	-	-	-	-	-	0.00056	0.22	0.019	-	-	-	-	-	<0.000001	-	-	-	0.000006
	Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.001															-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.009	-	-	-	0.028

Notes to Table:

(1) - Trigger Values for Fresh Water pH<6.5
(2) - Trigger Values for Fresh Water pH>6.5
(3) - Chromium (VI) Criteria Used to Assess Total Chromium
(4) - Freshwater Interim Indicative Working Level (ANZECC 2000)
(5) - Ammonium Trigger Values for Chemical and Physical Stressors (ANZECC 2000) Used to Assess Ammonia (Conservative)

Table B6 - Results of Groundwater Testing compared against SAC

																	Field ID	M-PZ-601
																	LocCode	M-PZ-601
																	Sample Date	21/07/2021
																	AOPCR	14.26
Chem_Group	**ChemName**	**Units**	**PQL**	ANZG (2018) Freshwater 95% toxicant DGVs	ANZG (2018) Freshwater 99% toxicant DGVs	ANZG (2018) Freshwater toxicant DGVs Slightly to Moderately Disturbed Systems	ANZG (2018) Marine water 95% toxicant DGVs	ANZG (2018) Marine water 99% toxicant DGVs	ANZG (2018) Marine water toxicant DGVs Slightly to Moderately Disturbed Systems	ANZECC (2000) DTVs for Lowland Rivers	ANZECC (2000) DTVs for Estuaries	PFAS HEPA (2020) Drinking Water	PFAS HEPA (2020) Interim Marine / Fresh water 95%	PFAS HEPA (2020) Interim Marine / Fresh Water 99%	NEPM 2013 Table 1C GILs, Drinking Water	NEPM 2013 Table 1C GILs, Fresh Waters	NEPM 2013 Table 1C GILs, Marine Waters	
Metals (Dissolved)	Aluminium	mg/L	0.01	0.0008 [1]/0.055 [2]	0.027	0.0008 [1]/0.055 [2]					**0.0005** [4]					0.055		**0.09**
	Arsenic	mg/L	0.001	0.013	0.0008	0.013									0.01			<0.001
	Boron	mg/L	0.02	0.94	0.34	0.94									4	0.37		<0.02
	Cadmium	mg/L	0.0001	0.0002	0.00006	0.0002	0.0055	0.0007	0.0007						0.002	0.0002	0.0007	<0.0001
	Calcium	mg/L	0.5															11
	Chromium (III+VI)	mg/L	0.001	0.001 [3]	0.00001	0.001 [3]	0.0044	0.00014	0.0044						0.05			0.002
	Copper	mg/L	0.001	0.0014	0.001	0.0014	0.0013	0.0003	0.0013						2	0.0014	0.0013	<0.001
	Iron	mg/L	0.01							0.3 [5]								0.3
	Lead	mg/L	0.001	0.0034	0.001	0.0034	0.0044	0.0022	0.0044						0.01	0.0034	0.0044	<0.001
	Magnesium	mg/L	0.5															5
	Manganese	mg/L	0.005	1.9	1.2	1.9	0.08		0.08						0.5	1.9		0.16
	Mercury	mg/L	0.00005	0.0006	0.00006	0.00006	0.0004	0.0001	0.0001						0.001	0.00006	0.0001	-
	Nickel	mg/L	0.001	0.011	0.008	0.011	0.07	0.007	0.007						0.02	0.011	0.007	0.005
	Phosphorus	mg/L	0.05							0.025	**0.03**							**0.08**
	Potassium	mg/L	0.5															2
	Zinc	mg/L	0.001	0.008	0.0024	0.008	0.008	0.0033	0.008							0.008	0.015	0.004
Biological	Total Coliforms by MF	CFU/100mL																-
	Faecal Coliforms	CFU/100mL	1															-
	E. Coli	MPN/100mL	1															<10
Inorganics	Alkalinity (Bicarbonate as CaCO3)	mg/L	5															47
	Alkalinity (Carbonate)	mg/L	5															-
	Alkalinity (Carbonate as CaCO3)	mg/L	5															<5
	Alkalinity (Hydroxide) as CaCO3	mg/L	5															<5
	Alkalinity (total)	mg/L	5															-
	Alkalinity (total) as CaCO3	mg/L	5															47
	Ammonia as N	mg/L	0.005	0.9	0.32	0.9	0.91	0.5	0.91	0.02 [5]	**0.015** [5]					0.9	0.91	**0.4**
	Chloride	mg/L	1															78
	Fluoride	mg/L	0.1															0.1
	Hydroxide	µg/L	5000															-
	Ionic Balance	%																-5
	Nitrate (as N)	mg/L	0.005												11.3			<0.005
	Nitrogen (Total)	µg/L	100							350	**300**							**900**
	pH (Lab)	pH Units								6.5-8.5	**7.0-8.5**							**6.2**
	Sodium (Filtered)	mg/L	0.5															48
	Sulphate	mg/L	1												500			12
	TDS	mg/L	5															210
PFOS/PFOA	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.002															-
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001															-
	N-ethyl-perfluorooctanesulfonamidoacetic acid	µg/L	0.002															-
	N-methylperfluorooctane sulfonamidoacetic acid	µg/L	0.002															-
	N-Methylperfluorooctanesulfonamidoethanol	µg/L	0.005															-
	Perfluorobutanoic acid (PFBA)	µg/L	0.002															-
	Perfluorodecanesulfonic acid (PFDS)	µg/L	0.002															-
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.001															-
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.001															-
	Perfluoropentanoic acid (PFPeA)	µg/L	0.002															-
	Sum of PFAS	µg/L	0.001															-
	Sum of PFHxS and PFOS	µg/L	0.001									0.07						-
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/L	0.000002															-
	Perfluorodecanoic acid (PFDA)	µg/L	0.002															-
	Perfluorohexanoic acid (PFHxA)	µg/L	0.001															-
	N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	µg/L	0.01															-
	N-ethylperfluorooctanesulfonamidoethanol (NEtFOSE)	µg/L	0.05															-
	N-Methyl perfluorooctane sulfonamide (NMeFOSA)	µg/L	0.005															-
	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.001															-
	Perfluorooctanesulfonic acid (PFOS)	mg/L	0.000001										0.00013	0.00000023				-
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.005															-
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.001															-
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.001															-
	Perfluorononanoic acid (PFNA)	µg/L	0.001															-
	Perfluorooctane sulfonamide (PFOSA)	µg/L	0.01															-
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05															-
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01															-
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.002															-
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/L	0.000001															-
	Perfluorooctanoic acid (PFOA)	mg/L	0.000001									0.00056	0.22	0.019				-
	Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.001															-

Notes to Table:

(1) - Trigger Values for Fresh Water pH<6.5
(2) - Trigger Values for Fresh Water pH>6.5
(3) - Chromium (VI) Criteria Used to Assess Total Chromium
(4) - Freshwater Interim Indicative Working Level (ANZECC 2000)
(5) - Ammonium Trigger Values for Chemical and Physical Stressors (ANZECC 2000) Used to Assess Ammonia (Conservative)

Table B7 - Areas of Potential Contamination Risk (Update of Table 6-1 Jacobs (2021))

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
1	Service station	John Renshaw Drive, Beresfield. Not in construction footprint.	• Shallow excavations (~1 m depth) for installation of new Optus service on John Renshaw Drive (East bound) 20m south of AOPCR • Cut of up to about 10 m for the motorway alignment about 320 m to south	• Zone 1	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols	• Migration of hydrocarbon via groundwater into excavations • Inhalation of dust and/or vapours • Dermal contact and ingestion with impacted soil, surface water or groundwater • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Road users (vehicles/pedestrians/cyclists) • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well D-PZ-134 (~260 m south) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Cadmium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Low	Low	
2	Former sanitary depot	New England Highway, Tarro. Not in construction footprint	• Installation of water quality controls and surface drainage adjacent to AOPCR. • Bridge over wetlands about 200 m south east (B02) including pier excavations. • No substantial excavations	• Zone 1	• Hydrocarbons • Nitrates • Metals • Biological hazards	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well M-PZ-102 (~300 south) • GW Analysis: Metals, Biological, Inorganics (basic) • SW Analysis (Sample M12RT1): Metals TN, TP, NOx	Groundwater: Cadmium, Manganese, Nickel, Phosphorus, Zinc, Ammonia, pH, Sulphate Surface Water : Zinc, Copper, Cadmium TN, TP, NOx, DO	Low	Low	
3	Waste burial (asbestos)	Private residence. Woodlands Close Tarro. Within construction footprint.	• Viaduct construction including viaduct pier excavations directly within AOPCR. • No substantial excavations.	• Zone 3	• Asbestos (known)	• Inhalation of asbestos fibres	• Construction workers • Maintenance workers	No testing conducted within the property	Asbestos based on EPA regulatory notice	High	Low	• TfNSW have indicated that they shall remove asbestos containing fill prior to viaduct construction activities commencing.
4	Gravity trunk main (potable water supply)	Tarro, Black Hill. Within construction footprint.	• Relocation and/or connection to existing subsurface HDPE trunk main at Tarro.	• Zone 1 & 2	• Asbestos • Metals (lead jointing and paint on old water main)	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • GW Analysis: Metals, Biological, Inorganics (basic) • Wells D-PZ-223A & B (? m east), DP-PZ-134, DP-PZ-135 and DP-PZ-136 and Soil M-LDB-104	Soil: nil Groundwater: Aluminium, arsenic, copper, chromium, cadmium, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate	Medium	Low	• Previous surface trunk main has been removed from proposal area and replaced by subsurface HDPE main. Source of CoPC removed, but residual CoPC may remain in localised surface soils. • Disturbance of residual CoPC during proposed utility work is therefore likely to be localised (if any).

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
5	Former mineral sands processing facility (RZM)	Tomago. Within construction footprint.	• RZM site remediation initially • M12RT construction including viaduct, temporary and permanent detention basins, earthworks fill etc post remediation	• Zone 4	• Naturally occurring radioactive materials • Heavy metals • Hydrocarbons • ASS • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Radiation exposure • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Road users (vehicles/pedestrians/cyclists) • Maintenance workers • Ecological receptors	• Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, gamma radiation • GW Analysis: Metals, TRH / BTEX, PAH, phenol, gamma radiation. • SW analysis Metals, TRH / BTEX, PAH, phenol, gamma radiation.	Soil: TRH, PAH, chromium, nickel, zinc, pH; radionuclides asbestos Groundwater : cadmium, copper, nickel, zinc Surface water : Zinc (dissolved and total), copper (dissolved and total)	High	Low	• EnRiskS HHRA indicates an acceptable health risk from radionuclides for workers under normal exposure scenarios and range of soil/sediment concentrations. Unacceptable risks scenarios were determined for continuous hotspot exposure and exposure to worst case concentrations. • Known asbestos impacts have been remediated.
6	Former coal loading facilities	New England Highway, Hexham Not in construction footprint.	• Installation of new optic fibre utility in shallow excavations (~1 m depth) • Ancillary facility AS8 to east on opposite side of Maitland Road.	• Zone 3	• Petroleum hydrocarbons • Heavy metals • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Aggressivity @ depth • BH106, BH107	Soil: nil	Low	Low	
7	Former dairy processing and wastewater irrigation	Waste water irrigation area is located about 280 m west of utility relocation and 200 m south of project alignment (western end of viaduct). Not in construction footprint	• Trenching works for optic fibre utility upgrade along Maitland Road / New England Highway • Fill embankment and Viaduct pier excavations.	• Zone 3	• Metals • Nutrients • Pathogens • Hydrocarbons	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Aggressivity • BH104, BH105	Soil : nil	Low to Medium	Low	
8	Railway	Between New England Highway and Woodlands Close, Tarro. Within construction footprint.	• Construction of bridge over railway for motorway. Design eliminates any intrusive work in railway corridor	• Zone 3	• Monocyclic aromatic hydrocarbons • Petroleum hydrocarbons • Heavy metals • Carbamates • Organochlorine pesticides • Organophosphate pesticides • PCBs • Phenols • Herbicides • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted within railway easement	Not Applicable	Low	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
9	Hunter River sediments	Hunter River channel. Within construction footprint	• Piling through sediments and pile caps for viaduct (B05) and bridge (B06) • Dredging of sediment for temporary access • RZM remediation located east (170m) of bridge work.	• Zone 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • Nutrients • Pathogens • PFAS • Naturally occurring radioactive materials	• Dermal contact and ingestion of Hunter River sediments • Mobilisation of contaminants to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors •	• Sediment (mid channel): M-BH-322, M-BH-323, M-BH-330, M-BH-331 • Sediment Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, PFAS. • Sediment (offsite - eastern bank) SED24 – 31, SEDB01-06 • Sediment analysis: Metals	Onsite sediment: Nickel Offsite sediment : Nickel Zinc	Low to Medium	Low	• TfNSW sampling of Hunter River Sediments at 4 locations within the construction footprint of the Hunter River (mid channel) present only minor nickel exceedances of sediment DGVs. • TfNSW sampling of Hunter River sediment (offsite) at the outlet of a drain from the RZM site showed exceedances of Nickel and Zinc. The construction footprint does extend to this area of the Hunter River and no disturbance of sediment shall occur in the location of the exceedances.
10	Asbestos waste (HazMat 2020)	Pacific Highway Lot 51, DP 739336, Tomago. Within proposal area.	• Ancillary facility AS11 • Installation of water quality control	• Zone 4	• Asbestos (known) • Other CoPC such as heavy metals, nutrients, hydrocarbons possible from former buildings which if present will add additional pathways/receptors	• Inhalation of asbestos fibres	• Construction workers • Maintenance workers	6 samples of potential ACM	3 samples asbestos (Chrysotile)	High	Low	
11	Industrial/ commercial operations	Adjacent to site, Tomago Road / Old Punt Road, Tomago. Not in construction footprint.	• Import / fill to construct new motorway • Culvert and drainage installation • Trenching for new services	• Zone 4	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors • Migration of hydrocarbon into trenches during excavation works	• Construction workers • Maintenance workers • Ecological receptors	• Soil Analysis: Nil • Well D-PZ-438(~100 m `north east of Tomago Industrial Estate) • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: Not Applicable • Groundwater: Aluminium, Copper, Iron, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Medium	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
12	Service station	Adjacent to site. Pacific Highway, Heatherbrae. Not in construction footprint.	• No substantial excavation area. • Adjustment of existing pavement • Installation of water quality controls about 60 m south west.	• Zone 5	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches or water quality controls during excavation works • Mobilisation of contaminants to sensitive ecological	• Construction workers • Maintenance workers • Ecological receptors	• Soil: D-TP-437 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos • Well D-PZ-440A/B (~350 m SW of property • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: B(a)P TEQ HILC • Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH	Medium to low	Low	• TfNSW indicate third party detailed contamination assessments (commercial in confidence) suggests that potential hydrocarbon impacts are not currently impacting the construction footprint. • Detentions basins proposed to be lined to prevent groundwater interaction.
13	Industrial/ commercial operations	Masonite Road, Heatherbrae. Partly within construction footprint.	• Imported fill formation for Masonite Road Bridge and motorway embankment. • Ancillary for construction support. AS14 next to site, AS15 south, and AS18 within site • Potential cutting of isolated hill for source of fill material	• Zone 5	• Solvents • Polyaromatic hydrocarbons • Organochlorine Pesticides • Aldrin and dieldrin • Metals • Boron • Ammonia • Cresols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches during excavation works • Migration of contaminants to nearby ecological receptors	• Construction workers • Maintenance workers • Ecological receptors at Windeyer's Creek and surroundings water bodies	• Soil: D-BH-519, D-BH-520,D-BH-601, BH 120, D-TP-506, D-BH-503 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, Aggressivity • Well D-PZ-614, D-PZ-615A, D-PZ-615B, D-BH-501 adjacent to or 300 m east of industrial estate , • GW Analysis: Metals, Biological, Inorganics (basic)	• Soil: nil • Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrate, Nitrogen (Total), pH	Medium	Low	
14	Wastewater treatment works	Raymond Terrace. Not in construction footprint.	• No substantial excavation area. • Piling for bridge over Windeyer's Creek about 370 m south of AOPCR • Ancillary facilities AS20 and AS21 about 200 m and 350 m south east	• Zone 6	• Nutrients • Metals • Phenols • Pathogens • PFAS	• Dermal contact and ingestion with impacted soil, sediment or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors at Windeyer's Creek and surrounding water bodies	• Soil Analysis: Nill • Well D-PZ-616, M-PZ-601 (~200 SE of WWTP) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH Soil: Not Applicable	Low to Medium	Low	• M12RT project groundwater model shows that the licensed WWTP is down gradient from construction footprint. • Dewatering during construction for proposed detention basins was predicted in the M12RT report to be minimal (0.4 m at basin extending to 0.2 m on the northern side of Pacific Highway but south of WWTP infrastructure.

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
15	Hazardous, industrial or Group A waste generation or storage	Masonite Road, Heatherbrae. Not in construction footprint.	• Fill embankments for Masonite Road Bridge and motorway formation. • Potential cut at local hill to source fill about 650m south of AOPCR	• Zone 5	• Solvents • Polyaromatic hydrocarbons • Organochlorine pesticides • Aldrin and dieldrin • Metals • Boron • Ammonia • Cresols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Migration of hydrocarbon into trenches during excavation works	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil: D-BH-519, D-BH-520,D-BH-601, BH 120 • Soil Analysis: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos, Aggressivity (BH120) • Well D-PZ-614, D-PZ-615A, D-PZ-615B adjacent to or 300 m east of industrial estate , • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Aluminium, Chromium, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrate, Nitrogen (Total), pH Soil: nil	Low to Medium	Low	
16	Historical herbicide application	Next to the Hunter River, Tomago and Tarro	• Piling through sediments and pile caps for viaduct (B05) and bridge (B06) • Access tracks and ancillary facility AS9	• Zone 3	• Organochlorine pesticides • Aldrin and dieldrin • Herbicides	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation of contaminants to sensitive ecological receptors • Runoff to sensitive ecological receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil/Sediment: M-BH-320, M-BH-322, M-BH-323, M-BH-330, M-BH-331 • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos, PFAS	Soil : nil Sediment: nickel	Low to Medium	Low	
17	Historical rifle range	Heatherbrae. Possibly within construction footprint.	• Cutting of isolated hill to win sand fill material • Ancillary for construction support. AS18 and AS19	• Zone 4 / Zone 5	• Lead from bullets and shot • Copper casings	• Dermal contact and ingestion with impacted soil • Inhalation of dust and/or vapours • Migration of metals in surface water during excavation works	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil: D-BH-512 and D-TP-506 about 250 m east/west of the former shooting range • Soil: Metals, TRH, BTEX, PAH, PCB, OCP, OPP, Phenols, Asbestos	Soil: nil Groundwater: Not applicable	Low	Low	
18	PFAS contamination	Tarro – 280m north of construction footprint. Heatherbrae – 250m west of construction footprint. Not in construction footprint.	• Tarro – Import fill for interchange ramps. • piling for interchange ramps • Heatherbrae – filling for motorway formation. • Ancillary facilities (various)	• Zone 5	• Per-and polyfluoroalkyl substances	• Dermal contact and ingestion with impacted soil, sediment or groundwater • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors at surrounding water bodies	• Soil Analysis: nil • Well M-PZ-301, M-PZ-201, M-PZ-501, D-PZ-614, D-PZ-221, D-PZ-222, D-PZ-223A/B, D-PZ-615 within 550 m to >2 km from the source sites, • GW Analysis: Metals, Biological, Inorganics (basic), PFAS	Groundwater: Aluminium, Boron, Copper, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH, Sulphate Soil: Not Applicable	Low to Medium	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
								(selected wells only) • Surface Water Analysis: nil	Surface Water: Not Applicable			
19	Former night soil disposal	Black Hill. Corner of John Renshaw drive and M1 Motorway. Within construction footprint.	• Temporary capping of AOPCR. • Ancillary for construction support. AS1 within the site. • 10m deep cut located 250m south east • Fill embankment over existing soils for motorway to west.	• Zone 1	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • Nutrients • Pathogens • Asbestos	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low to Medium	Low	• AS1 would not include disturbance of soils. Temporary placement of capping fill material over existing soils to stabilise area for use by vehicles, plant and equipment. Capping material to be removed during demobilisation.
20	Electrical Substation	Black Hill. Not within construction footprint.	• No excavation at AOPCR • 10m cut located 50 south of substation	• Zone 1	• PCB • Heavy metals • Solvents • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors • Cut material transferred to other locations on site.	• Construction workers • Maintenance workers • Ecological receptors	• Soil: M-LDB-104 (~ 100 m south) • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: D-PZ-135, D-PZ-136 (~250 south west and 100 m south east respectively) • GW Analysis: Metals, Biological, Inorganics (basic)	Groundwater: Arsenic, Aluminium, Chromium, Iron, Manganese, Nickel, Phosphorus, Zinc, Ammonia, Nitrogen (Total), pH Soil: nil	Low to Medium	Low	
21	Former LTTSF Works Compounds	Tarro. Immediately south of the Tarro interchange. Within construction footprint Woodlands Close, Hexham. Adjacent to construction footprint.	• Viaduct construction 140m north • Adjustment of Aurizon access road adjacent. • Immediately adjacent earthworks fill at Tarro Interchange	• Zone 2 & 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Nutrients • Pathogens • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil: D-TP-214 (~50 west of AOPCR) • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: M-PZ-201 within AOPCR • GW Analysis: Metals, Biological, Inorganics (basic), PFAS	• Soil: nil • Groundwater: Manganese, Nickel, Phosphorus, Ammonia, Nitrogen (Total), pH, Sulphate	Low to Medium	Low	• LTTSF project subject to regulatory oversight and spoil management was endorsed by regulatory processes.

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
22	Former works compound, former building/jetties, former overhead conveyor	New England Highway , Hexham including AS8 and land immediately north Purgatory Creek. Within construction footprint.	• No substantial excavation. • Ancillary for construction support. AS8 within the construction footprint.	• Zone 3	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Nutrients • Pathogens • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil, surface water or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	• Soil: BH107 (southern corner) • Soil Analysis: Aggressivity	Not applicable	Low to Medium	Low	• TfNSW have indicated AS8 was used by TfNSW as an ancillary facility to construct the nearby Hexham Bridge and imported material that was used to cap the previous land uses complied with TfNSW EMS process and is free of harmful levels of contaminants. • AS8 would not include disturbance of soils. Temporary placement of capping fill material over existing soils to stabilise area for use by vehicles, plant and equipment.
23	Service Stations (notified sites)	Maitland Road, Hexham. Not within construction footprint.	• No substantial excavation. • Utility installation (~1m excavation) 320m north or AOPCR.	• Zone 3	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	
24	Former sand pit	Heatherbrae between AS18 and AS15. Within construction footprint.	• No substantial excavation • Imported fil for motorway formation.	• Zone 5	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Asbestos	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	
25	Former aircraft runway	Tomago, northern end of Old Punt Road. Within construction footprint.	• No substantial excavation. • Minor upgrades of Old Punt Road	• Zone 4	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Phenols	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Low	Low	

AOPCR No.	Site	Location	Construction Element at/near this location *	Geotechnical Zone	Contaminants of Potential Concern (CoPC)	Potential Pathway	Potential Receptors	Contamination Testing Conducted	Soil / Groundwater Exceedances #	Inferred Risk Rating (Construction)	Inferred Risk Rating (Post Construction)	Comments
26	Former works compound	Northern interchange. Within construction footprint.	• No substantial excavation. • Imported fill interchanges and ramps. • AS21 ancillary area	• Zone 6	• Heavy metals • Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Polycyclic aromatic hydrocarbons • Pesticides and herbicides • PCB • Phenols • Asbestos • Acid/alkaline	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receivers	• Soil: D-BH-609, D-BH-610 • Soil Analysis: Metals, TRH, BTEX, PAH, OCP, OPP PCB, Phenols, Asbestos • Well: D-PZ-616, M-PZ-601 • GW Analysis: Metals, Biological, Inorganics (basic)	Soil: nil Groundwater: Aluminium, Chromium, Iron, Manganese, Phosphorus, Ammonia, Nitrogen (Total), pH	Medium	Low	
27	Former service station	Near Hexham Bridge, Maitland Road, Hexham. Not within construction footprint.	• Utility installation (~1m excavation) adjacent to proposal.	• Zone 3	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons • Heavy metals • Polycyclic aromatic hydrocarbons • Oil and greases • Solvents • Methyl tertiary-butyl ether and other oxygenates • Phenols • PCB • Asbestos	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No testing conducted by DP, Coffey or GHD	Not Applicable	Medium	Low	
Various	Stockpiling and/or illegal dumping	General, within construction footprint.	• General construction	• Various	• Asbestos • Metals • Hydrocarbons • (subject to source)	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No Testing conducted to date	Not Applicable	Medium	Low	
Various	Imported Fill	General, within construction footprint including roads/embankments/ access tracks and reclamation of low lying land	• General construction	• Various	• Asbestos • Metals • Hydrocarbons • (subject to source)	• Dermal contact and ingestion with impacted soil or groundwater • Inhalation of dust and/or vapours • Mobilisation to nearby sensitive receptors	• Construction workers • Maintenance workers • Ecological receptors	No targeted testing conducted to date, although fill materials have been tested.	Not Applicable	Low to Medium	Low	

Notes to Table B7:

- The basis for the determination of inferred contamination risk rankings is based on the weight of evidence gathered throughout the desktop assessment process, the results of previous contamination assessments and data, and professional judgement based on experience with numerous similar sites and projects. All risk rankings have been based on unmitigated project risks and have not considered the implementation of design or engineering controls.
- Where there is direct evidence or the combined weight evidence indicates a likely exposure scenario of workers to known contamination, the risk ranking potential has been considered ‘High’ as per Jacobs (2021).
- Post construction risk ratings are based on construction works being undertaken in accordance with an approved environmental management plan / remediation action plan (as required) to ensure contaminated soils are appropriately managed/disposed and validated.
- # Groundwater exceedances predominantly associated with ANZG (2018) DGVs for slightly to moderately disturbed systems in fresh water (or marine waters in some cases) and ANZECC (2000) DTVs for lowland rivers. Some groundwater exceedances also associated with NEPC (2013) GILs for drinking water (ie sulphate) (Refer to Table B6 in Appendix B for further details). Soil exceedances predominantly associated with NEPC (2013) HIL C (PAHs) and EIL for open space and commercial/industrial land use (Zinc). Sediment exceedances associated with ANZG (2018) DGVs for toxicants in sediments. Surface water exceedances taken from M12RT Surface and Groundwater Quality Working Paper (Appendix K of EIS) – refer to working paper for guidelines utilised and further details.
- * As advised by TfNSW

Appendix C

Site Assessment Criteria

Appendix C

Site Assessment Criteria

M1 Pacific Motorway Extension to Raymond Terrace, Hexham to Raymond Terrace

C1.0 Introduction

C1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- CRC CARE. *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39 (CRC CARE, 2017).
- HEPA *PFAS National Environmental Management Plan (NEMP)* (HEPA, 2020).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- NHMRC *Guidelines for Managing Risks In Recreational Water* (NHMRC, 2008).
- NHMRC, NRMMC *Australian Drinking Water Guidelines 6 2011, Version 3.2* (NHMRC, NRMMC, 2016).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

C1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: recreational/open space and commercial / industrial.
    - Corresponding to land use category ‘C‘, public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths.
    - Corresponding to land use category ‘D‘, commercial / industrial such as shops, offices, factories and industrial sites.
- Soil type: sand / silt / clay, although sand typically included in results tables as a conservative screening tool.

C2.0 Soils

C2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and **Error! Reference source not found.**.

Table 1: Health Investigation Levels (mg/kg)

Contaminant	HIL-C	HIL-D
Metals		
Arsenic	300	3000
Cadmium	90	900
Chromium (VI)	300	3600
Copper	17 000	240 000
Iron	NC	NC
Lead	600	1500
Manganese	19 000	60 000
Mercury (inorganic)	80	730
Nickel	1200	6000
Zinc	30 000	400 000
PAH		
B(a)P TEQ	3	40
Total PAH	300	4000
Phenols		
Phenol	40 000	240 000
Pentachlorophenol	120	660
OCP		
DDT+DDE+DDD	400	3600
Aldrin and dieldrin	10	45
Chlordane	70	530
Endosulfan	340	2000
Endrin	20	100
Heptachlor	10	50
HCB	10	80
Methoxychlor	400	2500
OPP		
Chlorpyrifos	250	2000
PCB		
PCB	1	7

Table 2: Health Screening Levels (mg/kg)

Contaminant	HSL-C	HSL-C	HSL-C	HSL-C
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	NL	NL	NL	NL
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	NL	NL	NL	NL
TRH F2	NL	NL	NL	NL
SILT	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	NL	NL	NL	NL
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	NL	NL	NL	NL
TRH F2	NL	NL	NL	NL
CLAY	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	NL	NL	NL	NL
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	NL	NL	NL	NL
TRH F2	NL	NL	NL	NL

Notes to Table 2:

TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} minus naphthalene

The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

Table 3: Health Screening Levels (mg/kg)

Contaminant	HSL-D	HSL-D	HSL-D	HSL-D
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	3	3	3	3
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	260	370	630	NL
TRH F2	NL	NL	NL	NL
SILT	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	4	4	6	10
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	250	360	590	NL
TRH F2	NL	NL	NL	NL
CLAY	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	4	6	9	20
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	NL	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	310	480	NL	NL
TRH F2	NL	NL	NL	NL

Notes to Table 3:

TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} minus naphthalene

The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 4.

Table 4: Health Screening Levels for Direct Contact (mg/kg)

Contaminant	DC HSL-C	DC HSL-D	DC HSL-IMW
Benzene	120	430	1100
Toluene	18 000	99 000	120 000
Ethylbenzene	5300	27 000	85 000
Xylenes	15 000	81 000	130 000
Naphthalene	1900	11 000	29 000
TRH F1	5100	26 000	82 000
TRH F2	3800	20 000	62 000
TRH F3	5300	27 000	85 000
TRH F4	7400	38 000	120 000

Notes to Table 4:
TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

C2.2 Health Investigation Levels for Per- and Poly-Fluoroalkyl Substances in Soil

The laboratory analytical results for per- and poly-fluoroalkyl substances (PFAS) in soil have been assessed against HIL published in HEPA (2020). The HIL represent a nationally-agreed suite that should be used to inform site investigations. The HIL are intentionally conservative, and an exceedance of these criteria may not constitute a risk if other exposure pathways are controlled. An exceedance of the HIL should trigger further investigations, such as a site-specific risk assessment. At the time of this investigation, screening values were available only for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS).

The HIL derived from Table 2 of HEPA (2020) are in Table 5.

Table 5: Health Investigation Levels (mg/kg)

Contaminant	HIL-C	HIL-D
PFOS and PFHxS *	1	20
PFOA	10	50

Notes to Table 5:
* Includes PFOS only, PFHxS only and the sum of the two.

C2.3 Asbestos in Soil

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table 6.

Table 6: Health Screening Levels for Asbestos

Form of Asbestos	HSL-C	HSL-D
ACM	0.02%	0.05%
FA and AF	0.001%	0.001%
FA and AF and ACM	No visible asbestos for surface soil *	No visible asbestos for surface soil *

Notes to Table 6:

Surface soils defined as top 10 cm.

* Based on site observations at the sampling points and the analytical results of surface samples.

C2.4 Ecological Investigation Levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, have been derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table 8, with inputs into their derivation shown in Table 7. It is noted that the EILs have been derived and presented below for the four broad representative areas described in Section 6 of the report (ie Zone 1/Zone 2-3/Zone 3-4/Zone 5-6) as an initial screening tool.

Table 7: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	“Aged” (>2 years)	Majority of AOPCR are considered aged
pH	5/7/7/5	Typical pH used from laboratory testing and ASS screening tests from the upper 3 m
CEC	10/8/7/6 $cmol_c/kg$	Typical CEC values within Zone based on Effective CEC values within upper 2 m soil profiles from CSIRO website[1]
Clay content	10/10/10/1%	Conservative values based on predominant soil types in Zones
Traffic volumes	high	Motorway/Highway
State / Territory	NSW	

1- https://www.asris.csiro.au/arcgis/rest/services/TERN/ECE_ACLEP_AU_NAT_C/MapServer

Table 8: Ecological Investigation Levels (mg/kg)

Contaminant	EIL- C	EIL-D
Metals		
Arsenic	100	160
Copper	110/180/160/110	160/250/220/160
Nickel	170/100/75/55	290/170/130/90
Chromium III	410/410/410/200	680/680/680/320
Lead	1100	1800
Zinc	310/460/430/270	410/650/590/360
PAH		
Naphthalene	170	370
OCP		
DDT	180	640

Notes to Table 8:
EIL- C public open space
EIL-D commercial/industrial

C2.5 Ecological Screening Levels

Ecological screening levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 9.

Table 9: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	EIL-C	EIL-D
Benzene	Coarse	50	75
Toluene	Coarse	85	135
Ethylbenzene	Coarse	70	165
Xylenes	Coarse	105	180
TRH F1	Coarse/ Fine	180*	215*
TRH F2	Coarse/ Fine	120*	170*
TRH F3	Coarse	300	1700
TRH F4	Coarse	2800	3300
B(a)P	Coarse	0.7	1.4
Benzene	Fine	65	95
Toluene	Fine	105	135
Ethylbenzene	Fine	125	185
Xylenes	Fine	45	95
TRH F1	Coarse/ Fine	180*	215*
TRH F2	Coarse/ Fine	120*	170*
TRH F3	Fine	1300	2500
TRH F4	Fine	5600	6600
B(a)P	Fine	0.7	1.4

Notes to Table 9:

ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} including naphthalene

EIL- C public open space

EIL-D commercial/industrial

The NEPM (2013) ESL of 0.7 mg/kg for benzo(a)pyrene (B(a)P) is understood to be based on a single invertebrate species referenced in the *Canadian Soil Quality Guidelines* (1999, since updated) and is considered conservative in the Australian context. These guidelines were updated in 2010 and now suggest a B(a)P concentration of 20 mg/kg for the protection of environmental health based on the soil contact exposure pathway.

It is also noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE (2017), *Risk-based Management and Remediation Guidance* for Benzo(a)pyrene, CRC CARE Technical Report No. 39. The high reliability value of 33 mg/kg for aged contamination recommended in CRC CARE (2017) has therefore been adopted.

C2.6 Ecological Soil Guideline Values

The interim ecological soil guideline values (EGV) derived from Table3 of HEPA (2020) are in Table 10.

Table 10: Ecological Soil Guideline Values (mg/kg) – All Land Uses

Contaminant	Direct Exposure	Indirect Exposure
PFOS	1	0.01
PFOA	10	NC
PFHxS	NC	NC

Notes to Table 10:
NC no criterion

C2.7 Management Limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards;
- Effects on buried infrastructure eg: penetration of, or damage to, in-ground services.

The adopted management limits are in Table 11.

Table 11: Management Limits (mg/kg)

Contaminant	Soil Type	ML- C	ML-D
TRH F1	Coarse	700	700
TRH F2	Coarse	1000	1000
TRH F3	Coarse	2500	3500
TRH F4	Coarse	10 000	10 000
TRH F1	Fine	800	800
TRH F2	Fine	1000	1000
TRH F3	Fine	3500	5000
TRH F4	Fine	10 000	10 000

Notes to Table 11:
TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML -C parkland and public open space
ML-D commercial/industrial

C3.0 Groundwater

C3.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected based on the potential risks posed from contamination sourced from the site to receptors at or down-gradient of the site, as identified by the conceptual site model (CSM). The receptors, exposure points and pathways are summarised in Table 12.

Table 12: Summary of Potential Receptors and Potential Risks

Receptor	Location	Exposure Point	Exposure Pathway
Surface water aquatic ecosystem	Within and down-gradient from site.	Receiving surface water body at the groundwater discharge point.	Exposure to contaminants.
Human consumption	Adjacent to and potentially on site/ down-gradient from site (Hunter Water Drinking Water Catchment)	Groundwater production bores (existing or proposed).	Ingestion of contaminants in water used for drinking water supply.

The rationale for the selection of GIL is in Table 13.

Table 13: Groundwater Investigation Level Rationale

Receptor / Beneficial Use	GIL	Source	Comments / Rationale
Aquatic ecosystem	DGV	ANZG (2018) / ANZECC (2000)	Freshwater 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants Marine water 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants Trigger Values for Physical and Chemical Stressors for South-East Australia for slightly disturbed systems (lowland rivers and estuaries)
Aquatic ecosystem	DGV	HEPA (2020)	Freshwater 99% LOP Marine water 99% LOP Screening values were only available for PFOS and PFOA at the time of this investigation.
Drinking water	GV	NHMRC (2016)	Health and aesthetic-based GV

Notes to Table 13:
DGV default guideline value
% LOP percentage level of protection of species
GV guideline value

C3.2 Groundwater Investigation Levels for Aquatic Ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 14.

Table 14: Groundwater Investigation Levels for Protection of Aquatic Ecosystems (mg/L)

Contaminant	Fresh Water	Marine Water
Metals		
Aluminium	0.0008 (1)/0.055 (2)	
Arsenic	0.013	
Boron	0.94	
Cadmium	0.0002	0.0007
Calcium		
Chromium (VI)	0.001 (3)	0.0044
Copper	0.0014	0.0013
Iron		
Lead	0.0034	0.0044
Magnesium		
Manganese	1.9	0.08
Mercury (inorganic)	0.00006	0.0001
Nickel	0.011	0.007
Phosphorus		
Potassium		
Zinc	0.008	0.008
Inorganics		
Ammonia	0.9	0.91

Notes to Table 14:
Where the contaminant does not have a % LOP, the 'unknown' LOP has been adopted

The DGV for the protection of aquatic ecosystems derived from HEPA (2020) are in Table 15.

Table 15: Groundwater Investigation Levels for Protection of Aquatic Ecosystems (µg/L)

Contaminant / LOP	Fresh Water DGV	Interim Marine Water DGV
PFOS 99% LOP	0.00023	0.00023
PFOA 99% LOP	19	19
PFOS 95% LOP	0.13	0.13
PFOA 95% LOP	220	220
PFOS 90% LOP	2	2
PFOA 90% LOP	632	632
PFOS 80% LOP	31	31
PFOA 80% LOP	1824	1824

Notes to Table 15:
HEPA (2020) indicates the 99% LOP be used for slightly to moderately disturbed systems.

C3.3 Groundwater Investigation Levels for Drinking Water

The GILs for the drinking water outlined in NEPC (2013) and HEPA (2020) are in Table 16.

Table 16: Groundwater Investigation Levels for Drinking Water (mg/L)

Contaminant	Guideline Value
Metals	
Aluminium	0.01
Arsenic	4
Boron	0.002
Cadmium	
Calcium	0.05
Chromium (VI)	2
Copper	
Iron	0.01
Lead	
Magnesium	0.5
Manganese	0.001
Mercury (inorganic)	0.02
Nickel	
Phosphorus	
Potassium	
Zinc	
Inorganics	
Nitrate as N	11.3
Sulphate as $S0_4$	500
PFAS	
Sum of PFOS and PFHxS	0.00007
PFOA	0.00056

C4.0 Sediment

The ANZG (2018) default guideline values (DGVs) for toxicants in sediment are considered to be appropriate (as a Tier 1 assessment) for the assessment of potential risks posed from contamination on aquatic ecosystems. The DGVs indicate the concentrations below at which there is a low risk of unacceptable effects occurring. The GV-High values provide an indication of concentrations at which you might already expect to observe toxicity-related adverse effects. As such GV-high values are not considered a guideline value, rather an indicator of potential high-level toxicity. The DGVs and GV-High values for the contaminants of concern are in Table 17.

Table 17: Guideline Values for Sediment (mg/kg)

Contaminant	Default Guideline Value for Toxicants in Sediment	Guideline Value - High for Toxicants in Sediment
Metals		
Arsenic	20	70
Cadmium	1.5	10
Chromium (III+VI)	80	370
Copper	65	270
Lead	50	220
Mercury	0.15	1
Nickel	21	52
Zinc	200	410
TPH		
C10-C40 (Sum of total)	280	550
PAHs		
Sum of Total PAHs	10	50
OCP		
DDT	0.0012	0.005
Dieldrin	0.0028	0.007
Endrin	0.0027	0.06
PCBs		
Sum of Total PCBs	0.034	0.28

C5.0 References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater.* Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

HEPA. (2020). *PFAS National Environmental Management Plan (NEMP).* Version 2.0: Heads of EPAs Australia and New Zealand and Australian Government Department of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC. (2008). *Guidelines for Managing Risks In Recreational Water.*

NHMRC, NRMMC. (2016). *Australian Drinking Water Guidelines 6 2011, Version 3.2.* Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

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Appendix D

R.010.D.001 – Test Location Plan (General)

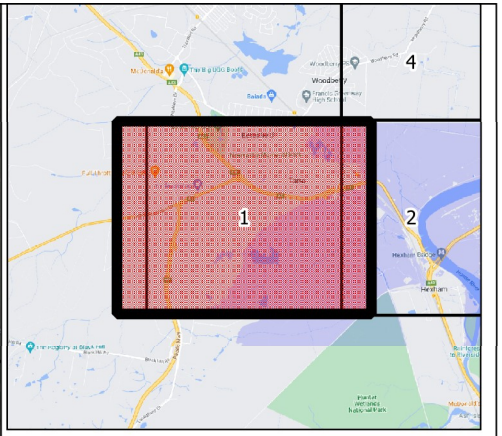
R.010.D.002 – Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)

R.010.D.003 - Areas of Potential Contamination Risk (Based on Figure 6-1, Jacobs (2021))

R.010.D.004 – Soil & Sediment Exceedances

R.010.D.005 – Groundwater Exceedances





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

- Approximate Test Locations (81641.00)

GHD (2005/06)

- Bore
- CPT
- Pit

Coffey (2007)

- Bore
- CPT
- Pit
- Section
- TfNSW Design Alignment
- 220128_Revised_ConstructionBdy
- 220128_Revised_AncillaryFacilities

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

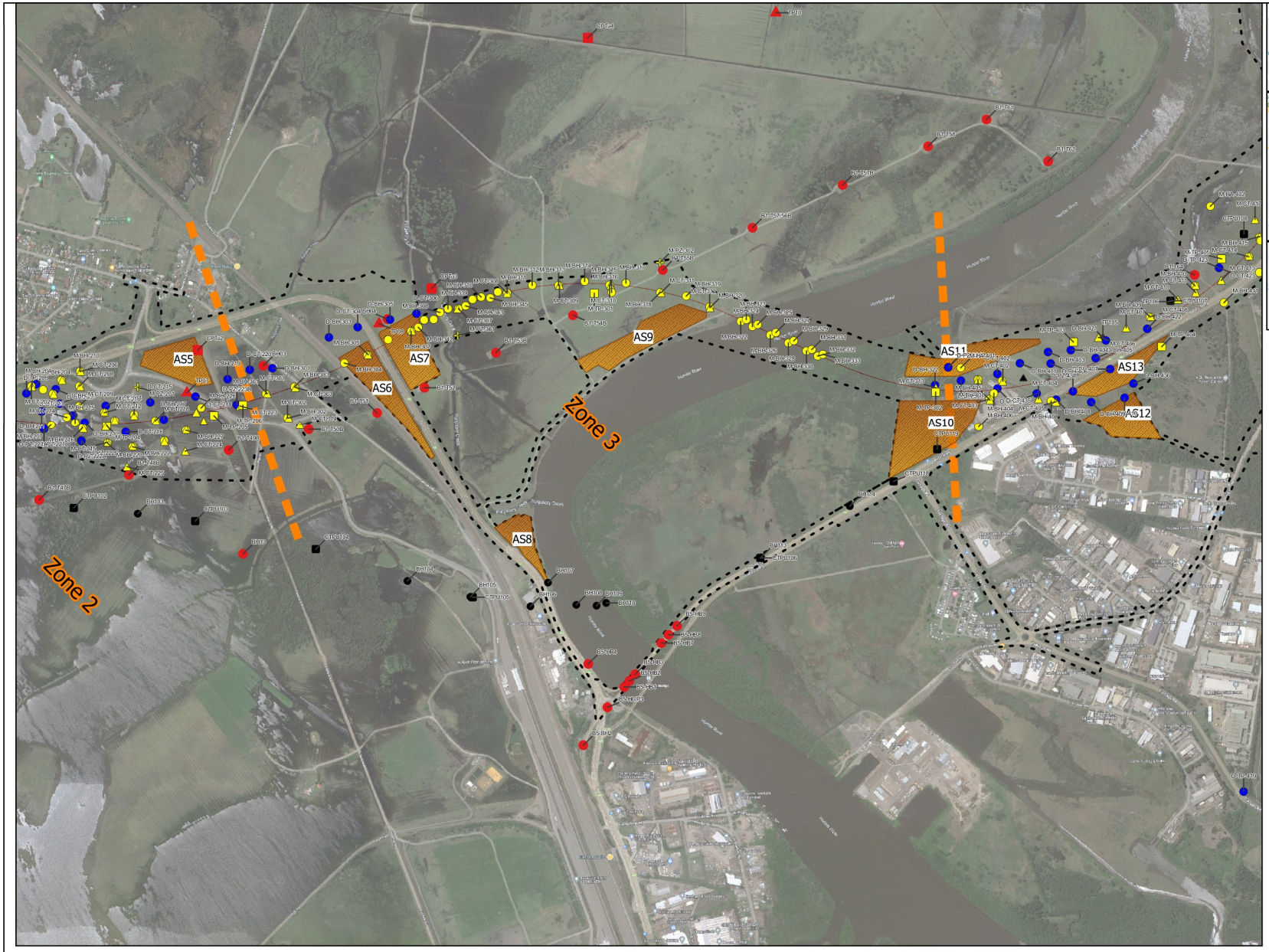
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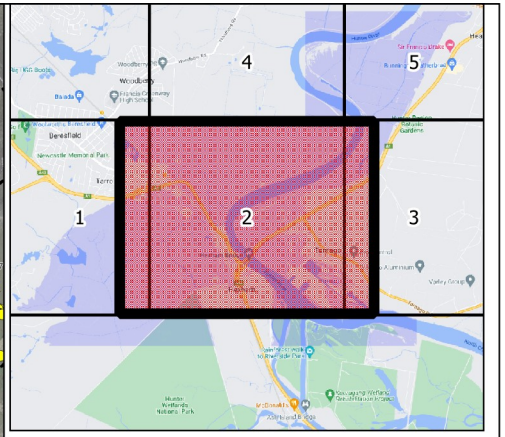
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 22.April.2022	

TITLE: **Test Location Plan (General)**
Supplementary Report - Soils and Contamination (M12RT)
D.001 - Sheet 1 of 6

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.001
REVISION:	Rev0





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

- Approximate Test Locations (81641.00)

GHD (2005/06)

- Bore
- CPT
- Pit

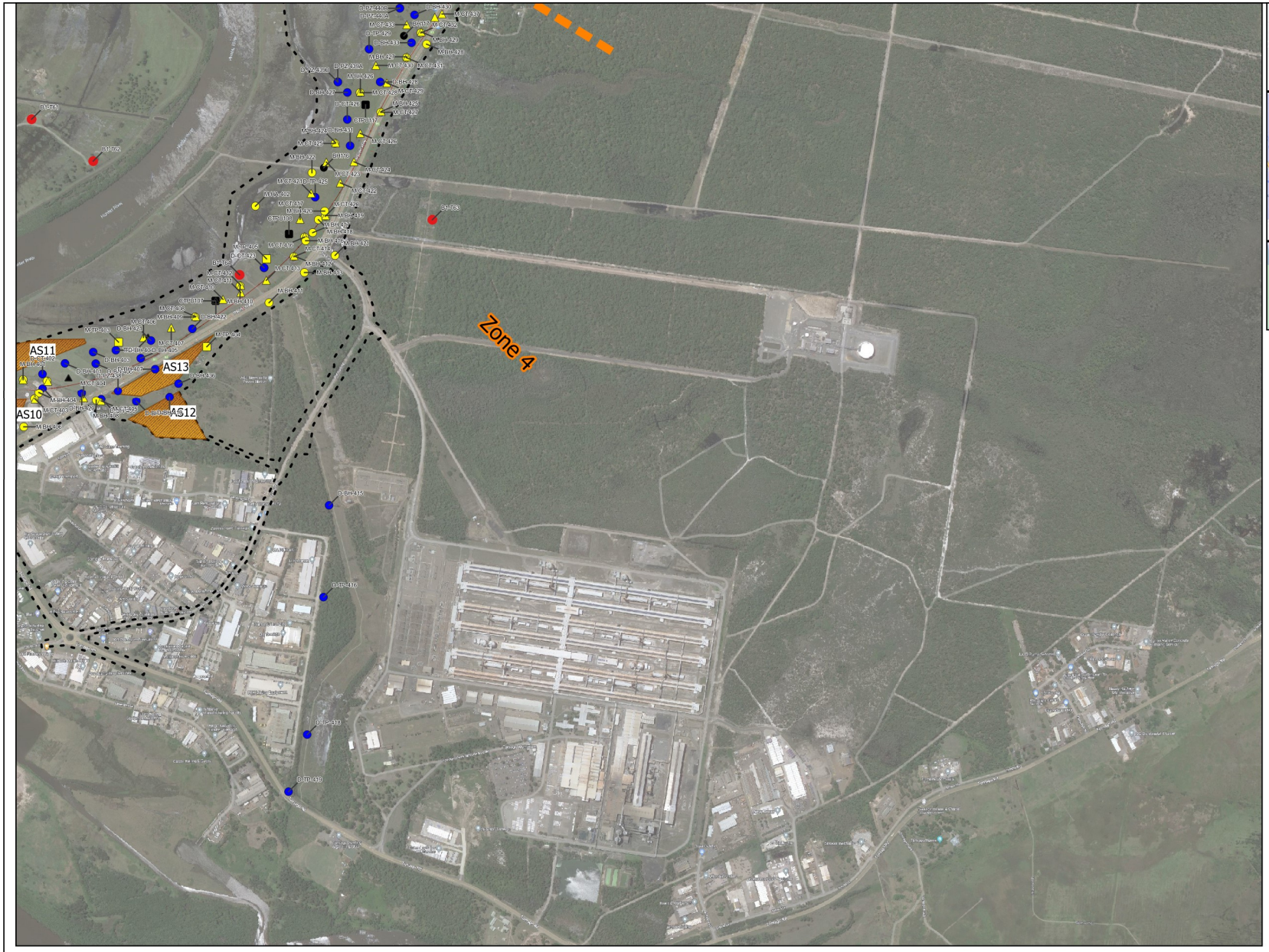
Coffey (2007)

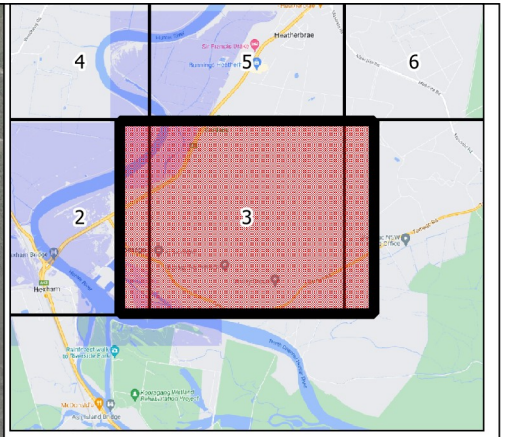
- Bore
- CPT
- Pit
- Section
- TfNSW Design Alignment
- 220128_Revised_ConstructionBdy
- 220128_Revised_AncillaryFacilities

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Transport for NSW	TITLE: **Test Location Plan (General)**	PROPOSAL: 81641.03
	OFFICE: Newcastle / DRAWN BY: JRK	**Supplementary Report - Soils and Contamination (M12RT)**	DRAWING No: R.010.D.001
	SCALE: 1:15,000 @ A3 / DATE: 22.April.2022	**D.001 - Sheet 2 of 6**	REVISION: Rev0





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

- Approximate Test Locations (81641.00)

GHD (2005/06)

- Bore
- CPT
- Pit

Coffey (2007)

- Bore
- CPT
- Pit
- Section
- TfNSW Design Alignment
- 220128_Revised_ConstructionBdy
- 220128_Revised_AncillaryFacilities

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

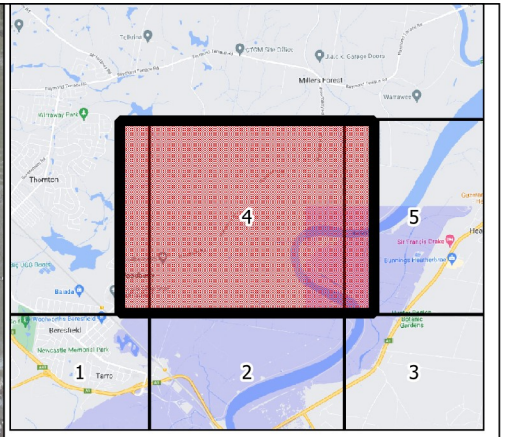
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 22.April.2022	

TITLE: **Test Location Plan (General)**
Supplementary Report - Soils and Contamination (M12RT)
D.001 - Sheet 3 of 6

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.001
REVISION:	Rev0





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

- Approximate Test Locations (81641.00)

GHD (2005/06)

- Bore
- CPT
- Pit

Coffey (2007)

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- CPT
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- 220128_Revised_ConstructionBdy
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Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

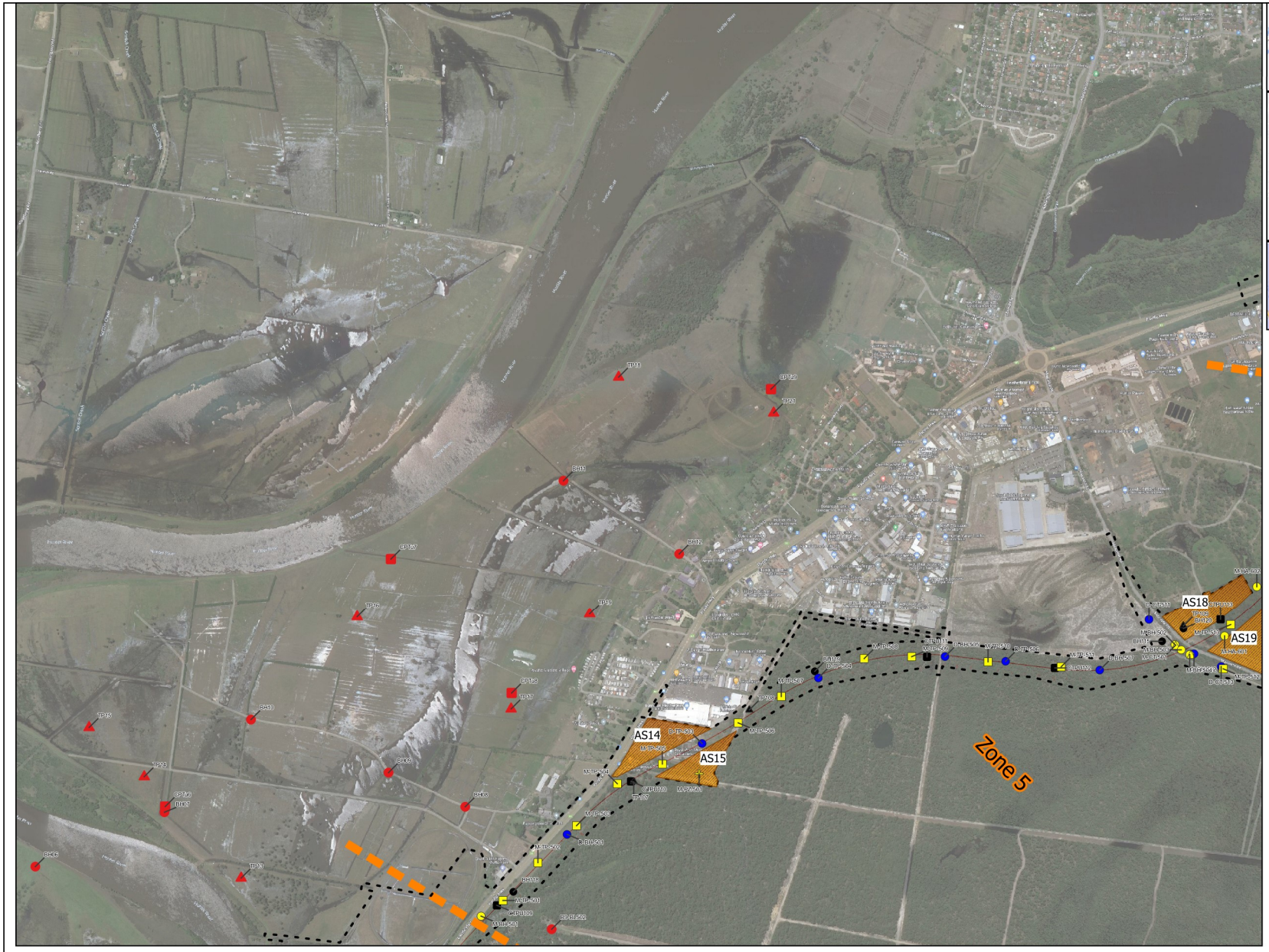
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Geotechnics / Environment / Groundwater

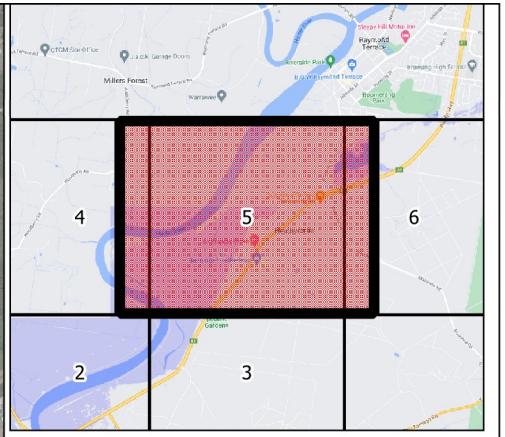
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OFFICE: Newcastle	DRAWN BY: JRK
SCALE: 1:15,000 @ A3	DATE: 22.April.2022

TITLE: **Test Location Plan (General)**
Supplementary Report - Soils and Contamination (M12RT)
D.001 - Sheet 4 of 6

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.001
REVISION:	Rev0





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

- Approximate Test Locations (81641.00)

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- CPT
- Pit
- Section
- TfNSW Design Alignment
- 220128_Revised_ConstructionBdy
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Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

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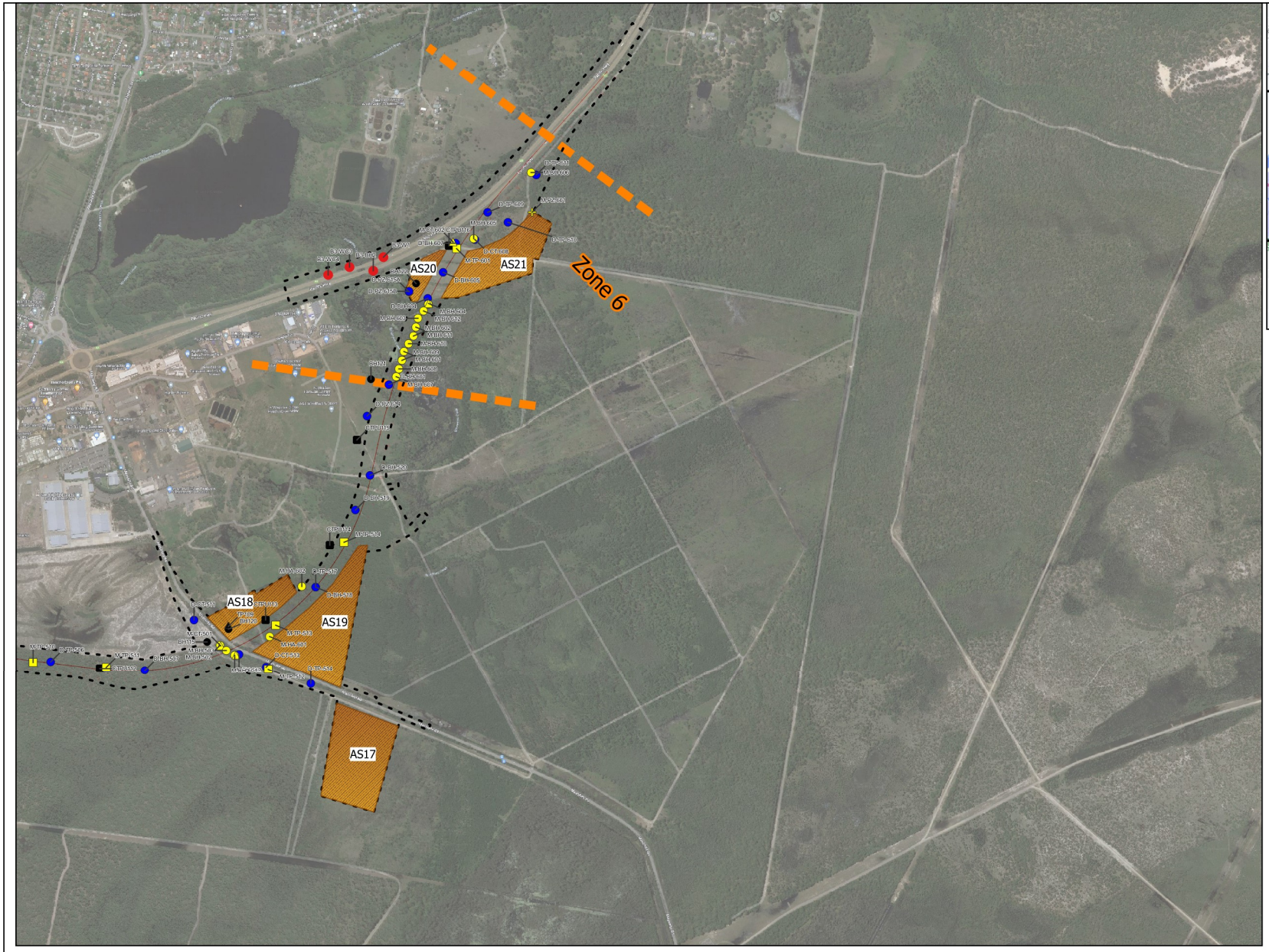
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Geotechnics / Environment / Groundwater

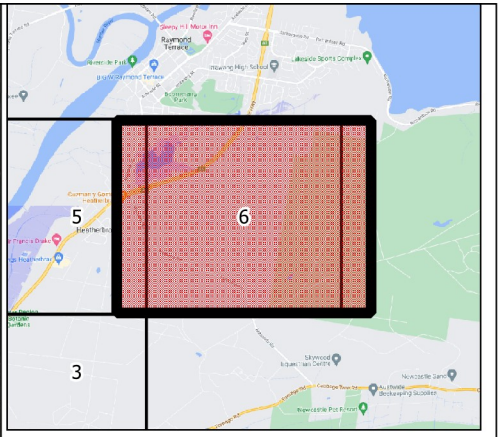
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SCALE: 1:15,000 @ A3	DATE: 22.April.2022	

TITLE: **Test Location Plan (General)**
Supplementary Report - Soils and Contamination (M12RT)
D.001 - Sheet 5 of 6

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.001
REVISION:	Rev0





Legend

Approximate Test Locations (81641.03)

- Borehole
- CPTu
- Test Pit

Approximate Test Locations (81641.00)

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GHD (2005/06)

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- TfNSW Design Alignment
- 220128_Revised_ConstructionBdy
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Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

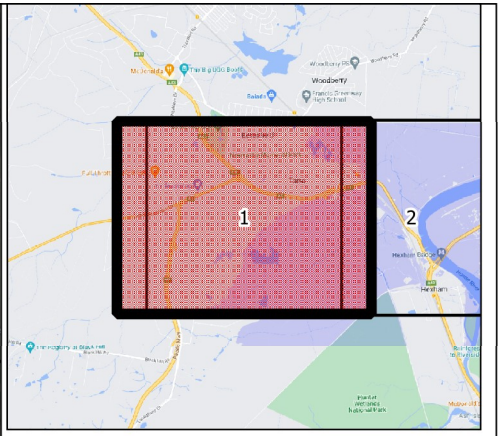
CLIENT: Transport for NSW		
OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 22.April.2022	

TITLE: **Test Location Plan (General)**
Supplementary Report - Soils and Contamination (M12RT)
D.001 - Sheet 6 of 6

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.001
REVISION:	Rev0





Legend

- Location of Soil / Sediment Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

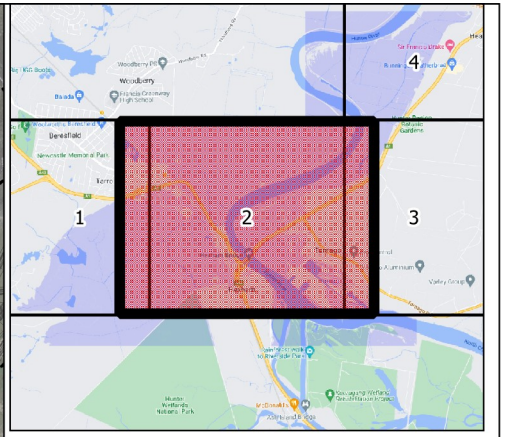
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)**
Supplementary Report - Soils and Contamination (M12RT)
D.002 - Sheet 1 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.002
REVISION:	Rev0





Legend

- Location of Soil / Sediment Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

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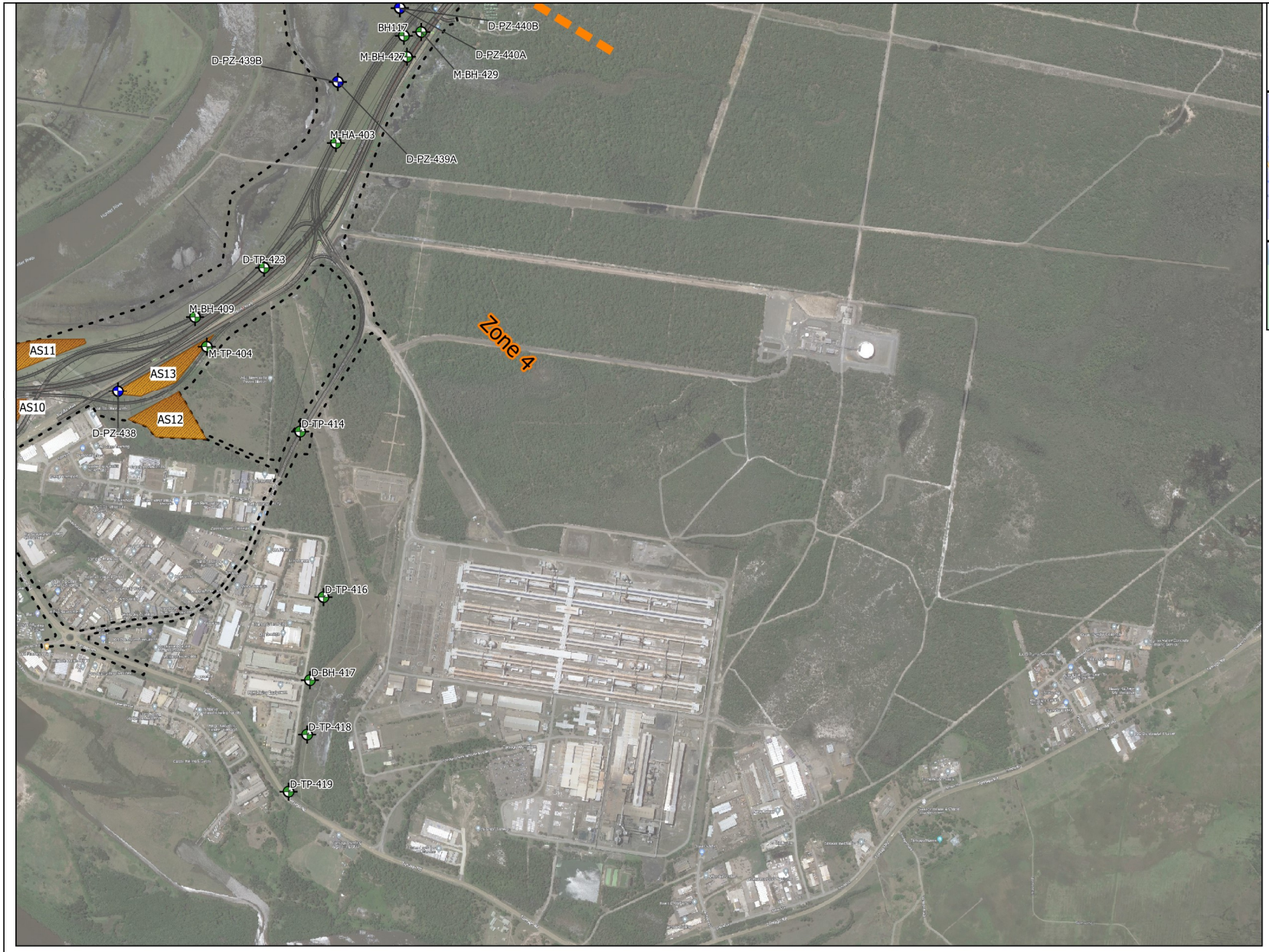
Douglas Partners
Geotechnics / Environment / Groundwater

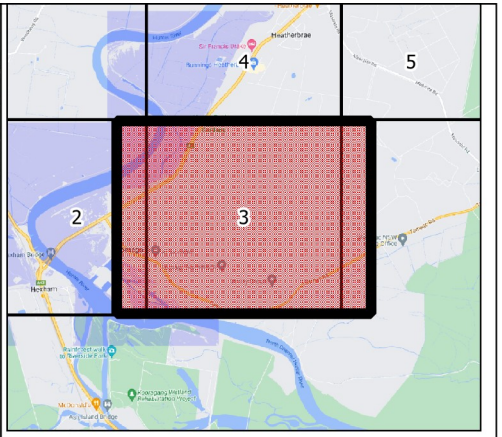
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SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)**
Supplementary Report - Soils and Contamination (M12RT)
D.002 - Sheet 2 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.002
REVISION:	Rev0





Legend

- Location of Soil / Sediment Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

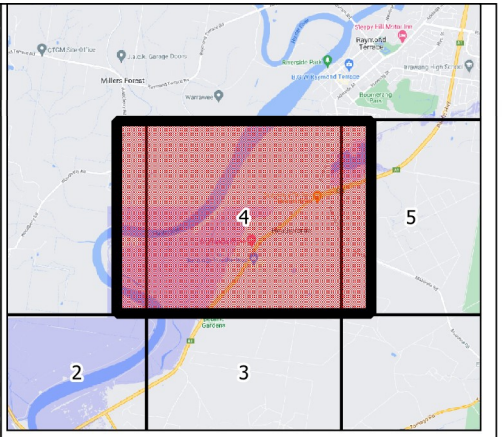
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)**
Supplementary Report - Soils and Contamination (M12RT)
D.002 - Sheet 3 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.002
REVISION:	Rev0





Legend

- Location of Soil / Sediment Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

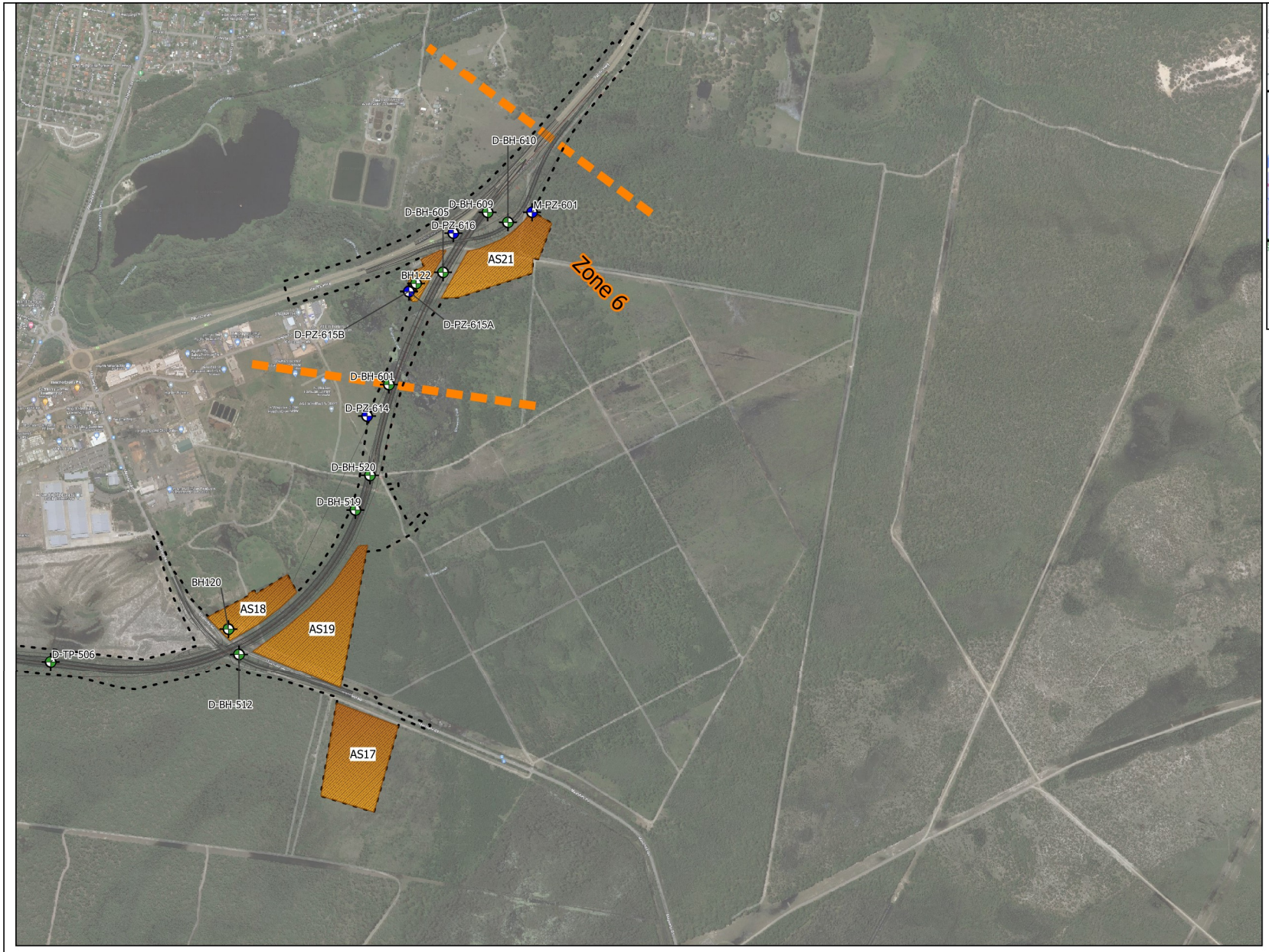
Douglas Partners
Geotechnics / Environment / Groundwater

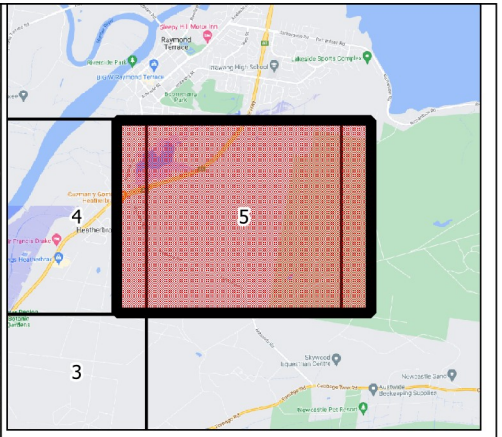
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)**
Supplementary Report - Soils and Contamination (M12RT)
D.002 - Sheet 4 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.002
REVISION:	Rev0





Legend

- Location of Soil / Sediment Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

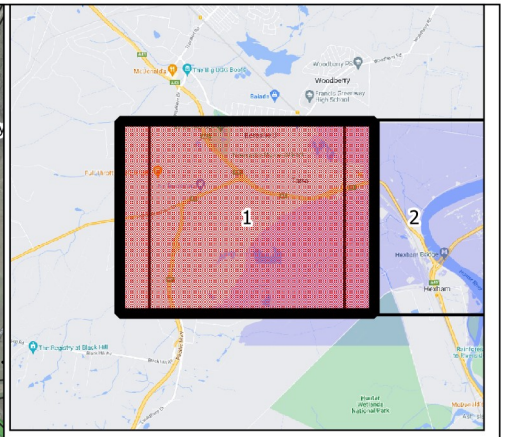
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Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Transport for NSW	TITLE:	**Test Location Plan (Soil, Sediment & Groundwater Contamination Testing)** **Supplementary Report - Soils and Contamination (M12RT)** **D.002 - Sheet 5 of 5**
OFFICE:	Newcastle	DRAWN BY:	JRK
SCALE:	1:15,000 @ A3	DATE:	26.April.2022

PROPOSAL:	81641.03
DRAWING No:	R.010.D.002
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary (The Project)
- Section Boundary (Generalised Geotechnical Zones)
- Areas of Potential Contamination Risk Location
- Areas of Potential Contamination Risk
- Cadastral Plan

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

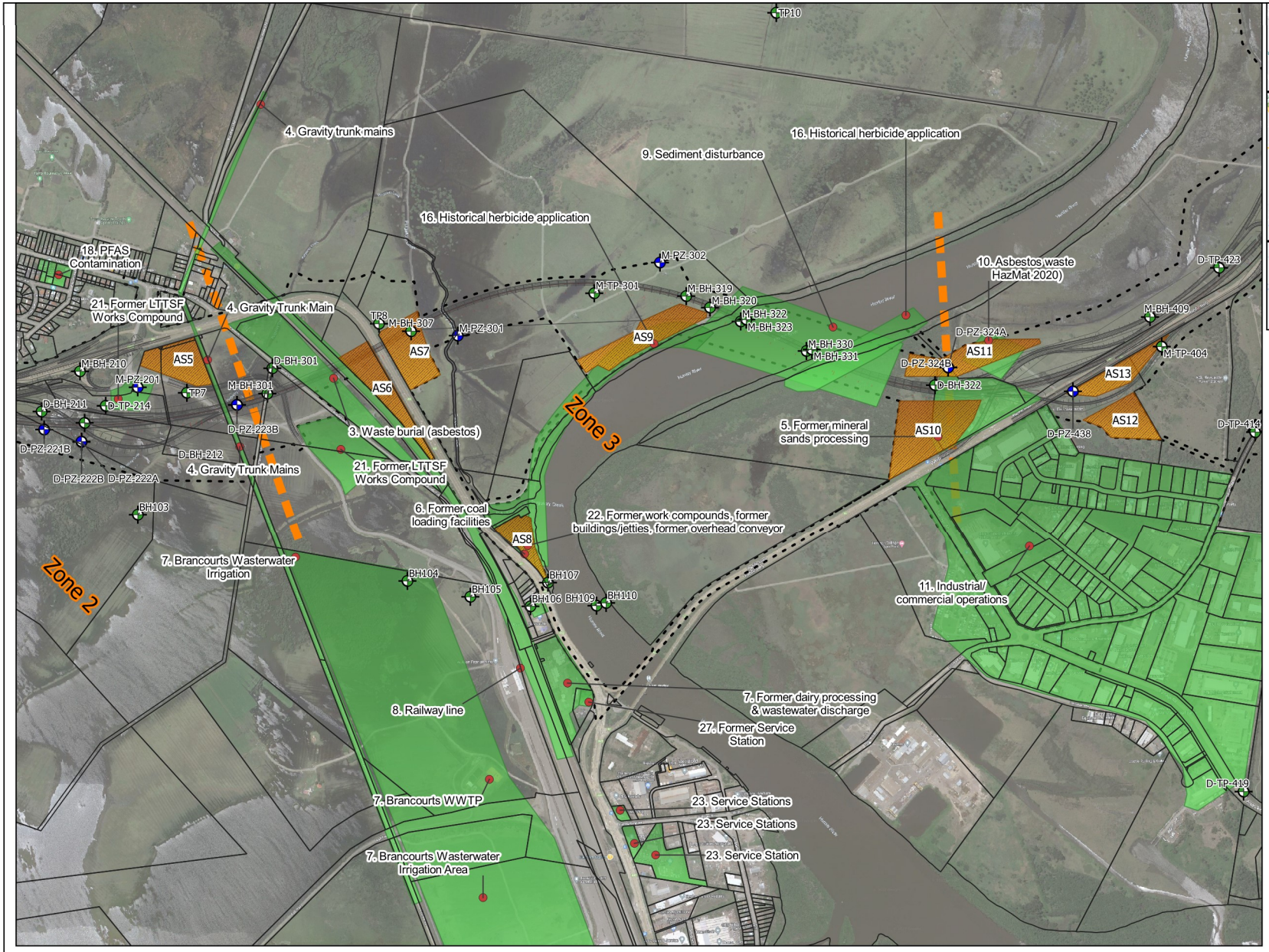
Douglas Partners
Geotechnics / Environment / Groundwater

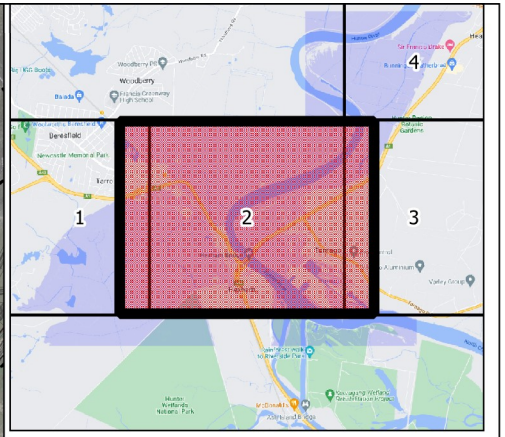
CLIENT: Transport for NSW		
OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Areas of Potential Contamination Risk (Update of Figure 6-1)**
Supplementary Report - Soils and Contamination (M12RT)
D.003 - Sheet 1 of 5

N

DRAWING No:	81641.03
DRAWING No:	R.010.D.003
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary (The Project)
- Section Boundary (Generalised Geotechnical Zones)
- Areas of Potential Contamination Risk Location
- Areas of Potential Contamination Risk
- Cadastral Plan

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

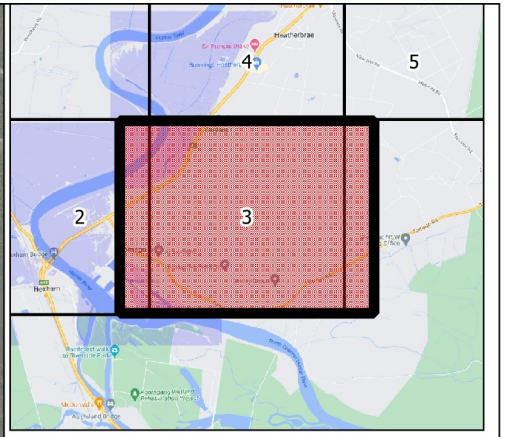
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OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Areas of Potential Contamination Risk (Update of Figure 6-1)**
Supplementary Report - Soils and Contamination (M12RT)
D.003 - Sheet 2 of 5

N

DRAWING No:	81641.03
DRAWING No:	R.010.D.003
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary (The Project)
- Section Boundary (Generalised Geotechnical Zones)
- Areas of Potential Contamination Risk Location
- Areas of Potential Contamination Risk
- Cadastral Plan

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

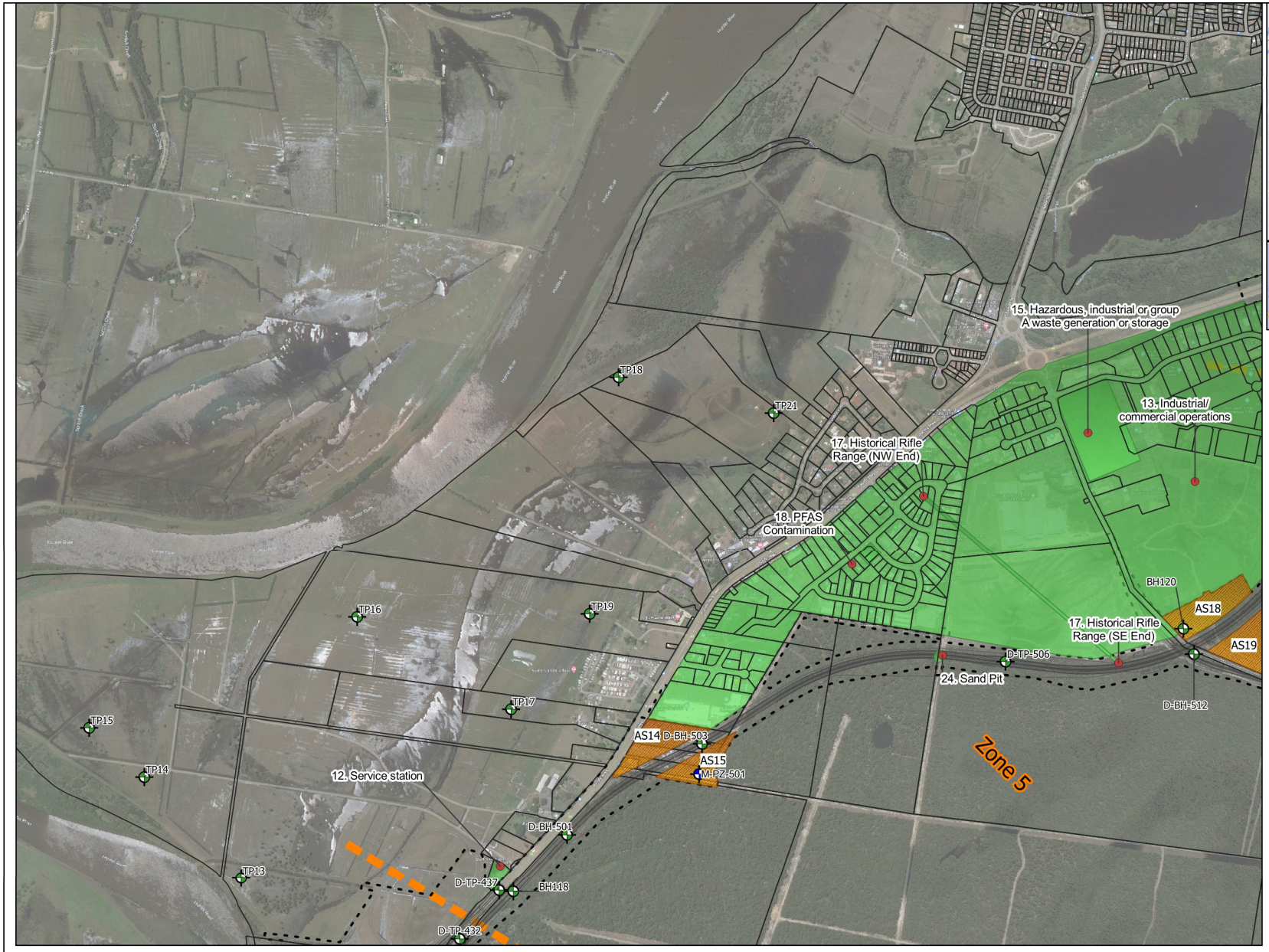
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Geotechnics / Environment / Groundwater

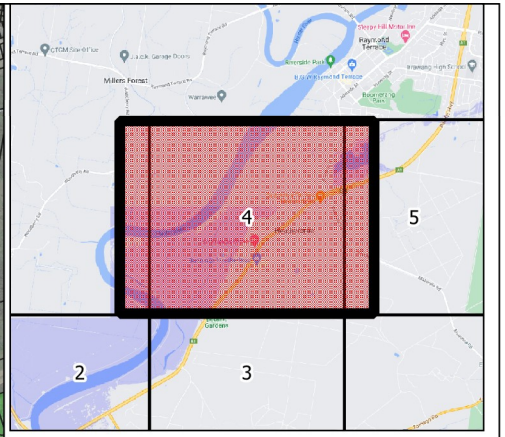
CLIENT: Transport for NSW		
OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Areas of Potential Contamination Risk (Update of Figure 6-1)**
Supplementary Report - Soils and Contamination (M12RT)
D.003 - Sheet 3 of 5

N

DRAWING No:	81641.03
DRAWING No:	R.010.D.003
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary (The Project)
- Section Boundary (Generalised Geotechnical Zones)
- Areas of Potential Contamination Risk Location
- Areas of Potential Contamination Risk
- Cadastral Plan

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

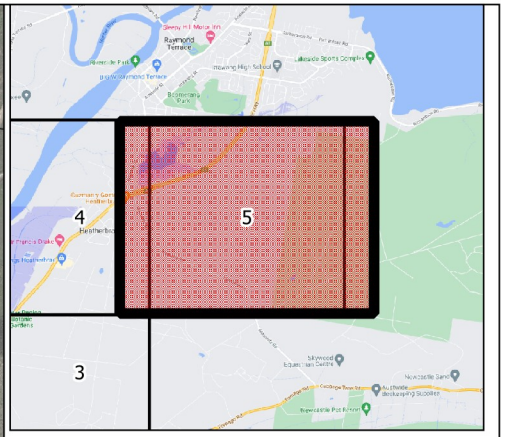
CLIENT: Transport for NSW	
OFFICE: Newcastle	DRAWN BY: JRK
SCALE: 1:15,000 @ A3	DATE: 26.April.2022

TITLE: **Areas of Potential Contamination Risk (Update of Figure 6-1)**
Supplementary Report - Soils and Contamination (M12RT)
D.003 - Sheet 4 of 5

N

DRAWING No:	81641.03
DRAWING No:	R.010.D.003
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary (The Project)
- Section Boundary (Generalised Geotechnical Zones)
- Areas of Potential Contamination Risk Location
- Areas of Potential Contamination Risk
- Cadastral Plan

Drawing adapted from Google Maps aerial.
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

Douglas Partners
Geotechnics / Environment / Groundwater

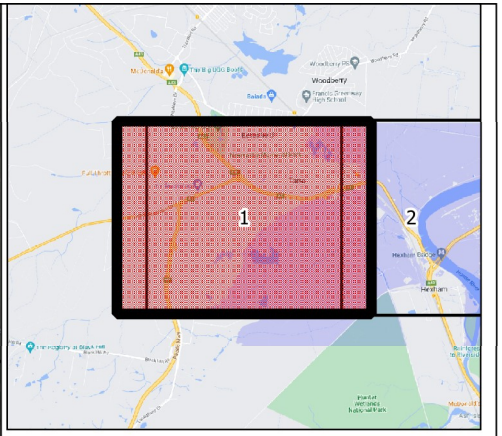
CLIENT: Transport for NSW		
OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Areas of Potential Contamination Risk (Update of Figure 6-1)**
Supplementary Report - Soils and Contamination (M12RT)
D.003 - Sheet 5 of 5

N

DRAWING No:	81641.03
DRAWING No:	R.010.D.003
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Refer to Table B3 and Table B4 in Appendix B for soil and sediment assessment criteria exceeded

Drawing adapted from Google Maps aerial and 1:100,000 Newcastle Coalfield Geology Sheet (NSW Dept of Mineral Resources)
Revised Construction Boundary and Design Alignment provided by TfNSW dated 28/01/2022

0 250 500 m

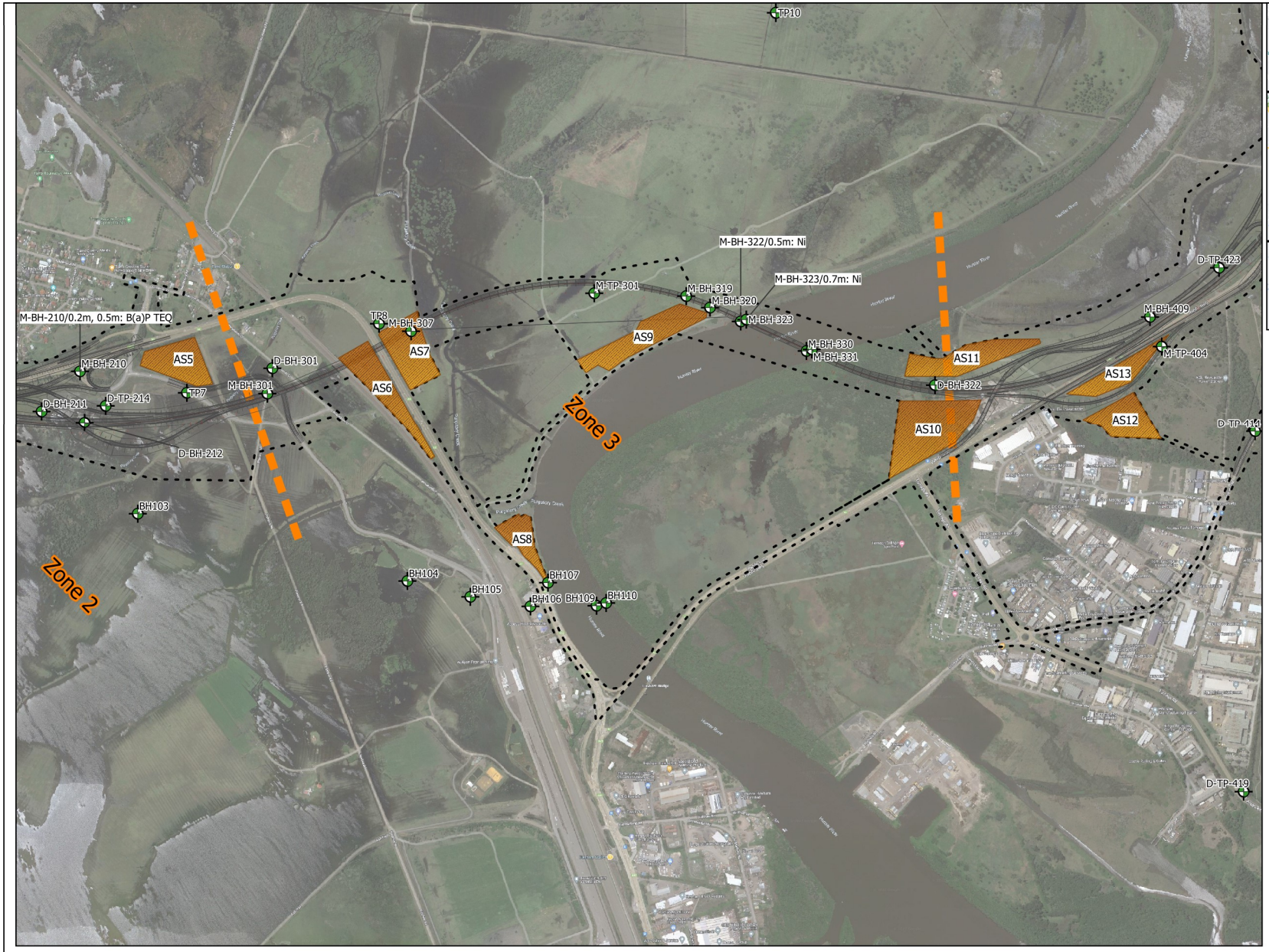
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Geotechnics / Environment / Groundwater

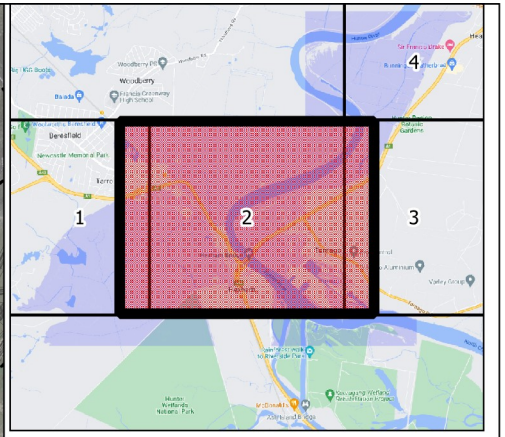
CLIENT: Transport for NSW		
OFFICE: Newcastle	DRAWN BY: JRK	
SCALE: 1:15,000 @ A3	DATE: 26.April.2022	

TITLE: **Soil & Sediment Exceedances**
Supplementary Report - Soils and Contamination (M12RT)
D.004 - Sheet 1 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.004
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
- Zone Boundary
- TfNSW Design Alignment (The Project)

Refer to Table B3 and Table B4 in Appendix B for soil and sediment assessment criteria exceeded

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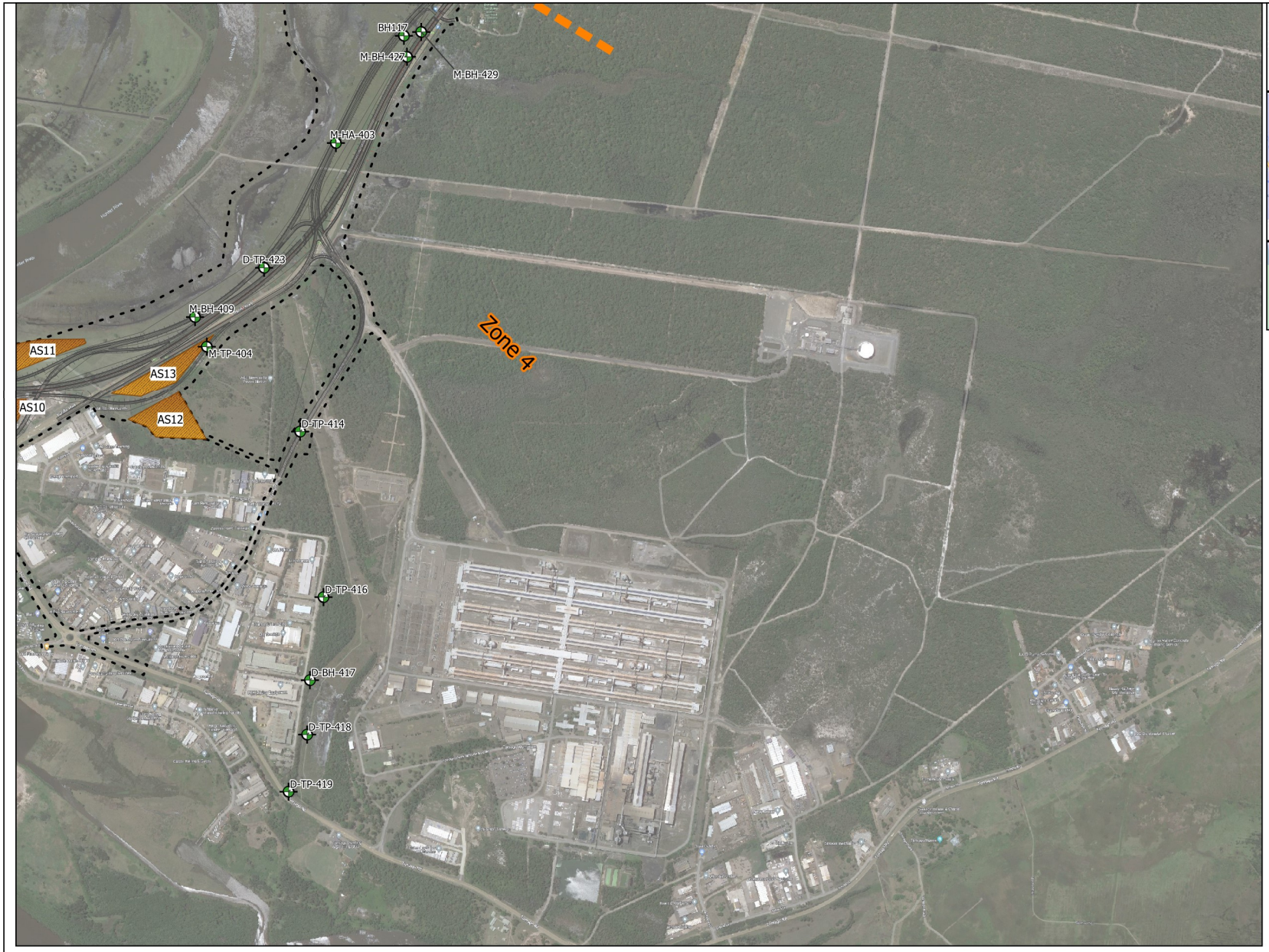
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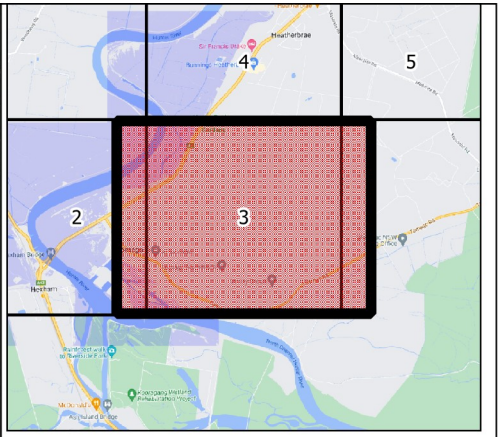
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Supplementary Report - Soils and Contamination (M12RT)
D.004 - Sheet 2 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.004
REVISION:	Rev0





Legend

- Location of Soil Contamination Testing
- Revised Ancillary Facilities
- Revised Construction Boundary
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Refer to Table B3 and Table B4 in Appendix B for soil and sediment assessment criteria exceeded

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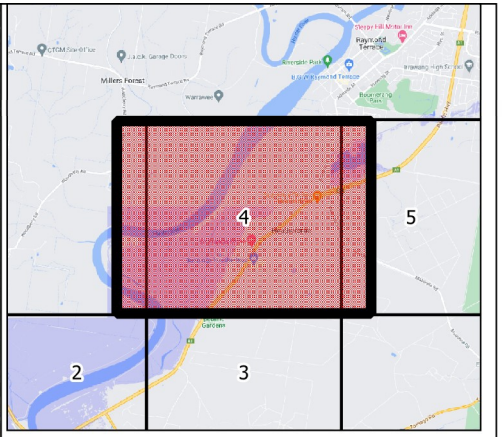
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D.004 - Sheet 3 of 5

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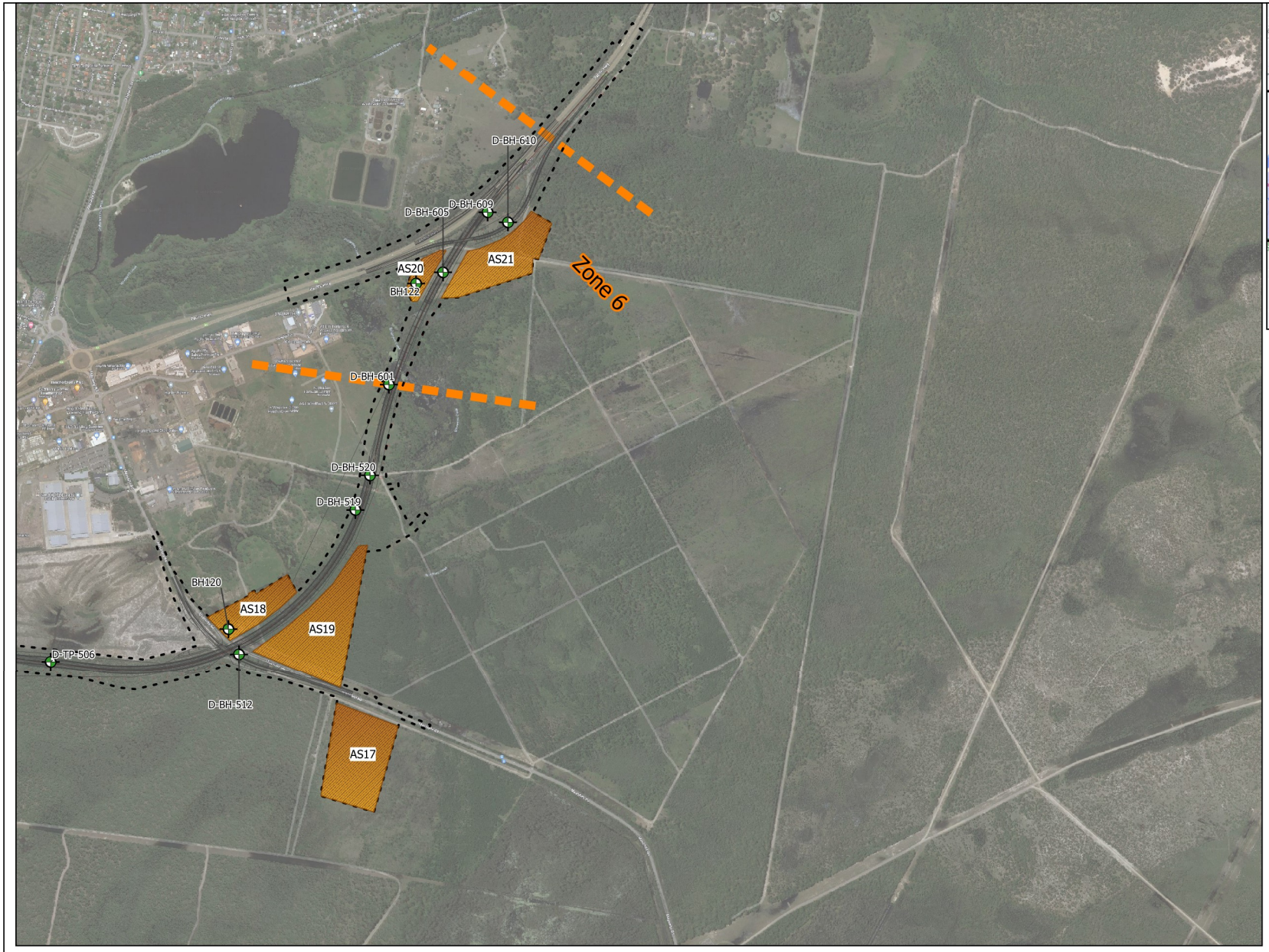
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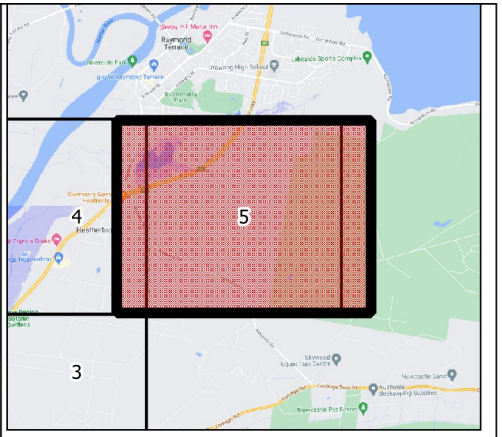
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D.004 - Sheet 4 of 5

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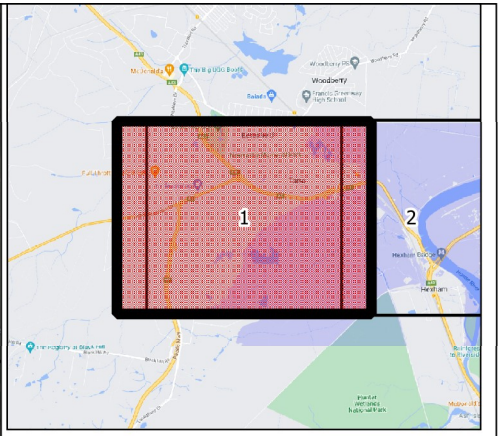
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Supplementary Report - Soils and Contamination (M12RT)
D.004 - Sheet 5 of 5

N

PROPOSAL:	81641.03
DRAWING No:	R.010.D.004
REVISION:	Rev0





Legend

- Location of Groundwater Contamination Testing
- Revised Ancillary Facilities (AS1 to AS21)
- Revised Construction Boundary
- Section Boundary
- TfNSW Design Alignment (The Project)

Well Notation:
A - Shallow Well
B - Deep Well

Refer to Table B6 in Appendix B for groundwater assessment criteria exceeded

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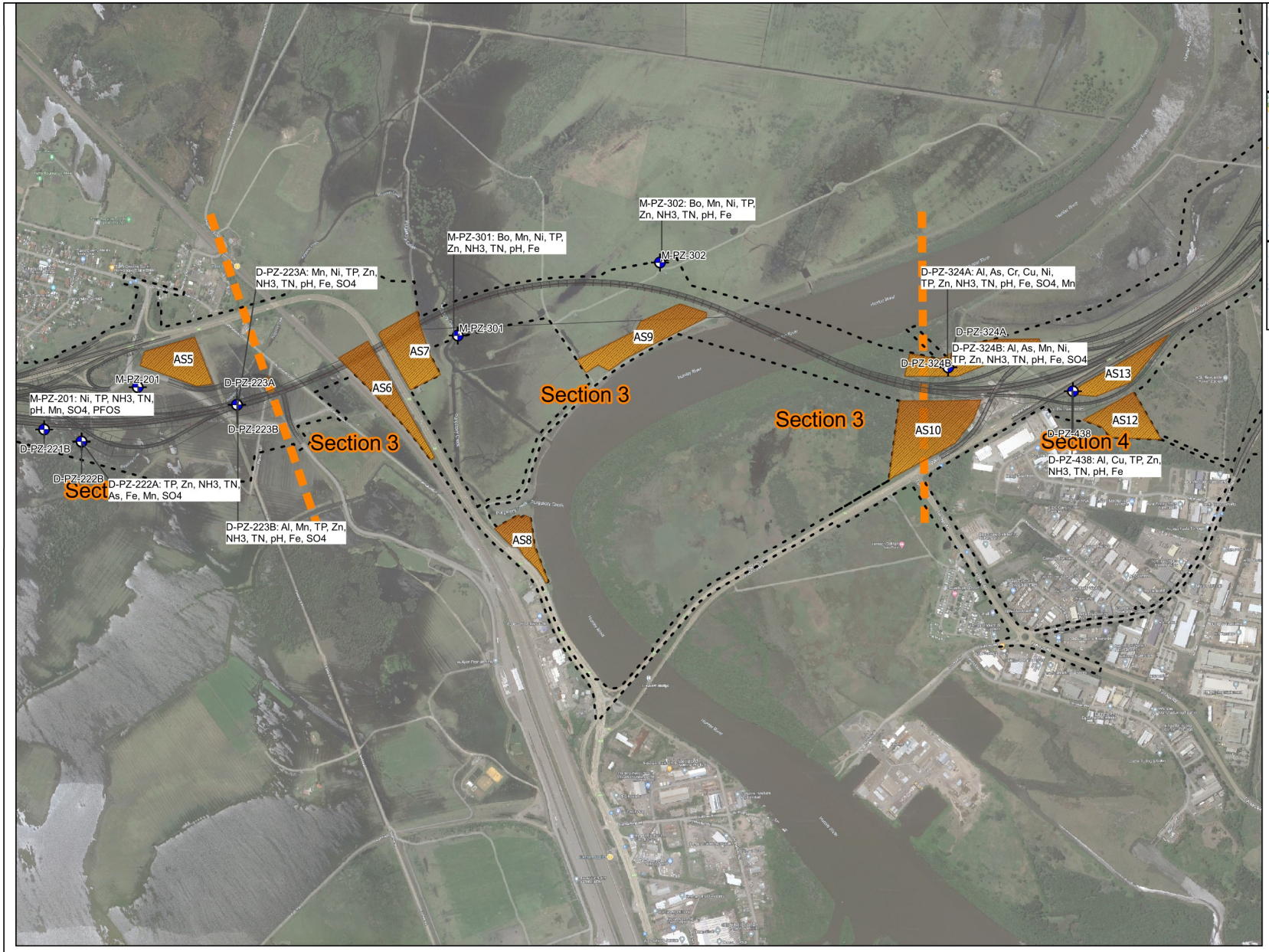
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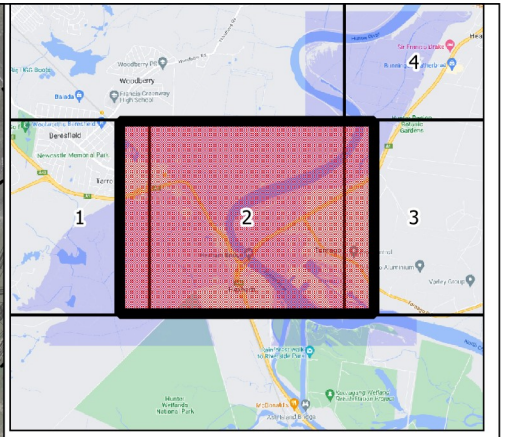
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Supplementary Report - Soils and Contamination (M12RT)
D.005 - Sheet 1 of 5

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PROPOSAL:	81641.03
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REVISION:	Rev0





Legend

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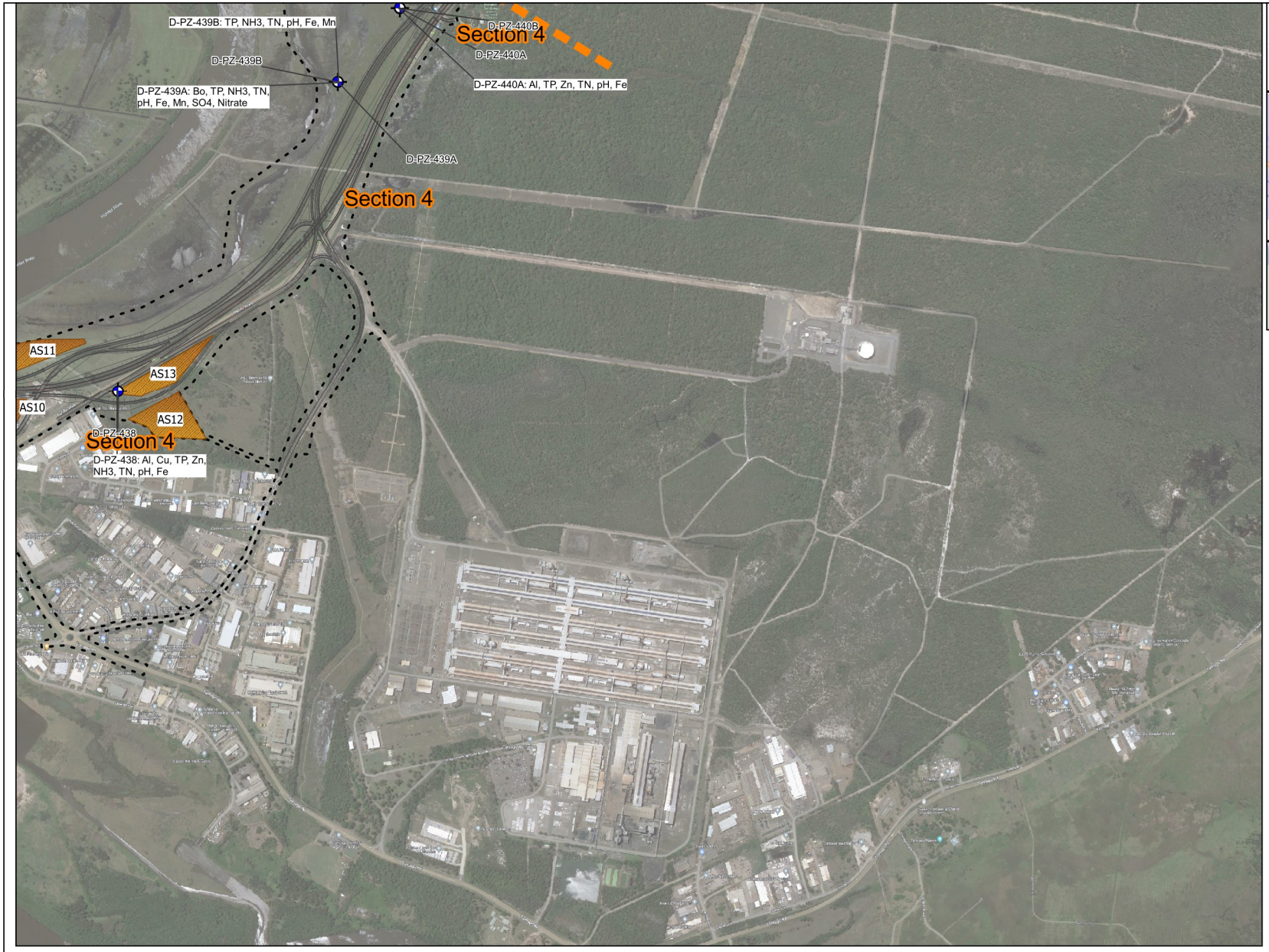
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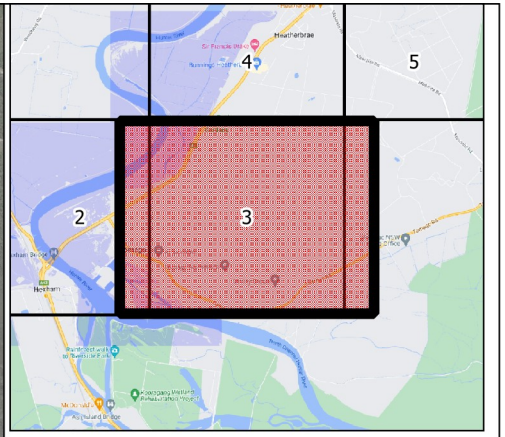
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TITLE: **Groundwater Exceedances**
Supplementary Report - Soils and Contamination (M12RT)
D.005 - Sheet 2 of 5

N

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DRAWING No:	R.010.D.005
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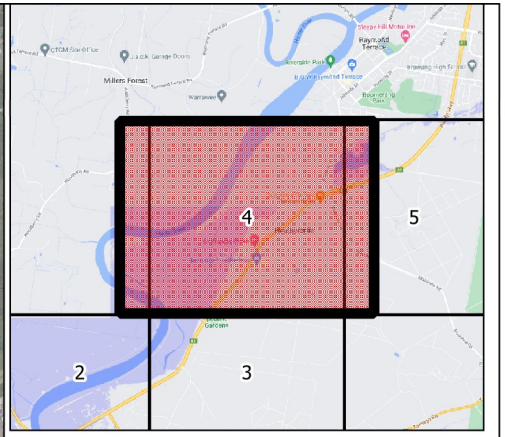
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D.005 - Sheet 3 of 5

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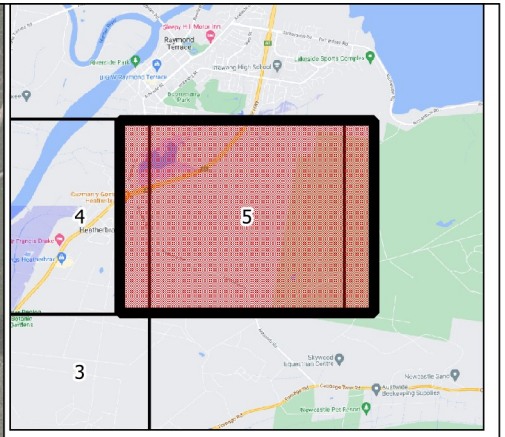
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Supplementary Report - Soils and Contamination (M12RT)
D.005 - Sheet 5 of 5

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PROPOSAL:	81641.03
DRAWING No:	R.010.D.005
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Attachment B. Rutile Zircon Mining Detailed Site Investigation - Jacobs. 2016

Former Rutile Zircon Mine Site: Detailed Site Investigation

NSW ROADS AND MARITIME SERVICES

Former RZM Site: Detailed Site Investigation

IA008200_R03 | A

Contract: 10.2714.1669-0012; Work Order: 00008

FINAL



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Executive Summary

The NSW Roads and Maritime Services (RMS) engaged Jacobs Group (Australia) Pty Ltd (Jacobs, formerly trading as Sinclair Knight Merz SKM Pty Ltd) to undertake a Detailed Site Investigation (DSI) associated with the former Rutile Zircon Mines (RZM) Mineral Dry Plant (the Site), in accordance with the RMS Panel Deed for Contaminated Site Assessment Services, Contract No. 10.2714.1669, Work Order No. 00008.

The total size of the Site is approximately 6 hectares, described as Lot 101, Deposited Plan 1038663 in the Local Government Area (LGA) of Port Stephens, and is located at 1877 Pacific Highway, Tomago NSW (**Appendix A, Figure 1**). RMS purchased the Site in 2011 as part of the proposed Pacific Highway Upgrade works, to upgrade 15 kilometres of the Pacific Highway between the M1 Pacific Motorway and Raymond Terrace.

RMS initially engaged Jacobs to undertake a dust classification assessment report (2013) to characterise metals concentrations in dust samples collected from the interior of disused mineral sand processing and storage buildings on the site, to support the planned demolition of buildings and reduce the attractiveness of the site to illegal dumping of waste and other episodes of trespassing.

Based on the site history and the likelihood of other forms of potential contamination possibly associated with the site, RMS engaged Jacobs to undertake a Preliminary Site Investigation (PSI) Report (2013) that identified potential contamination risks associated with the previous, historical operations on site specifically associated with Mineral Sand Storage and Processing). The PSI report recommended (among others) that Detailed Site Investigations (DSI) be undertaken to help identify and understand the potential occurrence, extent and significance of potential contaminants of concern. Based on the results of the PSI investigation, potential contaminants of concern included elevated levels of naturally occurring radioactive material (NORM), elevated concentrations of some metals, and localised hotspots of hydrocarbon contamination.

Prior to the DSI site investigations, Jacobs undertook radiation assessment works (Queensland Department of Health Radiation & Nuclear Science Unit, 2014) on accessible site areas, and at suitable off-site locations, to measure radiation levels, and to establish Worker Dose Constrain Levels for the site, to be protective of future demolition workers, and to inform decisions relating to potential future remediation activities. Once background radiation levels were understood and the dose constraint levels established for the site, the Sampling, Analysis and Quality Plan (SAQP) was created to guide the DSI scope and Data Quality Objectives for the study.

The SAQP scope defined vegetation clearing works across the site to allow greater site access, and established the locations for comprehensive radiation surveys across all newly accessible ground surfaces and at depth in selected locations, test-pit and drilling investigations, sample capture and analysis of soil, sediment, surface water and groundwater. In-situ radiation monitoring using Radiation Solutions RS-220 gamma surveyor instruments was undertaken to dynamically map elevated radiation levels at surface and at depth within test-pits and boreholes. X-ray fluorescence (XRF) spectrometry screening of soils at surface and at depth was also undertaken for metals, to allow dynamic interpretation of the potential extent of metals in soil during the test pitting events.

The results of the DSI scope can be broadly summarised as follows:

- Hydrocarbons in soil exceed management limits in surface soils at the former transformer location, adjacent to former Building 4
- Acid sulphate soils exceed the action level criteria at the majority of locations sampled across the site.
- Heavy metals detected within the sediments of the Hunter River and drainage line exceed the applied criteria
- Dissolved concentrations of cadmium, dissolved copper, dissolved nickel, dissolved zinc have been detected in surface water and groundwater exceeding investigation levels at locations within and adjacent to the drainage line and at several well locations
- Widespread distribution of NORM (areas of elevated dose rates relative to surrounds) have been identified across the site at surface and at depth.

Based on the completion of the DSI field works and draft reporting (including the establishment of worker does constraint levels and areas) and management presentations, the site demolition works (including decontamination and health physics reporting and verification - SGS Australian Radiation Services 2015) were completed in October 2015 by DECC Pty Ltd. The works included the decontamination of site buildings, demolition of all site buildings, stockpiling of processed mineral sand residue on site, and removal of demolished building materials from site. The results of the occupational radiation monitoring and reporting indicate that appropriate health physics practices and controls were implemented by DECC during site demolition works, from the perspective of restricting exposure of workers and the public to elevated levels of radiation sources.

Conclusions

Based on the combined results of the DSI and associated previous assessment works, the following conclusions are made:

- The site is proposed to be partially redeveloped as part of a highway upgrade.
- The site may be used as a construction works compound during the upgrade.
- There is contamination in soils, sediment, groundwater and surface water on the site in excess of the applied criteria.
- The DSI surface measurements for radiation provide excellent site coverage across the majority of the site and the site boundaries.
- In its current state, the sealed, vegetated and vacant site conditions do not provide a complete exposure pathway to humans to residual contamination, provided that site security measures are effective in restricting site access.
- A change of site usage conditions (such as) a construction compound may provide an exposure pathway to residual contamination
- A change of site usage conditions as a highway upgrade construction site may provide an exposure pathway to residual contamination
- Construction activities may alter ground conditions, contaminant behaviour and migration from the currently understood status
- The sealed and vegetated nature of surface conditions across the site is providing an effective means of reducing the generation and migration of dust and shallow soils
- Metals in groundwater and surface water may be migrating off site towards the Hunter River
- Metals and elevated levels of measured radioactivity in sediments in drains and at the foreshore of the site may be posing an exposure risk to aquatic receptors
- Elevated radiation dose rates in soils at surface need management to be protective of humans.
- Demolition works associated with the former Building 7 (Administration block) and former Building 8 (Potting shed) included the combined, bulk demolition of asbestos and other building materials, and the bulk removal of asbestos containing building materials along with general building materials, and this may have contributed to previously undetected asbestos contamination in soils in these areas.
- Further consideration is required in order to assign likelihood, severity and risk parameters in terms of potential consequences of contamination on site.
- Jacobs consider it likely that the site would trigger formal notification to the NSW EPA under Section 60 of the Contaminated Land Management Act (1997), based on off-site identification of contamination in the road verge, the off-site open drain, and in foreshore sediment

Recommendations

Based on the above conclusions, the following recommendations are made:

- An Interim Site Management Plan is recommended for the immediacy to control access to the site and to establish other controls as necessary.
- Additional monitoring of groundwater and surface water is recommended to establish trends and support predictions that will be required for future site management.
- Additional studies are recommended to calculate estimates for the depths and volumes of contaminated soil and to support remedial design options.
- In-situ waste classification studies in accordance with *NSW EPA Waste Classification Guidelines Part 3: Waste Containing Radioactive Material (2008)* is recommended to allow decisions relating to site future highway construction works and remedial design decisions.
- A Pre-Construction Land Condition Assessment Report is completed for the site in accordance with the *NSW RMS Environmental Procedure – Management of Wastes on Roads and Maritime Services Land (2014).*
- A risk assessment study is undertaken in line with the *CRCCare Technical Report no.16 – Safe on-site retention of contaminants Part 2: A risk-based approach (2013)*.

On the basis of the data that has been gathered during the combined contamination assessments, and subject to fulfilment of remaining data gaps, Jacobs consider that the site can be successfully managed and remediated to a standard that will allow construction of a highway upgrade, from a contamination perspective.

The following sections of this report contain specific details relating to the full DSI study results, interpretation and discussion.

1. .Introduction

The NSW Roads and Maritime Services (RMS) engaged Jacobs Group (Australia) Pty Ltd (Jacobs, formerly trading as Sinclair Knight Merz Pty Ltd) to undertake a Detailed Site Investigation (DSI) associated with the former Rutile Zircon Mines (RZM) Mineral Dry Plant (the Site). The Site is located at 1877 Pacific Highway, Tomago NSW, and described as Lot 101, under Deposited Plan 1038663 in the Local Government Area (LGA) of Port Stephens (**Appendix A, Figure 1**). The works are to be completed in accordance with the RMS Panel Deed for Contaminated Site Assessment Services, Contract No. 10.2714.1669, Work Order No. 00008.

RMS purchased the Site in 2011 as part of the proposed Pacific Highway Upgrade works, to upgrade 15 kilometres of the Pacific Highway between the M1 Pacific Motorway and Raymond Terrace. The site is currently vacant but has previously had episodes of opportunistic dumping and trespassing. Derelict buildings and disused structures were associated with attracting trespassers onto the site. Since the initial DSI field works and preliminary reporting tasks were completed in 2015, RMS completed demolition works for all remaining above-ground structures on site, to help decrease the visual barriers onsite and the opportunities for site trespassing and dumping.

The proposed Pacific Highway Upgrade alignment is currently in the conceptual design phase; however the construction works are expected to extend across the centre of the site, running east to west. The locations of some former site buildings and one former stockpile area are expected to be captured within the proposed Pacific Highway Upgrade works construction area. There is also the possibility of the concrete sealed areas of the site to be utilised as a construction works compound during the highway upgrade.

The overall objective for the contamination assessment due diligence works is to identify and manage likely existing contamination at the Site, in order to limit the effect on the surrounding environment, and support the construction and operation of the Hexham to Heatherbrae Pacific Highway upgrade works.

A Preliminary Site Investigation (PSI) report was completed in 2013 that identified a number of potential contaminants associated with the former operations and activities at the site, including the use of the site as a mineral sands dry processing plant, on site disposal of processed and unprocessed mineral sands, and also as a storage area for a treated timber company. Underground petroleum storage tanks and other chemical storage vessels were confirmed to have been installed at several locations across the site.

The PSI recommended the following actions be taken:

- Increase site security restrictions and methods to ensure no unauthorised site access;
- Apply restrictions on the extraction of groundwater and the use of surface water in the area until more detailed information has been gathered;
- Apply restrictions on any ground-disturbing activities across the site until risks associated with the presence of metals, contaminated dust and elevated levels of radiological activities are understood.

In order to understand the contamination risks to soil and groundwater at the site, Jacobs recommended the commencement of a DSI (this report) to investigate the nature and extent of the potential contamination risks that were identified during the PSI.

A Sampling, Analysis & Quality Plan (SAQP) was developed to scope the work and outline the methodology to be used throughout the DSI process. The SAQP was reviewed by a NSW EPA Accredited Site Contamination Auditor, Ross McFarland (the Auditor). The SAQP formed the basis for the completion of the DSI.

1.1 Aims and Objectives

The overall objective of the DSI scope is to obtain information on the quality of the soils, groundwater, surface water and sediments at specific locations across the site to allow an opinion to be formed regarding the contamination status of the site, and to gather data that will support future management decisions relating to contamination at specific areas of the site (if any).

The specific DSI objectives include the following:

- Assess the significance, nature and possible extent of the potential contaminants at the site in accordance with the *Contaminated Land Management Act 1997* (CLM Act) and all relevant guidelines made or endorsed by the NSW EPA;
- Determine whether there is a duty to report the site under Section 60 of the CLM Act and the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (2015);
- Assess whether the Site poses an unacceptable risk to human health or the environment on-site or off-site;
- Determine whether the site is fit for its current usage as a fenced off, unused former industrial site
- Consider the works required to support the proposed future land use for the upgrade of the Pacific Highway including the construction of additional Highway lanes on top of the central portion of the site;
- Gather information to allow a decision on the potential future management options or further investigations, if contamination is identified.

1.2 Scope of Works

The DSI undertaken by Jacobs in 2014 included the following scope of works:

- Preparation of a DSI Health, Safety and Environmental (HSE) Plan including relevant Job, Safety, Environment Analysis (JSEA).
- Desktop review of previous site investigations.
- Background and Demolition & DSI Planning Radiological Surveys on and off site.
- Preparation of a Sampling, Analysis and Quality Plan (SAQP) including comments from the NSW EPA Accredited Site Auditor, Ross McFarland (the Auditor).
- Identification of underground services present at the site by an accredited service location contractor.
- Clearing and removal of vegetation in accordance with the recommendations of the Preliminary Biodiversity Investigation (Jacobs 2014), within the pond and stockpile areas to gain access to the central portion of the site.
- Excavation of 27 test pits throughout the site, including the collection of soil samples, screening with portable devices and logging of the soil profiles.
- Drilling of 23 soil bores throughout the site, conversion of 13 soil bores into monitoring wells. During drilling activities soil samples were collected for analysis and screened with portable devices, soil profiles were logged by experienced site personnel.
- Collection of 10 sediment samples from within drainage lines and river foreshore.
- Completion of 1 round of groundwater monitoring from the 13 monitoring wells.
- Collection of 3 surface water samples from drainage lines, and artificial ponds at the site.
- Transportation of soil and water samples to a National Association of Testing Authorities (NATA) accredited laboratory for analysis.
- Surveying of the monitoring wells to a benchmarked height.
- Preparation of a detailed site investigation report in accordance with the SAQP (Jacobs, 2016).

2. Background Information

2.1 Previous Investigations

The following previous investigations reports for the former RZM site have been reviewed to assist in the development of the DSI SAQP:

- Rutile Zircon Mines Pty Ltd (RZM), *Tomago Separation Plant Site: Post Decommissioning Report*, March 2002, Ref: 02/02.
- Hazmat Services Pty Ltd (Hazmat), *Hazardous Materials Survey and Register – Former RZM site,* 1877 *Pacific Highway, Tomago*, February 2011, Ref: HAZ388_SUR_RPT_FIN_250211.
- Sinclair Knight Merz Pty Ltd (SKM), *Preliminary Site Investigation: Former RZM site, Tomago, NSW*, July 2013, Ref: EN03269.
- Sinclair Knight Merz Pty Ltd (SKM), Building Materials Dust Characterisation Report: *Former RZM site, Tomago, NSW*, July 2013, Ref: EN03269.
- Queensland Government, Health Services Support Agency (HSSA), *Background and Demolition & DSI Planning Radiological Survey, Tomago, NSW*, February 2014, Ref: 13PX363/364.
- Queensland Government, Health Services Support Agency (HSSA), *Environmental Radioactivity Assessment: Vegetation Buffer between Pacific Highway and former RZM site, Tomago, NSW*, April 2014, Ref: 13PX530.
- Sinclair Knight Merz Pty Ltd (SKM), *Preliminary Biodiversity Investigation: Former RZM site, Tomago, NSW*, May 2014, Ref: EN03269.
- Jacobs Group (Australia) Pty Ltd (Jacobs), *Former RZM Site DSI, Sampling, Analysis and Quality Plan*, July 2014, Ref: EN03269_DSI SAQP Rev C.
- Jacobs, *M1 to Raymond Terrace Environmental Impact Statement (EIS),* 2016 currently being prepared.

The information contained within the previous investigation reports have been used to develop the scope of this DSI, with the aim of confirming the findings of the previous investigations and assessing the significance of the contamination identified (if present).

The following sub-sections provide a brief summary of the findings for the key reliance documents above.

2.1.1 RZM Pty Ltd. 2002 Tomago Separation Plant Site – Post Decommissioning Report

The RZM Report includes summary details of the remedial works undertaken while decommissioning the site after processing operations had ceased. The report listed some site operation infrastructure, including underground fuel storage tanks (UST's), remnant ilmenite disposal areas, and monazite/garnet excavations.

The report provided an upper limit for residual radiation levels (200µR/hr) at the site and provided the results of a limited surface radiation survey within the site boundary.

A summary of remedial works is proved within the report, including:

- indications of remnant ilmenite disposal and burial on site;
- indications of previous disposal (and re-excavation) of surplus processed material (garnet and monazite) within excavated trenches on site ("Garnet Slots");
- indications of radiation dose readings for surface radiation screening across the site with potentially elevated levels of measured radiation (with readings ranging from 9 to 137µR/hr), although no allowance was made for background radiation levels as part of the survey;
- reference to at least 4 UST's located at the site to store and dispense unleaded petroleum and diesel fuels on site, with records indicating decommissioning and disposal of the UST's;

- a statement indicating that excavated fill from within the UST tank pits was land farmed on site, suggesting that fuels had leaked into the surrounding soils at the UST locations.

At the time of the investigation, the report concluded that the measured surface radiation levels were below the adopted upper limit, (with readings ranging from 9 to 137µR/hr) and that the site was therefore suitable for resale.

The report did not investigate the potential presence of heavy metals within the soil; the potential extent of leaking from the underground fuel storage tanks (and associated infrastructure pipework); potential contamination possibly associated with typical heavy-industry operations undertaken on site (spills, drips, leaks, machinery maintenance etc.) or potential impacts on groundwater.

2.1.2 Hazmat Services 2011. "Hazardous Materials Survey and Register.

The Hazmat Report outlined the investigation of hazardous building materials at the former RZM site, as part of the pre-demolition planning works. Hazmat completed hazardous building materials surveys of the eight remaining buildings on the site at the time of the survey. The Hazmat report defined hazardous building materials as asbestos-containing materials (ACM), synthetic mineral fibres (SMF), lead based paint (LBP) and polychlorinated biphenyls (PCB). The report listed each of the buildings and identified the defined hazardous materials within each of the buildings surveyed. The Report did not extend beyond the buildings and associated structures, or address any other potential pollutants (outside of the defined hazardous building materials) associated with a Mineral Dry Plant.

2.1.3 SKM Preliminary Site Investigation: Former RZM site. July 2013.

The PSI report concluded that:

- The vast majority of the site appeared to have been used for agricultural purposes until at least 1969. The site was then developed into a Mineral Sand Processing facility until the late 1990's, where a significant portion of existing processing and ancillary infrastructure were disassembled and reassembled at a new location in Mildura.
- The site was decommissioned including an assessment of the surface radiation in 2002;
- No chemicals of significant quantity were identified on site during the PSI site inspection;
- Potential sources or causes of contamination associated with the site included:
  - The Imported Fill (mine tailings) used to raise the site above the flood level;
  - The residual heavy metals and radiation found within the dust around the site, within buildings and beneath the concrete forecourt;
  - Hydrocarbons associated with the former USTs and bowsers at Building 4 and workshop operations/miscellaneous storage at Building 5;
  - PCB's associated with the former transformer at Building 4;
  - Possible copper, chromium, arsenic (CCA) or creosote treatment of timber in the vicinity of Building 4.
  - The findings of the Hazmat Services report also indicated the presence of asbestos containing materials, synthetic mineral fibre, lead based paint and polychlorinated biphenyls are present at various locations on the site.

The PSI report indicated that due to the historical activities conducted at the site, the historical operations may have contaminated the soil and groundwater. SKM recommend that prior to the removal of the site buildings (and vegetation at the front of the property) the following would be recommended to confirm the findings within the preliminary conclusion:

- Establishment of background radiation levels to allow an opinion to be formed regarding the radiological risk on site;

- Based on the establishment of site-specific radiological screening criteria for the site, screening for radiation within the buildings at the site for completion of waste classification advice prior to building removal (removal of trees may also require samples);
- Analysis and screening for radiation within soils across the property where historical records indicate mineral recovery activities;
- Selective analysis of soils at identified locations for hydrocarbons, PCBs and PAHs;
- Further investigations of sub-surface contamination and residual impacts possibly associated with the mineral processing operations was recommended, including groundwater and surface water analysis.

Given the type and possible extent of contamination identified on the site, SKM recommended the completion of a Detailed Site Investigation (DSI) to delineate the extent of identified soil contamination and determine the possible presence or absence of surface water and groundwater contamination. Results of the DSI would assist in quantifying the level of risk the area may represent to human health and/or the environment and thus allow RMS to more accurately define and manage potential contamination liabilities associated with areas identified as being impacted.

For the immediacy, SKM recommended restrictions be applied to the abstraction of groundwater and the use of surface water in the area until more detailed information is gathered.

Based on the potential risks and mobility that may be associated with the potential presence of metals contaminated dust and potentially elevated levels of radiological activity in dust identified on site, SKM recommended immediate restrictions on any ground-disturbing activities across the site. Appropriate background screening of naturally occurring levels of radiological activity was recommended in order to establish appropriate screening criteria for the site.

2.1.4 M1 Pacific Motorway to Raymond Terrace Highway Upgrade EIS

The RMS proposes to upgrade 15 kilometres of the Pacific Highway between the M1 Pacific Motorway and Raymond Terrace. The highway project was declared in September 2011 to be critical State significant infrastructure under section 115V of the NSW Environmental Planning and Assessment Act 1979 by virtue of clause 16 and is specified in Schedule 5 of the State Environmental Planning Policy (State and Regional Development) 2011.

In October 2015, a State Significant Infrastructure (SSI) application under Section 115X of the EP&A Act was submitted to the NSW Department of Planning and Environment (DPE) for the highway project. On 2 November 2015, the Secretary's environmental assessment requirements (SEARs) were issued. The highway project is therefore subject to assessment under Part 5.1 of the EP&A Act.

Jacobs was commissioned by Roads and Maritime to undertake an assessment of the potential environmental impacts of the highway project, and prepare an Environmental Impact Statement (EIS) in accordance the Environmental Planning and Assessment Act 1979 (EP&A Act) that adequately addresses the SEARs.

The highway project involves extending the M1 Pacific Motorway at Black Hill about 15 kilometres to the A1 Pacific Highway at Raymond Terrace. The highway project area is located between the M1 at Lenaghans Drive, Black Hill and the Pacific Highway, Raymond Terrace, about 13 kilometres northwest of Newcastle, NSW.

The highway project comprises the following key features:

- Four lane divided road (two lanes in each direction) with a median
- Provision for the possible widening of the road to six lanes (three lanes in each direction)
- A new road at Tomago, linking the proposed action to Tomago Road, with new intersections at Old Punt Road and Tomago Road
- New pavement and line-marking on Old Punt Road between the new Old Punt Road intersection to the Old Punt Road and Pacific Highway intersection

- New interchanges at:
- Black Hill, with connections to and from the roundabout at the M1 Pacific Motorway, John Renshaw Drive and Weakleys Drive intersection. This interchange would also provide a connection to and from Lenaghans Drive
- Tarro, with connections to and from New England Highway
- Tomago, with connections to Tomago Road and Pacific Highway via the new Tomago link road
- Heatherbrae, with connections to and from Pacific Highway
- Raymond Terrace, with connections to and from Pacific Highway.
- A viaduct about 2.6 kilometres long across the Hunter River and floodplain, the Main North Rail Line and the New England Highway
- Thirteen bridge structures.
- Footpaths at Heatherbrae for about 1.2 kilometres along the southbound carriageway of the Pacific Highway with access to the Hunter Region Botanic Gardens, and at Heatherbrae for about 600 metres along the northbound lane of Masonite Road near the proposed overpass.
- Drainage infrastructure including:
- Construction and operational water quality basins
- Culverts and drains
- Open channels and swales.
- New traffic control facilities including variable message signs (VMS)
- Safety infrastructure including wire rope, galvanised iron and concrete barriers
- Roadside furniture and street lighting
- Utility service relocations and protection
- Temporary and permanent changes to property access along the New England Highway and Pacific Highway
- Establishment of construction ancillary facilities including site compounds.

2.2 Physical Setting

2.2.1 Site Identification

The site is located at 1877 Pacific Highway, Tomago, NSW. The site is identified as Lot 101 in Deposited Plan (DP) 1038663 in the Local Government Area (LGA) of Port Stephens. The Australian Map Grid (AMG) co-ordinates of the approximate centre of the site are 151°42'17"E, 32°48'54"S. The total size of the Site is approximately 6 hectares. A site layout plan including the site location is shown in **Appendix A, Figure 1**.

Recognising the site history information and the extent of historical mineral sand storage and processing activities and infrastructure, and the possibility of migration of associated contaminants, investigations included the surface water drainage line and adjacent temporary access road contained within the easement on the adjoining property (Lot 102, DP1038663) which is not owned by RMS. Similarly, DSI investigations extended to sediments, surface water and groundwater on Lot 7310, DP1165716, at the foreshore of the Hunter River, also not owed by RMS.

Investigations also extended across boundary to the south of Lot 101 and into the road verge along the Pacific Highway.

For the purposes of this DSI report, the site boundary follows the boundary for Lot 101, DP1038663, however the DSI investigation Precincts (**Appendix A, Figure 2**) are aligned with historical operations, infrastructure and screening results, to allow consideration of the extent of contamination on and off site.

2.3 Site History

Most of the historical information of past activities at the RZM site was described within the SKM Preliminary Site Investigation (PSI) report (June 2013). A summary of the available information is provided in Sections 2.3.1 to Section 2.3.8.

2.3.1 Zoning and Landuse

The site is currently zoned as "1a – Rural Agriculture" under the Port Stephens Council *Local Environment Plan* (LEP) 2000. The site was previously occupied by a Former Mineral Sand Processing Facility. The surrounding land to the north, west and south was predominantly used as grazing land for a cattle farm, while sites to the east were occupied by the Pacific Highway and General Industrial properties. Future zoning of the site may change to allow for the proposed upgrade works to the Pacific Highway.

A search of Heritage databases did not identify any significant heritage items at the site. The closest listed Heritage item is Tomago House/Tomago Chapel located approximately 3.5km to the east of the site.

2.3.2 Title Information

Historical title information provided within the PSI (SKM, 2013), identified a number of previous site owners that appeared to have used the site for cattle grazing until 1969. In 1969, Rutile and Zircon Mines (RZM) purchased the majority of the current Site footprint, the remainder of which was purchased in 1972. In 2002 the site was sold to the Tomago Development Company until 2011 when it was acquired by the Roads and Traffic Authority of NSW.

2.3.3 Historical Aerial Photography

Historical Aerial Photographs from the NSW Department of Lands, Land and Property Information Division (LPI) were reviewed between 1954 and 2010, within the PSI (SKM, 2013). The aerials confirmed the site was used for cattle grazing up until the early 1970's when the RZM site had been constructed and commenced operations with continued site expansions and changes to operations until the 1990's. In 2004, parts of the RZM buildings could be observed to have been removed from the Site.

2.3.4 Industrial Process Overview

Information gathered during the preparation of the PSI (SKM, 2013) examined the operations of the RZM site during its operations. Several site buildings and stockpile areas were constructed to assist in the mineral sands processing activities around the site. These buildings/areas have been assigned identification numbers (illustrated on 0, Figure 1), which include:

- Building 1: Quality Control Laboratory
- Building 2: Mineral Sands Dry Processing Plant
- Building 3: Amenities Building
- Building 4: Store Room
- Building 5: Workshop
- Building 6: Weighbridge Hut and Water Laboratory
- Building 7: Administration Block
- Building 8: Potting Shed
- Stockpile 1: Ore Receival Stockpile Area; and
- Stockpile 2: Remnant Ilmenite Stockpile Area.

Jacobs identified two Precincts' that largely grouped similar operational aspects of the site together. The two Precincts' are illustrated on **Appendix A, Figure 1**, which are described as:

- **Precinct 1: Built Area** – This area formed the physical processing area of the mineral sand dry processing operations. The Precinct includes the footprints of all current and former Building1 to Building 8 and is predominantly covered by concrete hard stand. Records that were reviewed during the PSI and field observations at the site have identified the potential for chemical storage areas, underground petroleum storage tanks, electrical transformers, waste and treated timber storage, laboratories, drainage infrastructure and oil separator systems, asbestos materials and illegally dumped materials to be located within the Precinct 1 area.
- **Precinct 2: Ponds and Stockpile Area** – This area includes the mineral sands receival and stockpile area (Stockpile 1), the remnant ilmenite and monazite stockpile area (Stockpile 2), the dewatering ponds, and the surface water drainage lines from the site to the Hunter River. The area is also thought to include the previously identified 'Garnet Slots' a historic dumping area for potentially radioactive materials.

The Site Precincts were developed to allow a separation of the Dry Plant operations into the core processing areas (Precinct 1) and the supplementary operational areas (Precinct 2).

During operations at the site, Heavy Mineral Concentrate (HMC) from surrounding mineral sand mines were transported to the site and stockpiled in the vicinity of Stockpile 1. The HMC would then be moved into the Dry Plant to undergo initial dewatering, thermal dewatering and caustic attrition. The water and non-mineral fines removed during this process would be pumped out of the Dry Plant through the water laboratory and into one of the Dewatering ponds. After dewatering and caustic attrition, the HMC was passed through an electro-static separator and a magnetic separator to isolate the individual heavy metals. The individual metals were then bagged in the final stage of the Dry Plant prior to being sent off site for storage. The waste mineral materials (ilmenite and monazite) left over following the separation process were removed to Stockpile 2, prior to shipping offsite. A flow chart of the mineral dry plant operations is provided within the PSI (SKM, 2013).

The PSI also identified other operations that may have utilised the site throughout its history, including the operations of Carol's Pine, which may have stored or treated timber materials onsite.

2.3.5 Tanks and associated services

A Dangerous Goods Site Search completed during the PSI identified a number of dangerous goods stored at the RZM site that have been summarised within Table 1.

Table 1: Dangerous goods storage during RZM operations

Product	Vessel	Quantity	Location
Nitrous Oxide	Cylinder	23,000L	Southern wall of Building 6
Acetylene	Cylinder	15m^3	Southern wall of Building 6
LPG	Cylinder	40kg	North Western corner of Building 1
Compressed Air	Cylinder	15m^3	Southern wall of Building 1
Compressed NOS	Cylinder	18m^3	Southern wall of Building 1
LPG	Cylinder	40kg	Northern corner of Building 1
Sulfuric Acid	Above-Ground Storage Tank	6,000L	Northern wall of Building 2
Sodium Hydroxide	Above-Ground Storage Tank	12,000L	Northern wall of Building 2
Miscellaneous	Store Room	2,500kg	Northern wall of Building 2
Miscellaneous	Store Room	2,500kg	South of Building 5
Waste Oil	Store Room	N/A	Southern wall of Building 5
Poison	Store Room	200L	Northern wall of Building 5
Acetylene	Cylinder	42m^3	North of Building 4
Argon	Cylinder	40m^3	North of Building 4
Oxygen	Cylinder	50m^3	North of Building 4
LPG	Cylinder	225kg	North of Building 4

Product	Vessel	Quantity	Location
Petrol	Underground Storage Tank	5,000L	South of Building 4
Diesel	Underground Storage Tank	5,000L	South of Building 4
Diesel	Underground Storage Tank	5,000L	South of Building 4
Diesel	Underground Storage Tank	10,000L	South of Building 4
LPG	Cylinder	1,961L	South of Building 2
Oily Water Separator	Separator	N/A	North Western corner of Building 4

2.3.6 Imported Fill

Information gathered during an interview with a former site employee during the PSI, indicated that mine tailings was used to raise the site above the 1:100 year flood level, limiting the impact of flood events on the site and its operations. As a result of raising the site ground level above the flood plain, the depth to groundwater at the Site is also expected to have increased proportionally.

Materials stockpiled within Stockpile 2 were known to be radioactive. During site decommissioning works, the surface of Stockpile 2 was used to fill the bottom of the two deepest dewatering ponds which were located closest to the Pacific Highway. Other clean sands/fill materials were imported to the site to cap the underlying radioactive materials. The RZM report (2002) indicated that a minimum 0.5m of clean cover was placed above the underlying radioactive materials.

The RZM report (2002) also indicated Monazite and Garnet that had been extracted from the dry plant (Building 2) were buried in trenches along the western boundary. Monazite is known to have elevated levels of radioactivity, while the RZM report considered Garnet to be inert. The waste materials were buried on the western boundary of the site, prior to legislation such as the Radiation Control Act 1990 and Radiation Control Regulation 1993 coming into force. After the legislation was enacted, RZM operated an EPA licensed waste facility (EPL6063, located off 77 Cabbage Tree Rd, Williamtown) that was able to receive environmentally sensitive or inappropriate wastes for landfilling. The RZM report (2002) indicates that the trenches of Monazite/Garnet were excavated and removed to the Cabbage Tree waste facility.

Observations gathered as part of the DSI field investigations indicate that many areas where fill was spread across the central portion of the site have very little clean sand surface cover, and in some areas there is evidence of processed sand residue virtually at ground surface. Photographs under **Appendix F** provide a helpful indication of the stratigraphy of buried processed sand on site.

2.3.7 Odours and Staining

No obvious chemical or solvent-type odours were detected during previous PSI investigations, and no odours that could be associated with contamination were detected during any of the intrusive DSI field work activities.

Apparent tar staining was observed within the confines of the Building 2 footprint. It appears as though the tar (or similar compound) has dripped onto and solidified on the supports of either the electrostatic separator or magnetic separator.

Several surface areas of the site contained dark, coarse grained sand material, considered to be ilmenite waste resulting from processing and refining activities.

Oily residues were observed on the surface soils in the vicinity of the former site transformer (adjacent Building 4).

2.3.8 Chemicals and Waste

No chemicals were observed to be stored on site during the PSI or DSI; however evidence of previous storage (described in Section 2.3.5) was identified. During the DSI site investigations, qualities of fly-tipped waste

(illegally dumped material) were observed at many locations throughout the site, generally to the north of Building 2. All fly-tipped waste has now been removed from the property, as part of the demolition works scope.

2.4 Site Condition

General observations relating to the site condition include the following comments:

- The site has remained vacant since the mid-2000's, although there were several areas that contained fly-tipped waste and miscellaneous rubbish around dilapidated buildings when the DSI field works were initiated in late 2014. This material has since been removed from the site.

- Observations gathered during site inspections undertaken during the PSI works indicated signage for Carrol's Pine at former Building 4, possibly associated with treated timber products. There was also evidence of spray painting booth within former Building 4. No evidence of timber treatment processes being undertaken on site was noted during the PSI works (such as copper, chromium, arsenic (CCA) pressure vessels, waste drums, characteristic green staining or residues, for example).

- The site southern boundary of the site is fully fenced with chain-link fencing and a locking gate, while the chain-link fencing only extends a few hundred metres along the eastern boundary, with cow fencing consisting of barbed wire and wooden posts running the remaining extent of the eastern boundary to the 'pan handle" northern boundary, and further on the Hunter River foreshore. Cow hoof prints observed on site on during a number of occasions indicate that cows from the adjacent Lot 51 have found their way onto the site in the past. The western boundary of the site similarly has chain-link fencing that runs approximately 100 meters from the Pacific Highway fence, and then finishes in very dense overgrown vegetation. The remaining western boundary is unfenced and is bounded by dense vegetation and wetlands within Lot 102.

- All site buildings have been demolished to ground surface in 2015, with building rubble removed from the site.

- Dust and processed sand residue collected during the building demolition works has been stockpiled in a geofabric covered stockpile located on and unsealed area that formerly contained stockpiled sand to the north of the former Drying Sheds building.

- The unsealed areas of the site in Precincts 1 and 2 are vegetated and there is very little exposed surface soil, with some bare sand areas remaining at the former stockpile area north of the former Drying Shed building. There is little evidence of erosion anywhere on the site, given the sandy nature of shallow soils, the vegetated and stabilised surface areas and the rapid infiltration of surface water.

- In general terms, vegetation across the site is abundant and lush, with grasses, trees and bushes that were removed during the DSI field access clearing event (October 2014) rapidly recolonising the cleared areas, such that cleared areas now have complete vegetative ground cover again. There is no visual indication of plant stress on site.

2.4.1 Topography

The Newcastle 1:100,000 Topographic Map, Sheet 9232, Edition 1 (compiled by the Division of National Mapping, Commonwealth of Australia, 1983) indicates that the Site is flat with mangrove communities to the west on the Hunter River. Site observations indicate some areas have been raised above the flood levels. The site generally slopes from the highest levels at the Pacific Highway boundary down to lower levels at the northern boundary of the site, ultimately returning to low-laying ground levels at the foreshore of the Hunter River.

According to previous reports (RZM Report, 2002) the site was levelled using imported and stockpiled fill material, with four of the former dams on site being entirely filled in. a remnant stockpile of ilmenite was disposed of by burial on site by placing the ilmenite in the base of two deepest sedimentation ponds (ponds 2 and 3, directly to the north of the former potting shed), and then covered by pushing the dam (or pond) walls

over the ilmenite. Excess fill from the dam walls was used to minimally raise the surrounding ground level, and site observations undertaken as part of the DSI field program confirm that this area of the site generally flat. The former slimes dam (Pond 5) and adjacent settlement Pond 6 does not appear to have been filled in, with the RZM report stating that 'the two remaining dams have been retained as assets to the sale of the property'. Drainage infrastructure consisting of overflow pipes leading from Pond 5 into Pond 6 are still present and observed on site. The RZM report states that historically, monazite and garnet waste was disposed of on site in burial pits (or 'slots'), and that as part of the decommissioning works undertaken in 2001, this previously buried material was re-excavated from areas near Pond 3 and Pond 4 and disposed of off-site at RZM's Cabbage Tree Road Waste Facility (EPA Environmental Protection License 6063, surrendered 15 April 2003).

The south-west boundary of the site at the Pacific Highway is approximately 2.63 mAHD as measured during the geotechnical investigations associated with the M1 Pacific Motorway upgrade studies (Douglas Partners *Geotechnical Data Report, Highway A1 – Pacific Highway Upgrade M1 Extension to Raymond Terrace, December 2015*). Ground levels at the south-east boundary of the site at the Pacific Highway are reported as approximately 4.70 mAHD.

In general terms, the western boundary of the site is elevated above the adjacent boundary topography in Lot 102, DP 1038663, by approximately 2m above ground surface, as the former RZM site surface was raised in the early 1970's. The site topography is generally higher across the boundary footprint to the west and north, in relation to the adjacent property Lot 102, with elevations dropping off to the assumed original ground elevations north of the site, resulting in boggy wetlands from the northern site boundary of the foreshore of the Hunter River. Surface water is assumed to flow to the north, towards the lower elevations within the downgradient wetland areas and further towards the Hunter River.

2.4.2 Geology

The Newcastle 1:250 000 Geological Series Sheet SI 56-2 (Division of Regional Geology, Geological Survey of NSW, 1966) indicates that the site is underlain by Quaternary sands composed of gravel, sand, silt, clay, "Waterloo Rock" marine and freshwater deposits.

2.4.3 Soil Landscape

The Newcastle 1:100,000 Soil Landscape Series Sheet 9232 (Department of Land and Water Conservation, 1995) indicates that the Site extends across 3 separate soil landscapes that are described as:

- Fullerton Cove – tidal flats and creeks in tidal inlets and estuaries. Slope gradients are less than 3%, elevations are less than 3m, and local relief is less than 3m. Vegetation is characterised by mangrove scrub and saltmarsh. Soils are deep, saline, saturated, flood prone and are potentially acid sulphates soils.
- Hexham Swamp – broad, swampy, estuarine backplains on the Hunter Delta. Slopes are less than 1%, local relief is less than 2m and elevation is less than 2m. Vegetation is characterised by sedgeland with open-woodland on swamp margins. Soils are deep with the potential for seasonal water logging and flooding hazards. They are highly plastic potential acid sulphate soils of low fertility.
- Millers Forest – extensive alluvial plains on recent sediments in the Lower hunter. Elevations extend to a maximum of 6m, local relief are less than 1m and slope gradients are less than 1%. Soils are deep with the potential for seasonal water logging and flooding hazards.

Observations gathered as part of the DSI field investigations generally indicate highly disturbed ground conditions across the site, with most areas historically filled or impacted by importation of sand during the construction of the site areas.

In general terms, the soil profile encountered within Precinct 1 of the site consists primarily of yellowish-white, fine grained silty sand, beginning beneath concreted levels to approximate depths of 3 meters below ground surface, with evidence of silty marine clays encountered at depths below 3 or 4 metres.

The fill profile across Precinct 2 is somewhat more variable, due to the infilling of Dams and Ponds, and the past decommissioning activities that included spreading stockpiles of sand and waste processed material across the ground surface. At most test location excavations within Precinct 2, sandy fill material was encountered at

ground surface, with silty black to grey sands interspaced at times with mottled grey and white bands of sandy silts and clays. Silty clays were often reached at depths of approximately 3.5 to 4 metres below ground surface, although depths were variable when investigating locations within former Dams and Ponds.

2.4.4 Hydrogeology

A search of the NSW Natural Resources Atlas (compiled by the NSW Department of Natural Resources (DNR)) completed during the PSI (SKM, 2013) identified no registered groundwater wells within the site boundary. Five registered wells were within a 1 km radius of the site, with the closest bore is GW079605 and it appears northwest of the site toward the Hunter River.

2.4.5 Surface water

Surface Water flow within the Precinct 1 area of the site is largely influenced by the concrete sealed ground surface areas and the redundant storage and processing drainage systems. Unsealed areas within Precinct 1 are primarily associated with the former Potting Shed and areas west of the former Administration Block. Surface water in these areas is expected to infiltrate into the highly permeable sandy soils as identified during test pit investigations during the DSI field works, supported by visual observations during heavy rainfall events on site which indicate that surface water does not result in overland runoff and does not pond in the area.

Surface water ponding is common in the concrete sealed Precinct 1 areas west and east of the former Mineral Dry Plant building, and within underground drains associated with the former buildings and former processing activities.

Surface water flow across the majority of Precinct 2 appears to follow infilled drainage infrastructure and former ponds and dams that were associated with the former RZM site operations. Test pit logs indicate sandy soils across Precinct 2, with most rainwater observed to rapidly infiltrate the underlying soils during heavy rainfall events.

There is evidence of overland surface water movement within a former unlined surface water drain that runs westward from the former Potting Shed building, then heads north and follows the western boundary of the site and is assumed to discharge into wetlands at the northern boundary of the site, near the ‘pan-handle’ area of the boundary. A creek can be seen on the aerial photograph for the site for 1965 (SKM PSI 2013) running along this alignment, however at present this area appears to have been impacted by previous filling activities, as displayed on the aerial photograph for 1975, and is now overgrown and marshy. The portion of the drain that runs from the former Potters Shed to the western site boundary has been filled in, however a depression at surface can be seen where the drain used to be.

A second unlined surface water drain is located along the eastern boundary of Precinct 2, beginning just north of the former Storage Shed building and running north, adjacent to the former Pond 6 location. This unlined drain report to a concrete lined open drain (including a weir and control box) that runs from the northern boundary of the site (at the ‘pan handle) and ultimately reports to the foreshore of the Hunter River. It is unclear if the underground drains associated Precinct 1 feed into the Precinct 2 eastern drain, however the aerial photograph for 1979 displays a darker alignment beginning at the former Storage Shed and running towards the pan handle open drain, suggesting a potential for connectivity between the drains.

There is an unlined open drain that runs along the eastern side of the fence line along the adjacent property Lot 51, DP 739336, observed to begin around the property boundary at the Pacific Highway and running the length of Lot 51 to the foreshore of the Hunter River. There is interaction between this drain and the former RZM site eastern drain near the ‘pan handle’ location, with a concrete culvert connecting the two drains.

According to the specialist studies undertaken for the Highway Upgrade EIS, the following assumptions can be assumed in relation to surface water quality in the general site area:

- Overall water quality across the M1 Upgrade project area indicates eutrophic conditions with poorly oxygenated, nutrient rich turbid water. These eutrophic conditions are considered to be likely due to high nutrient and sediment inflows. , the majority of waterways for which there are data, particularly

Hexham Swamp and Hunter River did not meet the ANZECC/ARMCANZ (2000) guidelines it could be assumed that the aquatic ecosystems are degraded.

- High organic nitrogen and FRP concentrations relative to overall total nitrogen and phosphorus concentrations infer that nutrient concentrations are likely generated from degrading organic matter or diffuse runoff from areas under agricultural land use such as cattle grazing. Effluent irrigation over nearby lands are also likely to contribute to these nutrient loads (UHVA 2013a).
- Nutrients are generally higher in Hexham Swamp than in the adjacent River and are sufficiently high for Hexham Swamp to be considered moderately to highly eutrophic (Worley Parsons 2014).
- Newcastle City Council have identified erosion and sedimentation, gross pollutants, nutrients, heavy metals, litter and microbiological contamination are the major pollutants in their waterways (NCC 2005).
- Elevated numbers of bacteria recorded in in waterways (predominantly the estuary) have resulted the water being unsuitable for secondary contact recreation (UHVA 2013a).
- Low pH levels at some sites could be a result of the past oxidation of acid sulphate soils (UHVA 2013 Soil and water MP).
- Electrical conductivity is highly variable indicating brackish to saline waters in most areas.
- The existing, yet limited water quality data has provided an insight into the potential contaminants of concern in the Highway Upgrade study area and include pH, turbidity, faecal coliforms and biological oxygen demand. Metals of concern include aluminium, chromium, copper, nickel and zinc and the nutrients ammonia, TKN, total nitrogen, total phosphorus and FRP. Additionally, hydrocarbons have been recorded in waterways in the Highway Upgrade project area, particularly Total Polycyclic Aromatic Hydrocarbons (PAH), Anthracene and Benzo(a)pyrene (WP 2014).

2.4.6 Hunter River

The nearest watercourse, the Hunter River, is located approximately 100-200m to the north west of the site. The Hunter River flows in a south westerly direction. Based on the surrounding site topography, the overall groundwater flow direction from the Site is expected to be from the east to the west and the area is thought to be influenced by tidal movements.

The quality of the water in the Hunter River is largely influenced by agricultural activities, mining and urban development. The Hunter River in the M1 to Raymond Terrace Upgrade Project area is classified as estuarine. Sampling of the Hunter River in the vicinity of the proposed crossing for the M1 to Raymond Terrace Upgrade Project has been undertaken by the Upper Hunter Valley Alliance as part of the Hexham Relief Roads project. Monitoring of the Hunter River was undertaken on 4 occasions between August 2012 and February 2013. The receiving water quality of the Hunter River at the time of sampling had variable dissolved oxygen levels ranging between 4.21mg/L and 12.31mg/L, and neutral pH (7.47-7.92) which complied with the recommended ANZECC/ARMCANZ (2000) guidelines for protection of estuarine aquatic ecosystems (UHVA 2013b). With the exception of Zinc, metal concentrations were below the marine ANZECC/ARMCANZ (2000) toxicant trigger values for the 95% species protection level. Zinc exceeded the recommended guideline (0.015mg/L) on one occasion with a concentration of 0.045mg/L.

Overall water quality within the Hunter River in the M1 to Raymond Terrace Upgrade Project area indicates eutrophic conditions with poorly oxygenated, nutrient rich turbid water. These eutrophic conditions are likely due to high nutrient and sediment inflows. Considering the majority of waterways for which there are data, the Hunter River did not meet the ANZECC/ARMCANZ (2000) guidelines and it could be assumed that the aquatic ecosystems are degraded.

Additionally, whilst not enough water quality data is available to give any trends, Newcastle City Council have identified erosion and sedimentation, gross pollutants, nutrients, heavy metals, litter and microbiological contamination are the major pollutants in their waterways (NCC 2005).

2.4.7 Meteorology

Based on the long-term averages at the Williamtown weather station, the Tomago area has an average minimum and maximum temperature of 12.4°C and 23.1°C respectively. The bureau of meteorology wind speed and direction rose indicate winds at the site are typically from the west and north west.

2.5 Contaminants of Potential Concern

The potential contaminants of concern identified within the PSI (SKM, 2013) associated with the former operations at the site have been summarised for each source in Table 2.

Table 2: Potential Contaminants of Concern

Precinct	Source	Heavy metals	TPH & BTEX	PAHs	Phenols	pH	Radiation	PCBs	CCA treated timber	(P)ASS	Hazardous Materials*
Precinct 1: Built Industrial Area	Building 1	✓					✓				✓
	Building 2	✓				✓	✓				✓
	Building 3	✓					✓				✓
	Building 4	✓	✓	✓	✓		✓	✓	✓		✓
	Building 5	✓	✓	✓	✓		✓				✓
	Building 6	✓					✓				✓
	Building 7	✓					✓				✓
	Building 8	✓					✓				✓
	Imported Fill	✓					✓			✓	
Precinct 2: Ponds and Stockpile Areas	Stockpile Area 1	✓					✓				
	Stockpile Area 2	✓				✓	✓				
	Dewatering Ponds	✓				✓	✓			✓	
	Imported Fill	✓					✓			✓	

* Hazardous Materials – refers to the asbestos containing materials, lead based paint, synthetic material fibres and polychlorinated biphenyls described within the Hazmat Services – Hazardous Materials Survey report.

2.5.1 Integrity of Background Information

The Preliminary Site Investigation report (SKM 2013) provides a detailed summary of the historical environmental and physical setting of the former RZM site and surrounds, including land title and ownership, and historical operations for the site. The Hazardous Materials Survey and Register (Hazmat Services 2011) includes a concise overview of previous site operations at each of the former buildings on site, and a catalogue of hazardous building materials and waste classification assumptions for the built areas. The RZM Tomago Separation Plant Site Post-Decommissioning Report (RZM 2002) provides a detailed account of past activities on the site, including comprehensive descriptions of infrastructure and practices associated with the heavy mineral concentrate processed at the RZM site since 1969, as well as descriptions relating to the disposal and placement of remnant ilmenite, rutile, monazite and garnet on site. The report includes details of how the site was progressively decommissioned and the ground surface recontouring and rehabilitation works previously undertaken for the site.

The specialist studies associated with the preparation of the Environmental Impact Statement (EIS) currently being undertaken by Jacobs (2016) have allowed a greater insight to be gained regarding the former RZM site in the context of the broader environmental setting across the M1 Pacific Motorway at Black Hill to the A1

Pacific Highway at Raymond Terrace alignment, including the proposed River crossing and design details that would see the upgrade works upon a portion of the site.

The pre-DSI investigation studies (background radiation studies, ecological studies, SAQP formulation and dust characterisation studies) have relied upon the background assessment works (Hazmat report, Decommissioning report and the PSI report), and formed the basis for a robust and comprehensive investigative platform. The research conducted in the led-up to the DSI field works has allowed adequate assumptions and predictions to be made on the location and extent of probable contamination on the site, and to form the basis for the DSI works package.

3. Data Quality Objectives

The project stakeholders attended a data quality objectives (DQOs) workshop for DSI at the Jacobs Newcastle office on 16 May 2014. Stakeholders included representatives from RMS (Chris McCallum, Brad Parkes), the AECOM Audit Team (Ross McFarland, Anna Lundmark) the Jacobs DSI project team (Robert Gauthier, Grant Moylan, Drew Watson – Queensland Health). The DQO's were presented in the draft DSI Sampling, Analysis and Quality Plan (SAQP July 2014) and following the Auditor review comments (24 July 2014 and acceptance 20 August), captured within the final SAQP (August 2014).

The DSI DQO Workshop has defined the specific decisions rules and expected outcomes for the DSI as follows:

- **Step 1: State the Problem** – The disused former mineral sands processing facility may be contaminated by metals, hydrocarbons, acidity, radiation, hazardous materials and acid sulphate soils from the historical processing operations at the site. A portion of the site is to be used during the construction of an upgrade to the Pacific Highway between the F3 Freeway and Raymond Terrace. In accordance with the RMS "*RTA Contaminated Land Management Guideline 2005*", RMS will develop a robust understanding of the contamination issues at the site and impose appropriate site management practices to limit the potential for future human health impacts from contact with pollutants on contaminated land and/or environmental impacts due to exposure, movement or re-distribution of pollutants from contaminated land.
  The DSI has been designed to assess the significance, nature and extent of potential contaminants at the site through the completion of an intrusive site investigation and associated instrumental screening and laboratory analysis of the soil, surface water and groundwater conditions present at the site. The results of the investigation will be used to confirm the assumptions within the current Conceptual Site Model (described in Section 8) and determine if there is an unacceptable risk to human health or the surrounding environment from the current land use as a vacant, unused former industrial site with limited access. Consideration is also given to the proposed future land use of the site, as part of the Pacific Highway upgrade, and the possible risks that this change in land use may pose.
- **Step 2: Identify the Decision** – The decision is to understand if the site is impacted by contamination, and if so, whether that impact is significant and represents an unacceptable risk to human health or the surrounding environment. Site specific criteria and guideline threshold levels have been developed for implementation in the DSI. These levels are discussed in Section 4. Each data point will be assessed individually throughout the investigation against the relevant criteria to enable any exceedances to be further investigated, if required. Further investigation may include risk assessment or other strategies as part of future remedial options planning exercises.
- **Step 3: Identify Inputs to the Decisions** – The investigation will comprise a series of different assessment methodologies, which are discussed in Section 5.1. The contaminants of concern for the areas of concern were identified during the previous investigations discussed in Section 2.1 and have been summarised in Table 2.
- **Step 4: Define the Study Boundaries** – Defined by the property boundaries of the RZM site, as detailed in the PSI Report (SKM July 2013), the boundaries of the potentially radioactive impacted sites indicated by areas with terrestrial air kerma rates below the site worker dose limits described within the Environmental Radioactivity Assessment (HSSA, April 2014, ie. <300µSv/yr, corrected for cosmic contribution) and potential areas impacted by environmental factors such as runoff and windblown mechanics have been described in previous Conceptual Site Models. The vertical and horizontal boundaries of the Study are defined in the DSI SAQP, and these boundaries were left flexible and subject to confirmation, based on ground truthing exercises (XRF, RAD and test pits and bore logs), to allow for the dynamic interrogation and observation of ground conditions during the field event. Temporal boundaries due to degradation of contaminant sources are not considered significant for the contaminants of concern, given the known and assumed contaminant behaviours and decay times. The staged approach to the investigations offers assurances that any budgetary limitations for data gathering can be revisited at later stages in the event of freshly identified data gaps that may require additional assessment works. The Areas of the site used for similar functions during the site operations have been separated into two precincts that are described in Section 2.3.4. The results of the DSI provide an indication of the conditions existing at the site at the time of the investigation (ie the sampling events).

- **Step 5: Develop a Decision Rule** – The following decision rules will be imposed on the investigations analytical results:
  - Each data point will in the first instance be assessed individually throughout the investigation against the relevant criteria to establish contaminant concentrations.
  - If a reported contaminant concentration exceeds the adopted assessment criteria described within Section 4 by a significant margin (equivalent to two standard deviations of the arithmetic mean), then the results will trigger further investigation of the accuracy of the result.
  - If the concentrations of the investigation contaminants on a 95% Upper Confidence Limit (UCL) of the arithmetic mean, exceeds the adopted assessment criteria described within Section 4, then the results will trigger further investigation and/or management.
  - The field and laboratory quality control procedures and limits that were approved within the SAQP will be imposed on the analytical data. If the results are outside the specified limits, the results will be reviewed to determine whether there is a significant impact on the acceptability of the results. Further investigation may be required if the results are not considered to be acceptable.
  - The results will be assessed against the PARCC parameters (Precision, Accuracy, Representativeness, Completeness and Comparability) to determine their acceptability for use in the investigation. The PARCC parameters assessment is included in Section 6.1.
  - An assessment of the appropriate laboratory detection limits required to compare against the adopted assessment criteria described in Section 4, was completed as part of the SAQP. All sample results in the DSI were confirmed to be acceptable for comparison against the adopted site assessment criteria.
- **Step 6: Specify Limits on Decision Errors** – The baseline condition adopted for the site was that the contaminants of concern exceed the adopted assessment criteria described in Section 4. The alternative condition would be that the contaminants detected at the site are below the adopted assessment criteria. The most serious decision error would be to decide that the concentration of contaminants were below the adopted assessment criteria, when in truth the concentrations exceeded the adopted assessment criteria. This incorrect decision may result in exposure to contaminants that may cause adverse human health conditions or impact to the surrounding environment. The decision was made that if the true contaminant concentration at a sampling location was at the adopted assessment criteria, the probability of making a false acceptance decision error should be no more than 10% and the probability of making a false rejection decision error, should be no more than 5%.
  The use of a judgemental sampling strategy and the statistical analysis described within Step 5 of the DQO process are likely to cause a bias towards higher levels of contamination. This conservative approach may create a false acceptance decision error, however as this is the least serious decision error Jacobs consider this sampling strategy and statistical analysis to be acceptable.
- **Step 7: Optimise the Design for Obtaining Data** – The inputs and assessments of the previous investigations have allowed for the determination of an effective sampling and analysis design. The sampling scope and methodology have been outlined within Section 5.

3.1 Standards

The standards and methodologies that have been used to develop the DSI scope are those endorsed by the NSW Environment and Protection Authority (EPA) and comply with the provisions of the "NSW Contaminated Land Management Act 1997". The documents where these standards and methodologies are described comprise:

- National Environment Protection (Assessment of Site Contamination) Measures – (NEPM, amended 2013);
- Guidelines on the Duty to Report Contamination (NSW EPA September 2015)
- Waste Classification Guidelines – Part 1: Classifying Waste (NSW DECC, December 2009);
- Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, November 1997); and,
- Guidelines for the Management of Acid Sulfate Materials (NSW RTA, April 2005)

The DSI was developed in accordance with the requirements of:

- NSW DEC Sampling Design Guidelines, September 1995; and,
- The NSW DEC as set out in their Guidelines for Consultants Reporting on Contaminated Sites (November 1997).

3.2 Assumptions

For the purpose of this DSI, the following assumptions have been made:

1. The data provided by the available documentation was obtained by suitably trained and experienced professionals, was accurate and suitable for assessing contamination risks;
2. The site is comprised of the areas of land (and the immediate surrounds), illustrated on 0, Figure 1;
3. The current land use is a vacant, former industrial site, with limited site access to the general public;
4. The proposed final land use for the site is for the construction of the Pacific Highway upgrade, possibly including a construction works compound during the construction phase of the upgrade. It is noted the site is currently zoned as 1a – Rural Agricultural under the Port Stephens LEP, however given the former use of the site as an industrial property the commercial / industrial investigation levels are considered appropriate; and
5. Potential road construction and the existing vacant industrial land use have been taken to be equivalent to the NEPM (2013) Commercial / Industrial (column D) land use.

3.2.1 Soil Sampling Densities

As discussed in the approved SAQP, Jacobs considered that in order to characterise each Precinct to the satisfaction of the DQO's, the sample design would have to fully take into account the natural variability of soil, and the unpredictability of fill horizons, particularly as there are different areas of each the Precinct that required characterisation (e.g. side wide general soil contamination, filled areas of the site, drains, former or existing structures, maintenance compounds, etc.). If the most appropriate sample design was not used at each of these particular areas and circumstances, it would not adequately characterise contamination at key areas of each Precinct, especially those areas that are fairly heterogeneous and/or where presence of contamination is unknown (such as the precise location of filled areas and other potential unknowns).

Accordingly, Jacobs imposed a judgmental, stratified sampling pattern, (based on the site history as contained in the PSI), in order to target the areas of greatest potential for contamination, and to adjust for differing sampling conditions, and differing data quality objectives at different areas of each Precinct. The sampling densities and methods included hot spot detection, average concentrations, proportions of contamination (filled ponds and surrounding areas) and was strongly reliant on the surface readings gathered during the previous RAD surveys, as well as the dynamic RAD surveys during the DSI field works event.

The approved SAQP (Table 10 – DSI Sampling Plan) specifies each investigation area, the number of proposed sampling points, the probability of missing a hot spot of a determined size, and the calculated grid spacing's at each area.

The assessment of hot spot radius, grid spacing and probability of missing a hot spot, was determined using Procedure A in the NSW EPA Sample Design Guidelines (1995). The procedure is based on detecting circular hot spots with a 95% confidence, using a square grid based sampling pattern, it is noted that the sampling locations identified on the SAQP were indicative and were not illustrated in a grid based pattern. As a result the calculated hot spot radius size and grid spacing size were indicative only. The same assessment method and assumptions were used in providing the Precinct summary in Table 11 of the SAQP. The sampling densities proposed for the DSI were successfully achieved for all proposed locations, while actual placement of locations are displayed on relevant figures within this report.

4. Adopted Site Assessment Criteria

The primary guideline to be used in the assessment of contamination in soils and/or groundwater at the site is the National Environment Protection Council's (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999), amended 2013 (NEPC, 2013), which provides human health and environment based levels to assess selected organic and inorganic chemicals against. Site specific criteria have been developed for the radiation to understand the natural background radiation levels within the surrounding area to confirm if the former operations at the site had influenced the current radiation readings.

4.1 Soils

The soil chemical analyses have been assessed (as a Tier 1 assessment) against the investigation and screening levels in Schedule B1 of the NEPC, 2013. This guideline has been endorsed by the NSW EPA under the Contaminated Land Management (CLM) Act 1997. Schedule B1, NEPC (2013) provides investigation and screening levels for commonly encountered contaminants which are applicable to generic land uses and include consideration of, where relevant, the soil type and the depth of contamination. The Tier 1 assessment will provide an initial screening assessment of the contaminant data. Any exceedances of the screening levels outlined in Section 4.1 to Section 4.5, will undergo a further Qualitative Risk Assessment to evaluate the potential impact and determine the plausibility of an adverse impact on human health or ecological values for the site (refer to Section 8.2.4).

4.1.1 Background - Health Investigation and Screening Levels

The health investigation levels (HILs) are scientifically based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use scenarios. Given the existing and proposed land use of the site (disused industrial land to form part of the Pacific Highway upgrade works), the HILs for commercial / industrial sites, column D of Table 1A(1) of NEPC (2013) have been adopted (HIL D). The adopted HILs are shown in 0, Table B1.

Health Screening Levels (HSLs) are used for selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact with affected soils and groundwater. The HSLs were derived through the consideration of health effects only, with particular emphasis on the vapour exposure pathway. Other considerations such as ecological risk, aesthetics, the presence of free phase product and explosive / fire risk are not addressed by the HSLs. As such the HSLs are used similarly to the HILs, i.e. as a screening tool.

The HSLs have been developed for a range of petroleum hydrocarbons, and for different land uses, media, pathways, soil types and depths to contamination. HSLs have also been derived for direct contact with petroleum hydrocarbons for the four land use scenarios and intrusive maintenance workers.

The adopted HSLs for the site have been based on the continued commercial / industrial land use and the apparent soil type of sand. They have also been developed based on the possibility of workers engaged in subsurface works, such as preparation of sub-profile pavements for road construction activities and installation of underground services such as electrical cables for lighting along the proposed highway through the RZM site. Therefore, HSLs for soil vapour intrusion and direct contact for HSL D at near surface depths (0 to <1m) in soils classified as sands have been adopted. The adopted HSLs are shown in 0, Table B1.

4.1.2 Background – Ecological Investigation and Screening Levels

Ecological Investigation Levels (EILs) have been developed and discussed in NEPC (2013) for selected metals including zinc, copper, chromium, nickel, lead and arsenic. Given the existing and proposed land use of the site (disused industrial land to form part of the Pacific Highway upgrade works), the EIL for commercial / industrial sites, of Table 1B(1) to Table 1B(5) of NEPC (2013) has been adopted for both Precincts. The majority of Precinct 1 is beneath the proposed footprint of the Pacific Highway upgrade works according the existing conceptual design and is therefore considered to have reduced potential impact on the surrounding ecology.

The Precinct 1 results will still be assessed against the EIL's to assess potential ecological impacts until the commencement of construction.

Ecological investigation levels (EILs) for the protection of terrestrial ecosystems have been derived for common contaminants in soil based on a species sensitivity distribution (SSD) model developed for Australian conditions. EILs apply principally to contaminants in the top 2 metres of soil at the finished surface/ground level which corresponds to the root zone and habitation zone of many species. In arid regions, where the predominant species may have greater root penetration, specific considerations may result in their application to 3 metres depth.

The methodology assumes that the ecosystem is adapted to the ambient background concentration (ABC) for the locality and that it is only adding contaminants over and above this background concentration which has an adverse effect on the environment.

The ABC of a contaminant is the soil concentration in a specified locality that is the sum of the naturally occurring background level and the contaminant levels that have been introduced from diffuse or non-point sources by general anthropogenic activity not attributed to industrial, commercial, or agricultural activities, for example, motor vehicle emissions.

The preferred method to determine the ABC is to measure the ABC at an appropriate reference site. This approach is essential in areas where there is a high naturally occurring background level such as will occur in mineralised areas.

An added contaminant limit (ACL) is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required. The EIL is derived by summing the ACL and the ABC.

ACLs are based on the soil characteristics of pH, CEC and clay content. Empirical relationships that can model the effect of these soil properties on toxicity are used to develop soil-specific values. These soil-specific values take into account the biological availability of the element in various soils. In this approach different soils will have different contaminant EILs rather than a single generic EIL for each contaminant.

The pH values were analysed for selected samples across the site and ranged in values from a pH of 4.6 to 8.7. For the determination of the correct EIL's a pH has been selected from sample SB08/2.0 (5.2) as the sample was considered to be representative of the primary soil type (sand) at the site and that the soils are unlikely to be impacted by anthropogenic sources due to the sample depth (2.0 m bgl). With no CEC and clay content results available for the site, the most conservative CEC (5) and clay content (1 %) values have been applied. The adopted EILs are shown in 0, Table B1 and Table 3 below.

Table 3: Calculating the ACL

ACLs	mg/kg								
	SB08/2.0	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
pH	5.2								
CEC	5				140			55	210
% clay	1			310					
Generic	-					1800			

Information derived from **Table 1B(1)** *Soil-specific added contaminant limits for aged zinc in soils*, **Table 1B(2)** *Soil-specific added contaminant limits for aged copper in soils,* **Table 1B(3)** *Soil-specific added contaminant limits for aged chromium III and nickel in soils,* and **Table 1B(4)** *Generic added contaminant limits for lead in soils (commercial/industrial) irrespective of their physicochemical properties (NEPM 2013).*

Table 4: Calculating the ABC

ABC	mg/kg							
	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
SB08/2.0	n/a	n/a	9	5	5	n/a	2	5

Sample SB08/2.0 (sand) was assumed to be representative of the 'background concentration' of the site due to the depth 2.0 m bgl, and that the sands at that depth are unlikely to be impacted by anthropogenic sources.

The EIL is derived by summing the ACL and the ABC.

Table 5: Calculating the EIL

EILs	mg/kg									
	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	DDT	Naphth.
ABC + ACL			319 [3]	145 [3]	1805 [3]		57 [3]	215 [3]		
NEPM 2013	160 [1]								640 [1]	370 [1]
NEPM 1999		3 [2]				1 [2]				

[1] Generic EILs for aged arsenic, DDT and Naphthalene from **Table 1B(5)** for commercial/industrial land use**.**

[2] EILs from NEPM 1999 (no EILs specified for contaminants in NEPM 2013).

[3] EILs derived from NEPM 2013 equation ABC+ACL.

Ecological Screening Levels (ESLs) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESLs apply to the top 2 m of the soil profile, which essentially corresponds to the root zone and habitation zone of many species. ESLs have been derived in NEPC (2013) for the same four petroleum fractions as the HSLs Fraction 1 (F1, TRH C_6-C_{10}), Fraction 2 (F2, TRH >C_{10}-C_{16}), Fraction 3 (F3, TRH >C_{16}-C_{34}) and Fraction 4 (F4, TRH >C_{34}-C_{40}), as well as BTEX and Benzo(a)pyrene. The adopted ESLs are shown in 0, Table B1, and have been determined from Table 1B(6), Schedule B1 based on the following site specific data and assumptions:

- the ESLs will apply only to the top 2m of the soil profile;
- the ESLs for commercial / industrial land use; and
- the majority of soils encountered at the site contained sands, and conservatively a "coarse" soil texture has been adopted.

4.1.3 Management Limits – Petroleum Hydrocarbons

In addition to appropriate consideration and application of the HSLs and ESLs, there are further considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

Management Limits have been adopted in NEPC as interim Tier 1 guidance to avoid or minimise these potential effects. Management Limits have been derived in NEPC for the same four petroleum fractions as the HSLs (F1 to F4). The adopted Management Limits, from Table 1B(7), Schedule B1 of NEPC have been based on application to any depth within the soil profile, commercial / industrial land use and "coarse" soil texture. The TPH Management Limits are shown in 0, Table B1.

4.2 Sediment

The sediment quality investigation included sampling of surficial sediment; and comparison of analytical results to the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC) (2013) sediment quality guideline values (SQGV).

Table 6: Analytical Requirements for Chemical Analyses

Analyte	LOR Achieved	Unit	ANZECC/ARMCANZ SQG value	ANZECC/ARMCANZ High SQG value
Antimony (Sb)	0.5	mg/kg	2.0	25
Arsenic (As)	0.4	mg/kg	20	70
Cadmium (Cd)	0.1	mg/kg	1.5	10
Chromium (Cr)	0.1	mg/kg	80	370
Copper (Cu)	0.1	mg/kg	65	270
Lead (Pb)	0.5	mg/kg	50	220
Nickel (Ni)	0.1	mg/kg	21	52
Zinc (Zn)	0.5	mg/kg	200	410
Total PAHs	100	µg/kg	10,000	50,000

The ANZECC/ARMCANZ (2000) guidelines provide sediment quality guideline (SQG) values (a Trigger/Screening value and a High value) for a range of common contaminants. These SQG values are intended for use in the screening level assessment and to assist decisions when accompanied by additional lines of evidence, e.g. bioavailability and ecotoxicology data.

The ANZECC/ARMCANZ (2000) SQG values are based on the effects of sediment contaminants on benthic organisms. The interim SQG trigger value (TV or ISQG-Low) is based on the lower 10th percentile of an effects database (ANZECC/ARMCANZ, 2000). This is used as a screening value that if exceeded, triggers additional investigations to determine whether there is indeed a risk posed by the guideline exceedance. A second upper guideline value, the ISQG-high, is also derived from the median of the effects data. This value has no particular significance except as being indicative of a value above which there is a high probability of toxicity to benthic organisms.

The application of sediment guidelines involves a tiered, decision-tree approach in which the total concentrations of contaminants are compared to SQG values. The initial comparison is usually made with the ISQG-Low values. If the contaminant concentrations exceed the TVs, further investigations should be initiated to determine whether there is indeed an environmental risk associated with the exceedance. Importantly the TVs were not intended for use as a pass/fail basis, but as a means of identifying contaminants of potential concern (COPCs).

4.3 Groundwater and Surface Water

The Groundwater Investigation Levels (GILs) adopted in NEPC (2013) are based on:

- ANZECC & ARMCANZ (2000), National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality, Australian and New Zealand Conservation Council & Agriculture, and Resource Management Council of Australia and New Zealand; and
- NHMRC (2011), National water quality management strategy, Australian drinking water guidelines, National Health and Medical Research Council and National Resource Management Ministerial Council, Australia.

For assessing groundwater and surface water quality, the potential uses of groundwater at, or down-gradient of, the site have also been considered. Potential uses at, or down-gradient of, the site may include:

- The groundwater and surface water discharging to a water body sustaining an aquatic ecosystem. The Hunter River is the most likely receptor of groundwater or surface water from the site.
- Extraction for irrigation purposes (the PSI identified one registered groundwater bore (GW079605) in close proximity to the site <100m, however the purpose of the bore was not detailed); and
- Potential potable use (considered extremely unlikely, given the proximity to the Hunter River and potential influence of saline waters).

It should be noted that comparison to the drinking water investigation levels would be protective for the waters use for irrigation (based on the contaminants tested, not the physical characteristics of the water). On the basis of the identified potential human and ecological receptors, the adopted GILs are as follows:

- In order to assess whether the groundwater may impact on aquatic life within the water aquatic ecosystems associated with the Hunter River, the groundwater test results were assessed against the available Trigger Values in ANZECC & ARMCANZ (2000) for a slightly / moderately disturbed fresh and marine water system (due to the tidal influence), at a general protection level of protection of 95% of species. The adopted GILs are shown in 0, Table B4.

Health Screening Levels (HSLs) are used to assess selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact with affected soils and groundwater. The adopted groundwater HSLs for vapour intrusion, from Table 1A(4), Schedule B1 of NEPC (2013) requires consideration of a number of factors such as land use, soil type and depth of contamination. Therefore, HSLs for groundwater vapour intrusion for commercial/industrial properties (HSL D), with an assumed near surface depth to groundwater (2m to <4m) in soils classified as sands have been adopted for use in this DSI. The adopted Water HSLs are shown in 0, Table B4.

4.4 Radiation

Background radiation levels that exist at the site were developed in consultation with the Queensland Health's, Health Services Support Agency (HSSA). The HSSA conducted two field investigations at the site and at selected background locations surrounding the site. These investigations enabled the development of a site specific natural background radiation level to be considered for the site. The investigations also provided a best practice annual dose constraint for site workers to be applied over and above the natural background radiation levels. Literature provided by the HSSA from the International Commission on Radiological Protection (ICRP) also indicated the recommended limits on exposure of members of the public and for occupationally exposed persons to ionising radiation. The adopted radiation classification levels are summarised in Table 7 below.

Table 7: Radiation Classification Levels

Radiation Classification	Value	Description
Background Radiation Levels	<84 µSv/yr (or <0.084mSv/yr)	The Background Radiation Levels were determined during the Environmental Radioactivity Assessment: Background and Demolition & DSI Planning Radiological Survey (Queensland Government, February 2014, Ref:13PX363/364) and represent Terrestrial exposure only for an assumed 2,000 hrs/yr occupancy. A default background terrestrial air kerma rate of 60nGy/hr was recommended (derived from a normal natural background of 100nGy/hr corrected for cosmic contribution. The recommended default background level (60nGy/hr) was converted (to µSv/yr) in the example above to identify normal background levels at the site.
Site Workers Dose Constraint	>84 to 300 µSv/yr (or >0.084 to 0.3mSv/yr) Exclusive of background	An annual dose constraint of 300µSv/yr is recommended for Site Workers (over and above natural background levels). This is best practice, however an exceedance of this constraint level would not pose an unacceptable risk based on provided literature.

Member of Public Dose Limit	>300 to 1,000 µSv/yr (or >0.3 to 1mSv/yr)	The International Commission on Radiological Protection (ICRP) recommend the 1mSv/yr limit on the exposure of members of the public to ionising radiation (over and above natural background levels). This has been adopted by the regulatory authority.
Occupationally Exposed Dose Limit	>1,000 to 20,000 µSv/yr (or >1 to 20 mSv/yr)	If a radiation monitoring plan is implemented for the life of the project, workers can be classified as occupationally exposed. The International Commission on Radiological Protection (ICRP) recommends a 20mSv/yr limit on occupationally exposed persons to ionising radiation (over and above natural background levels). This has been adopted by the regulatory authority. Discussions with Ross Kleinschmidt indicate that this is not considered to be necessary for the RZM site, based on the results observed at this stage of the investigation.

Further guidance on the characterisation of radioactively contaminated sites for remediation purposes is provided in:

- IAEA (May 1998) “Characterization of radioactively contaminated sites for remediation purposes”, Document IAEA-TECDOC-1017, 103 pages
- US EPA (June 2001) “Multi-agency Radiation Survey and Site Investigation Manual MARSSIM)”, Revision 1
- CIRIA (2009) “Safegrounds, Good practice guidance for site characterisation”, Version 2, 178 pages
- The ARPANSA Radiation Protection Series No. 1 (March 2002), “Recommendations for Limiting Exposure to Ionizing Radiation (1995) (Guidance Note [NOHSC: 3022 (1995)]) and National Standard for Limiting Occupational Exposure to Ionizing Radiation”, [NOHSC: 1013(1995)]”
- The ARPANSA Radiation Protection Series No. 9 (August 2005), “Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing”
- The ARPANSA Radiation Protection Series No. 15 (August 2008), “Management of Naturally Occurring Radioactive Material (NORM)”
- NSW EPA (June 2009) Guidelines for Licensing of Mineral-sand Mining that Generates Radioactive Residues.

Based on the Radiation Classification Levels within Table 7, the Radiation Action Level Criteria (RALC) has been developed based on standard criteria, taking into account the natural background levels. The RALC are summarised within Table 8.

Table 8: Radiation Action Level Criteria (RALC)

Radiation Classification	Dose rate	Value	Action
Workers Target Radiation level (TRL)	Weekly	10µSv/wk	If a worker exceeds the TRL on consecutive week’s constraints to site activities may be imposed. This level is to demonstrate best practice and to limit acute exposure to site radiation.
Site Workers Dose Constraint (DC)	Annually	>84 to 384 µSv/yr	The DC level is the best practice target for workers, to allow for the impact of external radiation sources (eg X-rays, airline travel) in the workers day-to-day life. If this level is exceeded, the workers activities may need to be altered to work in an area with less radiation.
Member of Public Dose Limit (DL)	Annually	>384 to 1,084 µSv/yr	If a site worker is approaching the DL, they will be removed from the site for the remainder of the year, until an appropriate radiation monitoring plan for occupationally exposed workers has been developed and implemented.

Note: calculated annual dose constraint should be based on a working week (8 hrs by 5 days) in a working year (48 weeks).

4.5 Acid Sulphate Soil

The NSW Acid Sulphate Soil Risk Map for the relevant areas of the site (Dept Land and Water Conservation 1998) indicates the entire site is situated on a High Risk area for the likelihood of acid soils to be present.

The Acid Sulphate Soils (ASS) soil action criteria are referenced in the RTA's *Guidelines for the Management of Acid Sulfate Materials* (RTA, 2005) have been adopted for this investigation. The RTA's guidelines are based on the *Queensland ASS Technical Manual, Soil Management Guidelines* (QASSIT, 1998). These criteria are classified according to the soil texture and take into account the volume of soil to be disturbed and are assessed against the combined existing and potential acidity of the soil. For this investigation the action criteria applied are for coarse textured soils due to the sandy soils encountered in the investigation area. The volume of soil disturbed is of no consequence for sandy soils, as the limits are the same for both volume ranges. The soil action criteria to be used for this investigation are summarised in Table and are also shown in 0, Table B1.

Table 9: ASS Soil Action Criteria

Type of Material		**Soil Action Criteria**	
Texture Range	Approx clay content (%)	Equivalent sulphur (%S) (oven-dry basis)	Equivalent acidity (mol H^+/tonne (oven-dry basis)
Coarse Texture (sands to loamy sands)	=5	0.03	18

Taken from RTA's Guidelines for the Management of Acid Sulfate Materials (RTA, 2005), ASM Procedure No. 1 – Attachment 2

4.6 Decision Errors

In accordance with the decision error limits imposed on the investigation within the DQO process (discussed in Section 3), samples within the false acceptance and false rejection decision error limits of the adopted assessment criteria should be further assessed against the baseline conditions (that the contaminants of concern exceed the assessment criteria) and alternative conditions (that the contaminants of concern are below the assessment criteria). As a result, the following decision error rules will be imposed:

- False Acceptance – Any result that is below the adopted assessment criteria by equal to or less than 10% may be within the baseline condition (ie the true value may actually exceed the assessment criteria).
- False Rejection – Any result that exceeds the adopted assessment criteria by equal to or less than 5% may be within the alternative condition (ie the true value may actually be less than the assessment criteria).

5. Site Investigation

The Site Investigation tasks described in Section 1.2 were undertaken by Jacobs in August and September 2014 at the RZM Site Tomago, as detailed within Table .

Table 10: Fieldwork Program

Investigation	Date	Task Completed
Baseline Ambient Air Monitoring	14th April to 23rd July 2014.	Installation of 5 passive gamma and 5 passive radon ambient air monitors at the boundary of the site.
Development of SAQP	15th August 2014.	Final SAQP approved by auditor.
Identification of underground services	21st August 2014	Underground services located by an accredited service locator.
Vegetation Clearing	25th August 2014.	Create access to Precinct 2.
DSI Ambient Air Monitoring	25th August to 25th November 2014.	Installation of 5 passive gamma monitors at the boundary of the site.
Excavation of Test Pits	26th to 27th August 2014	Excavate 27 test pits, collect soil samples and log soil profiles. Test Pits backfilled at the completion of investigation.
Site Radiation Survey	26th to 27th August 2014	Queensland Health physicists complete a site radiation survey and sampling event.
Surface XRF Screening	29th August 2014	Jacobs complete a site XRF survey of areas in Precinct 1 and Precinct 2.
Soil Bore Installation	1st to 4th September 2014	Drilling of 23 soil bores, collect soil samples and log soil profiles. Soil bores backfilled with cuttings at the completion of investigation.
Monitoring Well Conversion	1st to 4th September 2014	Conversion of 13 soil bores into monitoring wells.
Sediment Sampling	4th September 2014	Collection of 10 sediment samples from the drainage line and river foreshore.
Monitoring Well Survey	8th September 2014	Jacobs benchmarked the top of casing for the 13 monitoring wells.
Groundwater Monitoring	9th to 10th September 2014	Collection of 13 groundwater samples.
Surface Water Sampling	10th September 2014	Collection of 3 surface water samples.

5.1 Investigation Methods

The methods for undertaking the fieldworks program described in Table were completed in accordance with the DSI SAQP developed by Jacobs and approved by the NSW EPA accredited Contaminated Site Auditor (Ross McFarland) prior to undertaking the DSI event. All works were completed in accordance with the SAQP and in accordance with the Jacobs Standard Operating Procedures for completion of contaminated site investigations. A brief summary of each sampling methodology completed during the DSI and any deviations from the approved SAQP are described in Section 5.1.1 to Section 5.1.7.

5.1.1 Background Air Monitoring

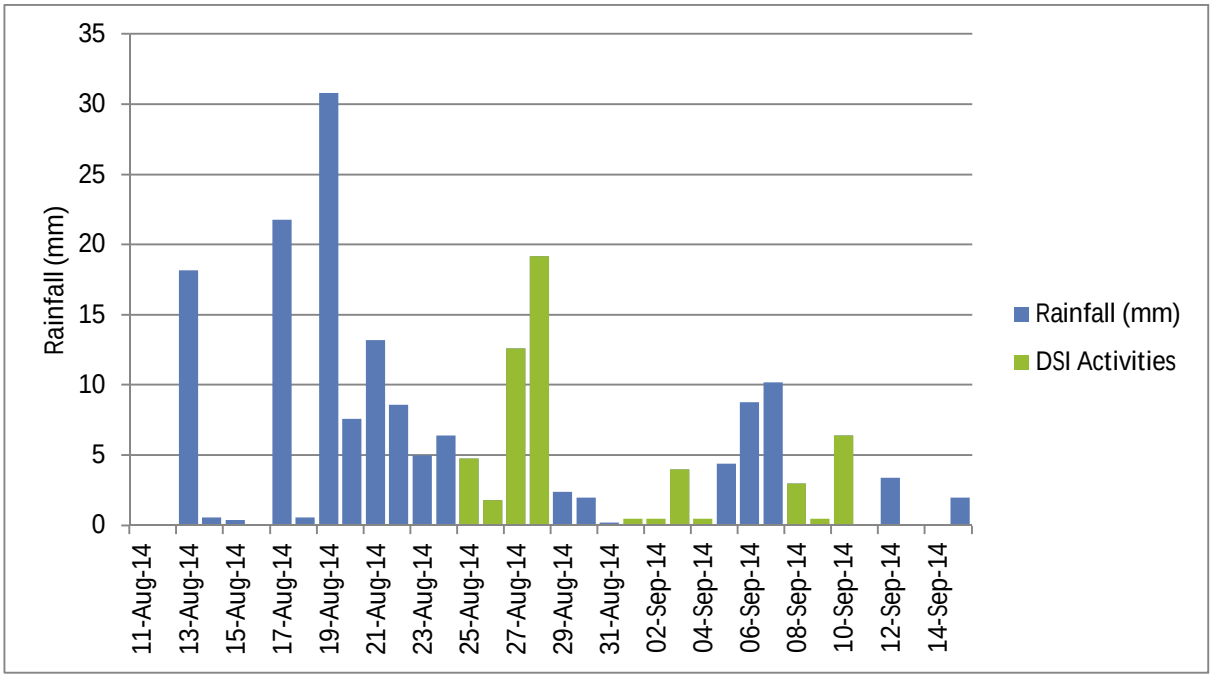
The proposed background air monitoring program was developed to investigate two potential impacts associated with the DSI fieldworks, these include:

- Boundary particulate screening.
- Passive RAD monitoring at boundary locations.

Boundary Particulate Screening

During the DSI event the SAQP outlined a Dust Trigger Action Response Plan (TARP), which set out the site actions to be implemented to mitigate dust levels onsite, based on the results of a real-time active particulate air monitoring instrument (DusTrak) located on the southern boundary of the site. In the lead up to and throughout the DSI event heavy rainfall acted as an ongoing dust mitigation activity and limited the potential for dust emission (refer to Chart 1). As a result of the rainfall periods the DustTrak was deemed to be unnecessary as the dust potential during the DSI was considered to be very low. Ongoing site observations of visible dust were completed by site personnel throughout the DSI and no dust was observed being generated from any of the site equipment.

Chart 1: Newcastle University Weather Station – Historical Rainfall Data



Passive Radiation Boundary Monitoring

A Thermoluminescent Dosimeter (TLDs) and a radon gas monitor were installed at five boundary locations surrounding the RZM site. The five monitoring locations were chosen based on available radiation survey data to target highly active areas and to surround the site. The monitors were placed between 1m and 1.8m above ground level depending on the available terrain to secure the monitors too.

The monitors were installed for a period of three months prior to the completion of the DSI activities to enable the determination of baseline passive radiation levels.

Passive gamma monitors were reinstalled throughout the DSI event at boundary locations as near to the original locations as possible. The results of the DSI monitoring event had not been available for reporting at the time of writing of the DSI.

5.1.2 Test Pit, Soil Bores and Monitoring Wells

Test Pits

Twenty seven test pits were excavated across the site (refer to 0, Figure 2 and Figure 3) on the 26th and 27th August 2014. The location of the sampling points were measured using a global positioning system (GPS) device of type Garmin, GPSMAP 62S. Jacobs site personnel were present during all of the excavation activities to confirm the sampling location, collect the soil samples and log the soil profile. Screening of the soil samples with a Photo-Ionisation Device (PID) and X-Ray Fluorescence (XRF) was unable to be achieved on all locations during the test pitting activities due to the heavy rainfall/humidity affecting the instrumentation. XRF screening of

the soil surface layer of the site was subsequently undertaken by Jacobs on the 29th August 2014, PID screening was not completed at that time as any volatiles that would have been present during initial excavation would already volatilised.

Jacobs staff used disposable nitrile gloves to collect soil grab samples from the centre of the excavator bucket during test pit sampling. Soil samples were selected for collection in accordance with the agreed DSI SAQP sampling method ie. samples were collected in one metre increments; at changes in lithology; or where the groundwater surface was encountered, based on site observations. The samples were collected in laboratory supplied containers and subsequently placed within ice filled eskies. ASS samples were targeted at ASS/PASS prone areas, including soil profiles at or below the groundwater table. ASS samples were collected in laboratory supplied ziplock bags and placed in eskies containing dry ice to freeze the sample for transport. All samples were transported to the laboratory under Chain of Custody (COC) documentation. Two samples from each test pit were selected, based upon the site observations, to be analysed for the Contaminants of Potential Concern (CoPC's) identified within the DSI SAQP and listed within Section 2.5. All test pits were logged by trained Jacobs staff including a description of the soils, records of any groundwater encountered. Copies of test pit logs can be found in 0. At the completion of the test pit sampling and logging activities each test pit was backfilled in reverse sequence that it was removed by the excavator operator, to the extent possible.

Soil Bores

Twenty three soil bores were drilled across the site (refer to 0, Figure 2 and Figure 3) between the 1st and 4th September 2014. The location of the sampling points were measured using a global positioning system (GPS) device of type Garmin, GPSMAP 62S. Jacobs site personnel were present during all of the drilling works carried out by Epoca Environmental using a Geoprobe 7822DT. A variety of drilling techniques were utilised in order to collect samples across the site and construct monitoring wells (if required), including:

- Hand augering – to clear the first 0.5m near potential underground services. The Hand Auger was decontaminated with decon 90 between each sample location. Jacobs staff collected the sample directly from the hand auger using disposable nitrile gloves. The samples were collected in laboratory supplied containers and were subsequently placed within ice filled eskies.
- Push tube – Solid casing containing 1.5m internal disposable sample liners and sample catchers. The casing and liners were driven 1.5m into the soil profile and removed to allow sampling. New sample liners and catchers would then be inserted into the casing for collection of the next samples. As all samples were collected from disposable liners and catchers, there was no need for decontamination between each sample. Jacobs staff collected the sample directly from the disposable liners using disposable nitrile gloves. The samples were collected in laboratory supplied containers and were subsequently placed within ice filled eskies.
- Solid flight augers – following the collection of samples via push tube methodology, solid flight augers were used to widen the soil bore to create the well annulus and allow the installation of the monitoring well.
- Hollow flight augers – following the collection of samples via push tube methodology, and if the ground conditions caused the well annulus to collapse, hollow flight augers would be used to widen the annulus for installation of monitoring wells and prevent the collapsing of the side walls of the soil bore.

Soil samples were collected at regular intervals during the hand auger and push tube drilling works. The samples were screened with a PID to identify the presence of any Volatile Organic Compounds (VOC's) and with an XRF to identify any metal compounds. Soil samples were selected for collection in accordance with the agreed DSI SAQP sampling method ie. samples were collected in one metre increments; at changes in lithology; or where the groundwater surface was encountered, based on site observations. The samples were collected in laboratory supplied containers and subsequently placed within ice filled eskies. Two samples from each soil bore were selected, based upon the site observations and screening results, to be analysed for the Contaminants of Potential Concern (CoPC's) identified within the DSI SAQP and listed within Section 2.5. All samples were transported to the laboratory under Chain of Custody (COC) documentation. All soil bores were logged during drilling works including a description of the soils, records of any groundwater encountered. Copies of soil bore logs details can be found in 0.

At the completion of drilling activities each soil bore (not including soil bores converted into monitoring wells) was backfilled in reverse sequence that it was removed, to the extent possible.

Monitoring Well Installation

Thirteen soil bores were selected to be converted into monitoring wells. The locations of the monitoring wells (refer to 0, Figure 2 and Figure 3) were chosen to surround the site boundary or to target specific potential areas of contamination based upon the results of the PSI and as agreed within the DSI SAQP. The location of the sampling points were measured using a global positioning system (GPS) device of type Garmin, GPSMAP 62S. The groundwater wells were preferentially screened across groundwater horizon to facilitate capture of hydrocarbon contaminants and were limited to the sands above the confining silts layers. The monitoring well annulus was filled with 2mm graded sands around the screened section of the well. Where possible, a 0.5m thick bentonite seal was installed between the top of the screen and the surface. The top of the monitoring well was protected by the installation of a flush mount gatic cover or a stick up monument. Following installation, all newly installed wells were developed by purging at least three well volumes or until dry.

All soil bores and monitoring well construction details were logged by Jacobs during drilling including a description of the soils, records of any groundwater encountered. Copies of the soil bore logs and monitoring well installation details can be found in 0.

5.1.3 Groundwater Monitoring

Groundwater monitoring was undertaken on the newly installed groundwater monitoring wells on the 9th and 10th September 2014. The location of the sampling points were measured using a global positioning system (GPS) device of type Garmin, GPSMAP 62S.

At each well sampled, depth to water and total depth measurements were recorded using a multi-phase interface probe that detects water levels and the presence of non-aqueous phase liquids. To ensure representativeness, the gauging event was completed continuously for all monitoring wells to limit the tidal influence on the depth to water results recorded.

To ensure representative groundwater samples were collected from each monitoring well, at least three well volumes (or until dry) of groundwater were purged from the monitoring wells prior to the collection of the samples. Groundwater was purged from each monitoring well using dedicated Waterra tubing and foot-valves. Physical and chemical water quality parameters were recorded during well purging and once these parameters had stabilised, samples were collected in laboratory-supplied sample bottles. Water quality indicator data was collected using a peristaltic pump and flow cell connected to a YSI Pro Plus multi parameter meter. Parameters recoded during purging included electrical conductivity, reduction/oxidation (redox) potential, pH, dissolved oxygen (mg/L and percentage saturation) and temperature. The water quality meter was calibrated prior to sampling by the qualified personnel, with copies of calibration certificates provided in 0.

All tubing used to purge or collect water quality indicators were dedicated to each groundwater well during purging and sampling. Fresh disposable nitrile gloves were used at each sampling location. To assess dissolved metal and groundwater radiation concentrations, each sample was field filtered using a disposable 0.45µM Waterra FHT filters prior to chemical preservation. The samples were collected in laboratory supplied containers and subsequently placed within ice filled eskies.

5.1.4 Surface Water Sampling

Surface water samples were collected on the 10th September 2014. The location of the sampling points were measured using a global positioning system (GPS) device of type Garmin, GPSMAP 62S.

A laboratory supplied non-preserved sample bottle was attached to a telescopic arm to enable the collection of surface water samples. At each sampling location, the sample bottle would be replaced. Samples were collected from the centre of the water body where possible; or at least 1m from the edge of the sampling locations. Samples were also collected from 10cm below the water surface (where possible) to reduce the potential of collecting organic materials (ie. aquatic weeds, pond scum) on the water surface that may affect analytical results.

Fresh disposable nitrile gloves were used at each sampling location. To assess dissolved metal and surface water radiation concentrations, each sample was field filtered using a disposable 0.45µM Stericup filter with a vacuum pump, prior to chemical preservation. The samples were collected in laboratory supplied containers and subsequently placed within ice filled eskies.

5.1.5 River and drainage line sediment sampling

River and drainage line sediment sampling was undertaken on the 4th September 2014. Sediment samples were collected from the locations indicated on 0, Figure 3 and were analysed for the Contaminants of Potential Concern (CoPC's) identified within the DSI SAQP and listed within Section 2.5. The location of the sampling points were measured using a global positioning systems (GPS) device type Garmin, GPSMAP 62S.

The samples were collected using the push tube casing and 1.5m internal disposable sample liners with sample catchers. At the selected sampling locations, the casing and internal liners were pushed into the sediments to a depth of between 10 to 20cm below the surface. The sample liners were removed to allow for Jacobs staff to collect the sediment samples using disposable nitrile gloves. The samples were collected in laboratory supplied containers and subsequently placed within ice filled eskies.

5.1.6 Soil Vapour Monitoring

Soil vapour screening was intended to be completed if volatile compounds were detected during the sampling event. During the DSI, PID screening results and field observations did not identify any significant volatile compounds. Discussions onsite between Jacobs and the audit team decided to wait until the analytical results were received to determine if any soil vapours were likely to be present. If the results of the DSI identified significant volatiles, a separate targeted soil vapour screening event would be developed if necessary.

5.1.7 Radiation Survey

The surface gamma radiation levels were measured using Radiation Solutions RS-220 gamma surveyor instruments, calibrated specifically for environmental radiation (air kerma rate) measurements in units of nanoGray per hour (nGy/h). In addition to this, the response of the instruments to Naturally Occurring Radioactive Materials (NORM) has been assessed through measurements over concrete calibration pads with known concentrations of uranium, thorium and potassium.

All site radiation level measurements are performed approximately one metre above the ground surface. Using this measurement geometry and with typical soil densities, approximately 90% of the measured exposure rate originates from the top 200mm of material over an 8m radii.

The geographical location of recorded surface gamma radiation levels were measured using global positioning systems (GPS) of type Holux model M-1200E.

The cosmic radiation component of natural background is latitude, longitude and altitude dependent; and has been calculated using United States Federal Aviation Administration Civil Aerospace Medical Institute software 'CARI-6'. The mean cosmic surface air kerma rate assumes the site location of 32.814 S, 151.700 E, an elevation of 9m, and using a dose conversion factor of 1Sv/Gy.

The background assessment was performed local to the former RZM, Tomago, NSW site previously and is reported within Environmental Radioactivity Assessment Report 13PX363/364 (Queensland Government, 2014a). This report summarised that the natural background value of 100nGy/h (understood to be inclusive of cosmic radiation) that has been previously used for the assessment of contaminated land in NSW is appropriate for this site and is comparable to the highest terrestrial air kerma rate of the local background areas. Consequently the background terrestrial air kerma rate adopted for this site is 60nGy/h (corrected for the cosmic component).

6. Quality Assurance/Quality Control (QA/QC)

The QA/QC methods implemented throughout the DSI event have been assessed by implementing the Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) parameters. The PARCC assessment has been summarised in Section 6.1.

6.1 PARCC Assessment

In order to assess that the results of the DSI are of an appropriate quality, the PARCC parameters will be individually assessed against the QA/QC criteria and data objectives described within the DSI SAQP.

6.1.1 Precision

Precision refers to the degree of mutual agreement between duplicate measurements and provides an estimate of random error.

Section 8.2 of Australian Standard AS4482.1-2005 provides a procedure for the collection of field duplicate and triplicate samples and provides a minimum duplicate collection frequency of 5% (or 1 duplicate/triplicate sample per 20 primary samples). During the DSI the sampling team collected split samples from the soil profiles and analysed the samples in accordance with AS4482.1-2005. A summary of the primary samples and their respective duplicates/triplicates is provided in Table 11.

Table 11: Field Duplicate and Triplicate Quality Control Samples

Sample ID	Sample type	Primary Sample	Matrix	Sample Date	Analysis Conducted
QC1	Duplicate	TP01/0.5	Soil	26/08/2014	Metals, PAH's
QC1A	Triplicate	TP01/0.5	Soil	26/08/2014	Metals, PAH's
QC2	Duplicate	TP02/0.5	Soil	26/08/2014	Metals, PAH's
QC2A	Triplicate	TP02/0.5	Soil	26/08/2014	Metals, PAH's
QC3	Duplicate	TP26/0.2	Soil	27/08/2014	Metals, PAH's
QC3A	Triplicate	TP26/0.2	Soil	27/08/2014	Metals, PAH's
QC4	Duplicate	SB17/0.5	Soil	01/09/2014	TRH/BTEX, Metals, PAH's, Phenol, PCB's
QC4A	Triplicate	SB17/0.5	Soil	01/09/2014	N/A – Sample bottle broken by courier
QC5	Duplicate	SB21/2.0	Soil	02/09/2014	Metals, PAH's
QC5A	Triplicate	SB21/2.0	Soil	02/09/2014	Metals, PAH's
QC6	Duplicate	SB20/2.0	Soil	02/09/2014	Metals, PAH's
QC6A	Triplicate	SB20/2.0	Soil	02/09/2014	Metals, PAH's
QC7	Duplicate	SB19/1.8	Soil	03/09/2014	Metals, PAH's
QC7A	Triplicate	SB19/1.8	Soil	03/09/2014	Metals, PAH's
TP12_0.5-1.0 Duplicate	Duplicate	TP12_0.5-1.0	Soil	26/08/2014	Metals
QC8	Duplicate	MW09	Water	09/09/2014	TRH/BTEX, Metals, PAH's, Phenol
QC8A	Triplicate	MW09	Water	09/09/2014	TRH/BTEX, Metals, PAH's, Phenol

During the DSI a total of 99 soil samples were analysed for a variety of parameters. The frequency of blind field duplicate and triplicate analysis corresponds to sampling frequency of approximately 8% and 6% respectively. A total of 16 water samples were analysed throughout the DSI, corresponding to a duplicate and triplicate frequency of 6% for water samples.

The precision of the DSI has been assessed through the calculation of relative percentage differences (RPD's) between primary and duplicate (or triplicate) samples to provide an estimate of random error. The acceptable RPD limits adopted for the DSI are an RPD of less than 30% for metals and inorganic analytes, and an RPD less than 50% for organic analytes.

Laboratory results for the blind field duplicate samples are presented in 0. The RPD results that exceeded the QA/QC criteria have been shaded darker within 0, Table B1 and Table B4; all RPD's appeared to be within the QA/QC criteria with the exception of the RPD's that have been listed in Table . Table also includes an assessment of the potential reason for the exceedance of the RPD criteria and a determination of the acceptability in terms of precision for of the DSI. Explanations of the Reason for Exceedance and why they are considered to be acceptable include:

- When calculating RPD's for concentrations that are close to the laboratory Limit of Reporting (LOR), the RPD calculation can distort the RPD result to a higher value. The distortion of the RPD result may exceed the RPD limits, however the true concentrations are relatively similar and are therefore not considered significant to the findings of the report.
- When RPD's are found to exceed the RPD limits, the concentrations for that analyte collected during the investigation are reviewed. If the concentrations are below the LOR or below the adopted assessment criteria for the majority of samples, the detected variation in the results would be considered to not have a significant impact on the DSI findings.
- The heterogeneity of a sample describes a non-uniform consistency of the material or contaminant that may have impacted the results of one sample greater than the other, resulting in an increased RPD. The RPD may exceed the adopted limits, but are still considered to be acceptable for use in the investigation.

Table 12: Relative Percentage Difference Summary

Primary and Duplicate (or Triplicate) Sample ID's	Relative Percentage Difference (%)	Analyte	Reason for Exceedance				Acceptable for use in Investigation
			Results close to LOR, distorting RPD calculation	Results below assessment criteria	Results below LOR	Sample heterogeneity	
TP01/0.5 and QC1A	67%	Arsenic	✓	✓			Yes
	32%	Lead	✓	✓			Yes
TP02/0.5 and QC2A	75%	Arsenic	✓	✓			Yes
	67%	Copper	✓	✓			Yes
	35%	Lead	✓	✓			Yes
	76%	Nickel	✓	✓			Yes
	48%	Zinc	✓	✓			Yes
TP26/0.2 and QC3	50%	Chromium (III+VI)	✓	✓			Yes
TP26/0.2 and QC3A	40%	Nickel	✓	✓			Yes
	36%	Zinc		✓			Yes
	67%	Acenapthene	✓	✓	✓		Yes
	67%	Indeno(1,2,3-c,d)pyrene	✓	✓	✓		Yes
	53%	Naphthalene	✓	✓	✓		Yes
SB17/0.5 and QC4	91%	Chromium (III+VI)	✓	✓			Yes
	67%	Copper	✓	✓			Yes
	147%	Zinc	✓	✓			Yes
	171%	TRH C10-C16		✓	✓	✓	Yes
	196%	TRH C16-C34		✓	✓	✓	Yes
	68%	TRH C34-C40		✓	✓	✓	Yes
	172%	TRH F2		✓	✓	✓	Yes
	68%	TRH C10-C14		✓	✓	✓	Yes
	196%	TRH C15-C28		✓	✓	✓	Yes
	147%	TRH C29-C36		✓	✓	✓	Yes
	198%	TRH C10-C36 (total)		✓	✓	✓	Yes
	198%	TRH C10-C40 (total)		✓	✓	✓	Yes
SB20/2.0 and QC6	55%	Chromium (III+VI)	✓	✓			Yes
	33%	Lead	✓	✓			Yes
SB20/2.0 and QC6A	100%	Chromium (III+VI)	✓	✓			Yes
	80%	Lead	✓	✓			Yes
	55%	Nickel	✓	✓			Yes
	67%	Zinc	✓	✓			Yes
SB21/2.0 and QC5A	77%	Lead	✓	✓			Yes
	52%	Nickel	✓	✓			Yes
MW09 and QC8	35%	Lead (filtered)	✓	✓			Yes
	36%	Zinc (filtered)	✓			✓	Yes
MW09 and QC8A	111%	Cadmium (filtered)	✓				Yes

Based on the compliance with the sampling procedures and frequencies described in AS4482.1-2005, and the assessment of the RPD exceedances summarised within Table , the QA/QC assessment considers the DSI precision to be satisfactory.

6.1.2 Accuracy

Accuracy refers to the difference between a samples analytical result and the true value of the sample.

Accuracy of the DSI has been assessed for the primary laboratory (ALS Global) and secondary laboratory (Envirolab) by each laboratories internal quality control results. The laboratory internal QA/QC testing procedures involves evaluating reagent blank results, laboratory duplicates, and the percent recoveries of matrix spike samples, surrogate spikes and laboratory control samples. ALS Method Codes are referenced to APHA 20th or as stated under their Schedule of Services (January 2013).

Both laboratories are NATA registered for the specified tests and all tests were undertaken in accordance with the 1999 NEPM (as amended in 2013) quality guidelines. All analytical laboratory reports (including internal QA/QC assessments of compliance) are provided in 0.

Table 13 provides a brief summary of both laboratories internal QA/QC assessments.

Table 13: Laboratory QA/QC Assessment

Protocol	Description
Holding Times	Holding times are the maximum permissible elapsed time in days from the collection of the sample to its extraction and/or analysis. All extraction and analyses were completed within standard guidelines.
Reagent Blanks	The reagent blank sample is a laboratory prepared sample containing the reagents used to prepare the sample for final analysis. The purpose of this procedure is to identify contamination in the reagent materials and assess potential bias in the sample analysis due to contaminated reagents. The QC criterion is no detectable contamination in the reagents. Each analysis procedure was subject to a reagent blank analysis. The results of each indicated that contaminants were not detected.
Laboratory Duplicates	Laboratory duplicates are field samples that are split in the laboratory and subsequently analysed a number of times in the same batch. These sub-samples are selected by the laboratory to assess the accuracy and precision of the analytical method. ALS Global and Envirolab undertake QA/QC procedures such as intra-laboratory duplicates at a frequency of 1 per 10 samples. All laboratory duplicate sample recovery rates were within the acceptable limits.
Laboratory Control Standard	A laboratory control standard is a standard reference material used in preparing primary standards. The concentration should be equivalent to a mid-range standard to confirm the primary calibration. Laboratory control samples are performed on a frequency of 1 per 20 samples or at least one per analytical run. All laboratory control standard recovery rates were within the acceptable limits.
Matrix Spikes / Matrix Spike Duplicates (MS/MSD)	MS/MSDs are field samples to which a predetermined stock solution of known concentration has been added. The samples are then analysed for recovery of the known addition. Recoveries should be within the stated laboratory control limits and duplicates should have RPDs of less than 50%. All matrix spike recovery rates were within the acceptable limits and reported RPD's were less than 50%.
Surrogate Spikes	Surrogate spikes provide a means of checking, for every analysis that no gross errors have occurred at any stage of the procedure leading to significant analyte loss. Recoveries should be within the stated laboratory control limits. All surrogate spike sample recovery rates were within the acceptable limits, with the exception of: • a phenolic compound surrogate on MW08, which recovered greater than the upper data quality objective by 2.7%. The exceedance may indicate that phenolic results are being reported at higher concentrations than actually occur. A review of the phenolic sample results for the analytical report, indicate that no phenols were detected above the laboratory limit of detection. As a result, the detection of the phenolic compound surrogate outside the adopted limits is not considered to be significant to the integrity of the laboratory results.
QA/QC Conclusion	The QA/QC indicators should either all comply with the required standards or showed no variations that would have a significant effect on the quality of the data.

Both laboratories internal QA/QC procedures identified no significant variations that would affect the quality of the data. The accuracy of the laboratory results is therefore considered to be acceptable for the purposes of the DSI.

6.1.3 Representativeness

Representativeness refers to the degree to which data accurately and precisely measures the conditions and characteristics of the parameter of interest.

Representativeness can be assessed by the execution of consistent sample collection procedures, storage, shipping, equipment decontamination and proper laboratory sample handling procedures (eg Chain of Custody procedures).

The sampling team was composed of professionally qualified environmental scientists trained in conducting site contamination investigations (Grant Moylan, Tina Donovan, Robert Gauthier, Luke Spencer). In completing the field investigation, the SAQP and EHS Plan provided a framework for meeting the DSI Data Quality Objectives. All equipment was calibrated as specified in relevant operator's manuals. Calibration certificates and in-field check record sheets for the portable site equipment (ie PID, WQM, and XRF) are provided in 0.

All samples sent to the primary or secondary laboratories for analysis were logged and transferred under appropriately completed Chain of Custody (COC) Forms. Copies of the COC's are provided in 0.

All samples were collected within laboratory prepared and preserved containers, with preservation including packing samples with ice packs in eskies.

In order to ensure the sampling methodologies were consistent, Jacobs collected the Quality Control Samples listed in Table 14.

Table 14: Field Representativeness Quality Control Samples

Sample ID	Sample Type	Task Sampled	Analysis Conducted
QCA	Trip Blank	Sample Batch 1	BTEXN
QCB	Equipment Rinsate	Sampled from Hand Auger	TRH/BTEX, Metals, PAH's, Phenol, PCB's
QCC	Trip Blank	Sample Batch 2	BTEXN
QCD	Trip Blank	Sample Batch 3	BTEXN
QCE	Trip Blank	Sample Batch 4	BTEXN
QCF	Trip Blank	Sample Batch 5	BTEXN
Trip Spike	Trip Spike	Trip Spike Field – Week 1 (Soil)	BTEXN
TSC	Trip Spike	Trip Spike Control – Week 1 (Soil)	BTEXN
Trip Spike	Trip Spike	Trip Spike Field – Week 2 (Soil)	BTEXN
TSC	Trip Spike	Trip Spike Control – Week 2 (Soil)	BTEXN
Trip Spike	Trip Spike	Trip Spike Field – Week 3 (Water)	BTEXN

Rinsate blanks were prepared following the use of reusable sampling equipment in accordance with the requirements of the DSI SAQP. As described in Section 5.1, the sampling methodologies conducted throughout the DSI used disposable or dedicated sampling equipment for each location. The only exception to the use of disposable or dedicated sampling techniques was the collection of soil samples with a hand auger on the 27 August 2014. An equipment rinsate was prepared and analysed in accordance with Section 8 of Australian Standard AS4482.1-2005 for the contaminants of concern to determine if any cross contamination may have occurred during sampling. The laboratory result for the equipment rinsate sample is presented in 0, Table B4. All analytical results were detected below the laboratory limit of reporting and the use of the hand auger for sampling is therefore not considered to have contributed to any cross-contamination.

Two soil trip spikes and one water trip spike were submitted for analysis, corresponding to the two weeks of soil sampling and one week of water sampling, in accordance with the adopted frequency requirements. Laboratory results for the soil and water trip spike samples are presented in 0, Table B1 and Table B4. The QA/QC criteria adopted for this investigation is a recovery of between 70% and 130% of the initial concentration. All trip spikes

were within the acceptable recovery rates. The field sampling procedures are therefore considered to be acceptable to restrict the loss of volatiles during the sampling and transportation activities.

One trip blank was submitted with each sample batch to the primary laboratory to analyse for any cross-contamination of volatile compounds between samples during storage or transport to the laboratory. Laboratory results for the trip blank samples are presented in 0, Table B4. All trip blank results were detected below the laboratories limit of reporting for all volatile analytes, indicating there was no cross-contamination of volatile compounds during storage or transport of the samples to the laboratory.

Based on the above assessment of QA/QC procedures it is considered that the results provided are representative for the purposes of this DSI.

6.1.4 Completeness

Completeness refers to the amount of actual data collected throughout the DSI event compared to the amount expected in the DSI SAQP scope.

Table 15 provides an assessment of the agreed SAQP scope of works and the actual scope of works completed during the DSI.

Table 15 : Completeness Assessment

TASK	SAQP Scope	DSI Completed Works	Acceptable
Boundary Particulate Screening	Ongoing DusTrak	N/A – Refer to Note 1	Yes
Boundary Passive Radiation	5 passive radon monitors	N/A – refer to Note 2	Yes
	5 passive gamma monitors	5 passive gamma monitors	Yes
Test Pits – soil sampling	24 Test Pits	27 Test Pits	Yes
Soil Bores – soil sampling	24 Soil Bores	23 Soil Bores – refer to Note 3	Yes
Grab Samples – sediment sampling	10 Sediment Samples	10 Sediment Samples	Yes
Monitoring Well Installation	13 Monitoring Wells	13 Monitoring Wells	Yes
Groundwater Monitoring	13 Groundwater Samples	13 Groundwater Samples	Yes
Surface Water Monitoring	3 Surface Water Samples	3 Surface Water Samples	Yes
Soil Vapour Monitoring	Soil Vapour Screening	N/A – refer to Note 4	Yes
Radiation Survey	Surface Gamma Screening	Surface Gamma Screening	Yes
Notes			
Note 1	During the DSI event (25 August to 5 September 2014), the site encountered continuous heavy rainfall. Any dust that may have become airborne during the event would have been attenuated by the rainfall and as a result continuous air monitoring with a DusTrak air monitor was deemed unnecessary.		
Note 2	Passive radon monitors placed at boundary locations during the baseline event identified concentrations significantly lower than the Australian house hold levels. As a result the radon monitors were deemed unnecessary during the DSI event and testing with gamma monitors only would be sufficient.		
Note 3	During the first week of the DSI event, additional test pits were excavated at places of interest based on the results of the radiation surface gamma screening. One of these locations TP26 was in the same approximate position as the proposed SB14 and was therefore used as a replacement sampling methodology.		
Note 4	Soil vapour screening was intended to be completed if volatile compounds were detected during the sampling event. During the DSI, PID screening results and field observations did not identify any significant volatile compounds. Discussions onsite between Jacobs and the audit team decided to wait until the analytical results were received to determine if any soil vapours were likely to be present and if a separate targeted soil vapour screening event would be required.		

Based upon the above assessment of completeness, the DSI is considered to have fulfilled the obligations agreed within the SAQP.

6.1.5 Comparability

Comparability refers to the confidence with which one data set can be compared to another.

All site works were completed in accordance with Jacobs' standard operating procedures for contaminated site investigations and published guidance materials for sampling and investigation methodologies. The above assessment of QA/QC sample results within Section 6.1.1 to Section 6.1.3 including duplicate samples, triplicate samples, reagent blank samples, matrix spike samples, surrogate spikes and laboratory control samples provide a suitable level of confidence that the data provided is acceptable for the purposes of this DSI. All analytical results have been analysed by laboratories that have been accredited by the National Association of Testing Authorities (NATA) and all reported results have been verified by the laboratories to have been completed in accordance with the NATA sampling requirements.

As a result, the findings of the DSI investigation have been determined in a manner that will ensure comparability with other investigations, criteria and standards.

6.2 QA/QC Evaluation

The assessment of QA/QC results within Section 6.1, indicate that the results reported by both laboratories are considered to be precise, accurate, representative, complete and comparable. As a result the laboratory results are considered to be reliable for the purposes of the DSI.

7. Investigation Results

7.1 Background Air Monitoring

7.1.1 Boundary Particulate Screening

As discussed in Section 5.1.1, the prevalent weather conditions (heavy rainfall) during the DSI were not conducive to the creation of dust during the site activities. As a result the monitoring of dust levels with a DustTrak was not deemed to be necessary. Continued site observations of dust conditions (for visible dust) were ongoing by Jacobs staff throughout the DSI and no dust was observed being generated from any of the site equipment.

7.1.2 Passive Radiation Boundary Monitoring

A total of 5 TLD's and 5 radon gas monitors, were installed at boundary locations around the RZM site (refer to 0, Figure 4) prior to the commencement of the DSI to develop a baseline passive radiation result. A control TLD was placed within the Jacobs office for the duration of the baseline monitoring period (3 months) to allow for the comparison of onsite radiation levels and those experienced offsite. A further 5 TLD's were installed at similar locations as the baseline investigation during the DSI.

The TLD radiation monitors were analysed for proton radiation by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) a NATA certified laboratory. The radon monitors were also assessed by ARPANSA. The results of the baseline TLD and radon radiation monitors are summarised in Table 16, please note all results in Table 16 were the dose levels in excess of the control TLD results.

Table 16 : Baseline Passive Radiation Results (14 April 2014 to 23 July 2014)

Location	Baseline Dose	Baseline Dose Rate	Radon Level	Average Radon Concentration
West Boundary	750 µGy	313 nGy/h	19.1 kBq/day/m^3	187 Bq/m^3
QC Laboratory	1,430 µGy	596 nGy/h	*6.7 kBq/day/m^3	*63 Bq/m^3
Gate Stockpile 2	1,940 µGy	808 nGy/h	2.4 kBq/day/m^3	20 Bq/m^3
Boundary at Weir	4,500 µGy	1,875 nGy/h	9.7 kBq/day/m^3	93 Bq/m^3
Building 5	1,770 µGy	738 nGy/h	4.9 kBq/day/m^3	45 Bq/m^3

* *Denotes a monitor that was chewed by an animal, accuracy of the result influenced ±20%*

The outdoor radon (radon-222, progeny of the uranium-238 decay chain) concentration ranged from 20Bq/m^3 to 187Bq/m^3. The highest value was recorded at the 'Boundary West' location. Outdoor radon concentration is highly dependent on the surrounding environment and prevailing weather conditions. All radon concentrations at the site are in excess of the mean Australian home radon in air concentration of 11Bq/m^3; however while the concentrations are higher than expected they are still noted to be below the recommended public and worker air concentration limits of 200Bq/m^3 and 1000Bq/m^3 respectively.

7.2 Soil Conditions

7.2.1 Site Geology

Throughout the DSI the soil profile of each sampling location was logged by Jacobs staff (refer to 0). The subsurface conditions that were generally encountered during the investigation works were typically comprised of:

- CONCRETE/ASPHALT/VEGETATION surface layers ranging from 0.1m to 0.3m in thickness.
- FILL – Layers up to 2.5m depth, consisting of gravels and sands.

- SANDS – Well graded with silts and some trace gravels.
- SILTS – very dense marine silts, saturated.
- SILTSTONE – white very brittle in areas within close proximity to the river area.

7.2.2 Soil Investigation Results

A total of 113 soil samples were submitted for laboratory analysis as part of the soil investigation, comprised of 99 primary samples (52 samples were analysed from test pit locations; and 47 samples were analysed from soil bore locations) and 14 QA/QC soil samples (8 blind field duplicates and 6 blind field triplicate samples).

Soil samples were analysed for the contaminants of concern listed in the DSI SAQP and Table 2 and included:

- Heavy Metals (89 samples)
- PAH's (58 samples)
- Phenols (58 samples)
- PCB's(9 samples)
- TRH (12 samples)
- BTEX (12 samples)
- pH (14 samples)
- SPOCAS (10 samples)
- Asbestos (13 samples)

Contaminant compounds in all samples analysed were detected at concentrations below the assessment criteria and/or the laboratory limits of reporting with the exception of the following (note: sample ID's that have been **bolded** indicate samples with concentrations within the decision error limits):

- Nickel (**SB01/0.5**) at a concentration of 53mg/kg, which is below the EIL, but still within the decision error limits agreed within the DSI SAQP.
- Zinc (TP22/0.0-0.4) at a concentration of 257mg/kg exceeded the EIL criteria.
- TRH C16-C34 (QC4 (a duplicate of SB17/0.5) and SB17/SFC) at concentrations of 9,780mg/kg to 14,700 mg/kg respectively exceeding the TPH Management Limits.
- Equivalent Sulphur (TP01/3.0; **TP01/2.5**; TP03/1.5; TP04ASS/3.4; **TP06/2.8**; TP07/2.0-2.5; TP14ASS/3.8; TP18ASS/2.3-2.5; TP24/3.0) concentrations ranged from 0.04%S to 0.21%S, exceeding the ASS action criteria.
- Equivalent Acidity (TP01/3.0; TP01/2.5; TP03/1.5;TP04ASS/3.4; TP06/2.8; TP07/2.0-2.5; TP14ASS/3.8; TP18ASS/2.3-2.5; TP24/3.0) concentrations ranged from 22 H^+/tonne to 129 H^+/tonne, exceeding the ASS action criteria.

The above soil samples that exceeded the adopted assessment criteria are illustrated in 0, Figure 5 and Figure 6. Laboratory results for soil samples are presented in 0, Table B1, while copies of the laboratory reports are included in 0.

In accordance with the DSI SAQP and Step 5 of the DQO process discussed in Section 3, a statistical assessment was completed for all of the soils investigation results (presented in Table B2). The statistical assessment identified maximum concentrations that exceeded the assessment criteria by a significant margin (2 standard deviations), and compared the 95% Upper Confidence Limit (UCL) of the sample data against the assessment criteria to confirm the accuracy of the results and whether a false acceptance or false rejection condition may be present (as discussed in Section 4.6).

The statistical assessment identified 3 analytes where the maximum soil concentration exceeded the adopted assessment criteria by a significant margin, these analytes included:

- TRH C_{16}-C_{34}
- Equivalent Sulphur
- Equivalent Acidity

The statistical assessment also determined the 95% UCL for each of the analytes within the DSI, and confirmed that the same 3 analytes (mentioned above) exceeded the adopted assessment criteria. The 95%UCL further identified and confirmed that the nickel results listed above (which were below the assessment criteria but within the decision error limits), were found not to be false rejections and will be considered as below the adopted assessment criteria for the discussion and interpretation of the soil investigation results.

Based on the statistical assessment, the soil results that exceeded the adopted assessment criteria are considered to be accurate and do not represent false acceptance conditions of the actual site conditions and are therefore suitable for use within the DSI. These results are assessed and discussed further in Section 8 and Section 9.1.

7.2.3 XRF Soil Screening

A total of 57 locations were screened using a portable X-Ray Fluorescence (XRF) device to identify if heavy metals are present in soils at the surface of the site. The XRF results were compared against the NEPM HIL's for the respective analytes. The majority of locations were detected at concentrations below the HIL's with the exception of the following:

- Copper (24 detections), detected concentrations ranging from 145mg/kg to 28,100mg/kg;
- Chromium (17 detections), detected concentrations ranging from 172mg/kg to 8,843mg/kg;
- Lead (13 detections), detected concentrations ranging from 187mg/kg to 2,394mg/kg;
- Manganese (33 detections), detected concentrations ranging from 271mg/kg to 276,200mg/kg;
- Arsenic (2 detections), detected concentrations ranging from 147mg/kg to 2,003mg/kg;

The combined XRF results described above are illustrated on 0, Figure 7.

Thorium was also detected at 20 locations at concentrations ranging from 40mg/kg to 14,500mg/kg; however as no HIL's exist for thorium, these values have not been compared to NEPM guidelines and as a result have not been plotted in 0, Figure 7.

As the XRF soil screening results have not been certified as being accurate and representative, there is a degree of uncertainty regarding the results and should be considered to be indicative only. As a result the values detected by the XRF that exceeded the NEPM HIL's, will not be considered representative of the true site conditions in the QRA within Section 8.2 or within the findings of this DSI. The XRF results will however provide an indication for any future works to assess the potential for metals to be present at the soil surface prior to undertaking any site activities.

7.3 River and Drainage Line Sediment Conditions

A total of 10 primary soil samples were submitted for laboratory analysis as part of the river and drainage line sediment investigation.

The sediment samples were analysed for the contaminants of concern listed in the DSI SAQP and Table 2 and included:

- Heavy metals (10 samples)
- PAH's (1 sample)
- pH (10 samples)

Contaminant compounds in all samples analysed were detected at concentrations below the assessment criteria and/or the laboratory limits of reporting with the exception of the following (note: sample ID's that have been **bolded** indicate samples with concentrations within the decision error limits):

- Chromium (**S06**) at a concentration of 80 mg/kg, which is below the ISQG-low value but still within the decision error limits agreed within the DSI SAQP
- Nickel (S01; S02; **S03**; S04; S05; S06; S07) at concentrations ranging from of 50 mg/kg to 79 mg/kg exceeding the ISQG-high value and at S03 (50 mg/kg) and S08 (39 mg/kg) exceeded the ISQG-low value.
- Zinc (S07) at a concentration of 236 mg/kg exceeding the ISQG-low value and at **S05** (189 mg/kg), **S08** (195 mg/kg) and **S09** (196 mg/kg) which are below the ISQG-low value but still within the decision error limits agreed within the DSI SAQP

The above sediment samples that exceeded the adopted assessment criteria are illustrated in 0, Figure 5 and Figure 6. Laboratory results for sediment samples are presented in 0, Table B1, while copies of the laboratory reports are included in 0.

In accordance with the DSI SAQP and Step 5 of the DQO process discussed in Section 3, a statistical assessment was completed for all of the sediment investigation results (presented in Table B3). The statistical assessment identified maximum concentrations that exceeded the assessment criteria by a significant margin (2 standard deviations), and compared the 95% Upper Confidence Limit (UCL) of the sample data against the assessment criteria to confirm the accuracy of the results and whether a false acceptance or false rejection condition may be present (as discussed in Section 4.6).

The statistical assessment identified 1 analyte where the maximum soil concentration exceeded the adopted assessment criteria by a significant margin, which was:

- Nickel

The 95% UCL was calculated for each of the sediment samples analytes and confirmed that chromium at results at location S06 and zinc results at S05, S08 and S09 (which were below the assessment criteria but within the decision error limits), were found not to be false rejections and will be considered as below the adopted assessment criteria for the discussion and interpretation of the soil investigation results. The 95% UCL calculations confirmed that nickel at location S03 recorded at concentrations below the ISQG-high value but within the decision error limits, was found to be a false rejection and as a result will be considered as an exceedance of the adopted assessment criteria for the discussion and interpretation of results. Based on statistical assessment, the sediment sample results that exceeded the adopted assessment criteria are considered to be accurate and do not represent false acceptance conditions of the actual site conditions and are therefore suitable for use within the DSI. These results are assessed and discussed further in Section 9.2.

7.4 Water Conditions

7.4.1 Groundwater Levels

Prior to purging the groundwater monitoring wells on 9^{h} September 2014, an interface probe was used to dip each monitoring well location. Due to proximity to the Hunter River and the potential tidal influence, all wells were dipped consecutively. The readings were used to confirm the static water level (SWL) and total depth (TD) within each well. The elevation of the top of casing (TOC) of the monitoring well was benchmarked (mB) by Jacobs on 8th September 2014. The depth of the SWL below the top of casing (BTOC) could then be converted into mB to allow for an assessment of groundwater flow direction. The static water levels identified during the DSI are presented in Table 17 and the inferred groundwater contours are illustrated on Figure 8.

Table 17 : Groundwater Gauging Data

Well ID	Easting	Northing	TOC (mB)	SWL (mBTOC)	SWL (mB)	TD (mBTOC)	Volume (L)
MW01	32°48.707	151°41.785	10.000	1.306	8.694	2.5	2
MW02	32°48.750	151°41.832	10.110	1.221	8.889	1.8	1
MW03	32°48.773	151°41.856	10.196	1.127	9.069	2.2	2
MW04	32°48.821	151°41.822	10.631	2.17	8.461	2.8	1
MW05	32°48.940	151°41.830	10.899	1.205	9.694	3	4

Well ID	Easting	Northing	TOC (mB)	SWL (mBTOC)	SWL (mB)	TD (mBTOC)	Volume (L)
MW06	32°48.915	151°41.892	12.611	2.19	10.421	2.9	1
MW07	32°48.882	151°41.945	12.230	0.827	11.403	3.7	6
MW08	32°48.839	151°41.986	12.440	0.768	11.672	3.7	6
MW09	32°48.848	151°41.036	12.398	1.311	11.087	2.7	3
MW10	32°48.831	151°42.006	12.055	0.325	11.730	2	3
MW11	32°48.812	151°42.009	12.223	0.692	11.531	2.5	4
MW12	32°48.804	151°41.956	12.552	0.995	11.557	3	4
MW13	32°48.802	151°41.887	11.193	1.111	10.082	1.7	1

7.4.2 Water Quality Data

Field measurements of intrinsic water quality parameters were recorded during groundwater sampling using a calibrated YSI Pro Plus multi parameter meter. Parameters recorded included electrical conductivity, oxidation-reduction (redox) potential, pH, dissolved oxygen (DO; mg/L and percent saturation) and temperature.

Intrinsic water quality results are summarised in Table 18 and calibration certificates for the water quality meter are provided in 0.

Table 18 : Water Quality Indicators

Sample ID	Sample Date	Conductivity (µS/cm)	Redox Potential (mV)	pH	Dissolved Oxygen		Temp. (^{0}C)
					mg/L	(% sat)	
MW01	10 Sep 2014	19,984.0	-13.8	6.35	0.02	0.3	16.5
MW02	10 Sep 2014	26,117.0	18.5	6.06	0.01	0.1	16.3
MW03	10 Sep 2014	8,109.0	-20.1	5.85	0.23	2.5	18.0
MW04	10 Sep 2014	871.0	-29.8	6.37	0.81	8.6	17.5
MW05	10 Sep 2014	833.0	26.7	5.96	0.08	1.0	16.2
MW06	10 Sep 2014	582.7	132.2	6.07	0.01	0.2	16.9
MW07	10 Sep 2014	345.7	-57.8	6.21	0.03	0.3	18.9
MW08	9 Sep 2014	281.3	67.1	6.07	0.13	1.4	19.3
MW09	9 Sep 2014	1,673.0	101.8	6.26	1.74	18.8	18.6
MW10	9 Sep 2014	305.6	54.0	6.28	0.03	0.5	18.4
MW11	9 Sep 2014	459.2	57.3	6.50	0.80	8.5	18.3
MW12	9 Sep 2014	241.6	73.3	6.10	0.17	1.8	18.2
MW13	9 Sep 2014	809.0	106.2	6.56	1.07	11.1	17.1
W1	10 Sep 2014	7,270.0	-30.1	7.00	6.29	71.4	19.4
W2	10 Sep 2014	1,839.0	113.4	6.67	4.92	53.0	15.7
W3	10 Sep 2014	130.0	-0.6	7.65	7.48	86.1	21.8

Intrinsic groundwater monitoring results (ID's MW1 to MW13) identified the following trends:

- Low dissolved oxygen (DO) at all monitoring locations ranging between 0.1% and 18.8%

- High electrical conductivity (EC) at monitoring locations close to the river and at MW9, indicating saline conditions, the other monitoring well locations indicated relatively fresh water conditions.
- pH readings range from acidic to neutral across the site
- Redox potential readings ranged from -57.8mV to 132.2mV, indicating a mixture of reducing and oxidising conditions across the site.

Intrinsic surface water monitoring results (ID's W1 to W3) identified the following trends:

- High dissolved oxygen (DO) at all monitoring locations ranging between 53% and 86%
- High electrical conductivity (EC) at monitoring locations close to the river, indicating saline conditions, and fresher conditions towards Precinct 1.
- pH readings were neutral across the site
- Redox potential readings ranged from -30.1mV to 113.4mV, indicating a mixture of reducing and oxidising conditions across the site.

7.4.3 Groundwater Investigation Results

A total of 15 groundwater samples were submitted for laboratory analysis as part of the groundwater investigation, comprised of 13 primary samples and 2 QA/QC samples (1 blind field duplicate and 1 blind field triplicate).

The groundwater samples were analysed for the contaminants of concern listed in the DSI SAQP and Table 2 and included:

- Dissolved Heavy Metals (13 samples)
- PAH's (13 samples)
- Phenols (13 samples)
- PCB's(1 sample)
- TRH (13 samples)
- BTEX (13 samples)

Contaminant compounds in all samples analysed were detected at concentrations below the assessment criteria and/or the laboratory limits of reporting with the exception of the following (note: sample ID's that have been **bolded** indicate samples with concentrations within the decision error limits):

- Dissolved cadmium (**MW01**; MW02; MW03; **MW09**) at concentrations ranging from 0.0002mg/L to 0.0003mg/L, exceeding the ANZECC freshwater guidelines.
- Dissolved copper (MW01; MW02; **MW03**; MW04; MW05; MW08; MW09; MW10; MW11; MW12; MW13) at concentrations ranging from 0.001mg/L to 0.116mg/L, exceeding the ANZECC freshwater guidelines.
- Dissolved nickel (MW02; MW03; MW09) at concentrations ranging from 0.014mg/L to 0.041mg/L, exceeding the ANZECC freshwater guidelines.
- Dissolved zinc (MW06; MW07; MW08; MW11) at concentrations ranging from 0.01mg/L to 0.013mg/L, exceeding the ANZECC freshwater guidelines.
- Dissolved zinc (MW01; MW02; MW03; MW04; MW05; MW09; MW10; MW12; MW13) at concentrations ranging from 0.0114mg/L to 0.114mg/L, exceeding the ANZECC marine water guidelines.

The above groundwater samples that exceeded the adopted assessment criteria are illustrated in 0, Figure 9 and Figure 10. Laboratory results for groundwater samples are presented in 0, Table B4, while copies of the laboratory reports are included in 0.

In accordance with the DSI SAQP and Step 5 of the DQO process discussed in Section 3, a statistical assessment was completed for all of the sediment investigation results (presented in Table B5). The statistical assessment identified maximum concentrations that exceeded the assessment criteria by a significant margin (2

standard deviations), and compared the 95% Upper Confidence Limit (UCL) of the sample data against the assessment criteria to confirm the accuracy of the results and whether a false acceptance or false rejection condition may be present (as discussed in Section 4.6).

The statistical assessment identified 3 analytes where the maximum concentrations exceeded the adopted assessment criteria by a significant margin, these analytes included:

- Dissolved cadmium
- Dissolved copper
- Dissolved zinc

The statistical assessment also determined the 95% UCL for each of the groundwater analytes and confirmed that dissolved cadmium, copper and zinc exceeded the adopted assessment criteria and additionally dissolved nickel also exceeded the adopted assessment criteria. The 95%UCL confirmed that all results listed above that were below the assessment criteria but within the decision error limits, were found to be false rejections and as a result will be considered as an exceedance of the adopted assessment criteria for the discussion and interpretation of results.

Based on the statistical assessment, the groundwater results that exceeded the adopted assessment criteria are considered to be accurate and do not represent false acceptance conditions of the actual site conditions and are therefore suitable for use within the DSI. These results are assessed and discussed further in Section 8 and Section 9.3.

7.4.4 Surface Water Investigation Results

A total of 3 surface water samples were submitted for laboratory analysis as part of the water investigation.

The surface water samples were analysed for the contaminants of concern listed in the DSI SAQP and Table 2 and included:

- Dissolved Heavy Metals (3 samples)
- Total Heavy Metals (3 samples)
- PAH's (3 samples)
- Phenols (3 samples)
- TRH (3 samples)
- BTEX (3 samples)

Contaminant compounds in all samples analysed were detected at concentrations below the assessment criteria and/or the laboratory limits of reporting with the exception of the following (note: sample ID's that have been **bolded** indicate samples with concentrations within the decision error limits):

- Dissolved copper (**W3**) at a concentration of 0.001mg/L, which is below the ANZECC freshwater guidelines, but still within the decision error limits agreed within the DSI SAQP.
- Dissolved zinc (**W2** and W3) at concentrations of 0.008mg/L and 0.014mg/L respectively, exceeding the ANZECC freshwater guidelines.
- Dissolved zinc (W1) at concentrations of 0.038mg/L, exceeding the ANZECC marine water guidelines.
- Total copper (W2 and W3) at concentrations of 0.002mg/L and 0.01mg/L respectively, exceeding the ANZECC freshwater guidelines.
- Total zinc (**W2**) at a concentration of 0.008mg/L, exceeding the ANZECC freshwater guidelines.
- Total zinc (W1 and W3) at concentrations of 0.039mg/L and 0.017mg/L respectively, exceeding the ANZECC marine water guidelines.

The above surface water samples that exceeded the adopted assessment criteria are illustrated in 0, Figure 9 and Figure 10. Laboratory results for groundwater samples are presented in 0, Table B4, while copies of the laboratory reports are included in 0.

In accordance with the DSI SAQP and Step 5 of the DQO process discussed in Section 3, a statistical assessment was completed for all of the surface water investigation results (presented in Table B6). The statistical assessment identified maximum concentrations that exceeded the assessment criteria by a significant margin (2 standard deviations), and compared the 95% Upper Confidence Limit (UCL) of the sample data against the assessment criteria to confirm the accuracy of the results and whether a false acceptance or false rejection condition may be present (as discussed in Section 4.6).

The statistical assessment identified 1 analyte where the maximum concentrations exceeded the adopted assessment criteria by a significant margin, which was:

- Total copper

The statistical assessment also determined the 95% UCL for each of the groundwater analytes. The 95% UCL calculation confirmed that 3 analytes significantly exceeded the adopted assessment criteria, which included:

- Dissolved zinc.
- Total copper.
- Total zinc.

The 95%UCL confirmed that the dissolved copper result was a false acceptance and will not be considered to be an exceedance of the adopted assessment criteria. The remainder of the surface water results are considered not to be false rejection conditions and will therefore be assessed as exceedances of the adopted assessment criteria.

Based on the statistical assessment, the surface water results that exceeded the adopted assessment criteria are considered to be accurate and suitable for use within the DSI. These results are assessed and discussed further in Section 8 and Section 9.4.

7.5 Radiation Survey

7.5.1 Surface Radiological Survey

Surface terrestrial air kerma rates are illustrated in Figure 12 and tabulated within Appendix A.5 of the Queensland Government, Radiological Detailed Site Investigation report (Queensland Government, 2014c, 0). Terrestrial air kerma rates were identified at the site up to a maximum terrestrial air kerma rate of approximately 11,000nGy/h.

The results of the surface radiological survey may have been limited due to the following:

- Areas of Precinct 1 were observed to be capped with concrete or bitumen that can attenuate gamma radiation from underlying material. The terrestrial air kerma rates reported for these areas cannot be considered an accurate representation of material below these surface coverings.
- The site vegetation varied and included areas of no vegetation, grasses, trees and dense shrubs. This variation adds uncertainty to the reported terrestrial air kerma rates due to attenuation of gamma radiation by vegetation.
- Terrestrial air kerma rates have not been corrected for soil moisture content. Soil moisture conditions varied both throughout the site and at the different dates of surface surveying (completed on 18th December 2013, 14th April 2014, 26th & 27th September 2014) due to the prevailing weather conditions and the seasons.

Terrestrial air kerma rates have been reported within colour coded ranges (refer to Figure 12) and it is expected that the aforementioned uncertainties associated with the surface gamma survey, may result in misclassification of some data points.

Figure 11 contains a radiation dose classification map calculated from the terrestrial air kerma rates and illustrates which radiation classification level applies for an assumed occupancy of 2,000 hours per year at each measurement location. The assessment of radiation dose classifications identified six areas of the site that appeared to be in excess of the public dose limit. The areas of soil potentially impacted by radiation at surface have been described as Processed Mineral Sand Deposits for consideration within the Conceptual Site Model (refer to Section 8.3 and Figure 15).

The Worker Dose Constraint RALC level is considered to be the best practice target for workers onsite. The concentration is conservative to allow the worker to complete daily site activities and to maintain typical day-to-day external radiation exposure to sources such as X-rays, MRI's and airline travel, without exceeding the ICRP recommended member of the public dose limit. The comparison looked at a worst case scenario for a full time worker (ie. 8 hours a day, 5 days a week, 50 weeks a year) stationed at the site for a full year. The comparison (refer to Figure 13) identified some small areas within Precinct 1 and large areas of Precinct 2 that may expose workers to levels of radiation in excess of best practice.

It should be noted the worker dose constraint RALC level was designed as a conservative limit to allow the worker to continue with normal daily activities (including exposure to other external radiation sources as mentioned above) without exceeding the ICRP annual member of the public dose limit.

7.5.2 Radiological Soil Analytical Results

During the surface radiological screening event described in Section 7.5.1, six hotspots were identified with the RS220 survey meters. Queensland Government HSSA staff, collected samples from each of the six "hot spot" locations (labelled as HS1 to HS6, refer to Figure 3 for sampling locations) for the purpose of attempting to sample the most active surface material encountered. The hotspot samples may therefore be considered as the highest activity surface material as opposed to the typical material, in the respective sampling regions.

A total of 74 samples were analysed for radiology from 27 test pits. A total of 32 samples were analysed for radiology from soil bores. Gross gamma screening analysis results and derived terrestrial air kerma rates are listed in 0, Table B7. The analytical laboratory reports are provided in 0. Comparison of these results with the Test Pit soil bore logs (refer to 0) provide some understanding of the subsurface radiological characteristics of this site. A few points of note are:

- Material of enhanced radioactivity (compared to background concentrations), were present in subsurface samples.
- The greatest terrestrial derived air kerma rates for sampled subsurface material were detected at SB19/0.5m (2,854nGy/h); and at TP06/2.0m (2,453nGy/h). By comparison the six hotspot samples (surface material) had terrestrial derived air kerma rates ranging from 1,823 to 15,569nGy/h.
- Greater depth did not always result in reduced radiological content. For example test pits TP05, TP07, TP12 and TP17, where the deepest samples (at either 2 or 3mbgs) was detected at a significantly lower concentration than the previous sample (at either 1 or 2mbgs).
- Although some soil bores were sampled at both 0-0.5m and 0.5, the terrestrial derived air kerma rates were not always comparable (for example SB16, SB19 and SB22). This indicates there is a potential for significant change in radiological content over small differences in depths.
- Samples TP12/3.0, TP17/3.0, TP25/0.5-1.0 were near the base of their respective test pits and of composition that is predominantly silt and clay. Few samples of this composition were analysed as they are not likely to include mineral sands, but these were assessed as an indication of whether radionuclides are leaching from mineral sands and attaching to the upper most layer of silt and clay. Each of the above samples had terrestrial derived air kerma rates consistent with background levels and TP25 in particular had overlying material of elevated radiological content. This is suggestive that radioactivity is not leaching and subsequently accumulating in underlying silt and clay.
- Sample TP26/0.1-0.5 contained yellow/brown sand and rounded gravel, whereas TP26/0.4 was of black ash-like appearance. The reason for this difference in material despite the overlapping depths is that the test pit was wide and the ash-like material was only observed on one side of the test pit. This difference in

sample composition appears to be associated with the corresponding difference in terrestrial derived air kerma rates.

High resolution gamma spectrometry was performed on 10 samples selected for their ability to correlate gross gamma count rates with derived air kerma rate. The results are provided in 0, Table B7. The most active sample (14PX82-HS2) was collected from the proximity of test pit TP25 and had activity concentrations of 6,300 ± 300Bq/kg, 25000 ± 2,000Bq/kg and 2,000 ± 200Bq/kg for uranium-238, thorium-232 and potassium-40 respectively (uncertainties based on a 95% confidence level). This is more than the maximum in-situ survey measurement of approximately 11,000nGy/h and is due to the hotspot sampling efforts to collect the most active material, thereby providing a worst case measurement.

7.5.3 Radiological Water Analytical Results

Six groundwater samples and one surface water sample were sampled and sent for analysis at the Queensland Health, Radiological and Nuclear Sciences laboratory. The laboratory analytical results are summarised within 0, Table B8 and laboratory certificates are provided in 0.

Many radionuclides can potentially be present at the site, however based on an assessment conducted by Queensland Health the most applicable radionuclides to the site are radium-226 and radium-228. These radionuclides were selected based on their historical site usage and the relatively high dose conversion factor, which makes them preferred radionuclides for analysis and comparison with the guideline dose. Comparisons (albeit conservative ones, given that the monitoring wells are not drinking water sources) can be made with the Australian Drinking Water Guidelines (AWDG). The AWDG recommends a guideline dose of 1mSv/year apply to radioactivity in drinking water.

The highest concentration of radium 226 (50 ± 10mBq/L) and radium 228 (50 ± 30mBq/L) was detected in monitoring well MW01. The levels detected are consistent with typical background concentrations. An individual's annual dose can be estimated using the radionuclide activity concentration, annual water consumption and the radionuclide specific dose conversion factor. An individual consuming 2L/day of water from MW01, would receive approximately 0.035mSv/y, which is significantly below the recommended guideline dose of 1mSv/year.

8. Conceptual Site Model

A Conceptual Site Model (CSM) is a representation of site related information regarding contamination sources, receptors and exposure pathways. For a particular contaminant to present a risk to human receptors, these three components must be present:

- Source An entity or action which releases contaminants into the environment.
- Pathway A mechanism by which receptors can become exposed to contaminants.
- Receptors The human or ecological component at risk of experiencing an adverse response following exposure to a contaminant.

If one of these three components is missing from an exposure scenario, then there can be no risk.

Information gathered in previous investigations at the site have allowed for the development of two CSM's for contaminants and radiation sources, which have been discussed in Section 8.2 and Section 8.3.

8.1 Data gaps and uncertainties

The NEPM (2013) guidelines advise that data gap identification and uncertainty assessment are key activities in developing and refining a Conceptual Site Model during site assessment. It is, therefore, important that the CSM addresses:

- How representative the available data is likely to be?
- What the potential sources of variability and uncertainty are? and
- How important the identified gaps are to the objectives and reliability of the site assessment?

In developing the CSM, the assessor needs to distinguish between variability and uncertainty. Variability can arise (among others) from true heterogeneity in the environment such as lateral variations in soil properties or lithology or changes in contaminant levels over time and space. Uncertainty represents lack of knowledge about factors, such as contaminant levels (which may be reduced with additional investigation).

The identification of data gaps should be carried out in a logical, structured manner, to facilitate the assessment of uncertainty and the significance of those data gaps to the assessment objectives. Subsequent investigative efforts should be focussed on addressing the critical data gaps in a manner that is proportional to the uncertainties identified and results in data which is representative of the assessment area.

8.1.1 Data Gap Identification

The first site-specific issue that needs to be considered is that Jacobs will not be able to address all data gaps relevant to the assessment of contamination risks at the site. These data gaps and the reasons for their existence are:

a) **Site history data gaps**: These include, but may not be limited to:
   - Loss of corporate knowledge as workers involved in earlier operations are no longer available for interview;
   - Records of earlier site operations are not available;
   - Dangerous goods and chemical storage practices and other details are limited and unreliable;
   - Monitoring of environmental impacts from earlier mineral processing operations since the site's activities pre-dated environmental regulation in NSW;

b) **Site condition data gaps**: These include, but may not be limited to:
   - Data on the sites pre-operations background conditions since site activities pre-dated environmental regulation in NSW;

- Knowledge on infrastructure design, buried services and as-built condition may be incomplete due to loss of corporate knowledge;
- The as-constructed condition of the dewatering ponds, garnet slots and stockpile areas due to the absence of construction documentation and site records during their operational life;

c) **Contamination data gaps**: These include, but may not be limited to:

- Hot-spots in buried waste materials will be difficult to locate and characterise using discrete sampling methods due to the large area involved and the complex site history;
- Localised contamination around tanks, pits and underground structures will be difficult to identify and characterise due to site history data gaps
- Variability in the quality of materials used to cap and landscape rehabilitated areas; and
- Impacts caused by hazardous building materials present in existing structures / services, since contamination risks will need to be assessed prior to and after demolition work.

Jacobs recognise that it will not be possible or practicable to address some of these data gaps due to the cessation of site operations and loss of the associated workers knowledge. Consequently, there will remain an inherent risk of unknown contamination being present in disturbed areas of the site. The DSI aimed to identify the majority of contamination existing at the site to allow for the development of appropriate assessment and management strategies to mitigate these risks.

Background Conditions

The second site-specific issue that needs consideration is the inherent variability in background conditions that are likely to exist at the site. Anecdotal evidence suggests a large portion of the site was made of heavy mineral sands tailings, which were used to elevate the site above the flood levels.

Background conditions that are likely to show significant variability include soil quality, acid sulphate soils (ASS), potential acid sulphate soils (PASS), radiation levels, hydrogeological conditions and groundwater quality.

Another activity that may have caused contamination at the site is where (P)ASS materials have been disturbed without control measures or where control measures have failed. The generation of acidic conditions may cause the liberation and mobilisation of metals in groundwater within the subsurface that have not been picked up by the DSI intrusive site works.

8.1.2 Data Gap and Uncertainty Assessment

An assessment of the existing data gaps identified in Section 8.1.1 and appropriate management options are includes the following:

a) **Site history data gaps**:

- Due to the cessation of operations at the RZM site in the mid 1990's, locating recent records of historical operations at the site is difficult to achieve. Jacobs have relied on the completion of records searches and reviews of available site decommissioning reports to develop the CSM.
- Data gaps in the site history will likely remain. The sampling strategy implemented during the DSI was designed in general conformance to the requirements of a judgemental sampling strategy in accordance with the NSW EPA, Sampling Design Guidelines. However, the following information has contributed to the predictability of contaminant types and distribution across the site:
    - a strong understanding of the former operations at the site
    - the location of previous potential contaminating activities
    - the potential contaminants of concern,
    - the potential exposure pathways and the sensitive receptors.

the weight of evidence as outlined in the Jacobs PSI report (2013) supports the use of a judgemental sampling pattern, as justified under the Guidelines, based on the strong understanding of site history and previous activity locations.

b) **Site condition data gaps**:

- Assess conditions by obtaining data on undisturbed areas within the site and/or in nearby off-site areas having similar geology (eg HSSA February 2014, Background and Demolition & DSI Planning Radiological Survey) and subsequent DSI activities described in this report;
- Review and assess documentation describing present conditions in mined and rehabilitated areas;

c) **Contamination data gaps**:

- Utilise the CSM to identify all potential contaminant sources and Areas of Environmental Concern (AECs) based on site history and conditions, and exposure pathways and receptors;
- Develop Data Quality Objectives (DQOs) appropriate for the site (refer to Section 3); and
- Assess existing data variability and uncertainty (refer to Section 7).

8.2 Contaminant Conceptual Site Model

8.2.1 Source

Based on the results of the DSI detailed within Section 7, the following contamination sources have been identified at the site:

- Hydrocarbons were detected within soils at the surface in the vicinity of the former transformer location adjacent to Building 4.
- Potential acid sulphate soils were confirmed to be present across the site.
- Metals were detected in river and drainage line sediment samples at locations close the Hunter River.
- Dissolved metals were found in excess of guidelines at all monitoring well locations.
- Dissolved and total metals were found in excess of guidelines at all surface water sampling locations.

Previously identified contamination sources, which have not been assessed as part of the DSI include:

- The site is currently unused. The site is fenced off at the front of the site along the Pacific Highway to discourage trespassers, however the western site boundary with Lot 102 is unfenced, while the eastern site boundary with Lot 51 is fenced with cattle fencing.
- Previous investigations indicate the presence of hazardous building materials within and outside the derelict buildings including asbestos cement sheeting (ACM), synthetic mineral fibres (SMF), Polychlorinated biphenyl (PCBs, from old light fittings) and lead based paints (LBP).

8.2.2 Exposure Pathways

The potential exposure pathways are identified by Jacobs to be:

- Dermal contact and incidental ingestion of impacted soils / groundwater / ponded water
- Inhalation of impacted dust generated by shallow soils
- Migration of contamination down to the shallow groundwater aquifer. The highest potential beneficial use of groundwater in the vicinity of the Site is potable non-domestic use, garden irrigation, stock watering and protection of freshwater ecosystems.
- Migration of contamination associated with surface water runoff.

8.2.3 Receptors

The potential receptors are identified by Jacobs as being:

- Construction workers conducting excavation operations at the site during the Highway upgrade activities.
- Demolition workers removing site buildings and remnant infrastructures.
- Trespassers that are entering the Site
- The beneficial use of groundwater extracted from bores in the local area, which include domestic non-potable use, livestock watering and irrigation, including from the groundwater bore in the north-east corner of the site.
- Flora and fauna on the Site and in surrounding land. Receptors would include all vegetation communities identified during the biodiversity investigation; and animals confirmed throughout the site investigation including (but not limited to) ground burrowing animals (rabbits, snakes), benthic organisms (crabs), birds, grazing animals, and fish life
- The freshwater/marine aquatic ecosystems located in the Hunter River located to the north-west of the Site.

8.2.4 Contaminant Qualitative Risk Assessment

The important exposure scenarios described in Section 8.2.1 to Section 8.2.3 are assessed within Table 19 and illustrated in 0, Figure 14.

Table 19: Contaminants Qualitative Risk Assessment

Sources	Pathway	Receptor	Comments	Relative Risk
Hydrocarbon contamination in of surface soils near Building 4	Dermal contact, ingestion or inhalation	Construction workers; demolition workers; illegal trespassers; flora/fauna	Concentrations of hydrocarbons were detected at levels exceeding the assessment criteria in the area surrounding the former electrical transformer location (adjacent to Building 4), confined to surface areas (<0.5m deep). Any ground disturbance of the impacted area may create an exposure pathway for humans to contact and possibly ingest or inhale impacted materials. As the concentrations within the surface soils exceed the TPH Management Limits, but is relatively localised and confined to surface layers, the risk to workers and the surrounding environment is considered to be moderate. The removal of the impacted area will reduce the ongoing risk of exposure to workers in the future, but may present a risk to workers during the removal of impacted materials. Where possible during the removal of the impacted soils, workers should stand up-wind and if odours become overpowering, the area should be vacated to allow the odours to disperse. Excavated materials should be screened onsite to ensure all impacted soils have been removed. The resultant excavation should be sampled to validate the excavation as being clean. Any excavated material should be land farmed within a bunded, lined and covered area and should be sampled and classified for offsite disposal. At the completion of the above remediation works the ongoing risk of human exposure to contamination at the site will reduce to low.	Moderate
	Dust migration	Construction workers; demolition workers; general public; illegal trespassers; flora/fauna	Concentrations of hydrocarbons were detected at levels exceeding the assessment criteria in the area surrounding the former electrical transformer location (adjacent to Building 4), confined to surface areas (<0.5m deep). Any ground disturbance of the impacted area may cause impacted soils to become airborne as dust. Due to the relatively small area that is impacted and the hard surface covering (asphalt) above the majority of impacted materials, the risk to humans is considered to be low. During the excavation of impacted materials discussed above, suitable controls should be in place to maintain appropriate dust levels.	Low
	Groundwater flow	Groundwater bodies	The hydrocarbon contamination detected within the surface soils was not observed in any of the monitoring wells throughout the DSI. As a result the risk of hydrocarbon contamination of groundwater's is considered to be low.	Low
	Surface water flow	Off-site water bodies	The hydrocarbon contamination detected within the surface soils was not observed in any of the surface water samples	Low

Sources	Pathway	Receptor	Comments	Relative Risk
			throughout the DSI. As a result the risk of hydrocarbon contamination of surface waters, are considered to be low.	
Potential acid sulphate soils across the site	Dermal contact, ingestion or inhalation	Construction workers; demolition workers; illegal trespassers; flora/fauna; surrounding environment.	Soil samples across the site identified potential acid sulphate soils (PASS) occurring below the current groundwater table. In its current location (ie below groundwater) the PASS materials are considered to be a low risk. However any ground disturbance works such as excavation activities during the Highway construction that may remove PASS material from below the groundwater table, allowing the materials to oxidise and release acid sulphates, would be considered to be a moderate risk. Human dermal contact with ASS materials containing high concentrations of acids and/or metals can cause skin irritation and dermatitis. Prior to conducting any excavation activities that would extend near to or below the groundwater table at the site, an acid sulphate management plan (or equivalent) should be prepared that would outline suitable mitigation measures to ensure protection of workers.	Moderate
	Dust migration	Construction workers; demolition workers; general public; illegal trespassers; flora/fauna	Soil samples across the site identified potential acid sulphate soils (PASS) occurring below the current groundwater table. In its current location (ie below groundwater) the PASS are considered to be a low risk. However any ground disturbance works such as excavation activities during the Highway construction that may remove PASS material from below the groundwater table, allowing the materials to oxidise and release acid sulphates, would be considered to be a moderate risk. The creation of any PASS stockpiles will increase the potential for dust to be released from disturbed ASS materials, which can irritate eyes. Prior to conducting any excavation activities that would extend near to or below the groundwater table at the site, an acid sulphate management plan (or equivalent) should be prepared that would outline suitable mitigation measures for any stockpiled material to minimise the potential for dust migration.	Moderate
	Groundwater flow	Groundwater bodies; surrounding flora/fauna.	Soil samples across the site identified potential acid sulphate soils (PASS) occurring below the current groundwater table. In its current location (ie below groundwater) the PASS are considered to be a low risk. However any ground disturbance works such as excavation activities during the Highway construction that may remove PASS material from below the groundwater table, allowing the materials to oxidise and release acid sulphates, would be considered to be a moderate risk. Once acid sulphates have been released from the soil, they can mix with water and potentially infiltrate back to the groundwater dropping the pH and potentially impacting the surrounding flora and fauna. Prior to conducting any excavation activities that would extend near to or below the groundwater at the site, an acid sulphate management plan (or equivalent) should be prepared that would outline suitable mitigation measures to prevent the release of acid sulphates to groundwater's from any excavated materials.	Moderate
	Surface water flow	Off-site water bodies	Soil samples across the site identified potential acid sulphate soils (PASS) occurring below the current groundwater table. In	Moderate

Sources	Pathway	Receptor	Comments	Relative Risk
			its current location (ie below groundwater) the PASS are considered to be a low risk. However any ground disturbance works such as excavation activities during the Highway construction that may remove PASS material from below the groundwater table, allowing the materials to oxidise and release acid sulphates, would be considered to be a moderate risk. Once acid sulphates have been released from the soil, they can mix with water and potentially migrate via surface water exposure causing the pH to fall and potentially impacting the surrounding flora and fauna. Prior to conducting any excavation activities that would extend near to or below the groundwater table at the site, an acid sulphate management plan (or equivalent) should be prepared that would outline suitable mitigation measures to prevent the release of acid sulphates to surface waters from any excavated materials.	
Heavy metal contamination of river and drainage line sediments	Dermal contact, ingestion or inhalation	Construction workers; general public; surrounding flora/fauna.	Concentrations of heavy metals in river sediments samples were detected at levels exceeding the ecological assessment criteria, but were below the human health investigation levels. As a result the risk to construction workers or the general public is considered to be low. Flora and fauna (mangroves and benthic creatures) were observed along the river banks and within the lower portion of the site drainage line and may therefore be impacted by the nickel concentrations and the risk is therefore considered to be moderate. The proximity of the impacted areas to the banks of the Hunter River increases the risk to general members of the public who may be fishing and/or laying crab traps in the impacted area. Access to the area for fishing and/or laying of crab traps should be restricted to the extent possible by erecting a suitable fence around the impacted area. An assessment of the nature and extent of heavy metals contamination in the river sediments and surrounding area may be necessary to ensure public health and that of the surrounding environment is maintained. Any ground disturbance activities undertaken within the impacted area must consider the handling and fate of potential heavy metals impacts, so as not to exacerbate existing levels.	Moderate
	Dust migration	Flora/fauna	Concentrations of heavy metals in river sediments samples were detected at levels exceeding the ecological assessment criteria. As ground disturbance activities are not expected within the impacted sediments, the liberation of metal impacted dust is considered to be a low risk, but should be considered and managed if any ground disturbance works are completed.	Low
	Groundwater flow	Groundwater bodies	The presence of heavy metals within the river sediments may infiltrate to the groundwater table and migrate via groundwater flows. Further discussion of the potential risks associated with heavy metals in groundwater flows, are included in the following section.	**High**
	Surface water flow	Off-site water bodies	The presence of heavy metals within the river sediments may migrate via surface water flows. Further discussion of the potential risks of heavy metal migration via surface water flows, are included in the following section.	**High**

Sources	Pathway	Receptor	Comments	Relative Risk
Dissolved heavy metals in groundwater	Dermal contact, ingestion or inhalation	Construction workers	Concentrations of dissolved heavy metals were detected at levels exceeding the assessment criteria within the groundwater across the Site, with the highest concentrations located within the operational area and down gradient of the dewatering ponds. The impacted groundwater may be encountered by construction workers during construction activities at the site for the highway upgrade. As a result the workers should be made aware of the potential contamination issues and have suitable management measures in place to control potential exposure (such as good hygiene practices). If suitable management measures are prepared and communicated to the workforce prior to commencing ground disturbance activities, the risk would be considered to be low.	Low
	Groundwater flow	Extracted bore water; Hunter River; members of the general public.	Concentrations of dissolved heavy metals were detected at levels exceeding the assessment criteria within the groundwater across the Site, with the highest concentrations located within the operational area and down gradient of the dewatering ponds. Concentrations were detected at levels exceeding the assessment criteria at multiple site boundaries indicating potential offsite migration into sensitive environments (eg. Hunter River). As a result the risk of the groundwater impact to the surrounding environment is considered to be high. Until the condition of the groundwater can be confirmed to be within acceptable limits, all water extraction from groundwater bores within the vicinity of the site should be stopped. An assessment of potential remedial options for the treatment of the dissolved heavy metals within the groundwater should be undertaken to allow for suitable treatment.	**High**
	Surface water flow	Off-site water bodies	The presence of heavy metals within the groundwater may be brought to the surface during ground disturbance activities and may potentially migrate via surface water flows. Further discussion of the potential risks associated with heavy metals in surface water flows, are included in the following section.	**High**
Total and dissolved heavy metals in surface waters	Dermal contact, ingestion or inhalation	Construction workers; Demolition workers; flora/fauna	Concentrations of total and dissolved heavy metals were detected at levels exceeding the assessment criteria within the surface waters at the Site. During demolition and construction works at the site, workers could potentially be exposed to the impacted waters. As a result the workers should be made aware of the potential contamination issues and have suitable management measures in place to control potential exposure (such as good hygiene practices). If suitable management measures are prepared and communicated to the workforce prior to commencing ground disturbance activities, the risk would be considered to be low. Animals that have been observed to occupy the site may also ingest the surface water impacted by heavy metals. The risk to animals is considered to be moderate as there are currently no controls to limit the potential exposure for the animals.	Moderate
	Groundwater flow	Groundwater bodies	The presence of heavy metals within surface waters may infiltrate to the groundwater table and migrate via groundwater flows. Further discussion of the potential risks associated with heavy metals in groundwater flows, were included in the previous section.	**High**

Sources	Pathway	Receptor	Comments	Relative Risk
	Surface water flow	Off-site water bodies	Concentrations of total and dissolved heavy metals were detected at levels exceeding the assessment criteria within surface waters across the Site, with the highest concentrations located within the drainage line closest to the Hunter River without any controls between the drainage line and the river indicating potential offsite migration into sensitive environments (eg. Hunter River). As a result the risk of the surface water impact to the surrounding environment is considered to be high. Until the condition of the surface water can be confirmed to be within acceptable limits, controls should be installed to limit, as much as possible, the potential for animals to consume the impacted surface waters (eg installation of secure fencing; extraction of ponded water). An assessment of potential remedial options for the treatment of the total and dissolved heavy metals within the surface water should be undertaken to allow for suitable treatment.	**High**

8.3 Radiation Conceptual Site Model

8.3.1 Source

Based on the results of the DSI detailed within Section 7, the following contamination sources relating to radiation has been identified at the site:

- Processed mineral sand deposits at the site, generally within surface soils (<1m).
- Processed mineral sand deposits at the site, within deeper soils (>1m)

8.3.2 Exposure Pathways

The potential exposure pathways are identified by Jacobs to be:

- Exposure to external gamma radiation from impacted shallow soils / shallow groundwater / ponded water
- Inhalation of airborne radon and its decay products generated by impacted shallow soil

8.3.3 Receptors

The potential receptors are identified by Jacobs as being:

- Construction workers conducting excavation operations at the site during the Highway upgrade activities.
- Demolition workers removing site buildings and remnant infrastructures.
- Trespassers that are entering the Site
- Flora and fauna on the Site and in surrounding land. Receptors would include all vegetation communities identified during the biodiversity investigation; and animals confirmed throughout the site investigation including (but not limited to) ground burrowing animals (rabbits, snakes), benthic organisms (crabs), birds, grazing animals, and fish life
- The freshwater/marine aquatic ecosystems located in the Hunter River located to the north-west of the Site.

8.3.4 Radiation Qualitative Risk Assessment

The important exposure scenarios described in Section 8.3.1 to Section 8.3.3 are assessed within Table 20 and illustrated in 0, Figure 15.

Table 20: Radiation Qualitative Risk Assessment

Sources	Pathway	Receptor	Comments	Relative Risk
Surface Radiation	Dermal contact, ingestion or inhalation	Construction workers; demolition workers; illegal trespassers; flora/fauna	Some areas of the site surface were identified to have radiation dose levels that would exceed the recommended Public Dose Limits set by the International Commission on Radiological Protection (ICRP). Soils deeper within the site (ie >1m) were also detected above ICRP recommended doses for members of the public (up to a maximum depth of 3m); however the majority of exceedances were detected in surface soils. Any exposure to the impacted soils for prolonged periods may increase the potential impacts. The calculated dose levels were based on an assumed exposure of 2,000 hours (standard 40hr work week, 50 weeks a year). It is possible (though unlikely) that construction workers may work at the site in excess of the ICRP recommended dose levels, while members of the public and demolition workers would be unlikely to be exposed to 2,000 hours at the site. Flora and fauna would be exposed to the elevated radiation levels at the site and as a result the risk of surface radiation via dermal contact is considered to be High. The removal of the areas with elevated radiation levels from locations currently outside the site boundary onto the site, will reduce the ongoing risk of exposure to members of the public. The management of surface radiation at the site must be considered in terms of the potential for workers on the site in the future, potential trespassers, and flora and fauna present at the site. An excavated materials management plan should be developed prior to moving impacted materials onsite. As a minimum the Excavated Materials Management Plan should consider the characteristics of the disposal site and any mitigation measures required to minimise potential effects of radiation to future site workers.	**High**
	Dust migration	Construction workers; demolition workers; general public; illegal trespassers; flora/fauna	Some areas of the site surface were identified to have radiation dose levels that would exceed the recommended Public Dose Limits set by the International Commission on Radiological Protection (ICRP). Any ground disturbance of the impacted area may cause impacted soils to become airborne as dust increasing the potential for exposure to workers onsite and the surrounding area. Works at the site are likely to cause ground disturbance and as a result the risk of radiation exposure via dust migration is considered to be moderate. During the excavation of impacted materials discussed above, suitable controls should be in place to maintain appropriate dust levels and minimise migration and potential exposure as much as possible.	Moderate

9. Summary Discussion

The following summary discussion comments are based on the review of available information, site inspections, analytical results at the locations tested and the QRA.

9.1 Soil

Concentrations of contaminants within soil samples were detected at levels in excess of the adopted assessment criteria for the following two contaminant categories:

- Hydrocarbons exceeded the TPH management limits in surface soils surrounding the former transformer location, adjacent to former Building 4; and
- Acid sulphate soils exceeded the action level criteria at the majority of locations sampled across the site.

The remainder of samples and analytes were either below the laboratories limit of detection, or below the adopted assessment criteria for the respective analytes.

9.2 River and Drainage Sediments

Concentrations of nickel were detected in excess of the ecological investigation levels in shallow sediments along the river foreshore and in the lower portions of the off-site drainage line. The proximity of the sampling locations to the Hunter River and the absence of nickel exceedances within the RZM site may indicate that the source of the nickel concentrations is not the RZM site. However due to the proximity of a sensitive receptor such as the Hunter River and the potential impact on the surrounding environment further investigation of the nature and extent of the impact may be recommended.

The remainder of samples and analytes were either below the laboratories limit of detection, or below the adopted assessment criteria for the respective analytes.

9.3 Groundwater

Dissolved heavy metals were detected exceeding the adopted criteria at all locations throughout the RZM site. A summary of the findings for each heavy metal is provided below:

- Dissolved cadmium – concentrations were detected at locations adjacent to the drainage line and at the up-gradient location MW09. The remainder of dissolved cadmium concentrations the site did not exceed the nominated investigation levels and may therefore represent the natural background conditions.
- Dissolved copper – concentrations were detected at significantly elevated concentrations surrounding MW09 in an up-gradient location. Other exceedances were detected within the operational area of Precinct 1 and along surface drainage lines, possibly indicating impacts that may have originated from site historical operations.
- Dissolved nickel – concentrations were detected at locations adjacent to the drainage line and at the up-gradient location MW09. The remainder of dissolved nickel concentrations at the site did not exceed the assessment criteria and may therefore the represent natural background conditions.
- Dissolved zinc – concentrations of zinc were detected exceeding the assessment criteria at every monitoring well location, indicating background conditions may already exceed the adopted assessment criteria. However concentrations of zinc were also detected at significantly higher concentrations (by an order of magnitude, or close to) than the natural background conditions. These significantly higher readings were detected within the operational area near the former UST farm (possibly impacted by the imported fill used to backfill the excavation), upstream of the weir within the drainage line and at the river interface.

The remainder of samples and analytes were either below the laboratories limit of detection, or below the adopted assessment criteria for the respective analytes.

9.4 Surface Water

Total and dissolved heavy metals were detected in each of the surface water sampling locations tested at the RZM site. A summary of the exceedances and the findings is provided below:

- Copper – concentrations of dissolved copper were detected slightly above the laboratory limits of reporting but within the decision error limits, for the ponded surface water adjacent to former Building 2. However the total copper concentration at the same location was detected significantly above the respective investigation criteria. Total copper was also detected above the assessment criteria up-stream of the drainage line weir. The high total copper concentration and lower dissolved copper concentrations indicates the copper contamination is likely to be associated with the suspended solids within the ponded water and the location of the two samples indicate the impact is likely to have been sourced from the RZM site.
- Zinc – concentrations of total and dissolved zinc were detected above the assessment criteria at all surface water monitoring locations. The dissolved concentrations of each sample were either equal to or slightly below the total concentration for the respective samples. The comparatively close results, indicates the zinc concentrations detected are associated with dissolved waters and may therefore be more mobile. The highest concentrations were detected within the drainage line close to the Hunter River.

The remainder of samples and analytes were either below the laboratories limit of detection, or below the adopted assessment criteria for the respective analytes.

9.5 Radiation

The presence of localised hotspots (areas of elevated dose rates relative to surrounds) demonstrates the inhomogeneity of radiological contaminants. Furthermore, some subsurface samples had greater radiological concentrations at depth, which shows potential for surface exposure rates to be increased if site activities bring this material to the surface. Collectively, the surface gamma radiation survey and sample analysis results confirm that radiological contaminants are present across a broad portion of the site and with varying spatial density and mineralogy.

Water sampled from monitoring wells was analysed for radium-226, radium-228, uranium-238, thorium-232 and potassium-40 and had low levels of the analysed radionuclides, such that the dose to an individual consuming 2L/day is significantly below the Australian Drinking Water Guidelines recommendation of 1 mSv/y.

10. Conclusions

Based on the combined results of the DSI and associated previous assessment works, the following conclusions are made:

- The site is proposed to be partially redeveloped as part of a highway upgrade.
- The site may be used as a construction works compound during the upgrade.
- There is contamination in soils, sediment, groundwater and surface water on the site in excess of the applied criteria.
- The DSI surface measurements for radiation provide excellent site coverage across the majority of the site and the site boundaries.
- In its current state, the sealed, vegetated and vacant site conditions do not provide a complete exposure pathway to humans to residual contamination, provided that site security measures are effective in restricting site access.
- A change of site usage conditions as a construction compound may provide an exposure pathway to residual contamination
- A change of site usage conditions as a highway upgrade construction site may provide an exposure pathway to residual contamination
- Construction activities may alter ground conditions, contaminant behaviour and migration from the currently understood status
- The sealed and vegetated nature of surface conditions across the site is providing an effective means of reducing the generation and migration of dust and shallow soils
- Metals in groundwater and surface water may be migrating off site towards the Hunter River
- Metals and elevated levels of measured radioactivity in sediments in drains and at the foreshore of the site may be posing an exposure risk to aquatic receptors
- Elevated radiation dose rates in soils at surface need management to be protective of humans.
- Demolition works associated with former Building 7 (Administration block) and former Building 8 (Potting shed) included the combined, bulk demolition of asbestos and other building materials, and the bulk removal of asbestos containing building materials along with general building materials, and this may have contributed to previously undetected asbestos contamination in soils in these areas.
- Further consideration is required in order to assign likelihood, severity and risk parameters in terms of potential consequences of contamination on site.
- Jacobs consider it likely that the site would trigger formal notification to the NSW EPA under Section 60 of the Contaminated Land Management Act (1997), based on off-site identification of contamination in the road verge and in foreshore sediment

11. Recommendations

Based on the above conclusions, the following recommendations are made:

- An Interim Site Management Plan is recommended for the immediacy to control access to the site and to establish other controls as necessary.
- Additional monitoring of groundwater and surface water is recommended to establish trends and support predictions that will be required for future site management.
- Additional studies are recommended to calculate estimates for the depths and volumes of contaminated soil and to support remedial design options.
- In-situ waste classification studies in accordance with *NSW EPA Waste Classification Guidelines Part 3: Waste Containing Radioactive Material (2008)* is recommended to allow decisions relating to site future highway construction works and remedial design decisions.
- A Pre-Construction Land Condition Assessment Report is completed for the site in accordance with the *NSW RMS Environmental Procedure – Management of Wastes on Roads and Maritime Services Land (2014).*
- A risk assessment study is undertaken in line with the *CRCCare Technical Report no.16 – Safe on-site retention of contaminants Part 2: A risk-based approach (2013)*.

On the basis of the data that has been gathered during the combined contamination assessments, and subject to fulfilment of remaining data gaps, Jacobs consider that the site can be successfully managed and remediated to a standard that will allow construction of a highway upgrade, from a contamination perspective.

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Appendix A. Figures

Figure 1: Site Locality Plan

Figure 2: Precinct 1 (Built Area) Sampling Locations

Figure 3: Precinct 2 (Ponds and Stockpiles) Sampling Locations

Figure 4: Radiation Boundary Monitoring Locations

Figure 5: Soil Investigation Results (Precinct 1)

Figure 6: Soil Investigation Results (Precinct 2)

Figure 7: Combined XRF Screening Results

Figure 8: Groundwater Contour Plan

Figure 9: Water Investigation Results (Precinct 1)

Figure 10: Water Investigation Results (Precinct 2)

Figure 11: Radiation Dose Classification Levels

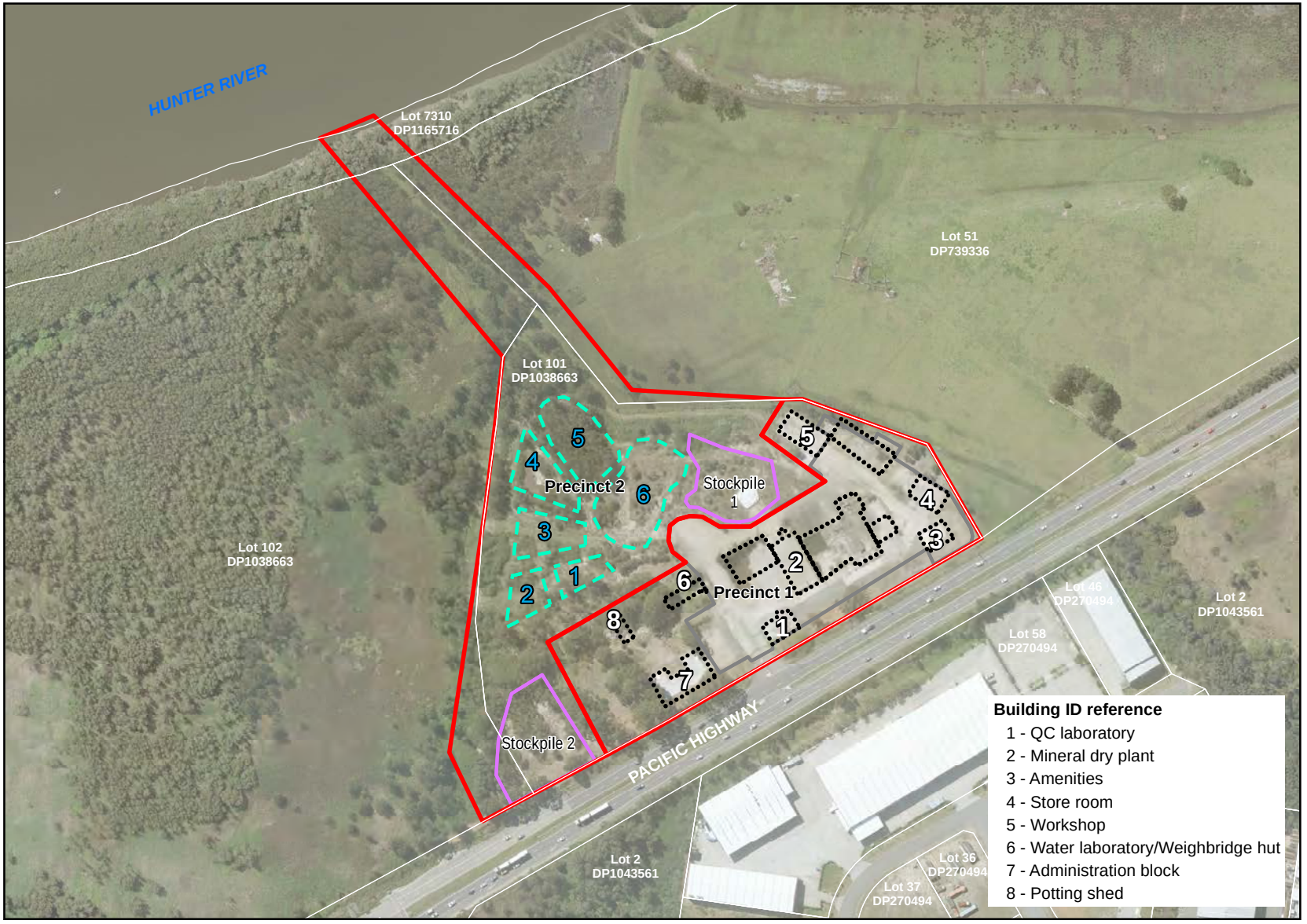
Figure 12: Radiation Terrestrial Air Kerma Rates

Figure 13: Radiation Worker Dose Exceedances

Figure 14: Contaminant Conceptual Site Model

Figure 15: Radiation Conceptual Site Model

FIGURE 1 | SITE LOCALITY PLAN



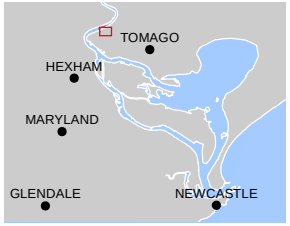
LEGEND

- Building ID
- Dewatering pond ID
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries

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DATA SOURCES
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JACOBS 2014

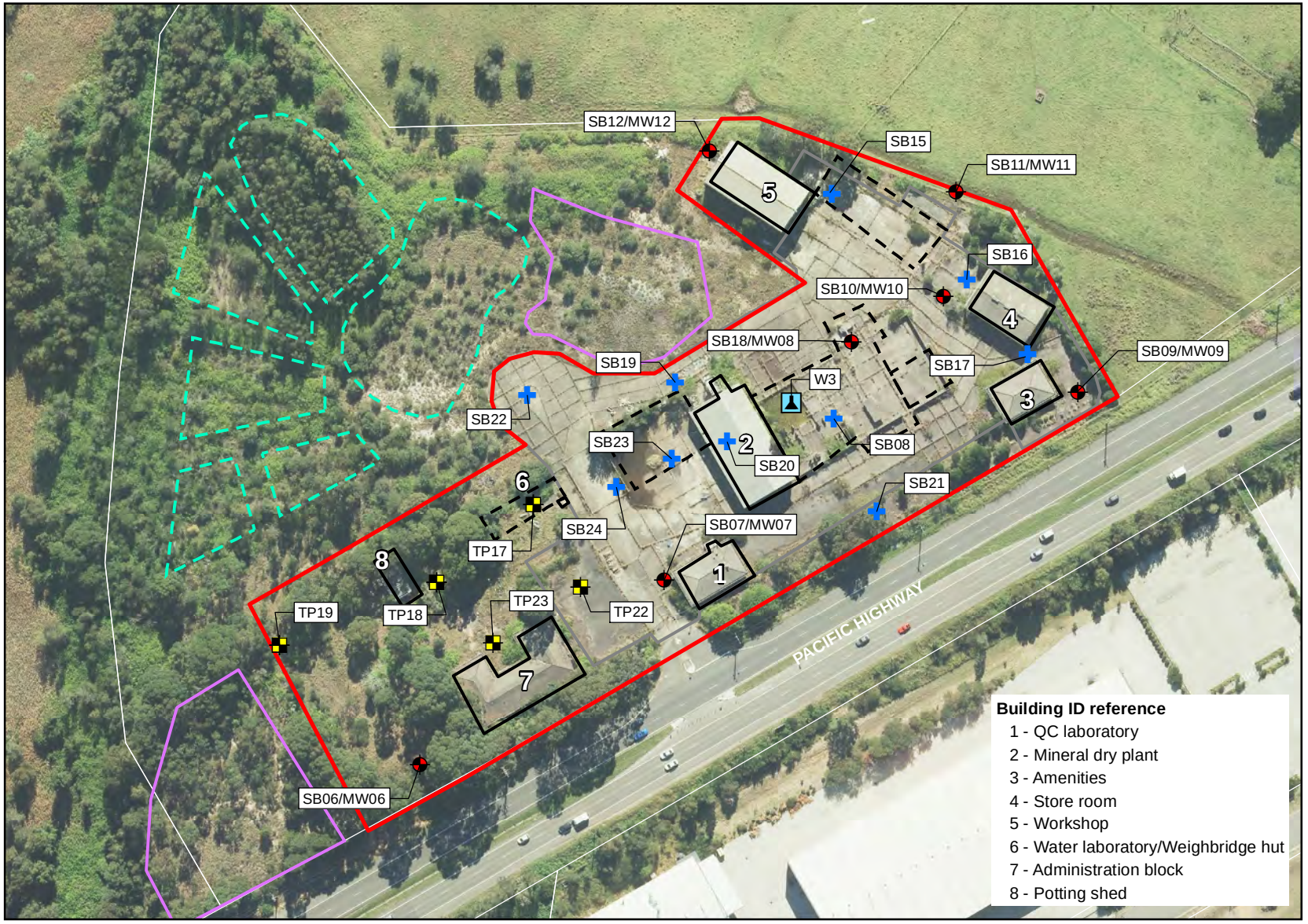
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FIGURE 2 | PRECINCT 1 (BUILT AREA) SAMPLING LOCATIONS



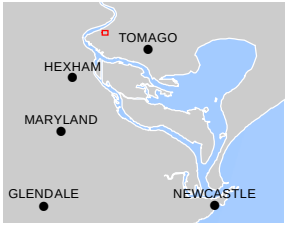
LEGEND

- Building ID
- Monitoring Well
- Soil Bore
- Surface Water Sample
- Test Pits
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Boundary of Precinct 1

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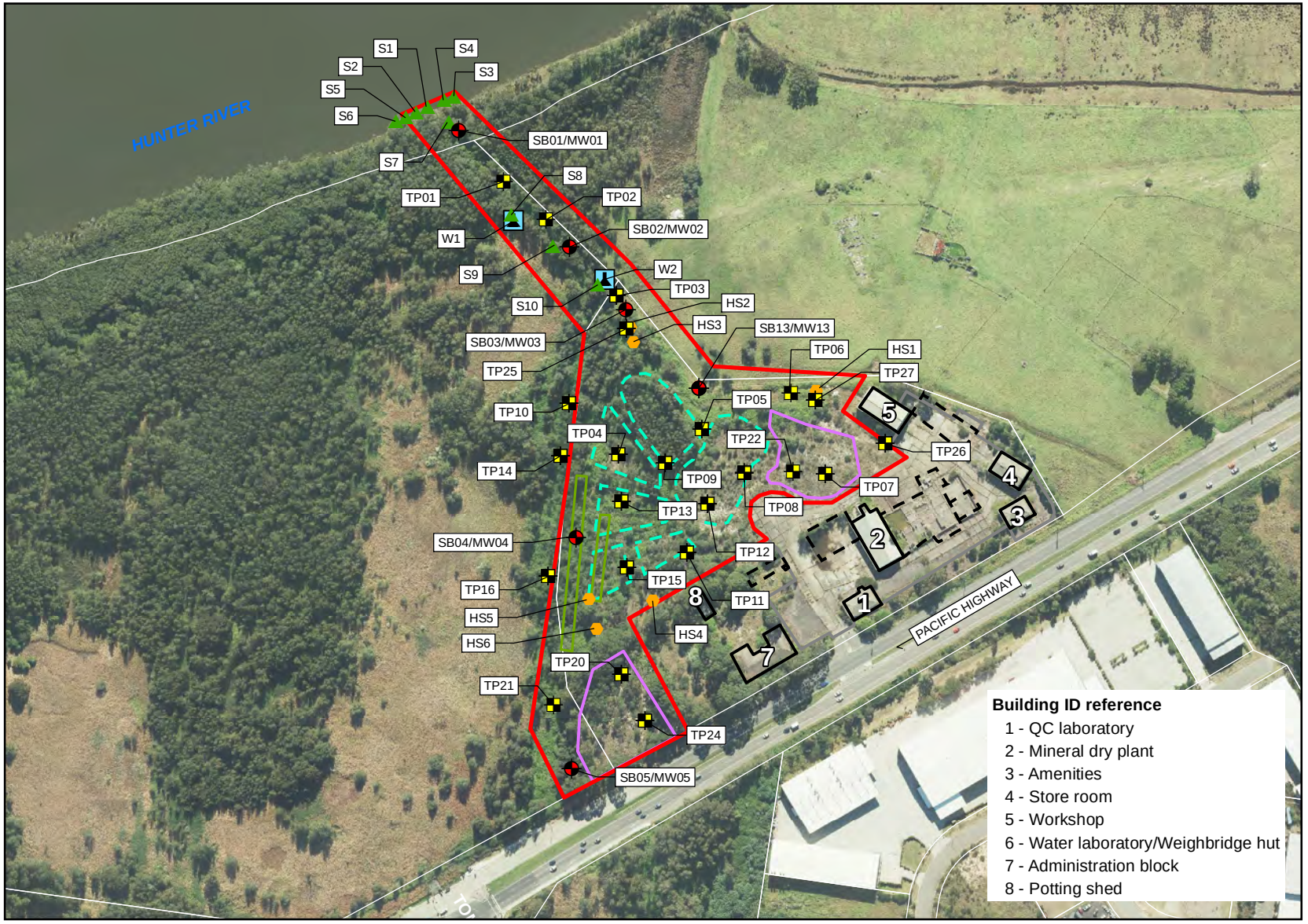
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Checked by : GM

FIGURE 3 | PRECINCT 2 (PONDS AND STOCKPILES) SAMPLING LOCATIONS



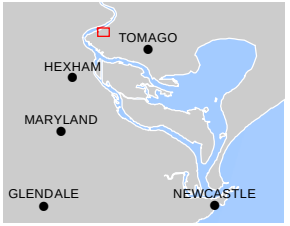
LEGEND

- Building ID
- Hotspot Sample
- Monitoring Well
- Sediment Samples
- Surface Water Sample
- Test Pits
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Garnet slots
- Boundary of Precinct 2

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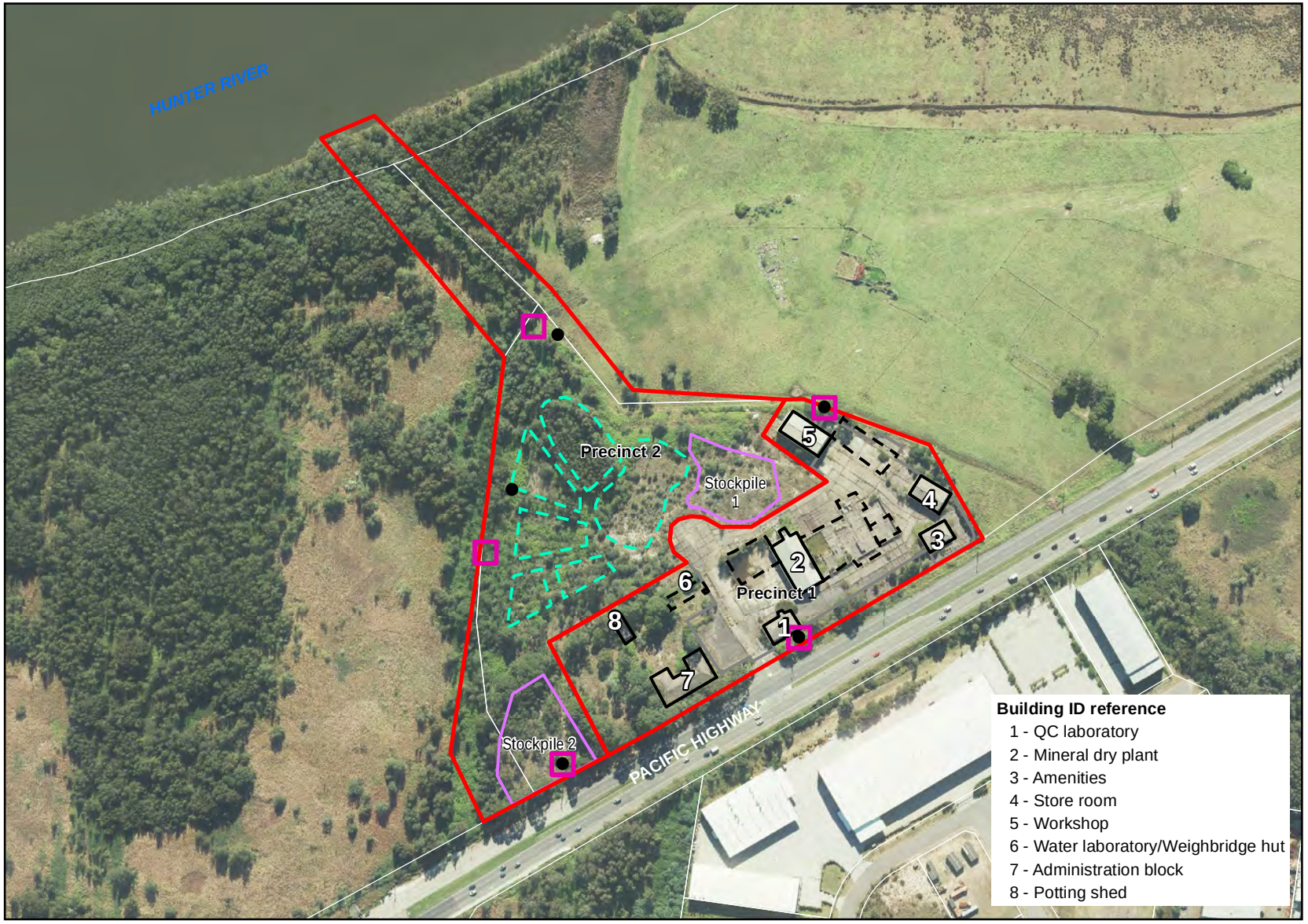
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FIGURE 4 | RADIATION BOUNDARY MONITORING LOCATIONS



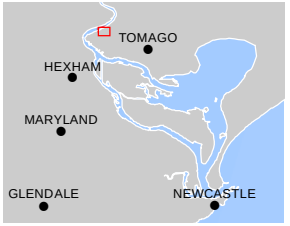
LEGEND

- Building ID
- Baseline Passive Radiation Monitoring Location
- Construction Passive Radiation Monitoring Location
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries

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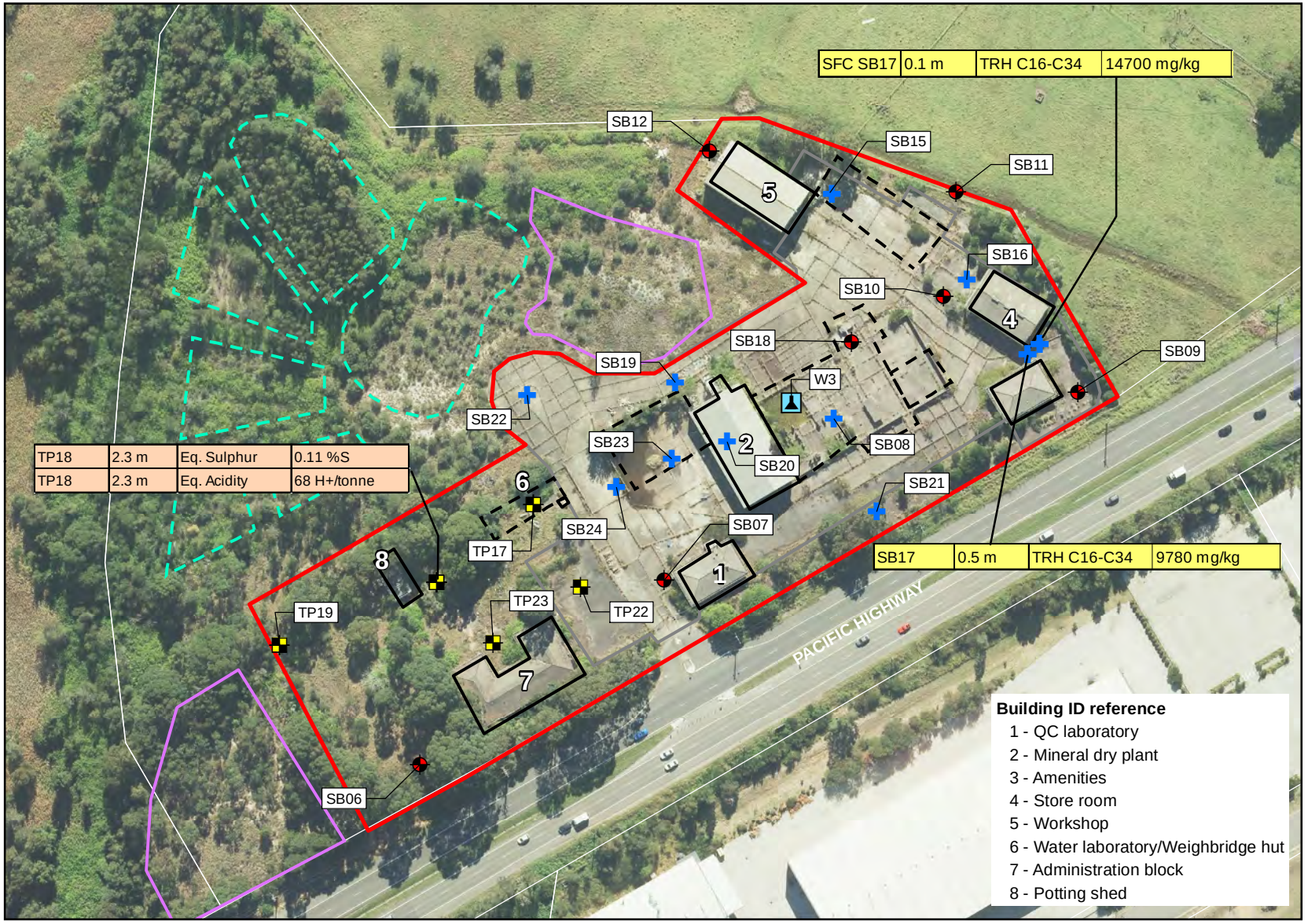
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FIGURE 5 | SOIL INVESTIGATION RESULTS - PRECINCT 1 (BUILT AREA)



Building ID reference

1 - QC laboratory
2 - Mineral dry plant
3 - Amenities
4 - Store room
5 - Workshop
6 - Water laboratory/Weighbridge hut
7 - Administration block
8 - Potting shed

LEGEND

- Building ID
- Monitoring Well
- Soil Bore
- Surface Water Sample
- Test Pits
- Boundary of Precinct 1

[D] NEPM 2013, Table 1B(6)-(7) ESL and TPH Mgt

Sample Location	Depth	Analyte	Concentration

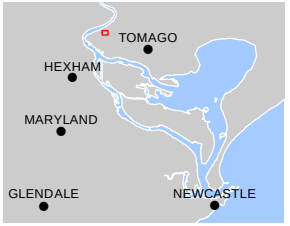
[E] QASSIT

Sample Location	Depth	Analyte	Concentration

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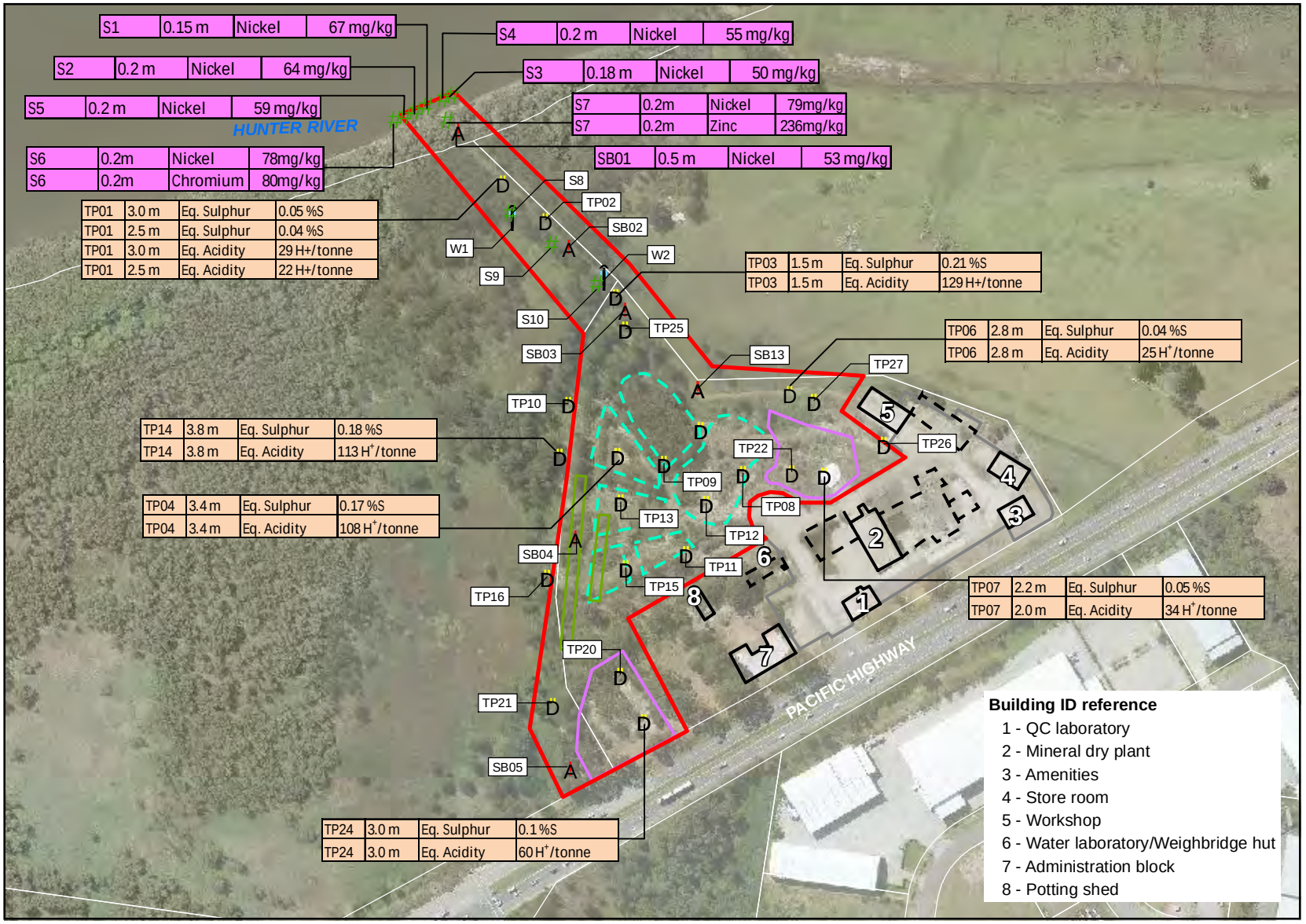
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FIGURE 6 | SOIL INVESTIGATION RESULTS - PRECINCT 2 (PONDS AND STOCKPILES)



LEGEND

- Building ID
- Monitoring Well
- Sediment Samples
- Surface Water Sample
- Test Pits
- Garnet slots
- Boundary of Precinct 2

ANZECC/ARMCANZ ISQG

Sample Location	Depth	Analyte	Concentration

QASSIT

Sample Location	Depth	Analyte	Concentration

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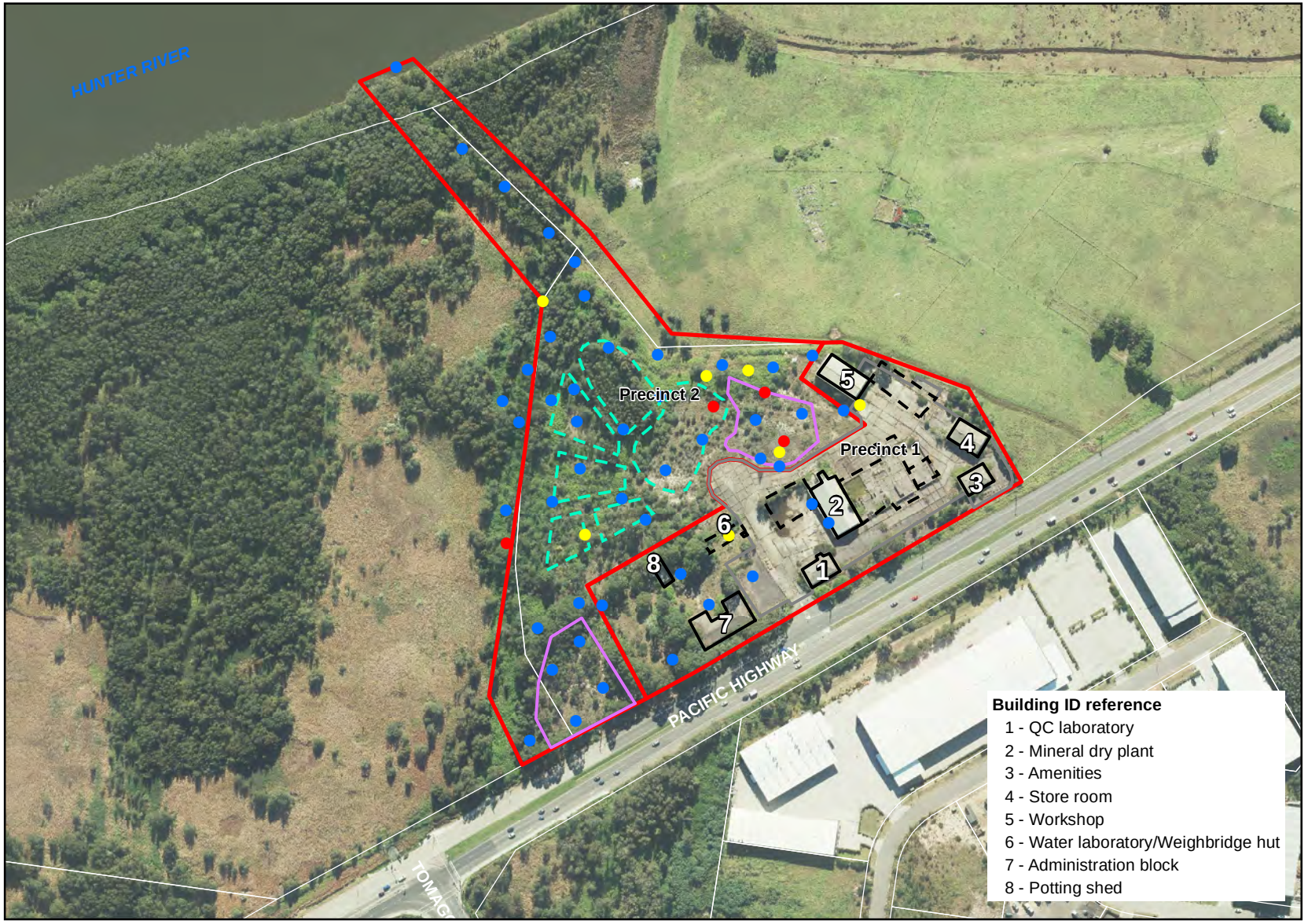
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Checked by : GM

FIGURE 7 | COMBINED XRF SCREENING RESULTS



LEGEND

- Building ID
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries

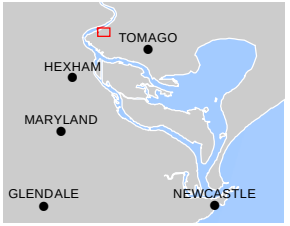
Combined XRF

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- > NEPM
- > NEPM x 2

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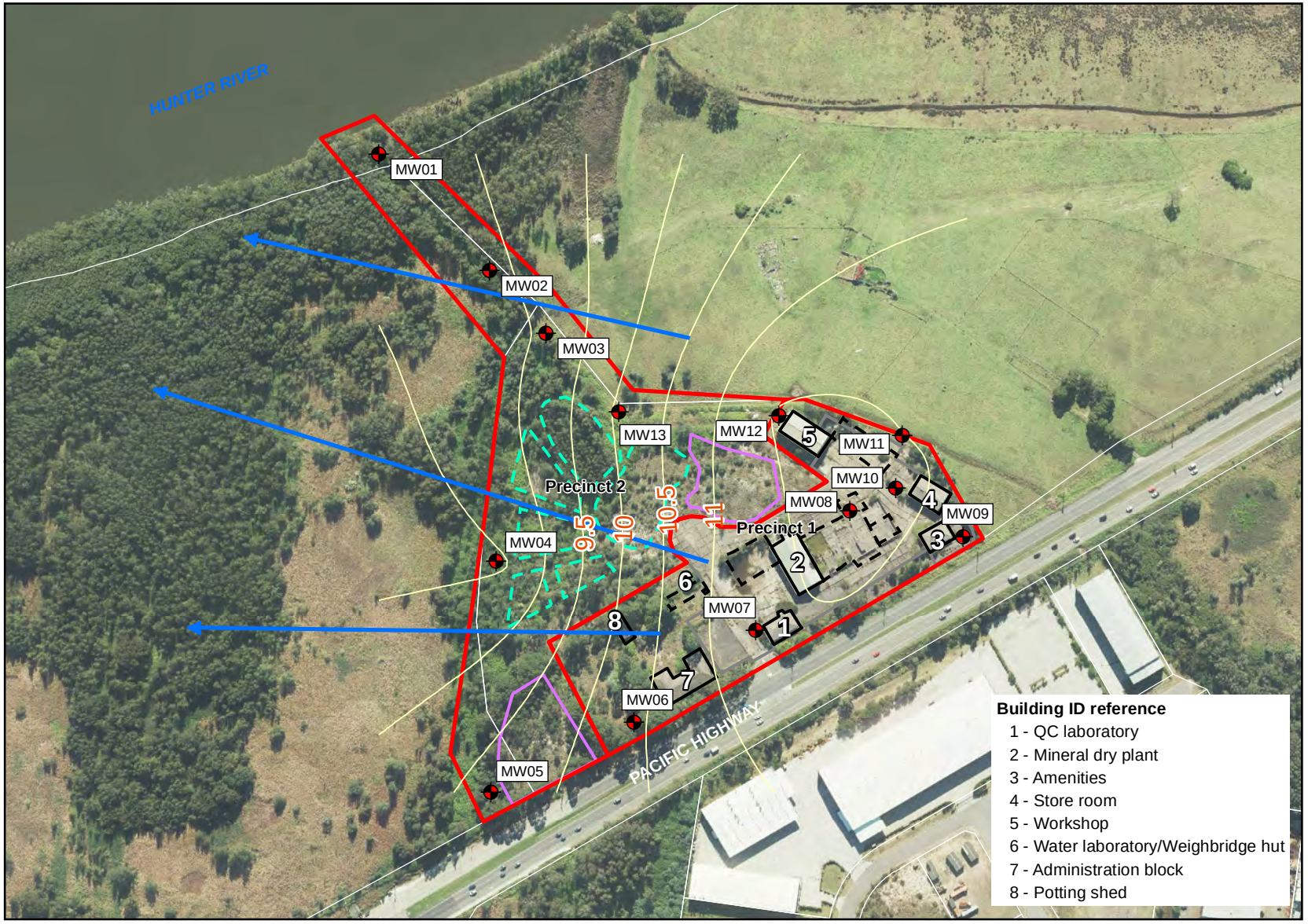
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Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AL
Checked by : GM

FIGURE 8 | GROUNDWATER CONTOUR PLAN



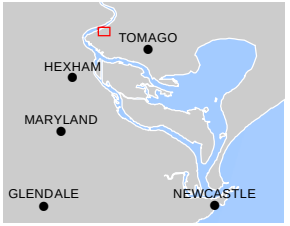
LEGEND

- Building ID
- Monitoring Well Locations
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries
- Groundwater Contour
- Inferred groundwater flow direction
- 9.5 Inferred groundwater contour levels (m) Benchmarked

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DATA SOURCES
AUSIMAGE - May 2014
LPI, NSW 2014
JACOBS 2014

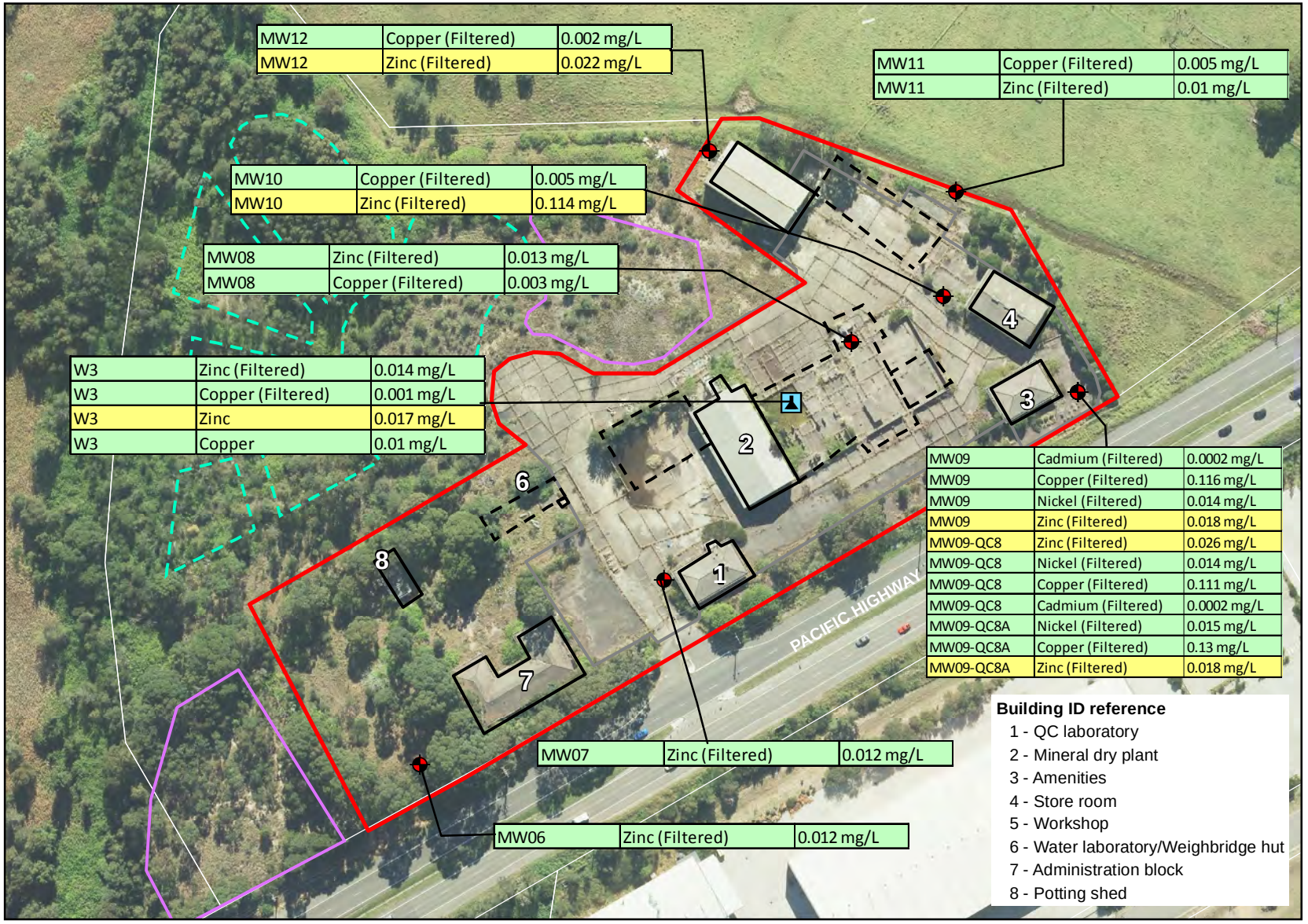
0 100
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AA
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FIGURE 9 | WATER INVESTIGATION RESULTS - PRECINCT 1 (BUILT AREA)



LEGEND

- Building ID
- Monitoring Well
- Surface Water Sample
- Boundary of Precinct 1

[B] ANZECC 2000 MW 95%

Sample Location	Analyte	Concentration

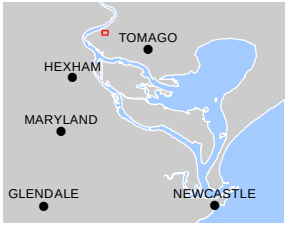
[A] ANZECC 2000 FW 95%

Sample Location	Analyte	Concentration

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DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

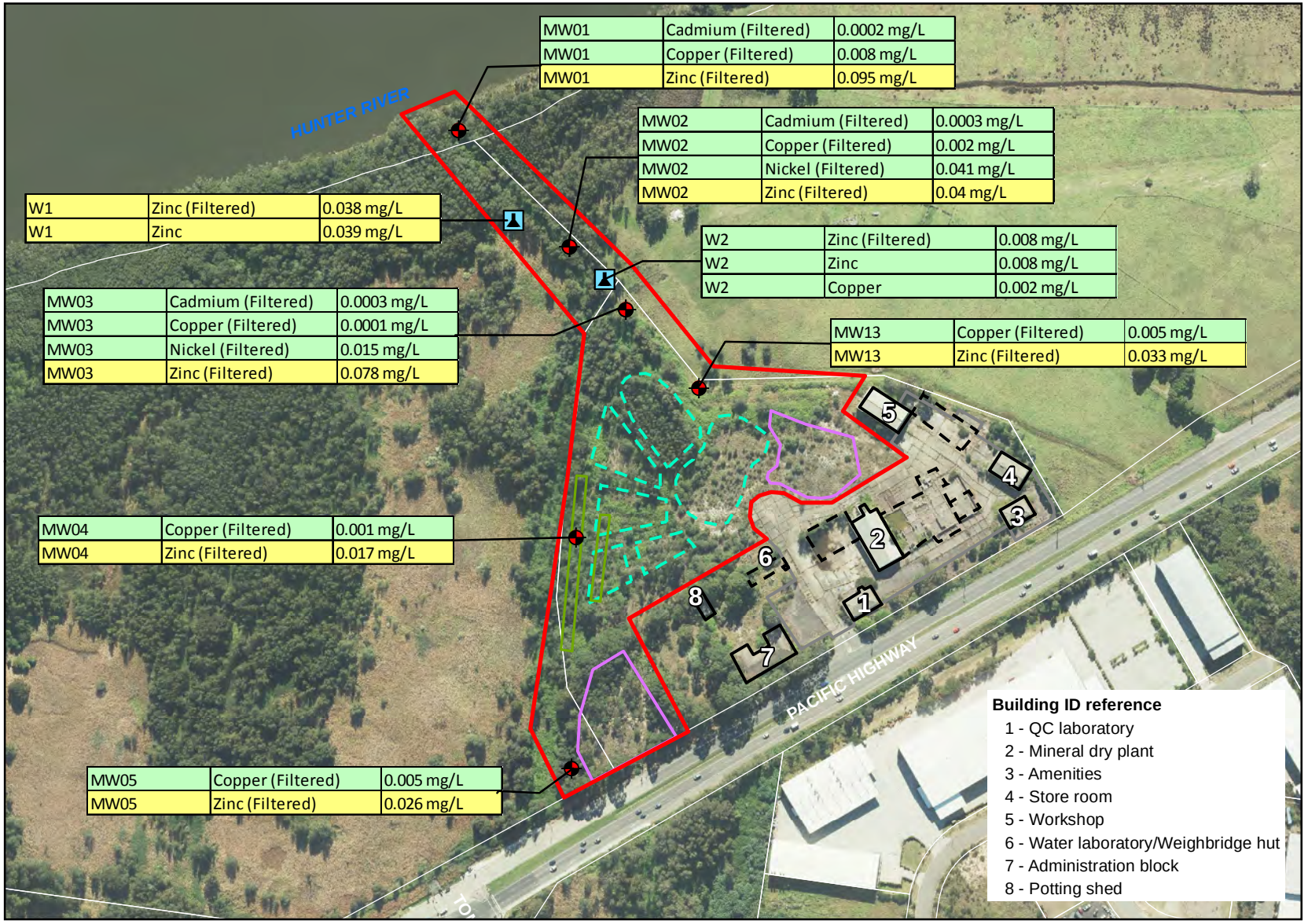
0 50
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AL
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FIGURE 10 | WATER INVESTIGATION RESULTS - PRECINCT 2 (PONDS AND STOCKPILES)



LEGEND

- Building ID
- Monitoring Well
- Surface Water Sample
- Garnet slots
- Boundary of Precinct 2

[B] ANZECC 2000 MW 95%

Sample Location	Analyte	Concentration

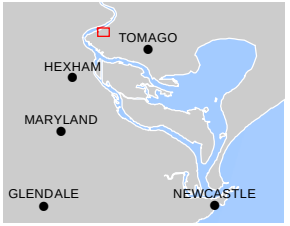
[A] ANZECC 2000 FW 95%

Sample Location	Analyte	Concentration

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DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

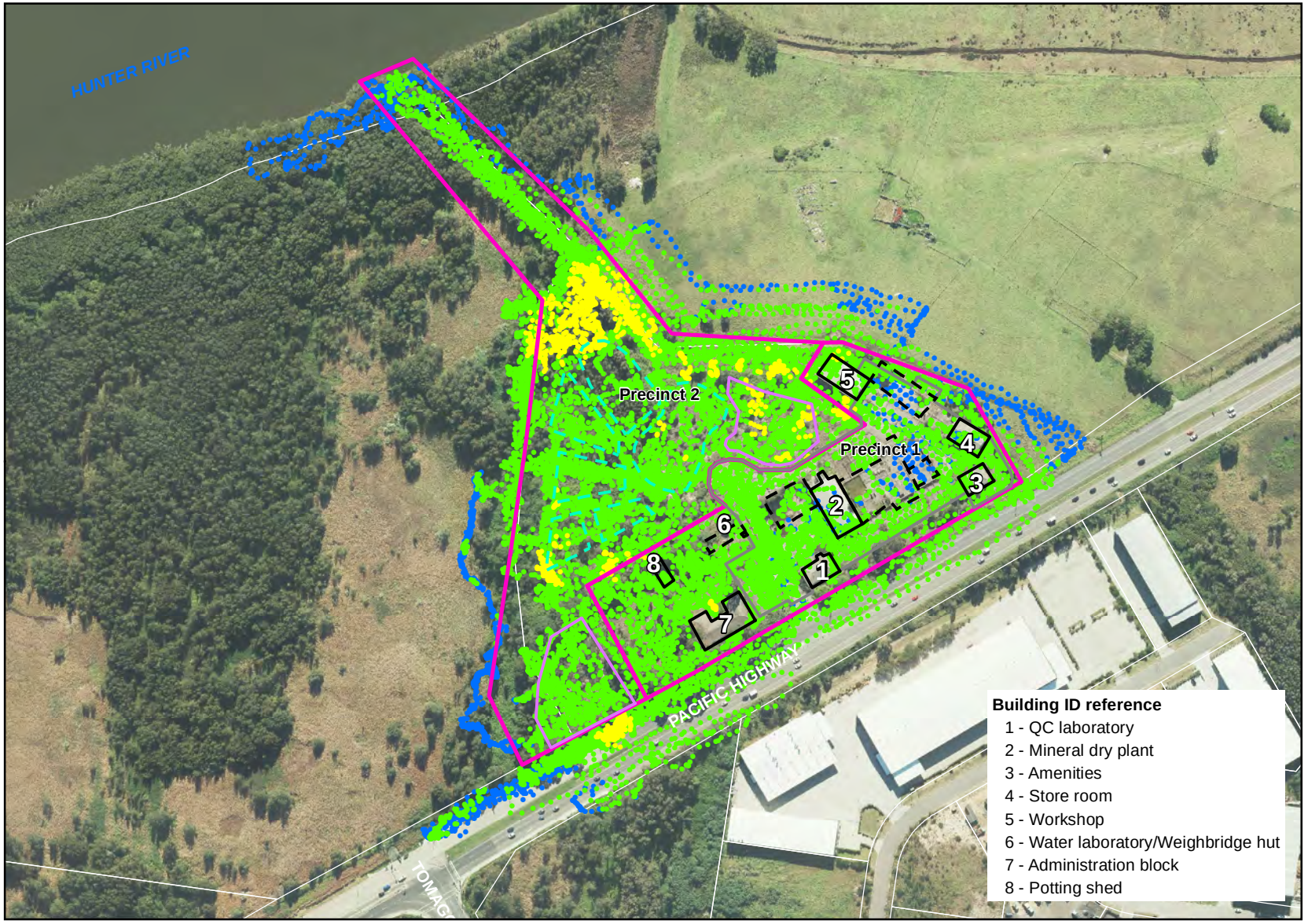
0 100
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AL
Checked by : GM

FIGURE 11 | RADIATION DOSE CLASSIFICATION LEVELS



LEGEND

- Building ID
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries

Radiation Dose Classification Levels (µSv/yr)

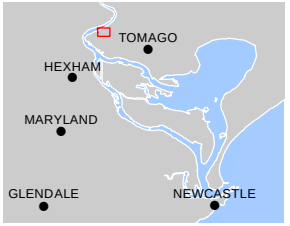
- Within Background Limits (10 - 84)
- Within Public Dose Limit (84 - 1,084)
- Within Occupationally Exposed Limit (1,084 - 20,084)
- Exceeds Radiation Dose Classification Levels (> 20,084)

Work week based on 8 hrs/day, 5 days/week
Work year based on 50 work weeks

DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

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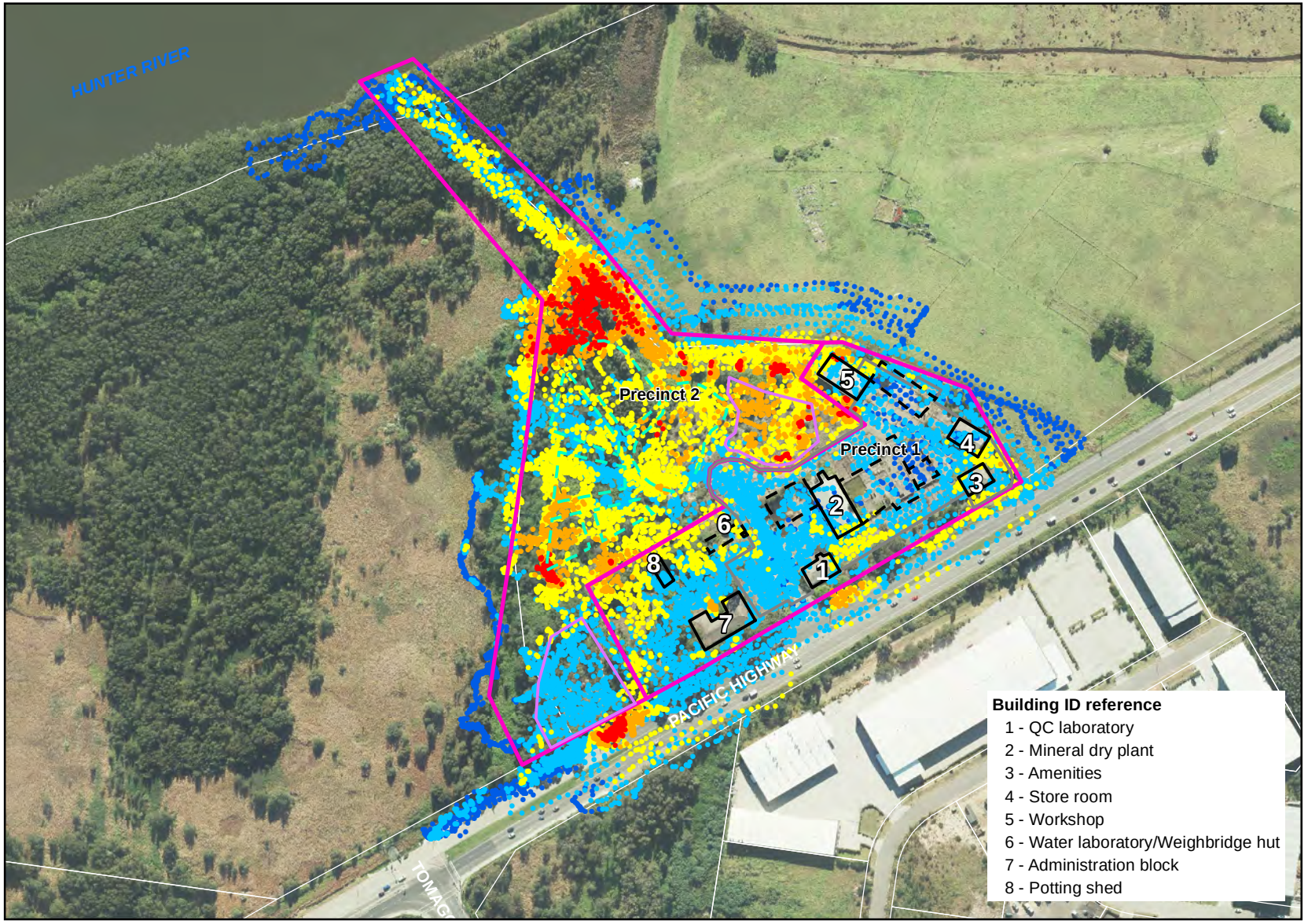
0 100
Metres



AUSIMAGE JACOBS

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FIGURE 12 | RADIATION TERRESTRIAL AIR KERMA RATES



LEGEND

- Building ID
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries

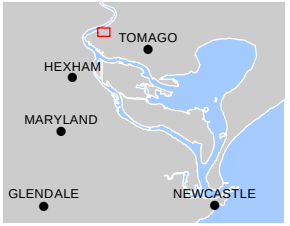
Terrestrial air kerma rates nGy/h

- <60 (Background)
- 61 - 200
- 201 - 500
- 501 - 1000
- 1001 - 11000

DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

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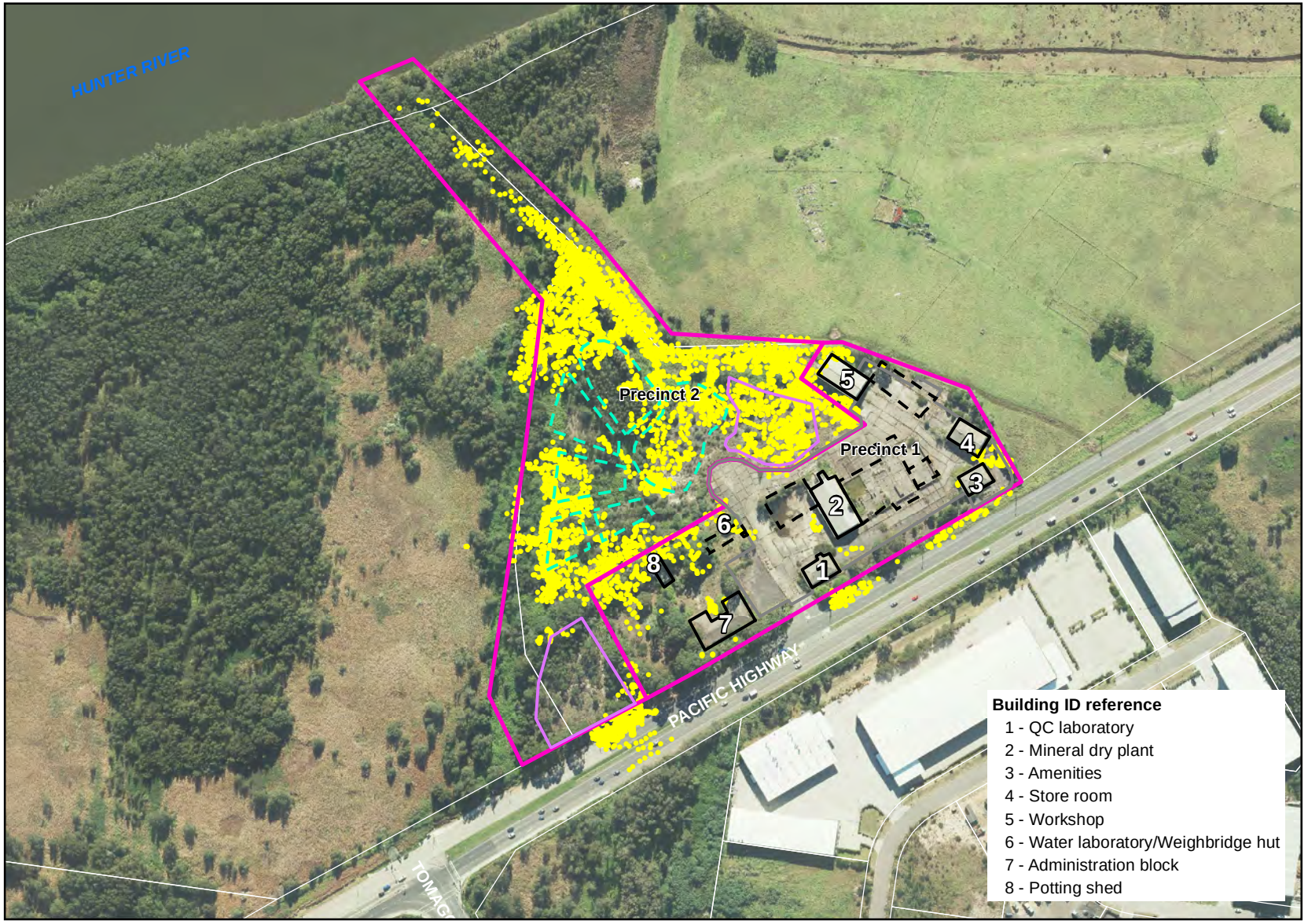
0 100
Metres



AUSIMAGE JACOBS

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FIGURE 13 | RADIATION WORKER DOSE EXCEEDANCES



LEGEND

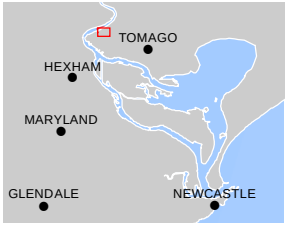
- Building ID
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Precinct boundaries
- In excess of worker dose constraint levels (> 384 µSv/yr)

Work week based on 8 hrs/day, 5 days/week
Work year based on 50 work weeks

DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

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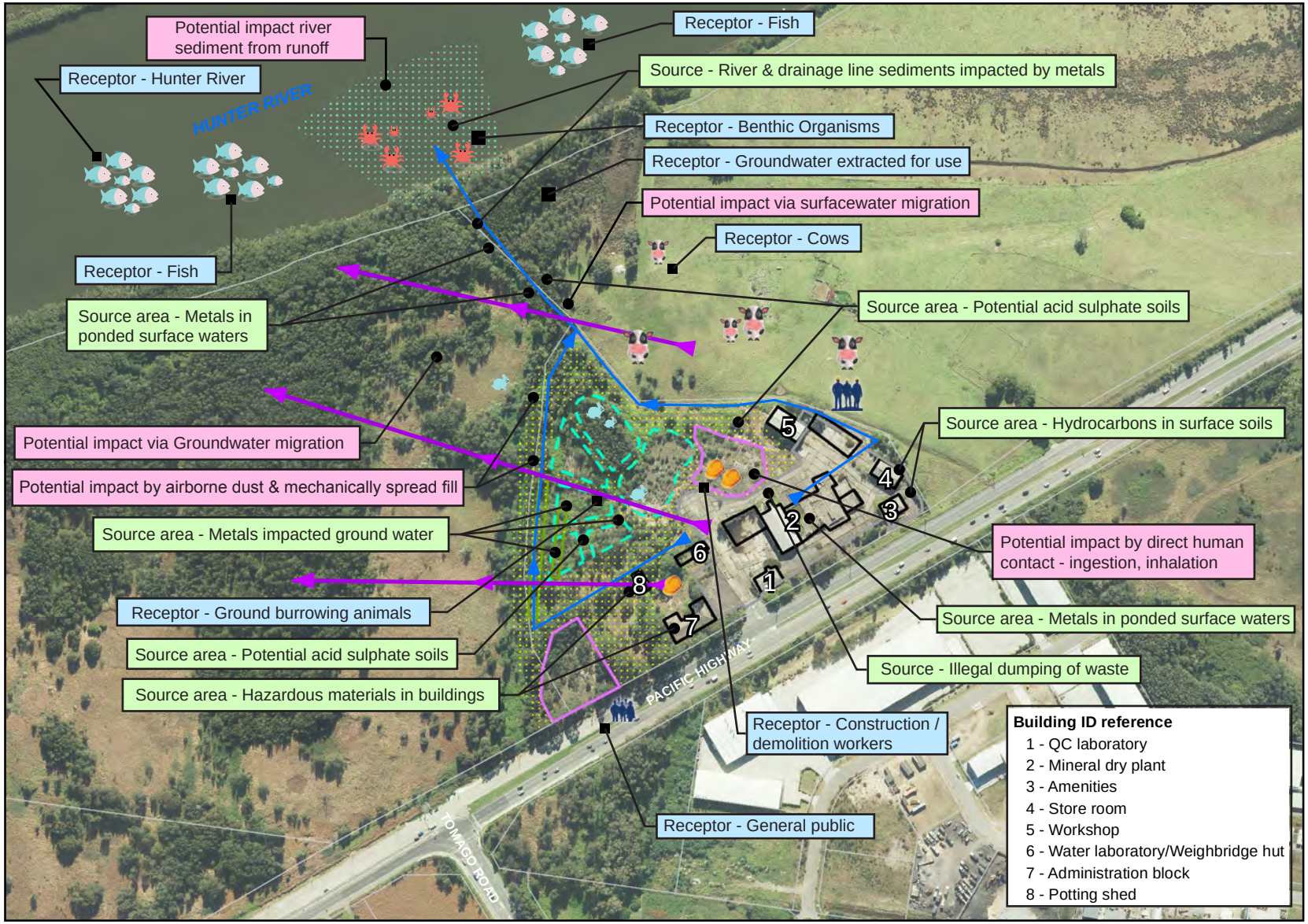
0 100
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AL
Checked by : GM

FIGURE 14 | CONTAMINANT CONCEPTUAL SITE MODEL



LEGEND

- Building ID number
- Building
- Dewatering pond
- Concrete
- Stockpile area
- Garnet slots
- Groundwater flow
- Surface water flow
- River sediment from runoff
- Air blown dust
- Source
- Exposure pathway
- Receptor

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DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

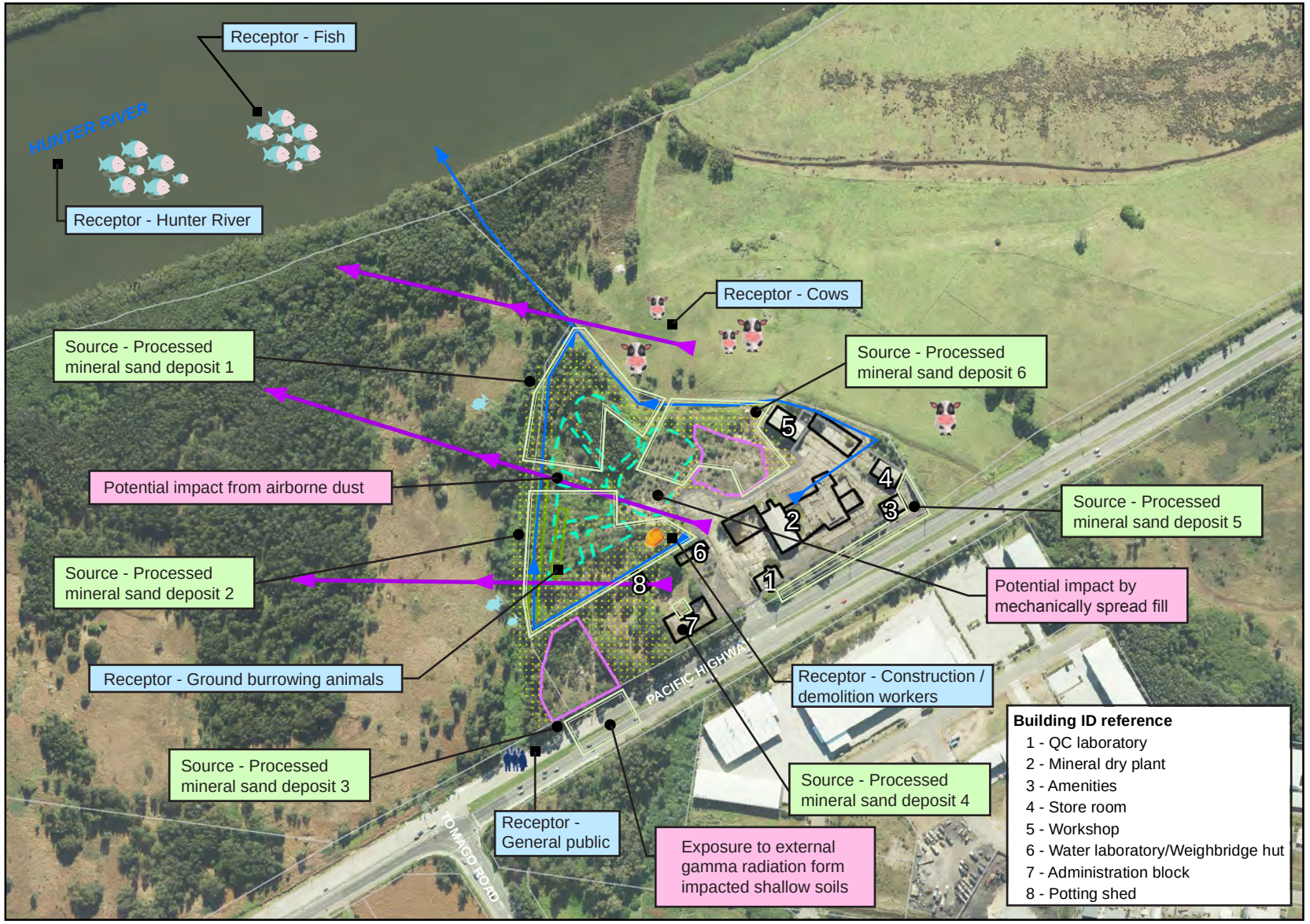
0 100
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AA
Checked by : GM

FIGURE 15 | RADIATION CONCEPTUAL SITE MODEL



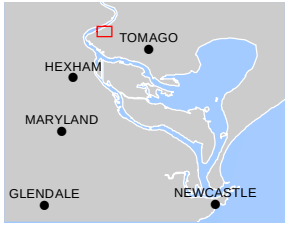
LEGEND

- Building ID number
- Building
- Dewatering pond
- Concrete
- Stockpile area
- Garnet slots
- Groundwater flow
- Surface water flow
- Air blown dust
- Source
- Exposure pathway
- Receptor
- Mineral deposit

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DATA SOURCES
AUSIMAGE - May 2014
LPMA 2014
JACOBS 2014

0 100
Metres



AUSIMAGE JACOBS

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Newcastle Spatial Team - Prepared by : AA
Checked by : GM

Appendix B. Tables

Table B1:Soil Analytical Results

Table B2:Soil Analytical Statistical Results

Table B3:Sediment Analytical Statistical Results

Table B4:Water Analytical Results

Table B5:Groundwater Analytical Statistical Results

Table B6:Surface Water Analytical Statistical Results

Table B7: Radiological Soil Analytical Results

Table B8: Radiological Water Analytical Results

Table B9: Sediment Analytical Results

Sample ID	TP01 3.0	TP01_0.5	QC01	RPD (%)	QC1A	RPD (%)	TP01_2.5	TP02_0.5	QC02	RPD (%)	QC2A	RPD (%)	TP02_2.2
Sample Date	26/08/2014	26/08/2014	26/08/2014		26/08/2014		26/08/2014	26/08/2014	26/08/2014		26/08/2014		26/08/2014
Comment			Duplicate of TP01/0.5		Triplicate of TP01/0.5				Triplicate of TP02/0.5		Triplicate of TP02/0.5		

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria												
Heavy Metals	Arsenic	mg/kg	4	3000		160			-	7	8	13%	<4	67%	-	11	14	24%	5	75%	-
	Cadmium	mg/kg	0.4	900					-	<1	<1	0%	<0.4	0%	-	<1	<1	0%	<0.4	0%	-
	Chromium (III+VI)	mg/kg	1			400			-	43	35	21%	35	21%	-	45	38	17%	34	28%	-
	Copper	mg/kg	1	240000		190			-	24	25	4%	22	9%	-	22	25	13%	11	67%	-
	Lead	mg/kg	1	1500		1800			-	11	12	9%	8	32%	-	10	10	0%	7	35%	-
	Mercury	mg/kg	0.1	730					-	<0.1	<0.1	0%	<0.1	0%	-	<0.1	<0.1	0%	<0.1	0%	-
	Nickel	mg/kg	1	6000		55			-	30	28	7%	25	18%	-	20	24	18%	9	76%	-
	Zinc	mg/kg	1	400000		360			-	51	49	4%	40	24%	-	26	30	14%	16	48%	-
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	<0.5	<0.5	0%	<0.5	0%	-	<0.5	<0.5	0%	<0.5	0%	-
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Acenaphthylene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Anthracene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Benz(a)anthracene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	<0.5	<0.5	0%	<0.05	0%	-	<0.5	<0.5	0%	<0.05	0%	-
	Benzo(b)fluoranthene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.2	0%	-	<0.5	<0.5	0%	<0.2	0%	-
	Benzo(k)fluoranthene	mg/kg	0.5						-	<0.5	<0.5	0%			-	<0.5	<0.5	0%			-
	Benzo(g,h,i)perylene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Chrysene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Dibenz(a,h)anthracene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Fluoranthene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Fluorene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Naphthalene	mg/kg	0.5			370			-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
	PAHs (Sum of total)	mg/kg	0.5	4000					-	<0.5	<0.5	0%	0	0%	-	<0.5	<0.5	0%	0	0%	-
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	<1.16	<1.16	0%	<0.172	0%	-	<1.16	<1.16	0%	<0.172	0%	-
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	<0.5	<0.5	0%	<0.1	0%	-	<0.5	<0.5	0%	<0.1	0%	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						-	30.2	30.9	2%	24	23%	-	31.8	31.7	0%	25	24%	-
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						5.6	-	-		-		5.6	-	-		-		6.8
	pH (Ox)	pH_Units	0.1						5.1	-	-		-		5.2	-	-		-		7
	Equivalent Sulphur	%S	0.02					0.03	0.05	-	-		-		**0.04**	-	-		-		<0.02
	Equivalent Acidity	H^+/tonne	10					18	29	-	-		-		22	-	-		-		<10
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	TP02-2.0	TP03_1.5	TP04_2.8-3.2	TP04ASS 3.4	TP05_0.4-3.0	TP06_0.2	TP06_2.8	TP07_0.0-0.2	TP07_2.0-2.5	TP08_0.4-0.9	TP09_0.5	TP09_2.5
Sample Date	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014
Comment												

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria											
Heavy Metals	Arsenic	mg/kg	4	3000		160			-	8	<5	-	<5	<5	<5	<5	-	<5	<5	-
	Cadmium	mg/kg	0.4	900					-	<1	<1	-	<1	<1	<1	1	-	<1	<1	-
	Chromium (III+VI)	mg/kg	1			400			-	31	<2	-	16	10	8	22	-	23	3	-
	Copper	mg/kg	1	240000		190			-	7	<5	-	<5	47	<5	6	-	<5	<5	-
	Lead	mg/kg	1	1500		1800			-	8	<5	-	33	59	14	25	-	22	<5	-
	Mercury	mg/kg	0.1	730					-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-
	Nickel	mg/kg	1	6000		55			-	6	<2	-	<2	<2	<2	<2	-	<2	<2	-
	Zinc	mg/kg	1	400000		360			-	13	<5	-	13	111	183	71	-	8	<5	-
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Acenaphthylene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Benz(a)anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Benzo(b)fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Chrysene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Fluorene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Naphthalene	mg/kg	0.5			370			-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	PAHs (Sum of total)	mg/kg	0.5	4000					-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	-	-	-	-	<1.16	-	<1.16	-	-	-	-
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	<0.5	-	-	-	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						-	21.7	22.2	-	8.9	6.7	12.8	12.8	-	8.8	14.1	-
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined	pH (KCl)	pH_Units	0.1						6.4	5.1	-	5.8	-	-	5.7	-	4.8	-	-	5.9
Acidity and Sulfate	pH (Ox)	pH_Units	0.1						6.6	2.9	-	3.4	-	-	3.5	-	4.5	-	-	3.7
	Equivalent Sulphur	%S	0.02					0.03	<0.02	0.21	-	0.17	-	-	**0.04**	-	0.05	-	-	<0.02
	Equivalent Acidity	H^+/tonne	10					18	<10	129	-	108	-	-	25	-	34	-	-	<10
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	No	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	TP10_0.2-0.7	TP11_0.5	TP12_0.5-1.0	TP12_0.5-1.0	RPD (%)	TP12_0-0.5	TP13_0.5	TP13_3.0	TP14_0.3-0.7	TP14ASS 3.8	TP15 2.5	TP15_0.5
Sample Date	26/08/2014	26/08/2014	26/08/2014	26/08/2014		26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014
Comment				Duplicate of TP12 0.5-1.0								

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria											
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	<5	<5	<5	0%	<5	<5	<5	<5	-	<5	<5
	Cadmium	mg/kg	0.4	900					<1	<1	<1	<1	0%	<1	<1	<1	<1	-	<1	<1
	Chromium (III+VI)	mg/kg	1			400			15	12	5	5	0%	25	4	7	3	-	<2	13
	Copper	mg/kg	1	240000		190			8	<5	<5	<5	0%	<5	<5	<5	<5	-	<5	<5
	Lead	mg/kg	1	1500		1800			12	14	6	7	15%	23	8	9	<5	-	<5	37
	Mercury	mg/kg	0.1	730					<0.1	<0.1	<0.1	<0.1	0%	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			8	2	<2	<2	0%	<2	<2	<2	<2	-	<2	<2
	Zinc	mg/kg	1	400000		360			20	35	<5	<5	0%	8	<5	<5	6	-	<5	<5
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Acenaphthylene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Benz(a)anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Benzo(b)fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Benzo(k)fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Benzo(g,h,i)perylene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Chrysene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Dibenz(a,h)anthracene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Fluoranthene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Fluorene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Naphthalene	mg/kg	0.5			370			-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	PAHs (Sum of total)	mg/kg	0.5	4000					-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	<1.16	-	-	-	-	-	-	-	-	<1.16	-
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	<0.5	-	-	-	-	-	-	-	-	<0.5	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						9	7.2	9.4	11	16%	4.8	5.8	15.2	4.4	-	13	4.7
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-		-	-	-	-	5.7	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-		-	-	-	-	4	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-		-	-	-	-	0.18	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-		-	-	-	-	113	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	TP16_0.5	TP16_2.5	TP16_3.0	TP17_0.5	TP17_1.0	TP18_3.5	TP18ASS 2.3-2.5	TP19_0.5	TP20_0-0.5	TP21_1.0	TP21_2.0	TP22_0.0-0.4
Sample Date	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014
Comment												

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria											
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5
	Cadmium	mg/kg	0.4	900					<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
	Chromium (III+VI)	mg/kg	1			400			4	10	9	9	11	10	-	2	6	4	4	4
	Copper	mg/kg	1	240000		190			<5	<5	<5	<5	8	<5	-	<5	<5	<5	<5	8
	Lead	mg/kg	1	1500		1800			<5	13	<5	8	18	<5	-	<5	<5	5	6	8
	Mercury	mg/kg	0.1	730					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			<2	<2	2	<2	7	<2	-	<2	<2	<2	<2	4
	Zinc	mg/kg	1	400000		360			<5	6	<5	13	45	<5	-	<5	<5	<5	<5	**257**
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Acenaphthylene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Anthracene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Benz(a)anthracene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Benzo(b)fluoranthene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Chrysene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Fluoranthene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Fluorene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Naphthalene	mg/kg	0.5			370			-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	PAHs (Sum of total)	mg/kg	0.5	4000					-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	-	-	<1.16	-	-	-	-	-	-	-	<1.16
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	-	-	<0.5	-	-	-	-	-	-	-	<0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						<1	9.1	19.5	5	29	17.5	-	4.5	4.6	6.8	10.7	22.8
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-	-	5	5.9	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-	-	5	3.8	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-	-	<0.02	0.11	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-	-	11	68	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	No	-	-	-	No	No	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	TP22_0.5-1.5	TP22_2.0-2.2	TP23_0.0-0.5	TP23_0.5-2.0	TP24 3.0	TP24_0.0-0.5	TP24_3.0-3.5	TP25_0-0.5	TP25_1.0-1.5	TP26/0.2	QC3	RPD (%)
Sample Date	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	26/08/2014	27/08/2014	27/08/2014	
Comment											Duplicate of TP26/0.2	

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria											
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	-	<5	<5	-	<5	5	6	<5	<5	<5	0%
	Cadmium	mg/kg	0.4	900					<1	-	<1	<1	-	<1	<1	<1	<1	<1	<1	0%
	Chromium (III+VI)	mg/kg	1			400			3	-	3	<2	-	10	26	15	10	5	3	50%
	Copper	mg/kg	1	240000		190			<5	-	7	<5	-	<5	14	8	<5	10	10	0%
	Lead	mg/kg	1	1500		1800			<5	-	10	<5	-	5	8	12	25	22	19	15%
	Mercury	mg/kg	0.1	730					<0.1	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%
	Nickel	mg/kg	1	6000		55			<2	-	<2	<2	-	<2	12	14	3	2	2	0%
	Zinc	mg/kg	1	400000		360			<5	-	21	24	-	<5	17	72	7	99	88	12%
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Acenaphthylene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Anthracene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Benz(a)anthracene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	1	1	0%
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Benzo(b)fluoranthene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	0.6	0.7	15%
	Benzo(k)fluoranthene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Benzo(g,h,i)perylene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Chrysene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	1	1.1	10%
	Dibenz(a,h)anthracene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Fluoranthene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	2.2	2.4	9%
	Fluorene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%
	Naphthalene	mg/kg	0.5			370			-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	0.7	0.7	0%
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	4.2	4.3	2%
	PAHs (Sum of total)	mg/kg	0.5	4000					-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	11.3	11.9	5%
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	-	<1.16	<1.16	-	-	-	<1.16	<1.16	0.6625	0.6635	0%
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	1.6	1.7	6%
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						15.6	-	9	8.6	-	5.3	25.4	16.9	22.4	8.9	8.2	8%
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	5.3	5.9	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	5.9	-	-	4.7	-	-	-	-	-	-	
	pH (Ox)	pH_Units	0.1						-	3.7	-	-	4.3	-	-	-	-	-	-	
	Equivalent Sulphur	%S	0.02					0.03	-	0.02	-	-	0.1	-	-	-	-	-	-	
	Equivalent Acidity	H^+/tonne	10					18	-	16	-	-	60	-	-	-	-	-	-	
Asbestos	Asbestos Detected	g/kg	0.1						-	-	No	-	-	-	-	No	No	No	No	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	QC3A	RPD (%)	TP26/1.0	TP26/1.2	TP27/0.5	TP27/1.6	SB01/0.5	SB01/1.1	SB02/0.5	SB02/1.9	SB03/0.5	SB03/1.3	SB03/2.0	SB04/0.5
Sample Date	27/08/2014		27/08/2014	27/08/2014	27/08/2014	27/08/2014	4/09/2014	4/09/2014	4/09/2014	4/09/2014	3/09/2014	3/09/2014	3/09/2014	4/09/2014
Comment	Triplicate of TP26/0.2													

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria													
Heavy Metals	Arsenic	mg/kg	4	3000		160			<4	0%	<5	<5	<5	<5	<5	<5	<5	5	5	5	13	<5
	Cadmium	mg/kg	0.4	900					<0.4	0%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (III+VI)	mg/kg	1			400			5	0%	3	<2	7	<2	40	26	11	17	23	41	17	4
	Copper	mg/kg	1	240000		190			8	22%	<5	<5	7	<5	27	13	6	10	32	8	10	<5
	Lead	mg/kg	1	1500		1800			17	26%	<5	<5	13	<5	8	8	10	6	41	9	16	7
	Mercury	mg/kg	0.1	730					<0.1	0%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			3	40%	2	<2	<2	<2	**53**	19	4	29	6	11	2	<2
	Zinc	mg/kg	1	400000		360			69	36%	19	<5	67	14	68	38	9	52	88	20	14	<5
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						0.8	67%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						0.2	67%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5						<0.1	0%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Anthracene	mg/kg	0.5						0.5	22%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Benz(a)anthracene	mg/kg	0.5						1.4	33%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Benzo(a) pyrene	mg/kg	0.5				0.7		0.49	20%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Benzo(b)fluoranthene	mg/kg	0.5						1	16%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5								<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5						0.3	29%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Chrysene	mg/kg	0.5						1.3	26%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.1	0%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Fluoranthene	mg/kg	0.5						2.6	17%	<0.5	-	<0.5	<0.5	-	-	-	-	0.9	<0.5	<0.5	<0.5
	Fluorene	mg/kg	0.5						0.5	22%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						0.2	67%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Naphthalene	mg/kg	0.5			370			1.2	53%	<0.5	-	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						5.4	25%	<0.5	-	<0.5	<0.5	-	-	-	-	2	<0.5	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5	4000					17	40%	<0.5	-	<0.5	<0.5	-	-	-	-	3.5	<0.5	<0.5	<0.5
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					0.716	8%	<1.16	-	<1.16	<1.16	-	-	-	-	<1.16	<1.16	<1.16	<1.16
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						1.8	12%	<0.5	-	<0.5	<0.5	-	-	-	-	0.6	<0.5	<0.5	<0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						12	30%	7.6	18.7	12	18.1	25.7	26.6	9.8	22.7	24.9	26.1	20.6	3.9
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	6.6	6.8	5	7.6	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-		-	-	-	-	-	-	-	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-		-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-		-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-		-	-	-	-	-	-	-	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.

B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.

C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.

D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.

E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.

BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	SB04/2.7	SB05/0.5	SB05/2.0	SB06/0.5	SB06/2.0	SB07/0.4	SB07/1.2	SB08/0.5	SB08/2.0	SB09/0.2	SB09/1.0	SB10/0.5	SB10/1.5	SB11/0.5	SB11/2.0
Sample Date	4/09/2014	2/09/2014	2/09/2014	2/09/2014	2/09/2014	27/08/2014	3/09/2014	27/08/2014	2/09/2014	27/08/2014	1/09/2014	27/08/2014	1/09/2014	27/08/2014	1/09/2014
Comment															

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria													
Heavy Metals	Arsenic	mg/kg	4	3000		160			10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5
	Cadmium	mg/kg	0.4	900					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (III+VI)	mg/kg	1			400			16	3	2	5	2	<2	2	<2	9	6	7	<2	3	19	14
	Copper	mg/kg	1	240000		190			7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5
	Lead	mg/kg	1	1500		1800			<5	<5	<5	7	<5	<5	<5	<5	5	8	<5	<5	<5	90	6
	Mercury	mg/kg	0.1	730					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			3	<2	<2	<2	<2	<2	<2	<2	2	<2	<2	2	<2	12	6
	Zinc	mg/kg	1	400000		360			7	<5	<5	<5	<5	6	<5	6	<5	6	<5	<5	<5	179	<5
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	<1	<1	<1	<1	<1
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Acenaphthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(a) pyrene	mg/kg	0.5				0.7		<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(b)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Chrysene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluorene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Naphthalene	mg/kg	0.5			370			<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<2
	Phenanthrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5	4000					<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					<1.16	<1.16	<1.16	<1.16	-	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	<0.1
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	<100	<100	<100	<100	<100
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	<1	<1	<1	<1	<1
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	<10
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	<10
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	<10
Moisture Content	Moisture	%	1						18.4	15	22.2	7.2	18.3	8.6	11.6	9.4	20.1	6.8	26.4	9.1	19.7	10.2	18.4
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	4.6	5.2	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	No	-	No	-	-	-	No	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	SB12/0.5	SB12/1.0	SB13/0.5	SB13/1.0	SB15/0.5	SB16/0.5	SB16/1.1	SB17/0.5	QC4	RPD (%)	SB17/1.0	SB17/SFC	SB18/0.5	SB18/1.0	SB19/0.5
Sample Date	3/09/2014	3/09/2014	3/09/2014	3/09/2014	1/09/2014	1/09/2014	1/09/2014	1/09/2014	1/09/2014		1/09/2014	1/09/2014	27/08/2014	1/09/2014	27/08/2014
Comment									Duplicate of SB17/0.5						

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria														
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	<5	<5	<5	<5	<5	<5	<5	<5	0%	<5	<5	<5	<5	<5
	Cadmium	mg/kg	0.4	900					<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	<1	<1	<1	<1
	Chromium (III+VI)	mg/kg	1			400			8	10	10	8	<2	3	11	4	<2	91%	<2	11	<2	4	6
	Copper	mg/kg	1	240000		190			<5	<5	7	<5	<5	<5	<5	8	<5	67%	<5	12	<5	<5	13
	Lead	mg/kg	1	1500		1800			15	14	11	<5	<5	<5	<5	<5	<5	0%	<5	27	<5	<5	7
	Mercury	mg/kg	0.1	730					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			<2	3	6	2	<2	<2	6	3	<2	67%	<2	<2	<2	3	7
	Zinc	mg/kg	1	400000		360			36	78	16	47	7	7	<5	26	<5	147%	<5	163	<5	<5	44
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,5-trichlorophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2-chlorophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2-methylphenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	2-nitrophenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	3-&4-methylphenol	mg/kg	1						<1	<1	-	-	-	<1	<1	<1	<1	0%	<1	<1	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Acenaphthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(a) pyrene	mg/kg	0.5				0.7		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(b)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Chrysene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluorene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Naphthalene	mg/kg	0.5			370			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Pentachlorophenol	mg/kg	2	660					<2	<2	-	-	-	<2	<2	<2	<2	0%	<2	<2	-	-	-
	Phenanthrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5	4000					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	0%	<1.16	<1.16	<1.16	<1.16	<1.16
	Phenol	mg/kg	0.5	240000					<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0%	<0.1	<0.1	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		<50	<50	-	-	-	<50	<50	<50	650	172%	<50	500	-	-	-
	C16-C34	mg/kg	100				3500		<100	<100	-	-	-	<100	<100	<100	9780	196%	<100	14,700	-	-	-
	C34-C40	mg/kg	100				10000		<100	<100	-	-	-	<100	<100	<100	200	68%	<100	170	-	-	-
	F2-NAPHTHALENE	mg/kg	50						<50	<50	-	-	-	<50	<50	<50	650	172%	<50	500	-	-	-
	C10 - C14	mg/kg	50						<50	<50	-	-	-	<50	<50	<50	100	68%	<50	90	-	-	-
	C15 - C28	mg/kg	100						<100	<100	-	-	-	<100	<100	<100	9790	196%	<100	14,300	-	-	-
	C29-C36	mg/kg	100						<100	<100	-	-	-	<100	<100	<100	650	147%	<100	960	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						<50	<50	-	-	-	<50	<50	<50	10,500	198%	<50	15,400	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						<50	<50	-	-	-	<50	<50	<50	10,600	198%	<50	15,400	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		<0.2	<0.2	-	-	-	<0.2	<0.2	<0.2	<0.2	0%	<0.2	<0.2	-	-	-
	Ethylbenzene	mg/kg	0.5				165		<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Naphthalene	mg/kg	1			370			<1	<1	-	-	-	<1	<1	<1	<1	0%	<1	<1	-	-	-
	Toluene	mg/kg	0.5				135		<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Total BTEX	mg/kg	0.2						<0.2	<0.2	-	-	-	<0.2	<0.2	<0.2	<0.2	0%	<0.2	<0.2	-	-	-
	C6 - C9	mg/kg	10						<10	<10	-	-	-	<10	<10	<10	<10	0%	<10	<10	-	-	-
	Xylene (m & p)	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Xylene (o)	mg/kg	0.5						<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	Xylene Total	mg/kg	0.5		230		180		<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	0%	<0.5	<0.5	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						<10	<10	-	-	-	<10	<10	<10	<10	0%	<10	<10	-	-	-
	C6-C10	mg/kg	10		260		700		<10	<10	-	-	-	<10	<10	<10	<10	0%	<10	<10	-	-	-
Moisture Content	Moisture	%	1						9	10.8	14.6	14.7	11.8	12.2	17.4	14.1	13	8%	13.5	9.4	7.5	25.1	7.2
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-	6.1	5.3	7
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-	-	-	-	-	-		-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-	-	-	-	-	-		-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-	-	-	-	-	-		-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	No	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	SB19/1.8	QC7	RPD (%)	QC7A	RPD (%)	SB20/0.5	SB20/2.0	QC6	RPD (%)	QC6A	RPD (%)	SB21/0.5	SB21/2.0
Sample Date	3/09/2014	3/09/2014		3/09/2014		27/08/2014	2/09/2014	2/09/2014		2/09/2014		27/08/2014	2/09/2014
Comment		Duplicate of SB19/1.8		Triplicate of SB19/1.8				Duplicate of SB20/2.0		Triplicate of SB20/2.0			

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria													
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	<5	0%	<4	0%	<5	<5	<5	0%	<4	0%	<5	<5
	Cadmium	mg/kg	0.4	900					<1	<1	0%	<0.4	0%	<1	<1	<1	0%	<0.4	0%	<1	<1
	Chromium (III+VI)	mg/kg	1			400			16	16	0%	16	0%	<2	4	7	55%	12	100%	3	6
	Copper	mg/kg	1	240000		190			<5	<5	0%	<1	0%	<5	<5	<5	0%	<1	0%	<5	<5
	Lead	mg/kg	1	1500		1800			<5	<5	0%	3	29%	<5	7	5	33%	3	80%	<5	<5
	Mercury	mg/kg	0.1	730					<0.1	<0.1	0%	<0.1	0%	<0.1	<0.1	<0.1	0%	<0.1	0%	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			9	9	0%	7	25%	<2	<2	2	16%	3	55%	2	<2
	Zinc	mg/kg	1	400000		360			<5	<5	0%	3	29%	<5	<5	<5	0%	2	67%	<5	<5
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						<0.5	<0.5	0%	<0.5	0%	<0.5	<0.5	<0.5	0%	<0.5	0%	<0.5	<0.5
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Anthracene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Benzo(a) pyrene	mg/kg	0.5				0.7		<0.5	<0.5	0%	<0.05	0%	<0.5	<0.5	<0.5	0%	<0.05	0%	<0.5	<0.5
	Benzo(b)fluoranthene	mg/kg	0.5						<0.5	<0.5	0%	<0.2	0%	<0.5	<0.5	<0.5	0%	<0.2	0%	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5						<0.5	<0.5	0%			<0.5	<0.5	<0.5	0%			<0.5	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Chrysene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Fluoranthene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Fluorene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Naphthalene	mg/kg	0.5			370			<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5	4000					<0.5	<0.5	0%	0	0%	<0.5	<0.5	<0.5	0%	0	0%	<0.5	<0.5
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					<1.16	<1.16	0%	<0.172	0%	<1.16	<1.16	<1.16	0%	<0.172	0%	<1.16	<1.16
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	0%	<0.1	0%	<0.5	<0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						20.8	22.1	6%	27	26%	11.1	16	20.5	25%	18	12%	12.3	21.9
pH (1:5)	pH (Lab)	pH_Units	0.1						6.5	5.9	10%	7.1	9%	5.6	5.7	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-		-		-	-	-		-		-	-
	pH (Ox)	pH_Units	0.1						-	-		-		-	-	-		-		-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-		-		-	-	-		-		-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-		-		-	-	-		-		-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.

B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.

C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.

D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.

E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.

BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	QC5	RPD (%)	QC5A	RPD (%)	SB22/0.5	SB22/1.9	SB23/0.5	SB23/0.7	SB24/0.5	SB24/2.0	S1	S2	S3	S4
Sample Date	2/09/2014		2/09/2014		27/08/2014	3/09/2014	2/09/2014	2/09/2014	2/09/2014	2/09/2014	4/09/2014	4/09/2014	4/09/2014	4/09/2014
Comment	Duplicate of SB21/2.0		Triplicate of SB21/2.0											

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria												
Heavy Metals	Arsenic	mg/kg	4	3000		160			<5	0%	<4	0%	<5	<5	<5	<5	<5	<5	6	8	6	<5
	Cadmium	mg/kg	0.4	900					<1	0%	<0.4	0%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (III+VI)	mg/kg	1			400			6	0%	8	29%	3	13	3	4	8	14	65	64	48	57
	Copper	mg/kg	1	240000		190			<5	0%	<1	0%	<5	6	<5	<5	<5	<5	45	46	33	40
	Lead	mg/kg	1	1500		1800			<5	0%	2	77%	7	13	<5	<5	14	11	12	14	22	13
	Mercury	mg/kg	0.1	730					<0.1	0%	<0.1	0%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	1	6000		55			<2	0%	1	52%	<2	5	<2	<2	<2	17	67	64	**50**	**55**
	Zinc	mg/kg	1	400000		360			<5	0%	<1	0%	7	52	9	<5	19	6	77	81	110	86
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						<0.5	0%	<0.5	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Acenaphthylene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Anthracene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Benz(a)anthracene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Benzo(a) pyrene	mg/kg	0.5				0.7		<0.5	0%	<0.05	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Benzo(b)fluoranthene	mg/kg	0.5						<0.5	0%	<0.2	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.5						<0.5	0%			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Chrysene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Fluoranthene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Fluorene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Naphthalene	mg/kg	0.5			370			<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	PAHs (Sum of total)	mg/kg	0.5	4000					<0.5	0%	0	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					<1.16	0%	<0.172	0%	<1.16	<1.16	<1.16	<1.16	<1.16	<1.16	-	-	-	-
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						<0.5	0%	<0.1	0%	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						21.8	0%	22	0%	15.9	18.4	21.1	14.6	15.8	18.9	44.9	48.5	40.2	38.4
pH (1:5)	pH (Lab)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	8.7	8.1	8.4	8.1
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-		-		-	-	-	-	-	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-		-		-	-	-	-	-	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-		-		-	-	-	-	-	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-		-		-	-	-	-	-	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	S5	S6	S7	S8	S9	S10	TRIP SPIKE	TSC	Recovery (%)	TRIP SPIKE	TSC	Recovery (%)
Sample Date	4/09/2014	4/09/2014	4/09/2014	4/09/2014	4/09/2014	4/09/2014	26/08/2014	26/08/2014		27/08/2014	27/08/2014	
Comment							Trip Spike Field - Wk1	Trip Spike Control - Wk1		Trip Spike Field - Wk2	Trip Spike Control - Wk2	

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria												
Heavy Metals	Arsenic	mg/kg	4	3000		160			14	7	10	8	7	6	-	-	-	-	-	-
	Cadmium	mg/kg	0.4	900					<1	<1	<1	<1	<1	<1	-	-	-	-	-	-
	Chromium (III+VI)	mg/kg	1			400			65	80	72	44	42	29	-	-	-	-	-	-
	Copper	mg/kg	1	240000		190			39	53	44	30	28	13	-	-	-	-	-	-
	Lead	mg/kg	1	1500		1800			31	14	30	24	31	7	-	-	-	-	-	-
	Mercury	mg/kg	0.1	730					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
	Nickel	mg/kg	1	6000		55			59	78	79	39	17	8	-	-	-	-	-	-
	Zinc	mg/kg	1	400000		360			189	87	236	195	196	17	-	-	-	-	-	-
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Acenaphthylene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Benz(a)anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Benzo(a) pyrene	mg/kg	0.5				0.7		-	-	-	-	-	<0.5	-	-	-	-	-	-
	Benzo(b)fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Chrysene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Fluoranthene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Fluorene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	Naphthalene	mg/kg	0.5			370			-	-	-	-	-	<0.5	-	-	-	-	-	-
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
	PAHs (Sum of total)	mg/kg	0.5	4000					-	-	-	-	-	<0.5	-	-	-	-	-	-
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					-	-	-	-	-	<1.16	-	-	-	-	-	-
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						-	-	-	-	-	<0.5	-	-	-	-	-	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	<0.2	0.2	50.0%	0.2	0.3	66.7%
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	0.8	1.1	72.7%	1	1.2	83.3%
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	<1	<1	-	<1	<1	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	6.9	8.9	77.5%	7.9	10.4	76.0%
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	14	18.3	76.5%	16.3	21	77.6%
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	4.4	5.7	77.2%	5.1	6.5	78.5%
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	1.9	2.4	79.2%	2.1	2.6	80.8%
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	6.3	8.1	77.8%	7.2	9.1	79.1%
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						55.5	51.2	55.4	54.7	54.6	23.7	-	-	-	-	-	-
pH (1:5)	pH (Lab)	pH_Units	0.1						7.1	8.6	7.6	8	7.4	8.7	-	-	-	-	-	-
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-	-	-	-	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID		Soils Statisitics							
Sample Date									
Comment		Maximum	Average	Standard Deviation	Sample Size	Confidence Coefficient	Margin of Error	Upper 95% Confidence Limit	Lower 95% Confidence Limit
Compounds	**Analyte**	**Units**	**EQL**	**[A]NEPM 2013, Table 1A(1), HIL's**	**[B]NEPM 2013, Table 1A(3), HSL's**	**[C]NEPM 2013, Table 1B(1)-(5) EIL's,**	**[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt**	**[E]RTA 2005, ASS Action Criteria**	
Heavy Metals	Arsenic	mg/kg	4	3000		160			13 3.09 1.85 89 1.96 0.38 3.47 2.71
	Cadmium	mg/kg	0.4	900					1 0.51 0.05 89 1.96 0.01 0.52 0.49
	Chromium (III+VI)	mg/kg	1			400			45 9.75 9.85 89 1.96 2.05 11.80 7.71
	Copper	mg/kg	1	240000		190			47 5.57 7.07 89 1.96 1.47 7.04 4.10
	Lead	mg/kg	1	1500		1800			90 10.04 13.02 88 1.96 2.72 12.76 7.32
	Mercury	mg/kg	0.1	730					0.05 0.05 0.00 89 1.96 0 0.05 0.05
	Nickel	mg/kg	1	6000		55			53 4.22 7.71 89 1.96 1.60 5.83 2.62
	Zinc	mg/kg	1	400000		360			257 25.97 44.96 89 1.96 9.34 35.31 16.63
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	2,4,5-trichlorophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2,4,6-trichlorophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2,4-dichlorophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2,4-dimethylphenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2,6-dichlorophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2-chlorophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2-methylphenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	2-nitrophenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	3-&4-methylphenol	mg/kg	1						0.5 0.5 0 12 1.96 0 0.5 0.5
	4-chloro-3-methylphenol	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	Acenaphthene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Acenaphthylene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Anthracene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Benz(a)anthracene	mg/kg	0.5						1 0.26 0.10 58 1.96 0.03 0.29 0.24
	Benzo(a) pyrene	mg/kg	0.5				0.7		0.25 0.25 0 58 1.96 0 0.25 0.25
	Benzo(b)fluoranthene	mg/kg	0.5						0.6 0.26 0.05 58 1.96 0.01 0.27 0.24
	Benzo(k)fluoranthene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Benzo(g,h,i)perylene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Chrysene	mg/kg	0.5						1 0.26 0.10 58 1.96 0.03 0.29 0.24
	Dibenz(a,h)anthracene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Fluoranthene	mg/kg	0.5						2.2 0.29 0.27 58 1.96 0.07 0.36 0.23
	Fluorene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						0.25 0.25 0 58 1.96 0 0.25 0.25
	Naphthalene	mg/kg	0.5			370			0.7 0.26 0.06 58 1.96 0.02 0.27 0.24
	Pentachlorophenol	mg/kg	2	660					1 1 0 12 1.96 0 1 1
	Phenanthrene	mg/kg	0.5						4.2 0.35 0.56 58 1.96 0.15 0.49 0.20
	PAHs (Sum of total)	mg/kg	0.5	4000					11.3 0.50 1.51 58 1.96 0.39 0.88 0.11
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					0.6625 0.58 0.01 58 1.96 0.00 0.58 0.58
	Phenol	mg/kg	0.5	240000					0.25 0.25 0 12 1.96 0 0.25 0.25
	Pyrene	mg/kg	0.5						1.6 0.28 0.18 58 1.96 0.05 0.33 0.23
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					0.05 0.05 0.00 9 1.96 0.00 0.05 0.05
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		500 64.58 137.12 12 1.96 77.58 142.17 0
	C16-C34	mg/kg	100				3500		14,700 1270.83 4229.09 12 1.96 2392.83 **3663.67** 0
	C34-C40	mg/kg	100				10000		170 60 34.64 12 1.96 19.6 79.6 40.4
	F2-NAPHTHALENE	mg/kg	50						500 64.58 137.12 12 1.96 77.58 142.17 0
	C10 - C14	mg/kg	50						90 30.42 18.76 12 1.96 10.62 41.03 19.80
	C15 - C28	mg/kg	100						14,300 1237.5 4113.62 12 1.96 2327.5 3565 0
	C29-C36	mg/kg	100						960 125.83 262.69 12 1.96 148.63 274.47 0
	+C10 - C36 (Sum of total)	mg/kg	50						15,400 1306.25 4438.38 12 1.96 2511.25 3817.5 0
	C10 - C40 (Sum of total)	mg/kg	50						15,400 1306.25 4438.38 12 1.96 2511.25 3817.5 0
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		0.1 0.1 0.00 12 1.96 0.00 0.1 0.1
	Ethylbenzene	mg/kg	0.5				165		0.25 0.25 0 12 1.96 0 0.25 0.25
	Naphthalene	mg/kg	1			370			0.5 0.5 0 12 1.96 0 0.5 0.5
	Toluene	mg/kg	0.5				135		0.25 0.25 0 12 1.96 0 0.25 0.25
	Total BTEX	mg/kg	0.2						0.1 0.1 0.00 12 1.96 0.00 0.1 0.1
	C6 - C9	mg/kg	10						5 5 0 12 1.96 0 5 5
	Xylene (m & p)	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	Xylene (o)	mg/kg	0.5						0.25 0.25 0 12 1.96 0 0.25 0.25
	Xylene Total	mg/kg	0.5		230		180		0.25 0.25 0 12 1.96 0 0.25 0.25
	C6-C10 less BTEX (F1)	mg/kg	10						5 5 0 12 1.96 0 5 5
	C6-C10	mg/kg	10		260		700		5 5 0 12 1.96 0 5 5
Moisture Content	Moisture	%	1						31.8 14.51 6.96 88 1.96 1.45 15.97 13.06
pH (1:5)	pH (Lab)	pH_Units	0.1						7.6 5.94 0.86 14 1.96 0.45 6.39 5.49
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						6.8 5.64 0.59 14 1.96 0.31 5.94 5.33
	pH (Ox)	pH_Units	0.1						7 4.48 1.20 14 1.96 0.63 5.10 3.85
	Equivalent Sulphur	%S	0.02					0.03	0.21 0.10 0.07 10 1.96 0.04 0.14 0.05
	Equivalent Acidity	H^+/tonne	10					18	129 55.91 42.89 11 1.96 25.35 81.26 30.56
Asbestos	Asbestos Detected	g/kg	0.1						- - - - - - - -

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits
denote maximum concentrations that exceed adopted assessment criteria by a significant margin (greater than 2 standard deviations)

Compounds	Analyte	Units	EQL	[A]NEPM 2013, Table 1A(1), HIL's	[B]NEPM 2013, Table 1A(3), HSL's	[C]NEPM 2013, Table 1B(1)-(5) EIL's,	[D]NEPM 2013, Table 1B(6)-(7) ESL & TPH Mgt	[E]RTA 2005, ASS Action Criteria	Sample ID: Sediments Statisitics							
									Sample Date / Comment	Maximum	Average	Standard Deviation	Sample Size	Confidence Coefficient	Margin of Error	Upper 95% Confidence Limit	Lower 95% Confidence Limit
Heavy Metals	Arsenic	mg/kg	4	3000		160			14	7.45	3.00	10	1.96	1.86	9.31	5.59
	Cadmium	mg/kg	0.4	900					0.5	0.50	0.00	10	1.96	0.00	0.50	0.50
	Chromium (III+VI)	mg/kg	1			400			80	56.60	15.59	10	1.96	9.66	66.26	46.94
	Copper	mg/kg	1	240000		190			53	37.10	11.47	10	1.96	7.11	44.21	29.99
	Lead	mg/kg	1	1500		1800			31	19.80	8.92	10	1.96	5.53	25.33	14.27
	Mercury	mg/kg	0.1	730					0.05	0.05	0.00	10	1.96	0	0.05	0.05
	Nickel	mg/kg	1	6000		55			79	51.60	23.95	10	1.96	14.85	66.45	36.75
	Zinc	mg/kg	1	400000		360			236	127.40	71.02	10	1.96	44.02	171.42	83.38
PAH/Phenols (SIM)	B(a)P Total Potency Equivalent	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	2,4,5-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2,4,6-trichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2,4-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2,4-dimethylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2,6-dichlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2-chlorophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	2-nitrophenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	3-&4-methylphenol	mg/kg	1						-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	mg/kg	0.5						-	-	-	-	-	-	-	-
	Acenaphthene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Acenaphthylene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Anthracene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Benz(a)anthracene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Benzo(a) pyrene	mg/kg	0.5				0.7		0.25	0.25	0	1	1.96	0	0.25	0.25
	Benzo(b)fluoranthene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Benzo(k)fluoranthene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Benzo(g,h,i)perylene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Chrysene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Dibenz(a,h)anthracene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Fluoranthene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Fluorene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						0.25	0.25	0	1	1.96	0	0.25	0.25
	Naphthalene	mg/kg	0.5			370			0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Pentachlorophenol	mg/kg	2	660					-	-	-	-	-	-	-	-
	Phenanthrene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	PAHs (Sum of total)	mg/kg	0.5	4000					0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
	Carcinogenic PAHs as B(a)P TPE	mg/kg		40					0.58	0.58	0.00	1	1.96	0.00	0.58	0.58
	Phenol	mg/kg	0.5	240000					-	-	-	-	-	-	-	-
	Pyrene	mg/kg	0.5						0.25	0.25	0.00	1	1.96	0.00	0.25	0.25
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	mg/kg	0.1	7					-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/kg	50				1000		-	-	-	-	-	-	-	-
	C16-C34	mg/kg	100				3500		-	-	-	-	-	-	-	-
	C34-C40	mg/kg	100				10000		-	-	-	-	-	-	-	-
	F2-NAPHTHALENE	mg/kg	50						-	-	-	-	-	-	-	-
	C10 - C14	mg/kg	50						-	-	-	-	-	-	-	-
	C15 - C28	mg/kg	100						-	-	-	-	-	-	-	-
	C29-C36	mg/kg	100						-	-	-	-	-	-	-	-
	+C10 - C36 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-
	C10 - C40 (Sum of total)	mg/kg	50						-	-	-	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	mg/kg	0.2		3		75		-	-	-	-	-	-	-	-
	Ethylbenzene	mg/kg	0.5				165		-	-	-	-	-	-	-	-
	Naphthalene	mg/kg	1			370			-	-	-	-	-	-	-	-
	Toluene	mg/kg	0.5				135		-	-	-	-	-	-	-	-
	Total BTEX	mg/kg	0.2						-	-	-	-	-	-	-	-
	C6 - C9	mg/kg	10						-	-	-	-	-	-	-	-
	Xylene (m & p)	mg/kg	0.5						-	-	-	-	-	-	-	-
	Xylene (o)	mg/kg	0.5						-	-	-	-	-	-	-	-
	Xylene Total	mg/kg	0.5		230		180		-	-	-	-	-	-	-	-
	C6-C10 less BTEX (F1)	mg/kg	10						-	-	-	-	-	-	-	-
	C6-C10	mg/kg	10		260		700		-	-	-	-	-	-	-	-
Moisture Content	Moisture	%	1						55.5	46.71	10.25	10	1.96	6.36	53.07	40.35
pH (1:5)	pH (Lab)	pH_Units	0.1						8.7	8.07	0.56	10	1.96	0.35	8.42	7.72
Suspension Peroxide Oxidation-Combined Acidity and Sulfate	pH (KCl)	pH_Units	0.1						-	-	-	-	-	-	-	-
	pH (Ox)	pH_Units	0.1						-	-	-	-	-	-	-	-
	Equivalent Sulphur	%S	0.02					0.03	-	-	-	-	-	-	-	-
	Equivalent Acidity	H^+/tonne	10					18	-	-	-	-	-	-	-	-
Asbestos	Asbestos Detected	g/kg	0.1						-	-	-	-	-	-	-	-

Notes
A - NEPM 2013, Schedule B1, Table 1A(1), Health-based Investigation Levels. Column D Commercial/Industrial Land Use.
B - NEPM 2013, Schedule B1, Table 1A(3), Soil Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 0m to <1m, Sands.
C - NEPM 2013, Schedule B1, Table 1B(1) to 1B(5), Ecological Investigation Limits. Commercial/Industrial land use, averaged pH level of 5.5 for all lithological profiles and most conservative Cation Exchange Capacity and/or Clay Content.
D - NEPM 2013, Schedule B1, Table 1B(6) to 1B(7), Ecological Screening Levels for TPH fractions and TPH management limits. Commercial/Industrial Land Use, Coarse Soil Texture.
E - RTA (2005) Guideline for the Management of Acid Sulfate Materials, ASM Procedure No.1 - Attachment 2. Coarse textured soils.
BOLD values, denote concentrations detected within agreed decision error limits
denote maximum concentrations that exceed adopted assessment criteria by a significant margin (greater than 2 standard deviations)

Sample ID	MW01	MW02	MW03	MW04	MW05	MW06	MW07	MW08	MW09	QC8	RPD (%)	QC8A	RPD (%)
Sample Date	10/09/2014	10/09/2014	10/09/2014	10/09/2014	10/09/2014	10/09/2014	10/09/2014	9/09/2014	9/09/2014	9/09/2014		9/09/2014	
Comments										Duplicate of MW09		Triplicate of MW09	

Compounds	Analytes	Units	EQL	[A]ANZECC 2000 FW 95%	[B]ANZECC 2000 MW 95%	[C]NEPM 2013, Table 1A(3), HSL's												
Heavy Metals (Dissolved)	Arsenic (Filtered)	mg/L	0.001				0.002	0.004	<0.001	0.002	<0.001	<0.001	0.004	0.002	0.005	0.006	18%	0.006	18%
	Cadmium (Filtered)	mg/L	0.0001	0.0002	0.0055		**0.0002**	0.0003	0.0003	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	**0.0002**	**0.0002**	0%	<0.0001	111%
	Chromium (III+VI) (Filtered)	mg/L	0.001				0.003	<0.001	<0.001	0.003	0.002	0.002	0.003	<0.001	0.002	0.002	0%	0.002	0%
	Copper (Filtered)	mg/L	0.001	0.0014	0.0013		0.008	0.002	**0.001**	0.005	0.003	<0.001	<0.001	0.003	0.116	0.111	4%	0.13	11%
	Lead (Filtered)	mg/L	0.001	0.0034	0.0044		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	35%	<0.001	0%
	Mercury (Filtered)	mg/L	0.0001	0.0006	0.0004		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0%	<0.00005	0%
	Nickel (Filtered)	mg/L	0.001	0.011	0.07		0.006	0.041	0.015	0.005	0.005	<0.001	0.002	0.001	0.014	0.014	0%	0.015	7%
	Zinc (Filtered)	mg/L	0.005	0.008	0.015		0.095	0.04	0.078	0.017	0.026	0.012	0.012	0.013	0.018	0.026	36%	0.018	0%
Heavy Metals (Total)	Arsenic	mg/L	0.001				-	-	-	-	-	-	-	-	-	-	-	-	-
	Cadmium	mg/L	0.0001	0.0002	0.0055		-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium (III+VI)	mg/L	0.001				-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper	mg/L	0.001	0.0014	0.0013		-	-	-	-	-	-	-	-	-	-	-	-	-
	Lead	mg/L	0.001	0.0034	0.0044		-	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury	mg/L	0.0001	0.0006	0.0004		-	-	-	-	-	-	-	-	-	-	-	-	-
	Nickel	mg/L	0.001	0.011	0.07		-	-	-	-	-	-	-	-	-	-	-	-	-
	Zinc	mg/L	0.005	0.008	0.015		-	-	-	-	-	-	-	-	-	-	-	-	-
PAH/Phenols	B(a)P Total Potency Equivalent	mg/L	0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0%	<0.005	0%
	2,4,5-trichlorophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2,4,6-trichlorophenol	µg/L	1	20			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2,4-dichlorophenol	µg/L	1	160			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2,4-dimethylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2,6-dichlorophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2-chlorophenol	µg/L	1	490			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2-methylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	2-nitrophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	3-&4-methylphenol	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	-	-
	4-chloro-3-methylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	-	-
	Acenaphthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Acenaphthylene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Benz(a)anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Benzo(a) pyrene	µg/L	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	<1	0%
	Benzo(b)fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<2	0%
	Benzo(k)fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%		
	Benzo(g,h,i)perylene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Chrysene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Dibenz(a,h)anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Fluorene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Indeno(1,2,3-c,d)pyrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Naphthalene	µg/L	1	16	70		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	PAHs (Sum of total)	µg/L	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	0	0%
	Pentachlorophenol	µg/L	2	10	22		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	-	-
	Phenanthrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Carcinogenic PAHs as B(a)P TPE	µg/L	1.82				<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	0%	<2.22	0%
	Phenol	µg/L	1	320	400		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<50	0%
	Pyrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	µg/L	1				-	-	-	-	-	-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%	<0.05	0%
	C16-C34	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%	<0.1	0%
	C34-C40	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%	<0.1	0%
	F2-NAPHTHALENE	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0%	<0.05	0%
	C10 - C14	µg/L	50				<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	0%	<50	0%
	C15 - C28	µg/L	100				<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	0%	<100	0%
	C29-C36	µg/L	50				<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	0%	<100	0%
	+C10 - C36 (Sum of total)	µg/L	50				<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	0%	<250	0%
	C10 - C40 (Sum of total)	µg/L	100				<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	0%	-	-
TRH Volatiles/BTEX	Benzene	µg/L	1	950	700	5000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0%	<1	0%
	Ethylbenzene	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	<1	0%
	Naphthalene	µg/L	5	16	70		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	0%	<1	0%
	Toluene	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	<1	0%
	Total BTEX	mg/L	0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	-	-
	C6 - C9	µg/L	20				<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	0%	<10	0%
	Xylene (m & p)	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	<2	0%
	Xylene (o)	µg/L	2	350			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	<1	0%
	Xylene Total	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0%	<3	0%
	C6-C10 less BTEX (F1)	mg/L	0.02			6000	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0%	<0.01	0%
	C6-C10	mg/L	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0%	<0.01	0%

Notes
A - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Freshwater Ecosystems with a 95% protection level
B - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Marine Water Ecosystems with a 95% protection level
C - NEPM 2013, Schedule B1, Table 1A(4), Groundwater Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 2m to 4m, Sands.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	MW10	MW11	MW12	MW13	W1	W2	W3	QCB	QCA	QCC	QCD	QCE	QCF
Sample Date	9/09/2014	9/09/2014	9/09/2014	9/09/2014	10/09/2014	10/09/2014	10/09/2014	27/08/2014	26/08/2014	27/08/2014	1/09/2014	4/09/2014	9/09/2014
Comments								Equipment Rinsate	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank

Compounds	Analytes	Units	EQL	[A]ANZECC 2000 FW 95%	[B]ANZECC 2000 MW 95%	[C]NEPM 2013, Table 1A(3), HSL's												
Heavy Metals (Dissolved)	Arsenic (Filtered)	mg/L	0.001				0.002	0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	-	-	-	-	-
	Cadmium (Filtered)	mg/L	0.0001	0.0002	0.0055		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Chromium (III+VI) (Filtered)	mg/L	0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
	Copper (Filtered)	mg/L	0.001	0.0014	0.0013		0.005	0.005	0.002	0.005	<0.001	<0.001	**0.001**	<0.001	-	-	-	-	-
	Lead (Filtered)	mg/L	0.001	0.0034	0.0044		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
	Mercury (Filtered)	mg/L	0.0001	0.0006	0.0004		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Nickel (Filtered)	mg/L	0.001	0.011	0.07		0.001	0.003	0.002	0.003	0.007	0.003	<0.001	<0.001	-	-	-	-	-
	Zinc (Filtered)	mg/L	0.005	0.008	0.015		0.114	0.01	0.022	0.033	0.038	**0.008**	0.014	<0.005	-	-	-	-	-
Heavy Metals (Total)	Arsenic	mg/L	0.001				-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
	Cadmium	mg/L	0.0001	0.0002	0.0055		-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Chromium (III+VI)	mg/L	0.001				-	-	-	-	<0.001	0.002	<0.001	<0.001	-	-	-	-	-
	Copper	mg/L	0.001	0.0014	0.0013		-	-	-	-	<0.001	0.002	0.01	<0.001	-	-	-	-	-
	Lead	mg/L	0.001	0.0034	0.0044		-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-
	Mercury	mg/L	0.0001	0.0006	0.0004		-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-
	Nickel	mg/L	0.001	0.011	0.07		-	-	-	-	0.007	0.003	<0.001	<0.001	-	-	-	-	-
	Zinc	mg/L	0.005	0.008	0.015		-	-	-	-	0.039	**0.008**	0.017	<0.005	-	-	-	-	-
PAH/Phenols	B(a)P Total Potency Equivalent	mg/L	0.0005				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	-
	2,4,5-trichlorophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2,4,6-trichlorophenol	µg/L	1	20			<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2,4-dichlorophenol	µg/L	1	160			<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2,4-dimethylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2,6-dichlorophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2-chlorophenol	µg/L	1	490			<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2-methylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	2-nitrophenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	3-&4-methylphenol	µg/L	2				<2	<2	<2	<2	<2	8.7	<2	<2	-	-	-	-	-
	4-chloro-3-methylphenol	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Acenaphthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Acenaphthylene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Benz(a)anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Benzo(a) pyrene	µg/L	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
	Benzo(b)fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Benzo(k)fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Chrysene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Dibenz(a,h)anthracene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Fluoranthene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Fluorene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Indeno(1,2,3-c,d)pyrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Naphthalene	µg/L	1	16	70		<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	PAHs (Sum of total)	µg/L	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
	Pentachlorophenol	µg/L	2	10	22		<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	-
	Phenanthrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Carcinogenic PAHs as B(a)P TPE	µg/L	1.82				<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	<1.82	-	-	-	-	-
	Phenol	µg/L	1	320	400		<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
	Pyrene	µg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	µg/L	1				<1	-	-	-	-	-	-	<1	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
	C16-C34	mg/L	0.1				<0.1	0.21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
	C34-C40	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
	F2-NAPHTHALENE	mg/L	0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-
	C10 - C14	µg/L	50				<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-
	C15 - C28	µg/L	100				<100	200	<100	<100	<100	<100	<100	<100	-	-	-	-	-
	C29-C36	µg/L	50				<50	<50	<50	<50	<50	<50	<50	<50	-	-	-	-	-
	+C10 - C36 (Sum of total)	µg/L	50				<50	200	<50	<50	<50	<50	<50	<50	-	-	-	-	-
	C10 - C40 (Sum of total)	µg/L	100				<100	210	<100	<100	<100	<100	<100	<100	-	-	-	-	-
TRH Volatiles/BTEX	Benzene	µg/L	1	950	700	5000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ethylbenzene	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Naphthalene	µg/L	5	16	70		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Toluene	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Total BTEX	mg/L	0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	C6 - C9	µg/L	20				<20	<20	<20	<20	<20	<20	<20	<20	-	-	-	-	-
	Xylene (m & p)	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene (o)	µg/L	2	350			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene Total	µg/L	2				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	C6-C10 less BTEX (F1)	mg/L	0.02			6000	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-
	C6-C10	mg/L	0.02				<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	-	-	-

Notes
A - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Freshwater Ecosystems with a 95% protection level
B - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Marine Water Ecosystems with a 95% protection level
C - NEPM 2013, Schedule B1, Table 1A(4), Groundwater Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 2m to 4m, Sands.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	TRIP SPIKE
Sample Date	9/09/2014
Comments	Trip Spike (14NEO49W)

Compounds	Analytes	Units	EQL	[A]ANZECC 2000 FW 95%	[B]ANZECC 2000 MW 95%	[C]NEPM 2013, Table 1A(3), HSL's	
Heavy Metals (Dissolved)	Arsenic (Filtered)	mg/L	0.001				-
	Cadmium (Filtered)	mg/L	0.0001	0.0002	0.0055		-
	Chromium (III+VI) (Filtered)	mg/L	0.001				-
	Copper (Filtered)	mg/L	0.001	0.0014	0.0013		-
	Lead (Filtered)	mg/L	0.001	0.0034	0.0044		-
	Mercury (Filtered)	mg/L	0.0001	0.0006	0.0004		-
	Nickel (Filtered)	mg/L	0.001	0.011	0.07		-
	Zinc (Filtered)	mg/L	0.005	0.008	0.015		-
Heavy Metals (Total)	Arsenic	mg/L	0.001				-
	Cadmium	mg/L	0.0001	0.0002	0.0055		-
	Chromium (III+VI)	mg/L	0.001				-
	Copper	mg/L	0.001	0.0014	0.0013		-
	Lead	mg/L	0.001	0.0034	0.0044		-
	Mercury	mg/L	0.0001	0.0006	0.0004		-
	Nickel	mg/L	0.001	0.011	0.07		-
	Zinc	mg/L	0.005	0.008	0.015		-
PAH/Phenols	B(a)P Total Potency Equivalent	mg/L	0.0005				-
	2,4,5-trichlorophenol	µg/L	1				-
	2,4,6-trichlorophenol	µg/L	1	20			-
	2,4-dichlorophenol	µg/L	1	160			-
	2,4-dimethylphenol	µg/L	1				-
	2,6-dichlorophenol	µg/L	1				-
	2-chlorophenol	µg/L	1	490			-
	2-methylphenol	µg/L	1				-
	2-nitrophenol	µg/L	1				-
	3-&4-methylphenol	µg/L	2				-
	4-chloro-3-methylphenol	µg/L	1				-
	Acenaphthene	µg/L	1				-
	Acenaphthylene	µg/L	1				-
	Anthracene	µg/L	1				-
	Benz(a)anthracene	µg/L	1				-
	Benzo(a) pyrene	µg/L	0.5				-
	Benzo(b)fluoranthene	µg/L	1				-
	Benzo(k)fluoranthene	µg/L	1				-
	Benzo(g,h,i)perylene	µg/L	1				-
	Chrysene	µg/L	1				-
	Dibenz(a,h)anthracene	µg/L	1				-
	Fluoranthene	µg/L	1				-
	Fluorene	µg/L	1				-
	Indeno(1,2,3-c,d)pyrene	µg/L	1				-
	Naphthalene	µg/L	1	16	70		-
	PAHs (Sum of total)	µg/L	0.5				-
	Pentachlorophenol	µg/L	2	10	22		-
	Phenanthrene	µg/L	1				-
	Carcinogenic PAHs as B(a)P TPE	µg/L	1.82				-
	Phenol	µg/L	1	320	400		-
	Pyrene	µg/L	1				-
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	µg/L	1				-
TRH - Semivolatile Fraction	C10-C16	mg/L	0.1				-
	C16-C34	mg/L	0.1				-
	C34-C40	mg/L	0.1				-
	F2-NAPHTHALENE	mg/L	0.1				-
	C10 - C14	µg/L	50				-
	C15 - C28	µg/L	100				-
	C29-C36	µg/L	50				-
	+C10 - C36 (Sum of total)	µg/L	50				-
	C10 - C40 (Sum of total)	µg/L	100				-
TRH Volatiles/BTEX	Benzene	µg/L	1	950	700	5000	16
	Ethylbenzene	µg/L	2				16
	Naphthalene	µg/L	5	16	70		18
	Toluene	µg/L	2				16
	Total BTEX	mg/L	0.001				0.081
	C6 - C9	µg/L	20				-
	Xylene (m & p)	µg/L	2				16
	Xylene (o)	µg/L	2	350			17
	Xylene Total	µg/L	2				33
	C6-C10 less BTEX (F1)	mg/L	0.02			6000	-
	C6-C10	mg/L	0.02				-

Notes
A - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Freshwater Ecosystems with a 95% protection level
B - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Marine Water Ecosystems with a 95% protection level
C - NEPM 2013, Schedule B1, Table 1A(4), Groundwater Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 2m to 4m, Sands.
BOLD values, denote concentrations detected within agreed decision error limits

Sample ID	Groundwater Statistics							
Sample Date								
Comments	Maximum	Average	Standard Deviation	Sample Size	Confidence Coefficient	Margin of Error	Upper 95% Confidence Limit	Lower 95% Confidence Limit

Compounds	Analytes	Units	EQL	[A]ANZECC 2000 FW 95%	[B]ANZECC 2000 MW 95%	[C]NEPM 2013, Table 1A(3), HSL's							
Heavy Metals (Dissolved)	Arsenic (Filtered)	mg/L	0.001				0.0050	0.0010	0.0015	13	1.96	0.0008	0.0018	0.0002
	Cadmium (Filtered)	mg/L	0.0001	0.0002	0.0055		0.0003	0.0001	0.0001	13	1.96	0.0001	**0.0002**	0.0001
	Chromium (III+VI) (Filtered)	mg/L	0.001				0.0030	0.0014	0.0011	13	1.96	0.0006	0.0020	0.0008
	Copper (Filtered)	mg/L	0.001	0.0014	0.0013		0.116	0.012	0.0313	13	1.96	0.0170	0.0290	0.0000
	Lead (Filtered)	mg/L	0.001	0.0034	0.0044		0.0005	0.0005	0.0000	13	1.96	0.0000	0.0005	0.0005
	Mercury (Filtered)	mg/L	0.0001	0.0006	0.0004		0.0001	0.0001	0.0000	13	1.96	0.0000	0.0001	0.0001
	Nickel (Filtered)	mg/L	0.001	0.011	0.07		0.0410	0.0076	0.0111	13	1.96	0.0060	0.0136	0.0016
	Zinc (Filtered)	mg/L	0.005	0.008	0.015		0.1140	0.0377	0.0349	13	1.96	0.0190	0.0567	0.0187
Heavy Metals (Total)	Arsenic	mg/L	0.001				-	-	-	-	-	-	-	-
	Cadmium	mg/L	0.0001	0.0002	0.0055		-	-	-	-	-	-	-	-
	Chromium (III+VI)	mg/L	0.001				-	-	-	-	-	-	-	-
	Copper	mg/L	0.001	0.0014	0.0013		-	-	-	-	-	-	-	-
	Lead	mg/L	0.001	0.0034	0.0044		-	-	-	-	-	-	-	-
	Mercury	mg/L	0.0001	0.0006	0.0004		-	-	-	-	-	-	-	-
	Nickel	mg/L	0.001	0.011	0.07		-	-	-	-	-	-	-	-
	Zinc	mg/L	0.005	0.008	0.015		-	-	-	-	-	-	-	-
PAH/Phenols	B(a)P Total Potency Equivalent	mg/L	0.0005				0.00025	0.00025	0	13	1.96	0	0.00025	0.00025
	2,4,5-trichlorophenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	2,4,6-trichlorophenol	µg/L	1	20			0.5	0.5	0	13	1.96	0	0.5	0.5
	2,4-dichlorophenol	µg/L	1	160			0.5	0.5	0	13	1.96	0	0.5	0.5
	2,4-dimethylphenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	2,6-dichlorophenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	2-chlorophenol	µg/L	1	490			0.5	0.5	0	13	1.96	0	0.5	0.5
	2-methylphenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	2-nitrophenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	3-&4-methylphenol	µg/L	2				1	1	0	13	1.96	0	1	1
	4-chloro-3-methylphenol	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Acenaphthene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Acenaphthylene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Anthracene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Benz(a)anthracene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Benzo(a) pyrene	µg/L	0.5				0.25	0.25	0	13	1.96	0	0.25	0.25
	Benzo(b)fluoranthene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Benzo(k)fluoranthene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Benzo(g,h,i)perylene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Chrysene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Dibenz(a,h)anthracene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Fluoranthene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Fluorene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Indeno(1,2,3-c,d)pyrene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Naphthalene	µg/L	1	16	70		0.5	0.5	0	13	1.96	0	0.5	0.5
	PAHs (Sum of total)	µg/L	0.5				0.25	0.25	0	13	1.96	0	0.25	0.25
	Pentachlorophenol	µg/L	2	10	22		1	1	0	13	1.96	0	1	1
	Phenanthrene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
	Carcinogenic PAHs as B(a)P TPE	µg/L	1.82				0.91	0.91	0	13	1.96	0	0.91	0.91
	Phenol	µg/L	1	320	400		0.5	0.5	0	13	1.96	0	0.5	0.5
	Pyrene	µg/L	1				0.5	0.5	0	13	1.96	0	0.5	0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	µg/L	1				0.5	0.5	0	1	1.96	0	0.5	0.5
TRH - Semivolatile Fraction	C10-C16	mg/L	0.1				0.5	0.5	0	13	1.96	0	0.5	0.5
	C16-C34	mg/L	0.1				0.5	0.5	0	13	1.96	0	0.5	0.5
	C34-C40	mg/L	0.1				0.5	0.5	0	13	1.96	0	0.5	0.5
	F2-NAPHTHALENE	mg/L	0.1				0.5	0.5	0	13	1.96	0	0.5	0.5
	C10 - C14	µg/L	50				25	25	0	13	1.96	0	25	25
	C15 - C28	µg/L	100				50	50	0	13	1.96	0	50	50
	C29-C36	µg/L	50				25	25	0	13	1.96	0	25	25
	+C10 - C36 (Sum of total)	µg/L	50				25	25	0	13	1.96	0	25	25
	C10 - C40 (Sum of total)	µg/L	100				50	50	0	13	1.96	0	50	50
TRH Volatiles/BTEX	Benzene	µg/L	1	950	700	5000	0.5	0.5	0	13	1.96	0	0.5	0.5
	Ethylbenzene	µg/L	2				1	1	0	13	1.96	0	1	1
	Naphthalene	µg/L	5	16	70		2.5	2.5	0	13	1.96	0	2.5	2.5
	Toluene	µg/L	2				1	1	0	13	1.96	0	1	1
	Total BTEX	mg/L	0.001				0.0005	0.0005	0	13	1.96	0	0.0005	0.0005
	C6 - C9	µg/L	20				10	10	0	13	1.96	0	10	10
	Xylene (m & p)	µg/L	2				1	1	0	13	1.96	0	1	1
	Xylene (o)	µg/L	2	350			1	1	0	13	1.96	0	1	1
	Xylene Total	µg/L	2				1	1	0	13	1.96	0	1	1
	C6-C10 less BTEX (F1)	mg/L	0.02			6000	0.01	0.01	0	13	1.96	0	0.01	0.01
	C6-C10	mg/L	0.02				0.01	0.01	0	13	1.96	0	0.01	0.01

Notes
A - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Freshwater Ecosystems with a 95% protection level
B - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Marine Water Ecosystems with a 95% protection level
C - NEPM 2013, Schedule B1, Table 1A(4), Groundwater Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 2m to 4m, Sands.

BOLD values, denote concentrations detected within agreed decision error limits
denote maximum concentrations that exceed adopted assessment criteria by a significant margin (greater than 2 standard deviations)

Sample ID	Surface Water Statistics							
Sample Date								
Comments	Maximum	Average	Standard Deviation	Sample Size	Confidence Coefficient	Margin of Error	Upper 95% Confidence Limit	Lower 95% Confidence Limit

Compounds	Analytes	Units	EQL	[A]ANZECC 2000 FW 95%	[B]ANZECC 2000 MW 95%	[C]NEPM 2013, Table 1A(3), HSL's							
Heavy Metals (Dissolved)	Arsenic (Filtered)	mg/L	0.001				0.001	0.0008	0.00017	3	1.96	0.000196	0.000996	0.000604
	Cadmium (Filtered)	mg/L	0.0001	0.0002	0.0055		0.00007	0.00007	0	3	1.96	0	0.00007	0.00007
	Chromium (III+VI) (Filtered)	mg/L	0.001				0.0007	0.0007	0	3	1.96	0	0.0007	0.0007
	Copper (Filtered)	mg/L	0.001	0.0014	0.0013		0.001	0.0008	0.00017	3	1.96	0.00020	0.000996	0.000604
	Lead (Filtered)	mg/L	0.001	0.0034	0.0044		0.0007	0.0007	0	3	1.96	0	0.0007	0.0007
	Mercury (Filtered)	mg/L	0.0001	0.0006	0.0004		0.00007	0.00007	0	3	1.96	0	0.00007	0.00007
	Nickel (Filtered)	mg/L	0.001	0.011	0.07		0.003	0.00185	0.00157	2	1.96	0.00218	0.00403	0
	Zinc (Filtered)	mg/L	0.005	0.008	0.015		0.038	0.02	0.01587	3	1.96	0.01796	0.03796	0.00204
Heavy Metals (Total)	Arsenic	mg/L	0.001				0.0007	0.0007	0	3	1.96	0	0.0007	0.0007
	Cadmium	mg/L	0.0001	0.0002	0.0055		0.00007	0.00007	0	3	1.96	0	0.00007	0.00007
	Chromium (III+VI)	mg/L	0.001				0.00200	0.00113	0.00075	3	1.96	0.00085	0.00198	0.00028
	Copper	mg/L	0.001	0.0014	0.0013		0.01000	0.00423	0.00504	3	1.96	0.00570	0.00993	0
	Lead	mg/L	0.001	0.0034	0.0044		0.0007	0.0007	0	3	1.96	0	0.0007	0.0007
	Mercury	mg/L	0.0001	0.0006	0.0004		0.00007	0.00007	0	3	1.96	0	0.00007	0.00007
	Nickel	mg/L	0.001	0.011	0.07		0.00700	0.00357	0.00319	3	1.96	0.00361	0.00717	0
	Zinc	mg/L	0.005	0.008	0.015		0.03900	0.02133	0.01595	3	1.96	0.01805	0.03938	0.00329
PAH/Phenols	B(a)P Total Potency Equivalent	mg/L	0.0005				0.00025	0.00025	0	3	1.96	0	0.00025	0.00025
	2,4,5-trichlorophenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	2,4,6-trichlorophenol	µg/L	1	20			0.5	0.5	0	3	1.96	0	0.5	0.5
	2,4-dichlorophenol	µg/L	1	160			0.5	0.5	0	3	1.96	0	0.5	0.5
	2,4-dimethylphenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	2,6-dichlorophenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	2-chlorophenol	µg/L	1	490			0.5	0.5	0	3	1.96	0	0.5	0.5
	2-methylphenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	2-nitrophenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	3-&4-methylphenol	µg/L	2				8.7	3.56667	4.44560	3	1.96	5.03067	8.59733	0
	4-chloro-3-methylphenol	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Acenaphthene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Acenaphthylene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Anthracene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Benz(a)anthracene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Benzo(a) pyrene	µg/L	0.5				0.25	0.25	0	3	1.96	0	0.25	0.25
	Benzo(b)fluoranthene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Benzo(k)fluoranthene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Benzo(g,h,i)perylene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Chrysene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Dibenz(a,h)anthracene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Fluoranthene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Fluorene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Indeno(1,2,3-c,d)pyrene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Naphthalene	µg/L	1	16	70		0.5	0.5	0	3	1.96	0	0.5	0.5
	PAHs (Sum of total)	µg/L	0.5				0.25	0.25	0	3	1.96	0	0.25	0.25
	Pentachlorophenol	µg/L	2	10	22		1	1	0	3	1.96	0	1	1
	Phenanthrene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
	Carcinogenic PAHs as B(a)P TPE	µg/L	1.82				0.91	0.91	0	3	1.96	0	0.91	0.91
	Phenol	µg/L	1	320	400		0.5	0.5	0	3	1.96	0	0.5	0.5
	Pyrene	µg/L	1				0.5	0.5	0	3	1.96	0	0.5	0.5
Polychlorinated Biphenyls (PCB)	PCBs (Sum of total)	µg/L	1				-	-	-	-	-	-	-	-
TRH - Semivolatile Fraction	C10-C16	mg/L	0.1				0.05	0.05	0	3	1.96	0	0.05	0.05
	C16-C34	mg/L	0.1				0.05	0.05	0	3	1.96	0	0.05	0.05
	C34-C40	mg/L	0.1				0.05	0.05	0	3	1.96	0	0.05	0.05
	F2-NAPHTHALENE	mg/L	0.1				0.05	0.05	0	3	1.96	0	0.05	0.05
	C10 - C14	µg/L	50				25	25	0	3	1.96	0	25	25
	C15 - C28	µg/L	100				50	50	0	3	1.96	0	50	50
	C29-C36	µg/L	50				25	25	0	3	1.96	0	25	25
	+C10 - C36 (Sum of total)	µg/L	50				25	25	0	3	1.96	0	25	25
	C10 - C40 (Sum of total)	µg/L	100				50	50	0	3	1.96	0	50	50
TRH Volatiles/BTEX	Benzene	µg/L	1	950	700	5000	0.5	0.5	0	3	1.96	0	0.5	0.5
	Ethylbenzene	µg/L	2				1	1	0	3	1.96	0	1	1
	Naphthalene	µg/L	5	16	70		2.5	2.5	0	3	1.96	0	2.5	2.5
	Toluene	µg/L	2				1	1	0	3	1.96	0	1	1
	Total BTEX	mg/L	0.001				0.0005	0.0005	0	3	1.96	0	0.0005	0.0005
	C6 - C9	µg/L	20				10	10	0	3	1.96	0	10	10
	Xylene (m & p)	µg/L	2				1	1	0	3	1.96	0	1	1
	Xylene (o)	µg/L	2	350			1	1	0	3	1.96	0	1	1
	Xylene Total	µg/L	2				1	1	0	3	1.96	0	1	1
	C6-C10 less BTEX (F1)	mg/L	0.02			6000	0.01	0.01	0	3	1.96	0	0.01	0.01
	C6-C10	mg/L	0.02				0.01	0.01	0	3	1.96	0	0.01	0.01

Notes
A - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Freshwater Ecosystems with a 95% protection level
B - ANZECC 2000, Table 3.4.1 Trigger Values for slightly to moderately disturbed Marine Water Ecosystems with a 95% protection level
C - NEPM 2013, Schedule B1, Table 1A(4), Groundwater Health Screening Levels for vapour intrusion. Column D Commercial/Industrial Land Use, 2m to 4m, Sands.
BOLD values, denote concentrations detected within agreed decision error limits
denote maximum concentrations that exceed adopted assessment criteria by a significant margin (greater than 2 standard deviations)

Loc	Sample ID	Depth	Gross Gamma Count Rate cpm/kg	Terrestrial Derived Air Kerma Rate nGy/h	Radiation Dose µSv/y	Moisture % by wt	Terrestrial Air Kerma		Gamma Spectrometry		
							nGy/h @1m	nGy/h @0m	Uranium-238 Isotope Bq/kg	Thorium Isotope Bq/kg	Potassium Isotope Bq/kg
ICRP, Member of the Public Dose Radiation Limit (above background)			--	--	1000	--	--	--	--	--	--
Hot Spots	14PX82-HS1	0.025	615788	3279	4591	4.8	1400	3200			
	14PX82-HS2	0.025	2749622	14641	20497	3.5	7700	16,300	6300 ± 300	25000 ± 2000	2000 ± 200
	14PX82-HS3	0.025	2658454	14156	19818	10.1	8100	17,000			
	14PX82-HS4	0.025	321875	1714	2400	11.8	1000	1800	1180 ± 60	2500 ± 200	260 ± 30
	14PX82-HS5	0.025	1493022	7950	11130	2.6	2600	7100	4100 ± 200	10500 ± 700	800 ± 100
	14PX82-HS6	0.025	535680	2852	3993	3.8	1600	6300			
Test Pits	14PX82-TP01/0.5	0.5	88072	469	657	16.2					
	14PX82-TP02/0.5	0.5	6435	34	48	43					
	14PX82-TP03/0.5	0.5	100483	535	749	12.5					
	14PX82-TP03/1.5	1.5	30808	164	230	33					
	14PX82-TP04/0-0.1	0.05	26979	144	202	13.4					
	14PX82-TP04/1.0-2.0	1.5	1135	6	8	13.1					
	14PX82-TP05/0.2	0.2	41168	219	307	4.2					
	14PX82-TP05/0.3-0.5	0.4	45357	242	339	4.7					
	14PX82-TP05/1.0	1	75579	402	563	10.3					
	14PX82-TP05/1.8	1.8	115988	618	865	10.3					
	14PX82-TP05/2.0-2.2	2.1	4465	24	34	19.1					
	14PX82-TP06/0.2-0.5	0.35	460605	2453	3434	7.4					
	14PX82-TP06/1.0	1	162754	867	1214	11.6					
	14PX82-TP06/2.0	2	433305	2307	3230	7.3			1590 ± 80	3000 ± 200	240 ± 30
	14PX82-TP06/3.0	3	202057	1076	1506	13.9					
	14PX82-TP07/0.1	0.1	43157	230	322	12.4			160 ± 7	290 ± 20	30 ± 10
	14PX82-TP07/0.2	0.2	157399	838	1173	9.5					
	14PX82-TP07/0.5-1.0	0.75	207364	1104	1546	9.6					
	14PX82-TP07/1.0	1	211673	1127	1578	8.7					
	14PX82-TP07/2.0	2	1458	8	11	18.2					
	14PX82-TP08/0.2-0.4	0.3	67904	362	507	10					
	14PX82-TP08/0.5-1.0	0.75	64046	341	477	8.2					
	14PX82-TP08/1.5	1.5	15803	84	118	14.6					
	14PX82-TP09/0.5	0.5	55785	297	416	15.5					
	14PX82-TP09/2.5	2.5	15692	84	118	17.2					
	14PX82-TP09/3.0	3	14339	76	106	18.7					
	14PX82-TP10/0.8-1.0	0.9	75004	399	559	6.5			310 ± 20	450 ± 30	60 ± 20
	14PX82-TP10/1.5-2.0	1.75	-18	0	0	5.4					
	14PX82-TP11/0.5-2.0	1.25	40206	214	300	8.7					
	14PX82-TP11/2.5	2.5	6101	32	45	18.4					
	14PX82-TP11/3.0	3	25580	136	190	18.4					
	14PX82-TP12/0.2	0.2	43935	234	328	5.6					
	14PX82-TP12/0.4-0.8	0.6	106432	567	794	6.5					
	14PX82-TP12/0.7-1.8	1.25	14079	75	105	9			52 ± 3	58 ± 4	37 ± 7
	14PX82-TP12/2.0	2	50565	269	377	23.3					
	14PX82-TP12/3.0	3	3212	17	24	19.5					
	14PX82-TP13/0.5	0.5	31439	167	234	6.1					
	14PX82-TP13/3.0	3	52785	281	393	12.8					
	14PX82-TP13/4.0	4	37563	200	280	9.3					
	14PX82-TP14/0.2	0.2	6305	34	48	3.5					
	14PX82-TP14/1.5-2.0	1.75	15516	83	116	3.9					
	14PX82-TP15/0.2	0.2	38475	205	287	1					
	14PX82-TP15/0.5-2.0	1.25	357425	1903	2664	6.7					
	14PX82-TP16/0.3	0.3	20927	111	155	4.1					
	14PX82-TP16/0.5	0.5	28178	150	210	3.7					
	14PX82-TP16/2.5	2.5	21794	116	162	5.6					
	14PX82-TP17/0.3	0.3	3652	19	27	16					
	14PX82-TP17/1.0-2.0	1.5	46900	250	350	5.6					
	14PX82-TP17/3.0	3..1	7519	40	56	43.1					
	14PX82-TP18/0.1	0.1	24588	131	183	8.6					
	14PX82-TP18/0.5-2.0	1.25	44192	235	329	9.6					
	14PX82-TP19/0.2	0.2	196458	1046	1464	10.4					
	14PX82-TP19/0.5	0.5	16615	88	123	11.7					
	14PX82-TP19/1.0	1	52068	277	388	8.1					
	14PX82-TP20/0.5	0.5	8904	47	66	4					
	14PX82-TP20/1.0-2.0	1.5	58878	314	440	11.4					
	14PX82-TP21/1.0	1	50608	269	377	6					
	14PX82-TP21/2.0	2	1358	7	10	8.1					
	14PX82-TP22/0.5-1.5	1	2990	16	22	11.8					
	14PX82-TP22/2.0	2	4850	26	36	14.6					
	14PX82-TP23/0.5-1.0	0.75	4727	25	35	13.2					
	14PX82-TP23/2.5-2.8	2.65	21162	113	158	19.5					
	14PX82-TP24/0.1	0.1	9556	51	71	14.4					
	14PX82-TP24/0.2-0.6	0.4	62680	334	468	8.6					
	14PX82-TP24/1.0-2.0	1.5	44481	237	332	9.9					
	14PX82-TP25/0-0.5	0.25	2167086	11539	16155	5.8					
	14PX82-TP25/0.5-1.0	0.75	7132	38	53	20.4					
	14PX82-TP26/0-0.1	0.05	759009	4042	5659	20.1					
	14PX82-TP26/0.1-0.5	0.3	14440	77	108	6.9					
	14PX82-TP26/0.4	0.4	79526	423	592	12					
	14PX82-TP26/0.5-0.8	0.65	1678	9	13	12.6					
	14PX82-TP27/0.5-0.6	0.55	287559	1531	2143	18.9			1500 ± 70	1800 ± 120	120 ± 30
	14PX82-TP27/1.5-1.6	1.55	7404	39	55	16.7					
	14PX82-TP27/1.8	1.8	88404	471	659	18.6					
Soil Bores	14PX82-SB01/0.5	0.5	24300	129	181	26.2					
	14PX82-SB02/0.5	0.5	97147	517	724						
	14PX82-SB03/0.5	0.5	56288	300	420	19.2					
	14PX82-SB04/0.5	0.5	30156	161	225						
	14PX82-SB05/0.5	0.5	10278	55	77	11.8					
	14PX82-SB06/0.5	0.5	28783	153	214	5.9					
	14PX82-SB07/0-0.5	0.25	7391	39	55						
	14PX82-SB07/0.5	0.5	4522	24	34	8.5					
	14PX82-SB08/0-0.5	0.25	173	1	1						
	14PX82-SB08/0.5	0.5	632	3	4	11.6					
	14PX82-SB09/0-0.5	0.25	24394	130	182				125 ± 6	190 ± 10	60 ± 10
	14PX82-SB09/0.5	0.5	37850	202	283	13.6					
	14PX82-SB10/0.5	0.5	6636	35	49	12.6					
	14PX82-SB11/0-0.5	0.25	13243	71	99						
	14PX82-SB11/0.5	0.5	1839	10	14	22.8					
	14PX82-SB13/0.5	0.5	47422	253	354	11.9					
	14PX82-SB15/0.5	0.5	805	4	6	14.3					
	14PX82-SB16/0-0.5	0.25	1858	10	14						
	14PX82-SB16/0.5	0.5	39131	208	291	12					
	14PX82-SB17/0.5	0.5	2404	13	18	11.7					

Sample ID	Date	Radium 226 Isotope mBq/L	Radium 228 Isotope mBq/L	Potassium mg/L	Potassium 40* Bq/L	Uranium µg/L	Uranium 238 mBq/L	Thorium µg/L	Thorium 232 mBq/L
14PX82-MW01	10/09/2014	50 ± 10	50 ± 30	100	3.2	3	40.3	<1.0	<4
14PX82-MW03	10/09/2014	50 ± 10	40 ± 30	33	1	2	25.2	<0.5	<2
14PX82-MW04	10/09/2014	17 ± 7	40 ± 30	8.9	0.28	2.3	28.9	0.2	0.8
14PX82-MW10	9/09/2014	<6	<50	3.3	0.1	0.1	1.3	<0.1	<0.4
14PX82-MW11	9/09/2014	14 ± 7	40 ± 30	6.3	0.2	1.2	15.1	<0.1	<0.4
14PX82-MW13	9/09/2014	25 ± 8	50 ± 30	2.9	0.09	0.6	7.5	<0.1	<0.4
14PX82-W3	10/09/2014	<5	<40	3.4	0.11	<0.1	<1.3	<0.1	<0.4

Notes
* Reported Potassium 40 concentrations are for beta decay only
ADWG - Australian Drinking Water Guidelines

Loc	Sample ID	Depth	Gross Gamma Count Rate cpm/kg	Terrestrial Derived Air Kerma Rate nGy/h	Radiation Dose µSv/y	Moisture % by wt	Terrestrial Air Kerma		Gamma Spectrometry		
							nGy/h @1m	nGy/h @0m	Uranium-238 Isotope Bq/kg	Thorium Isotope Bq/kg	Potassium Isotope Bq/kg
ICRP, Member of the Public Dose Radiation Limit (above background)			--	--	1000	--	--	--	--	--	--
Soil Bores	14PX82-SB18/0-0.5	0.25	2099	11	15						
	14PX82-SB18/0.5	0.5	986	5	7	7.8			13.1 ± 0.8	11 ± 1	20 ± 5
	14PX82-SB19/0-0.5	0.25	18759	100	140						
	14PX82-SB19/0.5	0.5	503969	2684	3758	10.1					
	14PX82-SB20/0-0.5	0.25	747	4	6						
	14PX82-SB20/0.5	0.5	-216	-1	-1	20.2					
	14PX82-SB21/0-0.5	0.25	1410	8	11						
	14PX82-SB21/0.5	0.5	1846	10	14	17.4					
	14PX82-SB22/0-0.5	0.25	94279	502	703						
	14PX82-SB22/0.5	0.5	1354	7	10	14.3					
	14PX82-SB23/0.5	0.5	75697	403	564	14.4					
	14PX82-SB24/0.5	0.5	176496	940	1316	11.6					

Notes
International Commission on Radiological Protection (ICRP), Recommended Member of Public Dose Limit

Appendix C. Site Photographs



PLATE 1 – Test Pit 15



PLATE 2 – Test Pit 13



PLATE 3 – Test Pit 08



PLATE 4 – Test Pit 22



PLATE 5 – Test Pit 07



PLATE 6 – Test Pit 09



PLATE 7 – Open Drain East Side



PLATE 8 – Open Drain West Side



PLATE 9 – Drain Outlets at Foreshore Hunter River



PLATE 10 – Open Drain West Side



PLATE 11 – Open Drain West Side



PLATE 12 – SB13/MW13



PLATE 13 – Example of silty clay at 2.1m below ground surface, SB10



PLATE 14 – XRF Soil Screening SB07



PLATE 15 – Example Fly-Tipped Waste



PLATE 16 – Example of soft wet silt, approx. 3m below ground surface, TP03



PLATE 17 – Demolished Admin Blding



PLATE 18 – Stockpiled processed material from Mineral Dry Plant

Appendix D. Bore Logs

BOREHOLE No. SB01/MW01

Sheet 1 of

Project: Former RZM Site, DSI
Location: Tomago, NSW
Job No: EN03269

Client: NSW RMS
Start - Finish Date: 4/9/2014 - 4/9/2014
Bore dia: 125mm

Driller: Epoca Environmental
Rig: Geoprobe 7822DT
Surface Conditions: Vegetation

Northings: 3248.707 mN
Eastings: 15141.785 mE
RL: 10.000 mB

Logged: GM
Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								SILT (CL), dark brown, dense, fine grained, roots, no odour.			
0.0	0	A	Zr 5352 Mn 573 Th 44	SB01/0.5	○			Sandy SILT (CL), dark brown, moist, moderate plasticity, coarse grained sand, no odour.		M	Push Tube and Solid Flight Augers
0.2	0	A	Zr 247	SB01/1.1	○	1 ▽		Silty SAND (SP), dark brown, wet, loose, no odour.		W	
						▼		SILT (CL), grey, moist, high plasticity, fine grained, no odour.		M	
0.0	0	A	Zr 174	SB01/2.0	○	2					
								Bore terminated at 2.7m in Silt.			
						3					
						4					
						5					

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄ ► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

BOREHOLE No. SB02/MW02

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.75 mN
Location: Tomago, NSW | Start - Finish Date: 4/9/2014 - 4/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.832 mE | Logged: GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Vegetation | RL: 10.110 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Sandy SILT (SP), dark brown/black, damp, dense, fine grained, clays, no odour.		M	
0.0	0	A	Cu 4371 Zr 394,800	SB02/0.5	○						Push Tube and Hollow Flight Augers
								SAND (SP), orange/brown, moist, soft, medium grained, no odour.		M	
								SILT (CL), grey, moist, soft, high plasticity, no odour.		M	
0.0	0	A	Zr 113	SB02/1.0	○	1		SAND (SP), dark brown, moist, loose, no odour.		M	
								SILT (CL), grey, wet, soft, fine grained, no odour.		W	
								Silty SAND (SM), grey/yellow, wet, very soft, no odour.		W	
0.0	0	A	Zr 138	SB02/1.9	○			SILTSTONE, white, dry, brittle, no odour.		D	
						2		Bore terminated at 1.9m. Refusal on Siltstone			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
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PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
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▽ = Standard Penetration Test (SPT top = start of N blowcount)
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■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB03/MW03

Sheet 1 of

Project: Former RZM Site, DSI
Location: Tomago, NSW
Job No: EN03269
Client: NSW RMS
Start - Finish Date: 3/9/2014 - 3/9/2014
Bore dia: 200mm
Driller: Epoca Environmental
Rig: Geoprobe 7822DT
Surface Conditions: Vegetation
Northings: 3248.773 mN
Eastings: 15141.856 mE
RL: 10.196 mB
Logged: GM
Checked: GM

FIELD DATA							SOIL DESCRIPTION	SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	ground water depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
							Gravelly SAND (GP), brown, moist, loose, coarse angular gravel, tree roots, no odour.		M	
0.0	0	A	Mn 7,891 Cu 1,889 Th 1	SB03/0.5	○		Silty CLAY (CL), brown, moist, very firm, fine grained, no odour.		M	Push Tube and Hollow Flight Augers
0.0	0	A	Zr 323	SB03/1.3	○		Sandy CLAY (CL), grey/red, wet, coarse grained sand, no odour.		W	
							As above but saturated and loose.		W	
0.0	0	A	Zr 537	SB03/2.0	○		Weathered SILTSTONE, yellow/red/green, dry, very stiff, no odour.		D	
							Bore terminated at 2.3m. Refusal on Siltstone.			

1
2
3
4
5

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Outflow / Inflow

FIELD DATA SYMBOLS
= Shear vane test
= Pocket Penetrometer test
= Standard Penetration Test (SPT top = start of N blowcount)
= SPT Spoon Sample (Pushed)
= Undisturbed Tube Sample
= Disturbed Sample
= Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB04/MW04

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.821 mN
Location: Tomago, NSW | Start - Finish Date: 4/9/2014 - 4/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.822 mE | Logged: GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Vegetation | RL: 10.631 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								SAND (SP), brown/yellow with black flecks, damp, loose, fine grained, tree roots, no odour.		M	
0.0	0	A	Zr 29,000	SB04/0.5	○						Push Tube and Hollow Flight Augers
								As above but no tree roots.		M	
0.0	0	A	Zr 38,900	SB04/1.0	○						
						1					
						▽		As above but becoming darker and wet.		W	
0.0	0	A	Zr 303	SB04/1.8	○						
								SILT (CL), grey, saturated, dense, fine grained, no odour.		W	
						2					
						▼		Silty SAND (SM), grey/red, saturated, soft, coarse grained, no odour.		W	
0.0	0	A		SB04/2.7	○						
								SILT (CL), grey, moist, dense, fine grained, no odour.		M	
								Bore terminated at 2.8m in Silt.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB05/MW05

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.94 mN
Location: Tomago, NSW | Start - Finish Date: 2/9/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.83 mE | Logged: GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Vegetation | RL: 10.899 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								FILL: SAND, yellow, moist, soft, no odour.		M	
0.1	0	A	Zr 801	SB05/0.5	○						Push Tube and Hollow Flight Augers
								SAND (SP), grey/yellow bands, moist, coarse grained, no odour.		M	
0.3	0	A	Zr 797	SB05/1.0	○	1					
								As above but saturated.		W	
0.0	0	A	Zr 338	SB05/2.0	○	2					
								Marine SILT (CL), grey, moist, stiff, fine grained, no odour.		M	
						3		Bore terminated at 3.0m in Silt.			
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB06/MW06

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.915 mN
Location: Tomago, NSW | Start - Finish Date: 2/9/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.892 mE | Logged: GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Vegetation | RL: 12.611 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								TOPSOIL (OL), brown, moist, loose, loam, roots, no odour.		M	
0.0	0	A	No XRF due to heavy rain.	SB06/0.5	○			SAND (SP), grey/yellow bands, moist, sorted, fined grained, no odour.		M	Push Tube and Hollow Flight Augers
0.0	0	A	No XRF due to heavy rain.	SB06/1.0	○	1					
						▽		As above but saturated.		W	
0.2	0	A	No XRF due to heavy rain.	SB06_2.0	○	2 ▼					
								Marine SILT (CL), grey, moist, stiff, fine grained, no odour.		M	
						3		Bore terminated at 2.9m in Silt.			
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB07/MW07

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.825 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 3/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.945 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Concrete | RL: 12.230 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.			
								Silty SAND (SM), pale white with black flecks, damp, loose, no odour.		M	
0.0	0	A	Zr 541	SB07/0.4	○			Silty SAND (SM), dark brown, moist, loose to dense, trace gravel, no odour.		M	Hand Auger to 1.1m
						▼ 1					
0.0	0	A	Zr 203	SB07/1.2	○			As above but becoming stained black.		M	
						▽		SAND (SP), yellow, saturated, loose, no odour.		W	
0.1	0	B	Zr 175	SB07/2.0	○	2		Silty SAND (SP), yellow, wet, very dense, anaerobic odour.		W	
						3					Push Tube and Hollow Flight Augers
								Silty CLAY (CL), brown, moist, dense, stiff, no odour.		M	
						4		Bore terminated at 3.7m in Silt.			
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB08

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.853 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.982 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete			
0.0	0	A	Mn 228 Zr 229	SB08/0.5	○			Silty SAND (SM), light brown, moist, soft, no odour.		M	Hand Auger to 0.6m
0.0	0	A	Zr 98	SB08/1.0		1					
						▽		As above but becoming lighter in colour and wet.		W	Push Tube to 2.7m
0.0	1	B	Zr 64	SB08/2.0	○	2		SAND (SP), white, wet, some fine gravel, slight odour.		W	
0.1	0	A	Zr 55	SB08/3.0	○	3		As above but grey.		W	
								SILT (CL), grey, moist, no odour.		M	Solid Flight Auger to 3.9m
						4		Bore terminated at 3.9 in Silt.			
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB09/MW09

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248848 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15142.036 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Asphalt | RL: 12.398 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Asphalt			
0.5	0	A	Zr 230	SB09/0.2	○			FILL: Silty GRAVEL, orange/brown, dry, loose, coarse gravel, road base, no odour.		D	
								Silty SAND (SM), dark brown, damp, loose, no odour.		M	Hand Auger to 0.5m
						▽		As above but wet.		W	
0.0	0	A	Zr 180	SB09/1.0	○		1				
						▼		SILT (CL), black, moist, dense, moderate plasticity, no odour.		M	
0.0	0	A	Zr 191	SB09/2.0	○		2	As above but becoming light brown.		M	Push Tube and Hollow Flight Auger
								Bore terminated at 2.7m in Silt.			
							3				
							4				
							5				

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB10/MW10

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.831 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15142.006 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Concrete | RL: 12.055 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete		D	
								Silty SAND (SM), dark brown, moist, loose, no odour.		M	
0.0	0	A	Zr 108	SB10/0.5	○						Hand Auger to 0.5m
0.0	0	A	Zr 93	SB10/1.0	○	1		As above but becoming lighter in colour.		M	
0.3	1	B	Zr 194	SB10/1.5	○			Silty SAND (SM), white, saturated, loose, slight hydrocarbon odour.		W	
								Clayey SILT (CL), grey mottled red, damp, stiff, no odour.		M	Push Tube and Hollow Flight Auger
0.0	0	A		SB10/2.0	○	2					
								Bore terminated at 2.7m in Silt.			
						3					
						4					
						5					

VISUAL RANKING
- 0 No visible evidence of contamination
- 1 Slight visible contamination
- 2 Visible contamination
- 3 Significant visible contamination

ODOUR RANKING
- A No Non-Natural odours
- B Slight Non-Natural odours
- C Moderate Non-Natural odours
- D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
- Suv = Uncorrected vane shear (kPa)
- Sup = Pocket penetrometer (kPa)
- N = SPT blows per 300mm
- FPM = Field permeability
- PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
- = Water level (static)
- = Water level (during drilling)
- = Outflow / Inflow

FIELD DATA SYMBOLS
- × = Shear vane test
- ⊥ = Pocket Penetrometer test
- ▽ = Standard Penetration Test (SPT top = start of N blowcount)
- = SPT Spoon Sample (Pushed)
- = Undisturbed Tube Sample
- ● = Disturbed Sample
- = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB11/MW11

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.812 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15142.009 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Asphalt | RL: 12.223 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Asphalt		D	
								FILL: Gravelly SAND, dark grey/black, wet, loose, trace ash, gravel, no odour.		W	
0.0	0	A	Zr 262	SB11/0.5	○						Hand Auger to 0.5m
								SAND (SP), mottled orange, moist, loose, no odour.		M	
0.0	0	A	Zr 186	SB11/1.0	○	1					
								As above but saturated.		W	
								SILT (CL), grey, wet, moderate plasticity, trace sands, no odour.		W	Push Tube and Hollow Flight Auger
0.1	0	A	Zr 230	SB11/2.0	○	2					
								Bore terminated at 2.5m in Silt.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB12/MW12

Sheet 1 of

Project: Former RZM Site, DSI
Location: Tomago, NSW
Job No: EN03269

Client: NSW RMS
Start - Finish Date: 2/9/2014 - 2/9/2014
Bore dia: 200mm

Driller: Epoca Environmental
Rig: Geoprobe 7822DT
Surface Conditions: Vegetation

Northings: 3248.814 mN
Eastings: 15141.956 mE
RL: 12.552 mB

Logged: GM
Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								FILL: CLAY, yellow, damp, low plasticity, fine grained, some gravel, no odour.		M	
								Gravelly SAND (GW), grey, damp, loose, coarse grained, angular gravel, no odour.		M	Push Tube and Hollow Flight Augers
0.0	0	A	Mn 171,000 Zr 2,000,000 Th 19,400	SB12/0.5	○	▽		SAND (SP), grey, wet, loose, coarse grained, no odour.		W	
0.0	0	A	Mn 5,523 Zr 323	SB12/1.0	○	▼ 1		As above but stained black.		W	
								As above but becoming white in colour and saturated.		W	
0.1	0	A	Zr 3,129 Th 59	SB12/2.0	○	2					
						3		Silty CLAY (CL), grey, dense, fine grained, no odour.		W	
								Bore terminated at 3.0m in Clay.			
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB13/MW13

Sheet 1 of

Project: Former RZM Site, DSI
Location: Tomago, NSW
Job No: EN03269

Client: NSW RMS
Start - Finish Date: 3/9/2014 - 3/9/2014
Bore dia: 200mm

Driller: Epoca Environmental
Rig: Geoprobe 7822DT
Surface Conditions: Vegetation

Northings: 3248.802 mN
Eastings: 15141.887 mE
RL: 11.193 mB

Logged: GM
Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								SAND (SP), brown, damp, loose, some angular gravel, no odour.		M	
								Gravelly SAND (GW), dark brown, damp, stiff, coarse angular gravel, no odour.		M	Push Tube and Hollow Flight Augers
0.0	0	A	Cu 2,931 Zr 237,200	SB13/0.5	○			SAND (SP), white with black specks, moist, loose, coarse grained, no odour.		M	
0.0	0	A	Zr 4,432	SB13/1.0	○	1		SAND (SM), black, wet, loose, coarse grained, no odour.		W	
								Silty CLAY (CL), grey with red bands, moist, high plasticity, no odour.		M	
0.0	0	A	Zr 952	SB13/2.0	○	2					
								Bore terminated at 2.7m in Clay.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▯ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB15

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.817 mN
Location: Tomago, NSW | Start - Finish Date: 1/9/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.989 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete		D	
								SAND (SP), brown, wet, loose, fine grained, no odour.		W	
0.1	0	A	Zr 114	SB15/0.5	○	▽					Push Tube
0.0	0	A	Zr 75	SB15/1.0	○						
0.0	0	A	Zr 119	SB15/2.0	○			As above but becoming yellow.		W	
								Silty CLAY (CL), brown, moist, very stiff/dense, no odour.		M	
0.0	0	A		SB15/2.8	○			Bore terminated at 2.8m in Silt.			

1 2 3 4 5

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)
VL (very loose) <10
L (loose) 10 - 20
MD (medium dense) 20 - 30
D (dense) 30 - 50
VD (very dense) >50
CO (compact) >50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)
VS (very soft) < 12 kPa
S (soft) 12 - 25
F (firm) 25 - 50
St (stiff) 50 - 100
VSt (very stiff) 100 - 200
H (hard) > 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB16

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.828 mN
Location: Tomago, NSW | Start - Finish Date: 1/9/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15142.011 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type field tests	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.			
								FILL: Silty GRAVEL, yellow, well sorted, road base, no odour.			
1.6	1	D	Zr 171	SB16/0.5	○			SAND (SP), brown, damp, loose, heavy oil odour.			Push Tube
						1					
0.0	1	B	Zr 6,639 Th 50	SB16/1.1				Silty SAND (SM), light brown, damp, loose, slight hydrocarbon odour.		M	
								SAND (SP), grey, moist, very dense, no odour.		M	
0.2	0	A	Zr 123	SB16/1.5							
						▽		Sandy SILT (SM), grey, wet, very stiff, no odour.		W	
						2		SAND (SP), grey, moist, loose, no odour.		M	
								Clayey SILT (CL), grey, moist, very dense, no odour.		M	
								Bore terminated at 2.7m in Silt.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB17

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.841 mN
Location: Tomago, NSW | Start - Finish Date: 1/9/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15142.031 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Asphalt | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Asphalt.		D	
								FILL: GRAVEL, yellow, moist, loose, gravel rounded and angular, well sorted, no odour.		M	
								SAND (SP), brown, moist, loose, no odour.		M	
0.0	0	A	Cu 731 Mn 5,282 Zr 73,300 Th 288	SB17/0.5, QC4							Push Tube
						▽					
1.2	1	B	Zr 132	SB17/1.0		1		As above but saturated with a slight hydrocarbon odour.		W	
								Silty SAND (SM), grey, saturated, loose, soft, no odour.		W	
0.0	0	A	Zr 171	SB17/2.0		2		SILT (CL), grey, wet, very stiff, no odour.		W	
						3		Bore terminated at 2.7m in Silt.			
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB18/MW08

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.639 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 1/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.986 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 200mm | Surface Conditions: Concrete | RL: 12.440 mB | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								FILL: Silty SAND, dark brown, damp, loose, trace gravel, no odour.		M	
0.0		A		SB18/0.5	○						Push Tube and Hollow Augers
								SAND (SP), yellow/orange becoming white, damp, loose, no odour.		M	
0.0		A	Zr 167	SB18/1.0	○	▼					
						1		As above but saturated.		W	
0.0		A	Zr 65	SB18/2.0	○						
						2					
0.0		A		SB18/3.0							
						3		Unable to sample via push tube, sand collaspe into bit.		W	
								CLAY (CL), grey, wet, dense, no odour.		W	
								Bore terminated at 3.7m in Clay.			
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB19

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.846 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 3/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141948 mE | Logged: RG
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								FILL: Silty SAND, grey and light brown, wet, loose, some gravel, no odour.		W	Hand Auger to 0.5m
0.0	0	A	Zr 184	SB19/0.5	○			FILL: GRAVEL, yellow, sorted gravels, road base, no odour.			
						1		SAND (SP), black, moist, loose, no odour.		M	
0.1	0	A	Zr 181	SB19/1.0	○			Becoming lighter in colour.		M	
								As above but white.		M	
0.0	0	A	Zr 161	SB19/1.8, QC7(A)	○	▽		As above but saturated.		W	Push Tube
						2					
								Silty CLAY (CL), light, brown, damp, fine grained, no odour.		M	
								Bore terminated at 2.7m in Silt.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB20

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.857 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.959 mE | Logged: RG
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								Silty SAND (SM), dark brown/dark grey, wet, soft, no odour.		W	
0.0	0	A		SB20/0.5	○			As above but becoming light brown.		W	Hand Auger to 0.6m
0.2	0	A	Zr 113	SB20/1.0	○	1					
						▽		As above but becoming white and saturated.		W	
0.0	0	A	Zr 74	SB20/2.0, QC6(A)	○	2					Push Tube
								Silty SAND (SM), light brown/white, saturated, very dense, fragments of fine angular gravel, no odour.		W	
								SILT (CL), brown, moist, very dense, no odour.		M	
								Bore terminated at 2.7m in Silt. Unable to retrieve sample.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB21

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.87 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 27/8/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.991 mE | Logged: RG & GM
Job No: EN03269 | Bore dia: 125mm | Surface Conditions: Asphalt | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Asphalt.		D	
								Silty GRAVEL (GM), orange, dry, hard, road base, no odour.		D	
								Silty SAND (SM), dark brown, dry, soft, no odour.		D	
											Hand Auger to 0.6m
0.0	0	A	Zr 87	SB21/0.5	○			SAND (SP), white, wet, loose, trace fine gravel, no odour.		W	
0.1	0	A	Zr 131	SB21/1.0	○		1				
						▽		As above but saturated.		W	
											Push Tube to 2.7m
0.0	0	A	Zr 55	SB21/2.0, QC5(A)	○		2	SAND (SP), brown, wet, loose, fine grained, no odour.		W	
0.3	0	A	Zr 68	SB21/3.0	○		3				
								SILT (CL), grey, moist, stiff, no odour.		M	
											Solid Flight Auger
							4	Bore terminated at 4.0m in Silt.			
							5				

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▮ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB22

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.848 mN
Location: Tomago, NSW | Start - Finish Date: 27/8/2014 - 3/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.916 mE | Logged: RG
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type field tests	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								Silty SAND (SM), light grey, damp, loose, trace black sand, no odour.		M	
0.0	0	A	Zr 230	SB22/0.5	○						Hand Auger to 0.5m
								As above but becoming black.		M	
0.0	0	A	Zr 206	SB22/1.0	○	1		SAND (SP), yellow/black bands, moist, no odour.		M	Push Tube
								As above becoming yellow.		M	
						▽		As above but saturated.		W	
0.0	0	A	Zr 173	SB22/1.9	○	2		Silty CLAY (CL), grey, wet, stiff, dense, no odour.		W	
								Bore terminated at 2.7m in Clay.			
						3					
						4					
						5					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

BOREHOLE No. SB23

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.86 mN
Location: Tomago, NSW | Start - Finish Date: 2/9/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.947 mE | Logged: GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								FILL: Gravelly SAND, grey with black staining, very stiff, road base, no odour.			
0.1	0	A	Zr 361	SB23/0.5	○			SAND (SP), brown, moist, loose, tree roots, anaerobic odour.		M	Push Tube
0.9	0	B	Zr 121	SB23/0.7	○			SAND (SP), white, moist, loose, anaerobic odour.		M	
						1					
						▽		As above but saturated.		W	
						2					
2.1	0	B	Zr 188	SB23/2.5	○			As above but very dense.		W	
								Bore terminated at 2.7m in Sand. Unable to retrieve sample.			
						3					
						4					
						5					

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

BOREHOLE No. SB24

Sheet 1 of

Project: Former RZM Site, DSI | Client: NSW RMS | Driller: Epoca Environmental | Northings: 3248.865 mN
Location: Tomago, NSW | Start - Finish Date: 2/9/2014 - 2/9/2014 | Rig: Geoprobe 7822DT | Eastings: 15141.935 mE | Logged: GM
Job No: EN03269 | Bore dia: 85mm | Surface Conditions: Concrete | RL: - | Checked: GM

FIELD DATA							SOIL DESCRIPTION		SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete.		D	
								FILL: GRAVEL, yellow, sorted, coarse angular gravels, road base, no odour.			
0.0	0	A	Zr 1,396	SB24/0.5	○			SAND (SP), black/yellow bands, moist, loose, no odour.		M	Push Tube
0.2	0	A	Zr 3,708	SB24/1.0	○			SAND (SP), brown, moist, dense, no odour.		M	
						▽		As above but saturated.		W	
8.6	0	B	Zr 37	SB24/2.0	○			SAND (SM), white, saturated, loose, some fine shell fragments, anaerobic odour.		W	
								Bore terminated at 2.7m in Sand. Unable to retrieve sample.			

1 2 3 4 5

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
◨ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

SKM ENV 1 FORMER RZM SITE, DETAILED SITE INVESTIGATION.GPJ SKM_ENVL1.GDT 24/9/14

Appendix E. Laboratory Analytical Certificates

CERTIFICATE OF ANALYSIS

Work Order	: **ES1418970**	Page	: 1 of 33
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: EN03269		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 05-SEP-2014
Site	: ----		
		No. of samples received	: 86
Quote number	: EN/003/14	No. of samples analysed	: 54

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
- Descriptive Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

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*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dian Dao		Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Satishkumar Trivedi	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos

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 performed, 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 insufficient 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **ASS: EA029 (SPOCAS): 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.**
- **ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5**
- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**
- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis on SAMPLES 1, 13, 31, 35, 36, 60, 67. As this has the potential to understate detection, results should be scrutinised accordingly and NATA accreditation does not apply to analysis on these samples.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**
- **EP080:The TRIP SPIKE and TRIP SPIKE CONTROL have been analysed for volatile TPH and BTEX only. The TRIP SPIKE and TRIP SPIKE CONTROL were prepared in the lab using reagent grade sand spiked with petrol. The TRIP SPIKE was dispatched from the lab and the TRIP SPIKE CONTROL retained. The spike samples were extracted and analysed concurrently with samples reported in this batch.**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TP23_0.0-0.5	TP23_0.5-2.0	TP24_0.0-0.5	TP24_3.0-3.5	TP14_0.3-0.7
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-001	ES1418970-002	ES1418970-004	ES1418970-006	ES1418970-007
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**9.0**	**8.6**	**5.3**	**25.4**	**4.4**
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		**No**	----	----	----	----
Asbestos Type	1332-21-4	-	--		**-**	----	----	----	----
Sample weight (dry)	----	0.01	g		**52.6**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--		**S.SPOONER**	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	**5**	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**3**	<2	**10**	**26**	**3**
Copper	7440-50-8	5	mg/kg		**7**	<5	<5	**14**	<5
Lead	7439-92-1	5	mg/kg		**10**	<5	**5**	**8**	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	**12**	<2
Zinc	7440-66-6	5	mg/kg		**21**	**24**	<5	**17**	**6**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
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	----	----	----
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+j)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	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP23_0.0-0.5	TP23_0.5-2.0	TP24_0.0-0.5	TP24_3.0-3.5	TP14_0.3-0.7
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-001	ES1418970-002	ES1418970-004	ES1418970-006	ES1418970-007
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**8.0**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**83.5**	**83.4**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**85.5**	**85.2**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**73.4**	**75.1**	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**85.5**	**88.7**	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**92.7**	**94.8**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**84.2**	**85.7**	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TP14ASS 3.8	TP04_2.8-3.2	TP04ASS 3.4	TP07_0.0-0.2	TP07_2.0-2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-009	ES1418970-011	ES1418970-012	ES1418970-013	ES1418970-015
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		**5.7**	----	**5.8**	----	**4.8**
pH OX (23B)	----	0.1	pH Unit		**4.0**	----	**3.4**	----	**4.5**
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**6**	----	**4**	----	**23**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		**109**	----	**91**	----	**39**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		**103**	----	**87**	----	**15**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	<0.02	----	**0.04**
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		**0.18**	----	**0.14**	----	**0.06**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		**0.16**	----	**0.14**	----	**0.02**
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	----	<0.02	----	**0.02**
Peroxide Sulfur (23De)	----	0.02	% S		**0.17**	----	**0.17**	----	**0.04**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		**0.17**	----	**0.17**	----	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		**106**	----	**104**	----	**10**
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		**0.10**	----	**0.08**	----	**0.04**
Peroxide Calcium (23Wh)	----	0.02	% Ca		**0.10**	----	**0.07**	----	**0.03**
Acid Reacted Calcium (23X)	----	0.02	% Ca		<0.02	----	<0.02	----	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		<10	----	<10	----	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		**0.10**	----	**0.07**	----	**0.06**
Peroxide Magnesium (23Tm)	----	0.02	% Mg		**0.10**	----	**0.06**	----	**0.06**
Acid Reacted Magnesium (23U)	----	0.02	% Mg		<0.02	----	<0.02	----	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		<10	----	<10	----	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	----	**1.5**	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.18**	----	**0.17**	----	**0.05**
Net Acidity (acidity units)	----	10	mole H+ / t		**113**	----	**108**	----	**34**
Liming Rate	----	1	kg CaCO3/t		**8**	----	**8**	----	**2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TP14ASS 3.8	TP04_2.8-3.2	TP04ASS 3.4	TP07_0.0-0.2	TP07_2.0-2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-009	ES1418970-011	ES1418970-012	ES1418970-013	ES1418970-015
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		----	**22.2**	----	**12.8**	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		----	----	----	**No**	----
Asbestos Type	1332-21-4	-	--		----	----	----	**-**	----
Sample weight (dry)	----	0.01	g		----	----	----	**76.6**	----
APPROVED IDENTIFIER:	----	-	--		----	----	----	**S.SPOONER**	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		----	<5	----	<5	----
Cadmium	7440-43-9	1	mg/kg		----	<1	----	**1**	----
Chromium	7440-47-3	2	mg/kg		----	<2	----	**22**	----
Copper	7440-50-8	5	mg/kg		----	<5	----	**6**	----
Lead	7439-92-1	5	mg/kg		----	<5	----	**25**	----
Nickel	7440-02-0	2	mg/kg		----	<2	----	<2	----
Zinc	7440-66-6	5	mg/kg		----	<5	----	**71**	----
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+j)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	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP14ASS 3.8	TP04_2.8-3.2	TP04ASS 3.4	TP07_0.0-0.2	TP07_2.0-2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-009	ES1418970-011	ES1418970-012	ES1418970-013	ES1418970-015
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	----	**1.2**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	----	----	**84.4**	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	----	----	**84.2**	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	----	----	**71.4**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	----	----	**87.3**	----
Anthracene-d10	1719-06-8	0.1	%		----	----	----	**94.1**	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	----	----	**85.2**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP08_0.4-0.9	TP10_0.2-0.7	TP18ASS 2.3-2.5	TP05_0.4-3.0	TP22_0.0-0.4
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-016	ES1418970-018	ES1418970-020	ES1418970-021	ES1418970-023
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	**5.9**	----	----
pH OX (23B)	----	0.1	pH Unit	----	----	**3.8**	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	**74**	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	**74**	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	----	**0.12**	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	----	**0.12**	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	**0.03**	----	----
Peroxide Sulfur (23De)	----	0.02	% S	----	----	**0.14**	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	----	**0.11**	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	**68**	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	----	**0.05**	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	----	**0.05**	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	----	<0.02	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	----	<0.02	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	----	**0.06**	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	----	**0.06**	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	----	<0.02	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	----	<0.02	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	**0.11**	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	**68**	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	**5**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP08_0.4-0.9	TP10_0.2-0.7	TP18ASS 2.3-2.5	TP05_0.4-3.0	TP22_0.0-0.4
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-016	ES1418970-018	ES1418970-020	ES1418970-021	ES1418970-023
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	8.8	9.0	----	8.9	22.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg	23	15	----	16	4
Copper	7440-50-8	5	mg/kg	<5	8	----	<5	8
Lead	7439-92-1	5	mg/kg	22	12	----	33	8
Nickel	7440-02-0	2	mg/kg	<2	8	----	<2	4
Zinc	7440-66-6	5	mg/kg	8	20	----	13	257
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	<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+j)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
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	----	----	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	----	----	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	----	----	----	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	----	----	----	1.2
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP08_0.4-0.9	TP10_0.2-0.7	TP18ASS 2.3-2.5	TP05_0.4-3.0	TP22_0.0-0.4
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-016	ES1418970-018	ES1418970-020	ES1418970-021	ES1418970-023
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	----	----	----	----	82.0
2-Chlorophenol-D4	93951-73-6	0.1	%	----	----	----	----	81.2
2.4.6-Tribromophenol	118-79-6	0.1	%	----	----	----	----	71.8
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	----	----	----	85.4
Anthracene-d10	1719-06-8	0.1	%	----	----	----	----	92.2
4-Terphenyl-d14	1718-51-0	0.1	%	----	----	----	----	83.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP22_0.5-1.5	TP22_2.0-2.2	TP12_0-0.5	TP12_0.5-1.0	TP12_0.5-1.0 DUPLICATE
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-024	ES1418970-025	ES1418970-026	ES1418970-027	ES1418970-028
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	**5.9**	----	----	----
pH OX (23B)	----	0.1	pH Unit		----	**3.7**	----	----	----
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	<2	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	**20**	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	**20**	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	<0.02	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	**0.03**	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	**0.03**	----	----	----
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	<0.02	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S		----	**0.02**	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		----	**0.02**	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		----	**16**	----	----	----
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		----	<0.02	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	<0.02	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	<0.02	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	<10	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	<0.02	----	----	----
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	<0.02	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	<0.02	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	<0.02	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	<10	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	<0.02	----	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	----	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	**0.02**	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	**16**	----	----	----
Liming Rate	----	1	kg CaCO3/t		----	**1**	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP22_0.5-1.5	TP22_2.0-2.2	TP12_0-0.5	TP12_0.5-1.0	TP12_0.5-1.0 DUPLICATE
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-024	ES1418970-025	ES1418970-026	ES1418970-027	ES1418970-028
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**15.6**	----	**4.8**	**9.4**	**11.0**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**3**	----	**25**	**5**	**5**
Copper	7440-50-8	5	mg/kg	<5	----	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	----	**23**	**6**	**7**
Nickel	7440-02-0	2	mg/kg	<2	----	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	----	**8**	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TP20_0-0.5	TP25_0-0.5	TP25_1.0-1.5	TP01_0.5	TP01_2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-031	ES1418970-035	ES1418970-036	ES1418970-037	ES1418970-038
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	**5.3**	**5.9**	----	----
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	----	----	----	**5.6**
pH OX (23B)	----	0.1	pH Unit		----	----	----	----	**5.2**
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	----	----	----	**10**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	----	----	----	**20**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	----	----	----	**10**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	----	----	----	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	----	----	----	**0.03**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	----	----	----	<0.02
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	----	----	**0.04**
Peroxide Sulfur (23De)	----	0.02	% S		----	----	----	----	**0.06**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		----	----	----	----	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		----	----	----	----	**12**
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		----	----	----	----	**0.08**
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	----	----	----	**0.08**
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	----	----	----	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	----	----	----	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	----	----	----	<0.02
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	----	----	----	**0.14**
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	----	----	----	**0.14**
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	----	----	----	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	----	----	----	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	----	----	----	<0.02
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	----	----	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	----	----	----	**0.04**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP20_0-0.5	TP25_0-0.5	TP25_1.0-1.5	TP01_0.5	TP01_2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-031	ES1418970-035	ES1418970-036	ES1418970-037	ES1418970-038
EA029-H: Acid Base Accounting - Continued									
Net Acidity (acidity units)	----	10	mole H+ / t		----	----	----	----	22
Liming Rate	----	1	kg CaCO3/t		----	----	----	----	2
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		4.6	16.9	22.4	30.2	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	No	No	----	----
Asbestos Type	1332-21-4	-	--		-	-	-	----	----
Sample weight (dry)	----	0.01	g		74.1	40.2	46.5	----	----
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	S.SPOONER	S.SPOONER	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	6	<5	7	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg		6	15	10	43	----
Copper	7440-50-8	5	mg/kg		<5	8	<5	24	----
Lead	7439-92-1	5	mg/kg		<5	12	25	11	----
Nickel	7440-02-0	2	mg/kg		<2	14	3	30	----
Zinc	7440-66-6	5	mg/kg		<5	72	7	51	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP20_0-0.5	TP25_0-0.5	TP25_1.0-1.5	TP01_0.5	TP01_2.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-031	ES1418970-035	ES1418970-036	ES1418970-037	ES1418970-038
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	0.6	0.6	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	1.2	1.2	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	83.8	83.3	85.2	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	85.6	84.3	86.8	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	74.4	72.5	78.2	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	86.6	84.8	88.2	----
Anthracene-d10	1719-06-8	0.1	%		----	92.4	89.4	94.1	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	83.6	84.2	86.2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP02_0.5	TP02_2.2	TP03_1.5	TP06_0.2	TP06_2.8
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-039	ES1418970-041	ES1418970-043	ES1418970-045	ES1418970-047
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	**6.8**	**5.1**	----	**5.7**
pH OX (23B)	----	0.1	pH Unit		----	**7.0**	**2.9**	----	**3.5**
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	<2	**11**	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	<2	**125**	----	**38**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	<2	**114**	----	**38**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	<0.02	<0.02	----	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	<0.02	**0.20**	----	**0.06**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	<0.02	**0.18**	----	**0.06**
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	<0.02	**0.02**	----	<0.02
Peroxide Sulfur (23De)	----	0.02	% S		----	<0.02	**0.21**	----	**0.04**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		----	<0.02	**0.19**	----	**0.04**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		----	<10	**118**	----	**25**
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		----	**0.06**	**0.04**	----	<0.02
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	**0.07**	**0.03**	----	<0.02
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	<0.02	<0.02	----	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	<10	<10	----	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	<0.02	<0.02	----	<0.02
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	**0.07**	**0.05**	----	<0.02
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	**0.08**	**0.05**	----	<0.02
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	<0.02	<0.02	----	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	<10	<10	----	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	<0.02	<0.02	----	<0.02
EA029-F: Excess Acid Neutralising Capacity									
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3		----	<0.02	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t		----	<10	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP02_0.5	TP02_2.2	TP03_1.5	TP06_0.2	TP06_2.8
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-039	ES1418970-041	ES1418970-043	ES1418970-045	ES1418970-047
EA029-F: Excess Acid Neutralising Capacity - Continued									
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S		----	<0.02	----	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	**1.5**	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	<0.02	**0.21**	----	**0.04**
Net Acidity (acidity units)	----	10	mole H+ / t		----	<10	**129**	----	**25**
Liming Rate	----	1	kg CaCO3/t		----	<1	**10**	----	**2**
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**31.8**	----	**21.7**	**6.7**	**12.8**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		**11**	----	**8**	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**45**	----	**31**	**10**	**8**
Copper	7440-50-8	5	mg/kg		**22**	----	**7**	**47**	<5
Lead	7439-92-1	5	mg/kg		**10**	----	**8**	**59**	**14**
Nickel	7440-02-0	2	mg/kg		**20**	----	**6**	<2	<2
Zinc	7440-66-6	5	mg/kg		**26**	----	**13**	**111**	**183**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	<0.1	<0.1	<0.1
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	----
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+j)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	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID: TP02_0.5	TP02_2.2	TP03_1.5	TP06_0.2	TP06_2.8
				Client sampling date / time: 26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
				ES1418970-039	ES1418970-041	ES1418970-043	ES1418970-045	ES1418970-047
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
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	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	<0.5	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	**1.2**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**85.2**	----	----	**88.2**	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**88.1**	----	----	**87.9**	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**74.9**	----	----	**73.9**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**88.2**	----	----	**89.2**	----
Anthracene-d10	1719-06-8	0.1	%	**94.9**	----	----	**94.8**	----
4-Terphenyl-d14	1718-51-0	0.1	%	**86.0**	----	----	**86.7**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP09_0.5	TP09_2.5	TP13_0.5	TP13_3.0	TP11_0.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-049	ES1418970-050	ES1418970-052	ES1418970-053	ES1418970-055
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	**5.9**	----	----	----
pH OX (23B)	----	0.1	pH Unit		----	**3.7**	----	----	----
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	<2	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	**15**	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	**15**	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	<0.02	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	**0.02**	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	**0.02**	----	----	----
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	<0.02	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S		----	<0.02	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		----	<0.02	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		----	<10	----	----	----
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		----	<0.02	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	<0.02	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	<0.02	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	<10	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	<0.02	----	----	----
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	<0.02	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	<0.02	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	<0.02	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	<10	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	<0.02	----	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	----	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TP09_0.5	TP09_2.5	TP13_0.5	TP13_3.0	TP11_0.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-049	ES1418970-050	ES1418970-052	ES1418970-053	ES1418970-055
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**14.1**	----	**5.8**	**15.2**	**7.2**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	----	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**3**	----	**4**	**7**	**12**
Copper	7440-50-8	5	mg/kg		<5	----	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	----	**8**	**9**	**14**
Nickel	7440-02-0	2	mg/kg		<2	----	<2	<2	**2**
Zinc	7440-66-6	5	mg/kg		<5	----	<5	<5	**35**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	<0.1	<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+j)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
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		----	----	----	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		----	----	----	----	**1.2**
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP09_0.5	TP09_2.5	TP13_0.5	TP13_3.0	TP11_0.5
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-049	ES1418970-050	ES1418970-052	ES1418970-053	ES1418970-055
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	----	----	----	----	85.2
2-Chlorophenol-D4	93951-73-6	0.1	%	----	----	----	----	83.1
2.4.6-Tribromophenol	118-79-6	0.1	%	----	----	----	----	75.0
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	----	----	----	86.6
Anthracene-d10	1719-06-8	0.1	%	----	----	----	----	93.1
4-Terphenyl-d14	1718-51-0	0.1	%	----	----	----	----	84.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP15_0.5	TP17_0.5	TP17_1.0	TP18_3.5	TP19_0.5
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-058	ES1418970-060	ES1418970-061	ES1418970-066	ES1418970-067
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	**5.0**	----
pH OX (23B)	----	0.1	pH Unit	----	----	----	**5.0**	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	**11**	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	----	**23**	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	----	**12**	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	<0.02	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	----	----	**0.04**	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	----	----	<0.02	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	----	<0.02	----
Peroxide Sulfur (23De)	----	0.02	% S	----	----	----	<0.02	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	----	----	<0.02	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	----	<10	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	----	----	**0.02**	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	----	----	**0.02**	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	----	----	<0.02	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	----	----	<0.02	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	----	----	**0.06**	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	----	----	**0.06**	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	----	----	<0.02	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	----	----	<0.02	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	----	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	**11**	----
Liming Rate	----	1	kg CaCO3/t	----	----	----	<1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15_0.5	TP17_0.5	TP17_1.0	TP18_3.5	TP19_0.5
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418970-058	ES1418970-060	ES1418970-061	ES1418970-066	ES1418970-067
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		4.7	5.0	29.0	17.5	4.5
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		----	No	----	----	No
Asbestos Type	1332-21-4	-	--		----	-	----	----	-
Sample weight (dry)	----	0.01	g		----	53.4	----	----	82.2
APPROVED IDENTIFIER:	----	-	--		----	S.SPOONER	----	----	S.SPOONER
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		13	9	11	10	2
Copper	7440-50-8	5	mg/kg		<5	<5	8	<5	<5
Lead	7439-92-1	5	mg/kg		37	8	18	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	7	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	13	45	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<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+j)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	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP15_0.5	TP17_0.5	TP17_1.0	TP18_3.5	TP19_0.5
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-058	ES1418970-060	ES1418970-061	ES1418970-066	ES1418970-067
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**1.2**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	----	**85.4**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	----	**87.3**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	----	**73.9**	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	**88.6**	----	----	----
Anthracene-d10	1719-06-8	0.1	%	----	**95.3**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	----	**86.3**	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP21_1.0	TP21_2.0	TP16_0.5	TP16_2.5	TP16_3.0
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-072	ES1418970-073	ES1418970-076	ES1418970-077	ES1418970-078
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	6.8	10.7	<1.0	9.1	19.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	4	4	4	10	9
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg	5	6	<5	13	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	6	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	QC01	QC02	TRIP SPIKE	TP24 3.0	TP01 3.0
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-079	ES1418970-080	ES1418970-082	ES1418970-083	ES1418970-084
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	----	----	**4.7**	**5.6**
pH OX (23B)	----	0.1	pH Unit		----	----	----	**4.3**	**5.1**
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	----	----	**28**	**4**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	----	----	**113**	**12**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	----	----	**85**	**8**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	----	----	**0.04**	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	----	----	**0.18**	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	----	----	**0.14**	<0.02
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	----	<0.02	<0.02
Peroxide Sulfur (23De)	----	0.02	% S		----	----	----	**0.05**	**0.04**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		----	----	----	**0.05**	**0.04**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		----	----	----	**31**	**25**
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		----	----	----	**0.06**	**0.06**
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	----	----	**0.07**	**0.06**
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	----	----	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	----	----	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	----	----	<0.02	<0.02
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	----	----	**0.06**	**0.10**
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	----	----	**0.06**	**0.11**
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	----	----	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	----	----	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	----	----	<0.02	<0.02
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	----	----	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	----	----	**0.10**	**0.05**
Net Acidity (acidity units)	----	10	mole H+ / t		----	----	----	**60**	**29**
Liming Rate	----	1	kg CaCO3/t		----	----	----	**4**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	QC01	QC02	TRIP SPIKE	TP24 3.0	TP01 3.0
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418970-079	ES1418970-080	ES1418970-082	ES1418970-083	ES1418970-084
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	30.9	31.7	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	8	14	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	35	38	----	----	----
Copper	7440-50-8	5	mg/kg	25	25	----	----	----
Lead	7439-92-1	5	mg/kg	12	10	----	----	----
Nickel	7440-02-0	2	mg/kg	28	24	----	----	----
Zinc	7440-66-6	5	mg/kg	49	30	----	----	----
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	<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	----	----	----
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+j)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	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----
EP080: BTEXN								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	QC01	QC02	TRIP SPIKE	TP24 3.0	TP01 3.0
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00
					ES1418970-079	ES1418970-080	ES1418970-082	ES1418970-083	ES1418970-084
EP080: BTEXN - Continued									
Benzene	71-43-2	0.2	mg/kg		----	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	----	**6.9**	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	**0.8**	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	**4.4**	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	**1.9**	----	----
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		----	----	**6.3**	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		----	----	**14.0**	----	----
Naphthalene	91-20-3	1	mg/kg		----	----	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**86.8**	**83.3**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**86.1**	**86.1**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**78.6**	**78.3**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**87.7**	**90.6**	----	----	----
Anthracene-d10	1719-06-8	0.1	%		**93.5**	**96.8**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		**84.5**	**87.4**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	----	**98.8**	----	----
Toluene-D8	2037-26-5	0.1	%		----	----	**95.4**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	----	**93.9**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP15 2.5	TSC	TP02-2.0	-----	-----
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	----	----
Compound	CAS Number	LOR	Unit	ES1418970-085	ES1418970-086	ES1418970-087	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	**6.4**	----	----
pH OX (23B)	----	0.1	pH Unit	----	----	**6.6**	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	<2	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	----	<0.02	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	**0.02**	----	----
Peroxide Sulfur (23De)	----	0.02	% S	----	----	**0.02**	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	----	<0.02	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	<10	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	----	**0.07**	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	----	**0.09**	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	----	<0.02	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	----	<0.02	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	----	**0.10**	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	----	**0.11**	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	----	<0.02	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	**10**	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	----	<0.02	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	**0.20**	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	**40**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15 2.5	TSC	TP02-2.0	----	----
				Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	----	----
Compound	CAS Number	LOR	Unit		ES1418970-085	ES1418970-086	ES1418970-087	----	----
EA029-F: Excess Acid Neutralising Capacity - Continued									
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S		----	----	**0.06**	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	----	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t		----	----	<1	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**13.0**	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg		<2	----	----	----	----
Copper	7440-50-8	5	mg/kg		<5	----	----	----	----
Lead	7439-92-1	5	mg/kg		<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg		<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg		<5	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<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+j)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	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP15 2.5	TSC	TP02-2.0	----	----
			Client sampling date / time	26-AUG-2014 15:00	26-AUG-2014 15:00	26-AUG-2014 15:00	----	----
Compound	CAS Number	LOR	Unit	ES1418970-085	ES1418970-086	ES1418970-087	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
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	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	**0.2**	----	----	----
Toluene	108-88-3	0.5	mg/kg	----	**8.9**	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	**1.1**	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	**5.7**	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	**2.4**	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg	----	**8.1**	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	**18.3**	----	----	----
Naphthalene	91-20-3	1	mg/kg	----	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**85.2**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**84.6**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**71.5**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**89.4**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**96.4**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**87.2**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	**103**	----	----	----
Toluene-D8	2037-26-5	0.1	%	----	**93.5**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	----	**93.6**	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: QCA	----	----	----	----
				Client sampling date / time: 26-AUG-2014 15:00	----	----	----	----
				ES1418970-081	----	----	----	----
EP080: BTEXN								
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	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**100**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**106**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**91.3**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	TP23_0.0-0.5 - 26-AUG-2014 15:00	Mid grey - brown sandy soil with grey rocks plus a trace of vegetation.
EA200: Description	TP07_0.0-0.2 - 26-AUG-2014 15:00	Dark grey - brown sandy soil with a trace of vegetation.
EA200: Description	TP20_0-0.5 - 26-AUG-2014 15:00	Mid brown sandy soil with a trace of vegetation.
EA200: Description	TP25_0-0.5 - 26-AUG-2014 15:00	Mid brown sandy soil with some vegetation.
EA200: Description	TP25_1.0-1.5 - 26-AUG-2014 15:00	Mid grey - brown sandy soil with a trace of vegetation.
EA200: Description	TP17_0.5 - 26-AUG-2014 15:00	Mid yellow sandy soil with a trace of vegetation.
EA200: Description	TP19_0.5 - 26-AUG-2014 15:00	Mid brown sandy soil with orange rocks plus a trace of vegetation.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1418970**	Page	: 1 of 16
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 05-SEP-2014
Order number	: EN03269		
		No. of samples received	: 86
Quote number	: EN/003/14	No. of samples analysed	: 54

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

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 performed, 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 insufficient 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

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*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dian Dao		Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Satishkumar Trivedi	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 3610586)									
ES1418969-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.1	6.8	4.0	0% - 20%
ES1418969-016	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.8	6.8	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: pH KCl (23A)	----	0.1	pH Unit	9.5	9.5	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.9	8.0	1.2	0% - 20%
ES1418969-014	Anonymous	EA029: pH KCl (23A)	----	0.1	pH Unit	6.1	6.2	1.6	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.1	7.0	1.4	0% - 20%
EA029-A: pH Measurements (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: pH KCl (23A)	----	0.1	pH Unit	5.7	5.7	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	3.5	3.4	2.9	0% - 20%
EA029-B: Acidity Trail (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
ES1418969-014	Anonymous	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.06	0.06	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.06	0.06	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	38	37	0.0	0% - 50%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	38	37	0.0	0% - 50%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-C: Sulfur Trail (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.42	6.4	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.18	0.19	5.6	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
ES1418969-014	Anonymous	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.03	0.03	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.04	0.05	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	25	24	6.4	No Limit
EA029-D: Calcium Values (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.33	0.34	4.4	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	2.31	2.40	3.7	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	1.98	2.05	3.6	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	1.59	1.64	3.6	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	989	1020	3.6	0% - 20%
ES1418969-014	Anonymous	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.44	0.44	0.0	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.47	0.51	6.6	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.04	0.06	49.9	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.03	0.05	49.9	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	19	32	49.9	No Limit
EA029-D: Calcium Values (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.03	0.03	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.03	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.04	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-E: Magnesium Values (QC Lot: 3615183) - continued									
EM1408760-001	Anonymous	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	23	24	5.6	No Limit
ES1418969-014	Anonymous	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.11	0.12	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.12	0.13	9.2	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	13	24.2	No Limit
EA029-E: Magnesium Values (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	5.88	5.88	0.0	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	1.88	1.88	0.0	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	1170	1180	0.0	0% - 20%
ES1418969-014	Anonymous	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.56	0.62	9.5	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.18	0.20	9.5	No Limit
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	112	123	9.5	0% - 50%
EA029-H: Acid Base Accounting (QC Lot: 3615183)									
EM1408760-001	Anonymous	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
ES1418969-014	Anonymous	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-H: Acid Base Accounting (QC Lot: 3615184)									
ES1418970-047	TP06_2.8	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	0.04	0.04	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-H: Acid Base Accounting (QC Lot: 3615184) - continued									
ES1418970-047	TP06_2.8	EA029: Liming Rate	----	1	kg CaCO3/t	2	2	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	25	24	6.4	No Limit
EA055: Moisture Content (QC Lot: 3613397)									
ES1418970-004	TP24_0.0-0.5	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	5.3	5.9	9.3	No Limit
ES1418970-027	TP12_0.5-1.0	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	9.4	9.9	5.4	No Limit
EA055: Moisture Content (QC Lot: 3613398)									
ES1418970-047	TP06_2.8	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	12.8	13.1	2.1	0% - 50%
ES1418970-073	TP21_2.0	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	10.7	12.5	15.1	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 3615220)									
ES1418910-181	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	14	12.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	7	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	6	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	13	13	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	22	23	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	48	49	2.3	No Limit
ES1418970-007	TP14_0.3-0.7	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	3	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	6	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3615223)									
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	4	25.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	<5	34.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
ES1418970-052	TP13_0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	6	16.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3616188)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005T: Total Metals by ICP-AES (QC Lot: 3616188) - continued									
ES1418970-076	TP16_0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	6	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
ES1419332-011	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	36	39	8.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	26	28	7.7	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	12	13	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	45	48	5.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	28	32	10.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	108	117	7.5	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3615221)									
ES1418910-181	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.1	0.1	0.0	No Limit
ES1418970-007	TP14_0.3-0.7	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3615224)									
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1418970-052	TP13_0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3616189)									
ES1418970-076	TP16_0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419332-011	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3610895)									
ES1418970-001	TP23_0.0-0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3610895) - continued									
ES1418970-001	TP23_0.0-0.5	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1418970-060	TP17_0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080: BTEXN (QC Lot: 3610554)									
ES1419159-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES1419159-010	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	1.7	1.5	11.6	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	3.6	3.4	6.3	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	3	2	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 3610764)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 3610764) - continued									
EN1402891-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES1419252-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA029-A: pH Measurements (QCLot: 3615183)								
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.30 pH Unit	100	70	130
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	2.80 pH Unit	104	70	130
EA029-A: pH Measurements (QCLot: 3615184)								
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.30 pH Unit	100	70	130
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	2.80 pH Unit	100	70	130
EA029-B: Acidity Trail (QCLot: 3615183)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	47.2 mole H+ / t	98.0	70	130
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	179.8 mole H+ / t	107	70	130
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 3615184)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	47.2 mole H+ / t	93.8	70	130
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	179.8 mole H+ / t	106	70	130
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 3615183)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	0.043 % S	99.6	70	130
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	0.205 % S	95.2	70	130
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 3615184)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	0.043 % S	98.6	70	130
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	0.205 % S	97.0	70	130
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 3615183)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	0.119 % Ca	101	70	130
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	0.301 % Ca	99.6	70	130
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA029-D: Calcium Values (QCLot: 3615183) - continued								
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 3615184)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	0.119 % Ca	101	70	130
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	0.301 % Ca	97.7	70	130
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 3615183)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	0.338 % Mg	88.2	70	130
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	0.307 % Mg	92.7	70	130
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 3615184)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	0.338 % Mg	83.5	70	130
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	0.307 % Mg	92.6	70	130
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 3615183)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----
EA029-H: Acid Base Accounting (QCLot: 3615183)								
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EA029-H: Acid Base Accounting (QCLot: 3615184)								
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3615220)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	113	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	106	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	115	80	136

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3615220) - continued								
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	113	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	106	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	115	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	113	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3615223)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	114	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	121	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	115	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	105	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	119	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	118	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3616188)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	114	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	90.4	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	112	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	108	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	114	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	108	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615221)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	87.7	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615224)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	87.2	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3616189)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	93.6	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3610895)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	99.8	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	101	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	103	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	102	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	101	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	104	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	109	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	109	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	96.2	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	100	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	92.7	70	118

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3610895) - continued								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	109	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	103	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	84.1	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	81.1	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	79.3	72.4	114
EP080: BTEXN (QCLot: 3610554)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	95.9	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	99.0	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	94.6	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	98.8	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	98.7	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	93.8	62	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3610764)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	113	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	113	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	112	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	95.3	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	109	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	115	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 3615220)							
ES1418910-181	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	105	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	101	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	101	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	104	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	99.6	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3615220) - continued							
ES1418910-181	Anonymous	EG005T: Nickel	7440-02-0	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	99.8	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3615223)							
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG005T: Arsenic	7440-38-2	50 mg/kg	91.0	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	111	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	109	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	109	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	110	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	109	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3616188)							
ES1418970-076	TP16_0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	89.0	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	111	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	95.9	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	111	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	110	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	112	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	109	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615221)							
ES1418910-181	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.9	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615224)							
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG035T: Mercury	7439-97-6	5 mg/kg	98.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3616189)							
ES1418970-076	TP16_0.5	EG035T: Mercury	7439-97-6	5 mg/kg	103	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3610895)							
ES1418970-001	TP23_0.0-0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.8	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	108	70	130
EP080: BTEXN (QCLot: 3610554)							
ES1419159-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	82.4	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	92.1	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	87.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.3	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	90.1	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	81.8	70	130

Sub-Matrix: **WATER**

		Matrix Spike (MS) Report			
		Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 3610764)							
EN1402891-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	107	70	130
		EP080: Toluene	108-88-3	25 µg/L	122	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	91.6	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	86.2	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	96.1	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	113	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3610554)										
ES1419159-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	82.4	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	92.1	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	87.4	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.3	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	90.1	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	81.8	----	70	130	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3610895)										
ES1418970-001	TP23_0.0-0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	96.8	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	108	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3615220)										
ES1418910-181	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	105	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	101	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	101	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	104	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	99.6	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	101	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	99.8	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615221)										
ES1418910-181	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.9	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3615223)										
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG005T: Arsenic	7440-38-2	50 mg/kg	91.0	----	70	130	----	----

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG005T: Total Metals by ICP-AES (QCLot: 3615223) - continued										
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG005T: Cadmium	7440-43-9	50 mg/kg	111	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	108	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	109	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	109	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	110	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	109	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3615224)										
ES1418970-028	TP12_0.5-1.0 DUPLICATE	EG035T: Mercury	7439-97-6	5 mg/kg	98.4	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3616188)										
ES1418970-076	TP16_0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	89.0	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	111	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	95.9	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	111	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	110	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	112	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	109	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3616189)										
ES1418970-076	TP16_0.5	EG035T: Mercury	7439-97-6	5 mg/kg	103	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3610764)										
EN1402891-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	107	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	122	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	91.6	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	86.2	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	25 µg/L	96.1	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	113	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1418970**	Page	: 1 of 12
Client	: JACOBS GROUP (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 05-SEP-2014
Order number	: EN03269		
		No. of samples received	: 86
Quote number	: EN/003/14	No. of samples analysed	: 54

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 Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
TP25_0-0.5, TP25_1.0-1.5	**26-AUG-2014**	**01-SEP-2014**	02-SEP-2014	✓	**01-SEP-2014**	01-SEP-2014	✓
EA029-H: Acid Base Accounting							
80* dried soil (EA029)							
TP02_2.2	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)							
TP14ASS 3.8, TP04ASS 3.4, TP07_2.0-2.5, TP18ASS 2.3-2.5, TP22_2.0-2.2, TP01_2.5, TP03_1.5, TP06_2.8, TP09_2.5, TP18_3.5, TP24 3.0, TP01 3.0, TP02-2.0	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
EA029-B: Acidity Trail							
80* dried soil (EA029)							
TP02_2.2	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)							
TP14ASS 3.8, TP04ASS 3.4, TP07_2.0-2.5, TP18ASS 2.3-2.5, TP22_2.0-2.2, TP01_2.5, TP03_1.5, TP06_2.8, TP09_2.5, TP18_3.5, TP24 3.0, TP01 3.0, TP02-2.0	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA029-D: Calcium Values								
80* dried soil (EA029)								
TP02_2.2		**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)								
TP14ASS 3.8,	TP04ASS 3.4,	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
TP07_2.0-2.5,	TP18ASS 2.3-2.5,							
TP22_2.0-2.2,	TP01_2.5,							
TP03_1.5,	TP06_2.8,							
TP09_2.5,	TP18_3.5,							
TP24 3.0,	TP01 3.0,							
TP02-2.0								
EA029-F: Excess Acid Neutralising Capacity								
80* dried soil (EA029)								
TP02_2.2		**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)								
TP14ASS 3.8,	TP04ASS 3.4,	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
TP07_2.0-2.5,	TP18ASS 2.3-2.5,							
TP22_2.0-2.2,	TP01_2.5,							
TP03_1.5,	TP06_2.8,							
TP09_2.5,	TP18_3.5,							
TP24 3.0,	TP01 3.0,							
TP02-2.0								
EA029-E: Magnesium Values								
80* dried soil (EA029)								
TP02_2.2		**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)								
TP14ASS 3.8,	TP04ASS 3.4,	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
TP07_2.0-2.5,	TP18ASS 2.3-2.5,							
TP22_2.0-2.2,	TP01_2.5,							
TP03_1.5,	TP06_2.8,							
TP09_2.5,	TP18_3.5,							
TP24 3.0,	TP01 3.0,							
TP02-2.0								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA029-A: pH Measurements							
80* dried soil (EA029)							
TP02_2.2	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)							
TP14ASS 3.8, TP04ASS 3.4, TP07_2.0-2.5, TP18ASS 2.3-2.5, TP22_2.0-2.2, TP01_2.5, TP03_1.5, TP06_2.8, TP09_2.5, TP18_3.5, TP24 3.0, TP01 3.0, TP02-2.0	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
EA029-G: Retained Acidity							
80* dried soil (EA029)							
TP02_2.2	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)							
TP14ASS 3.8, TP04ASS 3.4, TP07_2.0-2.5, TP18ASS 2.3-2.5, TP22_2.0-2.2, TP01_2.5, TP03_1.5, TP06_2.8, TP09_2.5, TP18_3.5, TP24 3.0, TP01 3.0, TP02-2.0	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
EA029-C: Sulfur Trail							
80* dried soil (EA029)							
TP02_2.2	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓
Snap Lock Bag - frozen (EA029)							
TP14ASS 3.8, TP04ASS 3.4, TP07_2.0-2.5, TP18ASS 2.3-2.5, TP22_2.0-2.2, TP01_2.5, TP03_1.5, TP06_2.8, TP09_2.5, TP18_3.5, TP24 3.0, TP01 3.0, TP02-2.0	**26-AUG-2014**	**02-SEP-2014**	26-AUG-2015	✓	**04-SEP-2014**	01-DEC-2014	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103)								
TP23_0.0-0.5,	TP23_0.5-2.0,	**26-AUG-2014**	**----**	----	----	**01-SEP-2014**	09-SEP-2014	✓
TP24_0.0-0.5,	TP24_3.0-3.5,							
TP14_0.3-0.7,	TP04_2.8-3.2,							
TP07_0.0-0.2,	TP08_0.4-0.9,							
TP10_0.2-0.7,	TP05_0.4-3.0,							
TP22_0.0-0.4,	TP22_0.5-1.5,							
TP12_0-0.5,	TP12_0.5-1.0,							
TP12_0.5-1.0 - DUPLICATE,	TP20_0-0.5,							
TP25_0-0.5,	QC01,							
TP25_1.0-1.5,								
TP01_0.5,	TP02_0.5,							
TP03_1.5,	TP06_0.2,							
TP06_2.8,	TP09_0.5,							
TP13_0.5,	TP13_3.0,							
TP11_0.5,	TP15_0.5,							
TP17_0.5,	TP17_1.0,							
TP18_3.5,	TP19_0.5,							
TP21_1.0,	TP21_2.0,							
TP16_0.5,	TP16_2.5,							
TP16_3.0,	QC02, TP15 2.5							
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Snap Lock Bag - Asbestos bag subsampled by ALS (EA200)								
TP23_0.0-0.5,	TP07_0.0-0.2,	**26-AUG-2014**	**---**	22-FEB-2015	----	**01-SEP-2014**	22-FEB-2015	✓
TP20_0-0.5,	TP25_0-0.5,							
TP25_1.0-1.5,	TP17_0.5,							
TP19_0.5								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
TP23_0.0-0.5,	TP23_0.5-2.0,	**26-AUG-2014**	**02-SEP-2014**	22-FEB-2015	✓	**03-SEP-2014**	22-FEB-2015	✓
TP24_0.0-0.5,	TP24_3.0-3.5,							
TP14_0.3-0.7,	TP04_2.8-3.2,							
TP07_0.0-0.2,	TP08_0.4-0.9,							
TP10_0.2-0.7,	TP05_0.4-3.0,							
TP22_0.0-0.4,	TP22_0.5-1.5,							
TP12_0-0.5,	TP12_0.5-1.0,							
TP12_0.5-1.0 - DUPLICATE,	TP20_0-0.5,							
TP25_0-0.5,	TP25_1.0-1.5,							
TP01_0.5,	TP02_0.5,							
TP03_1.5,	TP06_0.2,							
TP06_2.8,	TP09_0.5,							
TP13_0.5,	TP13_3.0,							
TP11_0.5,	TP15_0.5,							
TP17_0.5,	TP17_1.0,							
TP18_3.5,	TP19_0.5,							
TP21_1.0,	TP21_2.0							
Soil Glass Jar - Unpreserved (EG005T)								
TP16_0.5,	TP16_2.5,	**26-AUG-2014**	**03-SEP-2014**	22-FEB-2015	✓	**03-SEP-2014**	22-FEB-2015	✓
TP16_3.0,	QC01,							
QC02,	TP15 2.5							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
TP23_0.0-0.5,	TP23_0.5-2.0,	**26-AUG-2014**	**02-SEP-2014**	23-SEP-2014	✓	**03-SEP-2014**	23-SEP-2014	✓
TP24_0.0-0.5,	TP24_3.0-3.5,							
TP14_0.3-0.7,	TP04_2.8-3.2,							
TP07_0.0-0.2,	TP08_0.4-0.9,							
TP10_0.2-0.7,	TP05_0.4-3.0,							
TP22_0.0-0.4,	TP22_0.5-1.5,							
TP12_0-0.5,	TP12_0.5-1.0							
Soil Glass Jar - Unpreserved (EG035T)								
TP12_0.5-1.0 - DUPLICATE,	TP20_0-0.5,	**26-AUG-2014**	**02-SEP-2014**	23-SEP-2014	✓	**04-SEP-2014**	23-SEP-2014	✓
TP25_0-0.5,	TP25_1.0-1.5,							
TP01_0.5,	TP02_0.5,							
TP03_1.5,	TP06_0.2,							
TP06_2.8,	TP09_0.5,							
TP13_0.5,	TP13_3.0,							
TP11_0.5,	TP15_0.5,							
TP17_0.5,	TP17_1.0,							
TP18_3.5,	TP19_0.5,							
TP21_1.0,	TP21_2.0							
Soil Glass Jar - Unpreserved (EG035T)								
TP16_0.5,	TP16_2.5,	**26-AUG-2014**	**03-SEP-2014**	23-SEP-2014	✓	**03-SEP-2014**	23-SEP-2014	✓
TP16_3.0,	QC01,							
QC02,	TP15 2.5							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
TP23_0.0-0.5,	TP23_0.5-2.0,	**26-AUG-2014**	**29-AUG-2014**	09-SEP-2014	✓	**01-SEP-2014**	08-OCT-2014	✓
TP07_0.0-0.2,	TP22_0.0-0.4,							
TP25_0-0.5,	TP25_1.0-1.5,							
TP01_0.5,	TP02_0.5,							
TP06_0.2,	TP11_0.5,							
TP17_0.5,	QC01,							
QC02,	TP15 2.5							
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
TRIP SPIKE,	TSC	**26-AUG-2014**	**29-AUG-2014**	09-SEP-2014	✓	**29-AUG-2014**	09-SEP-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
QCA	**26-AUG-2014**	**01-SEP-2014**	09-SEP-2014	✓	**01-SEP-2014**	09-SEP-2014	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	14	**14.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	2	18	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	3	26	**11.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	6	59	**10.2**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	6	57	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	16	**12.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	26	**7.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	59	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	57	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	26	**7.7**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	59	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	57	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	59	**5.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	57	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	16	**6.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
TRH Volatiles/BTEX	EP080	2	18	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
TRH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
TRH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
TRH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	SOIL	Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Preparation Methods	Method	Matrix	Method Descriptions
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1418970**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	Page	: 1 of 5
Order number	: EN03269		
C-O-C number	: ----	Quote number	: ----
Site	: ----		
Sampler	: GM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 27-AUG-2014	Issue Date	: 28-AUG-2014 17:11
Client Requested Due Date	: 05-SEP-2014	Scheduled Reporting Date	: **05-SEP-2014**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 2.8'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 85
Security Seal	: Intact.	No. of samples analysed	: 53

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.
- SPOCAS analysis to be conducted by ALS Brisbane.
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
EA200 : Asbestos Identification in bulk solids		
TP23_0.0-0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP07_0.0-0.2	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP20_0-0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP25_0-0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP25_1.0-1.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP17_0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP19_0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

ES1418970-028 : 26-AUG-2014 15:00 : TP12_0.5-1.0 - DUPLICATE

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA029 SPOCAS	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - EP080 BTEXN	SOIL - S-02 8 Metals (incl. Digestion)
ES1418970-001	26-AUG-2014 15:00	TP23_0.0-0.5				✓	✓		✓
ES1418970-002	26-AUG-2014 15:00	TP23_0.5-2.0					✓		✓
ES1418970-003	26-AUG-2014 15:00	TP23_2.5-3.0	✓						
ES1418970-004	26-AUG-2014 15:00	TP24_0.0-0.5							✓
ES1418970-005	26-AUG-2014 15:00	TP24_0.6-1.1	✓						
ES1418970-006	26-AUG-2014 15:00	TP24_3.0-3.5							✓
ES1418970-007	26-AUG-2014 15:00	TP14_0.3-0.7							✓
ES1418970-008	26-AUG-2014 15:00	TP14_3.3-3.8	✓						
ES1418970-009	26-AUG-2014 15:00	TP14ASS 3.8			✓				
ES1418970-010	26-AUG-2014 15:00	TP04_0-0.5	✓						
ES1418970-011	26-AUG-2014 15:00	TP04_2.8-3.2							✓
ES1418970-012	26-AUG-2014 15:00	TP04ASS 3.4			✓				
ES1418970-013	26-AUG-2014 15:00	TP07_0.0-0.2				✓	✓		✓
ES1418970-014	26-AUG-2014 15:00	TP07_0.4-2.0	✓						
ES1418970-015	26-AUG-2014 15:00	TP07_2.0-2.5			✓				
ES1418970-016	26-AUG-2014 15:00	TP08_0.4-0.9							✓
ES1418970-017	26-AUG-2014 15:00	TP08_2.5-2.8	✓						
ES1418970-018	26-AUG-2014 15:00	TP10_0.2-0.7							✓
ES1418970-019	26-AUG-2014 15:00	TP10_1.8-2.3	✓						
ES1418970-020	26-AUG-2014 15:00	TP18ASS 2.3-2.5			✓				
ES1418970-021	26-AUG-2014 15:00	TP05_0.4-3.0							✓
ES1418970-022	26-AUG-2014 15:00	TP05_3.0-3.5	✓						

			(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA029 SPOCAS	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - EP080 BTEXN	SOIL - S-02 8 Metals (incl. Digestion)
ES1418970-023	26-AUG-2014 15:00	TP22_0.0-0.4					✓		✓
ES1418970-024	26-AUG-2014 15:00	TP22_0.5-1.5							✓
ES1418970-025	26-AUG-2014 15:00	TP22_2.0-2.2			✓				
ES1418970-026	26-AUG-2014 15:00	TP12_0-0.5							✓
ES1418970-027	26-AUG-2014 15:00	TP12_0.5-1.0							✓
ES1418970-028	26-AUG-2014 15:00	TP12_0.5-1.0 DUPLIC...							✓
ES1418970-029	26-AUG-2014 15:00	TP12_2.0-2.3	✓						
ES1418970-030	26-AUG-2014 15:00	TP12_2.7-3.2	✓						
ES1418970-031	26-AUG-2014 15:00	TP20_0-0.5				✓			✓
ES1418970-032	26-AUG-2014 15:00	TP20_0.5-1.0	✓						
ES1418970-033	26-AUG-2014 15:00	TP20_1.6-2.1	✓						
ES1418970-034	26-AUG-2014 15:00	TP20_3.2-3.7	✓						
ES1418970-035	26-AUG-2014 15:00	TP25_0-0.5		✓		✓	✓		✓
ES1418970-036	26-AUG-2014 15:00	TP25_1.0-1.5		✓		✓	✓		✓
ES1418970-037	26-AUG-2014 15:00	TP01_0.5					✓		✓
ES1418970-038	26-AUG-2014 15:00	TP01_2.5			✓				
ES1418970-039	26-AUG-2014 15:00	TP02_0.5					✓		✓
ES1418970-040	26-AUG-2014 15:00	TP02_2.0	✓						
ES1418970-041	26-AUG-2014 15:00	TP02_2.2			✓				
ES1418970-042	26-AUG-2014 15:00	TP03_0.5	✓						
ES1418970-043	26-AUG-2014 15:00	TP03_1.5			✓				✓
ES1418970-044	26-AUG-2014 15:00	TP03_2.0	✓						
ES1418970-045	26-AUG-2014 15:00	TP06_0.2					✓		✓
ES1418970-046	26-AUG-2014 15:00	TP06_1.0	✓						
ES1418970-047	26-AUG-2014 15:00	TP06_2.8			✓				✓
ES1418970-048	26-AUG-2014 15:00	TP06_3.0	✓						
ES1418970-049	26-AUG-2014 15:00	TP09_0.5							✓
ES1418970-050	26-AUG-2014 15:00	TP09_2.5			✓				
ES1418970-051	26-AUG-2014 15:00	TP09_3.0	✓						
ES1418970-052	26-AUG-2014 15:00	TP13_0.5							✓
ES1418970-053	26-AUG-2014 15:00	TP13_3.0							✓
ES1418970-054	26-AUG-2014 15:00	TP13_4.0	✓						
ES1418970-055	26-AUG-2014 15:00	TP11_0.5					✓		✓
ES1418970-056	26-AUG-2014 15:00	TP11_2.5	✓						
ES1418970-057	26-AUG-2014 15:00	TP11_3.0	✓						
ES1418970-058	26-AUG-2014 15:00	TP15_0.5							✓
ES1418970-059	26-AUG-2014 15:00	TP15_4.0	✓						
ES1418970-060	26-AUG-2014 15:00	TP17_0.5				✓	✓		✓
ES1418970-061	26-AUG-2014 15:00	TP17_1.0							✓
ES1418970-062	26-AUG-2014 15:00	TP17_2.8	✓						
ES1418970-063	26-AUG-2014 15:00	TP17_3.8	✓						

			(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA029 SPOCAS	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - EP080 BTEXN	SOIL - S-02 8 Metals (incl. Digestion)
ES1418970-064	26-AUG-2014 15:00	TP18_0.5	✓						
ES1418970-065	26-AUG-2014 15:00	TP18_3.2	✓						
ES1418970-066	26-AUG-2014 15:00	TP18_3.5			✓				✓
ES1418970-067	26-AUG-2014 15:00	TP19_0.5				✓			✓
ES1418970-068	26-AUG-2014 15:00	TP19_2.5	✓						
ES1418970-069	26-AUG-2014 15:00	TP19_3.0	✓						
ES1418970-071	26-AUG-2014 15:00	TP21_0.5	✓						
ES1418970-072	26-AUG-2014 15:00	TP21_1.0							✓
ES1418970-073	26-AUG-2014 15:00	TP21_2.0							✓
ES1418970-074	26-AUG-2014 15:00	TP21_3.0	✓						
ES1418970-075	26-AUG-2014 15:00	TP21_3.5	✓						
ES1418970-076	26-AUG-2014 15:00	TP16_0.5							✓
ES1418970-077	26-AUG-2014 15:00	TP16_2.5							✓
ES1418970-078	26-AUG-2014 15:00	TP16_3.0							✓
ES1418970-079	26-AUG-2014 15:00	QC01					✓		✓
ES1418970-080	26-AUG-2014 15:00	QC02					✓		✓
ES1418970-082	26-AUG-2014 15:00	TRIP SPIKE						✓	
ES1418970-083	26-AUG-2014 15:00	TP24 3.0			✓				
ES1418970-084	26-AUG-2014 15:00	TP01 3.0			✓				
ES1418970-085	26-AUG-2014 15:00	TP15 2.5					✓		✓
ES1418970-086	26-AUG-2014 15:00	TSC						✓	

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP080 BTEXN
ES1418970-081	26-AUG-2014 15:00	QCA	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com

MR ROBERT GAUTHIER

- *AU Certificate of Analysis - NATA (COA)	Email	rgauthier@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rgauthier@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rgauthier@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN	Email	rgauthier@globalskm.com
- Chain of Custody (CoC) (COC)	Email	rgauthier@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	rgauthier@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	rgauthier@globalskm.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-16 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / (N/A)
PROJECT: Formes RZM DSI PROJECT NO.: EN03269	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free Ice / ~~Frozen Ice bricks present upon~~ receipt? (Yes) / No / N/A
ORDER NUMBER: EN03269 PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC: (1) 2 3 4 5 6 7	Random Sample Temperature on Receipt: 4.4°C, 3.2°C,
PROJECT MANAGER: Robert Carthier CONTACT PH: 0407 464 578		OF: 1 2 3 4 5 6 (7)	Other comment: SPOAS FROZEN 0.6°C
SAMPLER: Grant Moylan SAMPLER MOBILE: 0408 728 184			
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:
Email Reports to (will default to PM if no other addresses are listed):	DATE/TIME: 27/8/14 8:30	DATE/TIME: 27/8/14 830	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed):			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: SPOCAS SENT TO EB.			RECEIVED BY: DATE/TIME: 27/08/14 7:00pm

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAH	PH	SPOCAS	Asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	TP23 0.0-0.5	26/08/14	S	Soil jar	1	✓	✓			✓				
2	TP23 0.5-2.0	"	S		1	✓	✓							
3	TP23 2.5-3.0	"	S		1									
4	TP24 0.0-0.5	"	S		1	✓								
5	TP24 0.6-1.1	"	S		1									
6	TP24 3.0-3.5	"	S		1	✓								
7	TP14 0.3-0.7	"	S		1	✓								
8	TP14 3.3-3.8	"	S		1									
9	TP14ASS 3-8	"	S	~~Soil jar~~ Zip lock	~~1~~ 1				✓					
10	TP04 0-0.5	"	S	Soil jar	1									
11	TP04 2.8-3.2	"	S		1	✓								
12	TP04 ASS 3.4	"	S	~~Soil jar~~ Zip lock	~~1~~ 1				✓					
				TOTAL	12	6	2		2	1				

Environmental Division
Sydney
Work Order
ES1418970

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Former RZM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 (2) 3 4 5 6 7
OF: 1 2 3 4 5 6 (7)

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14	DATE/TIME: 27/8/14 8:30	DATE/TIME:	DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals 8	PAH	TPH	SPOCAS	asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	TP07 0.0-0.2	26/8/2014	S	soil jar	1	✓	✓			✓				
14	TP07 0.4-2.0	"	S		1									
15	TP07 2.0-2.5	"	S	soil jar + zip lock	2				✓					
16	TP08 0.4-0.9	"	S	soil jar	1	✓								
17	TP08 2.5-2.8	"	S		1									
18	TP10 0.2-0.7	"	S		1	✓								
19	TP10 1.8-2.3	"	S		1									
20	TP12 ASS 2.3-2.5	"	S	~~soil jar~~ + zip lock	1				✓					
21	TP05 0.4-3.0	"	S	soil jar	1	✓								
22	TP05 3.0-3.5	"	S		1									
23	TP22 0.0-0.4	"	S		1	✓	✓							
24	TP22 0.5-1.5	"	S		1	✓								
				TOTAL	14	6	2		2	1				

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugol's Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RZM DSI PROJECT NO.: EN03269
ORDER NUMBER: EN03269 PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carruthers CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 2 (3) 4 5 6 7
OF: 1 2 3 4 5 6 (7)

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14	DATE/TIME: 27/8/14 830	DATE/TIME:	DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals 8	PAH	pH	SPOCAS	asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
28	TP22 2.0-2.2	26/08/2014	S	Soil jar	1				✓					
26	TP12 0-0.5	"	S		1	✓								
27	TP12 0.5-1.0	"	S		1	✓								
24	TP12 duplicate 0.5-1.0	"	S		1	✓								
29	TP12 2.0-2.3	"	S		1									
30	TP12 2.7-3.2	"	S		1									
31	TP20 0-0.5	"	S		1	✓				✓				
32	TP20 0.5-1.0	"	S		1									
33	TP20 1.6-2.1	"	S		1									
34	TP20 3.2-3.7	"	S		1									
SNR	~~TP07 ASS~~		S	ziplock	1				✓					Confirmed by Grant 27/8.
35	TP25 0-0.5	"	S	Soil jar	1	✓	✓	✓		✓				
				TOTAL	12	5	1	1	2	2				

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs

OFFICE: Newcastle

PROJECT: Formes RZM DSI — PROJECT NO.: EN03269

ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184

COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14	DATE/TIME: 27/8/14 830	DATE/TIME:	DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals 8	PAH	pH	sPOCAS	asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
36	TP25 1.0-1.5	26/8/2014	S	Soil jar	1	✓	✓	✓		✓				
37	TP01 0.5		S	↓	~~2~~ 1	✓	✓							
38	TP01 2.5		S	soil jar + zip lock	2				✓					
39	TP02 0.5		S	soil jar	1	✓	✓							
40	TP02 2.0		S	soil jar + zip lock	2									
41	TP02 2.2		S	soil jar	1				✓					
42	TP03 0.5		S	↓	1									
43	TP03 1.5		S	soil jar + zip lock	2	✓			✓					
44	TP03 2.0		S	soil jar	1									
45	TP06 0.2		S	↓	1	✓	✓							
46	TP06 1.0		S	↓	1									
47	TP06 2.8		S	soil jar + zip lock	2	✓			✓					
				TOTAL	16	6	2	1	4	1				

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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CLIENT: Jacobs

OFFICE: Newcastle

PROJECT: Formes RZM DSI — PROJECT NO.: EN03269

ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Cawthies — CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184

COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 (5) 6 7

OF: 1 2 3 4 5 6 (7)

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free Ice / frozen Ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY: [signature] DATE/TIME: 27/8/14

RECEIVED BY: [signature] DATE/TIME: 27/8/14 830

RELINQUISHED BY: DATE/TIME:

RECEIVED BY: DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals 8	PAH	pH	SPOCAS	asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
48	TP06 3.0	26/08/2014	S	Soil jar	1									
49	TP09 0.5	"	S	"	1	✓								
50	TP09 2.5		S	Soil jar & ziplock	2				✓					
51	TP09 3.0		S		1									
52	TP13 0.5				1	✓								
53	TP13 3.0				1	✓								
54	TP13 4.0				1									
55	TP11 0.5				1	✓	✓							
56	TP11 2.5				1									
57	TP11 3.0				1									
58	TP15 0.5				1	✓								
59	TP15 4.0				1									
				TOTAL	13	5	1		1					

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugol's Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs

OFFICE: Newcastle

PROJECT: Formes RZM DSI — PROJECT NO.: EN03269

ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184

COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14	DATE/TIME: 27/8/14 830	DATE/TIME:	DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals	PAH	pH	SPOCAs	Asbestos				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
66	TP17 0.5	26/8/2014	S	Soil jar	1	✓	✓			✓				
61	TP17 1.0	"			1	✓								
62	TP17 2.8	"			1									
63	TP17 3.0	"			1									
64	TP18 0.5	"			1									
65	TP18 3.2	"			1									
66	TP18 3.5	"		Soil jar + Ziplock	2	✓			✓					
67	TP19 0.5	"		Soil jar	1	✓				✓				
68	TP19 2.5	"			1									
69	TP19 3.0	"			1									
70	~~TP19~~	"			1									
71	TP21 0.5	"			1									
				TOTAL	13	4	1		1	2				

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CHAIN OF CUSTODY

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CLIENT: Jacobs

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PROJECT: Formes RZM DSI — PROJECT NO.: EN03269

ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184

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Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 (1)

OF: 1 2 3 4 5 6 (1)

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free Ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY: — DATE/TIME: 27/8/14 8:30a

RECEIVED BY: — DATE/TIME: 27/8/14 8:30

RELINQUISHED BY: — DATE/TIME:

RECEIVED BY: — DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals 8	PAH	pH	SPOCAS	Asbestos	BTEX			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
72	TP21 1.0	26/08/2014	S	Soil jar	1	✓								
73	TP21 2.0		S		1	✓								
74	TP21 3.0		S		1									
75	TP21 3.5		S		1									
SNR ~~TP21 4.0~~			S		1									
76	TP16 0.5		S		1	✓					Confirmed by Grant 27/8			
77	TP16 2-3		S		1	✓								
78	TP16 3.0		S		1	✓								
79	QC01		S		1	✓	✓							
80	QC02		S		1	✓	✓							
81	QCA		W	2VS	2						✓			
82	TRIP SPIKE		S	Soil jar	1						✓			
				TOTAL	13	7					2			
83	TP24 3.0	26/8	BAG		1				X		SPOCAS			
84	TP01 3.0	26/8	BAG		1				X		SPOCAS			

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles

Hayley Worthington

From: Hayley Worthington
Sent: Wednesday, 27 August 2014 9:32 AM
To: 'gmoylan@globalskm.com'
Cc: 'rgauthier@globalskm.com'; Samples Newcastle; Samples Sydney
Subject: ES1418970 Former RZM DSI
Attachments: img-827101910-0001.pdf

Importance: High

Morning Grant,

We have discovered a few discrepancies between COC and Samples with the batch dropped off this morning, hoping you might be able to help sort these out.

'TP14ASS 3.8' & 'TP04 ASS 3.4' we have only received a bag for the ASS for these samples and not an additional jar as indicated on COC, is this correct? Yes bag only

We have not received a jar or bag with the ID 'ASS 2.3-2.5' as indicated on the COC, however we have received a single bag ID 'TP18 2.3-2.5' 26/8 14:45 – is this the sample? And if so would you like us to change the ID on the COC or the sample bag? Yes TP18 2.3-2.5

We have not received a jar 'TP22 2.0' as indicated on the COC, however we have received a SPOCAS bag labelled 'TP22 2.0-2.2', so again is this the sample? And if so would you like us to change the ID on the COC or the sample bag? Yes TP22 2.0-2.2

We have not received SPOCAS bag 'TP07 ASS' or soil jar 'TP21 4.0' SNRV

We have however received the following extra samples not on the COC
TP24 3.0 (bag) SPOCAS
TP01 3.0 (bag) SPOCAS
A bag with no ID or date but sampler 'TD'
TP15 2.5 (jar) Metals + PAH as per Grant M 27/8

If you want to give me a call to discuss please feel free.

Thanks

Regards,

Hayley Worthington

Client Services/ Admin Co-Ordinator
ALS Environmental Division

How was your customer experience? Please send us your feedback

Please see our latest Enviromails

EnviroMail 00 – Summary of all EnviroMails by Category
EnviroMail 83 - NSW Waste Classification

ALS Environmental Newcastle has moved!!

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1419125**	Page	: 1 of 15
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: EN03269		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 03-SEP-2014
Site	: ----		
		No. of samples received	: 19
Quote number	: EN/003/14	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
- Descriptive Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos
Shobhna Chandra	Metals Coordinator	Sydney 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 performed, 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 insufficient 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**
- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.**
- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly and NATA accreditation does not apply to analysis on these samples.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**
- **EA200W: Filtration of Asbestos from Water is not covered under the current Scope of NATA Accreditation**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB07/0.4	SB20/0.5	SB22/0.5	SB19/0.5	SB08/0.5
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-001	ES1419125-002	ES1419125-003	ES1419125-004	ES1419125-005
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	5.6	----	7.0	4.6
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		8.6	11.1	15.9	7.2	9.4
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	----	----	----	No
Asbestos Type	1332-21-4	-	--		-	----	----	----	-
Sample weight (dry)	----	0.01	g		49.8	----	----	----	43.9
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	----	----	----	S.SPOONER
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		<2	<2	3	6	<2
Copper	7440-50-8	5	mg/kg		<5	<5	<5	13	<5
Lead	7439-92-1	5	mg/kg		<5	<5	7	7	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	7	<2
Zinc	7440-66-6	5	mg/kg		6	<5	7	44	6
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB07/0.4	SB20/0.5	SB22/0.5	SB19/0.5	SB08/0.5
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-001	ES1419125-002	ES1419125-003	ES1419125-004	ES1419125-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		85.1	87.1	87.8	85.9	82.8
2-Chlorophenol-D4	93951-73-6	0.1	%		91.4	93.3	97.6	92.4	89.6
2.4.6-Tribromophenol	118-79-6	0.1	%		89.2	87.6	85.4	80.2	75.5
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		92.0	96.6	100	96.1	93.3
Anthracene-d10	1719-06-8	0.1	%		102	104	108	104	99.8
4-Terphenyl-d14	1718-51-0	0.1	%		93.5	97.2	100	97.0	93.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB18/0.5	SB11/0.5	SB10/0.5	SB09/0.2	SB21/0.5
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-006	ES1419125-007	ES1419125-008	ES1419125-009	ES1419125-010
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		6.1	----	----	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		7.5	10.2	9.1	6.8	12.3
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		----	----	No	----	----
Asbestos Type	1332-21-4	-	--		----	----	-	----	----
Sample weight (dry)	----	0.01	g		----	----	41.8	----	----
APPROVED IDENTIFIER:	----	-	--		----	----	S.SPOONER	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		<2	19	<2	6	3
Copper	7440-50-8	5	mg/kg		<5	6	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	90	<5	8	<5
Nickel	7440-02-0	2	mg/kg		<2	12	2	<2	2
Zinc	7440-66-6	5	mg/kg		<5	179	<5	6	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	----	<0.1	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	<2	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB18/0.5	SB11/0.5	SB10/0.5	SB09/0.2	SB21/0.5
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-006	ES1419125-007	ES1419125-008	ES1419125-009	ES1419125-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
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	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB18/0.5	SB11/0.5	SB10/0.5	SB09/0.2	SB21/0.5
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-006	ES1419125-007	ES1419125-008	ES1419125-009	ES1419125-010
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
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	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	86.3	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		83.5	93.2	89.7	84.7	82.1
2-Chlorophenol-D4	93951-73-6	0.1	%		90.3	101	103	93.2	94.0
2.4.6-Tribromophenol	118-79-6	0.1	%		79.5	95.6	85.4	77.6	69.4
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		92.5	102	102	96.4	92.9
Anthracene-d10	1719-06-8	0.1	%		100	110	109	102	98.9
4-Terphenyl-d14	1718-51-0	0.1	%		94.9	104	103	97.0	94.1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	81.8	85.3	----	----
Toluene-D8	2037-26-5	0.1	%		----	97.3	102	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	100	107	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26/0.2	TP26/1.0	TP26/1.2	TP27/0.5	TP27/1.6
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-013	ES1419125-014	ES1419125-015	ES1419125-016	ES1419125-017
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		8.9	7.6	18.7	12.0	18.1
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	----	----	----	----
Asbestos Type	1332-21-4	-	--		-	----	----	----	----
Sample weight (dry)	----	0.01	g		37.3	----	----	----	----
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		5	3	<2	7	<2
Copper	7440-50-8	5	mg/kg		10	<5	<5	7	<5
Lead	7439-92-1	5	mg/kg		22	<5	<5	13	<5
Nickel	7440-02-0	2	mg/kg		2	2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		99	19	<5	67	14
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		0.7	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		4.2	<0.5	----	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		2.2	<0.5	----	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		1.6	<0.5	----	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		1.0	<0.5	----	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		1.0	<0.5	----	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		0.6	<0.5	----	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26/0.2	TP26/1.0	TP26/1.2	TP27/0.5	TP27/1.6
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]	[27-AUG-2014]
Compound	CAS Number	LOR	Unit		ES1419125-013	ES1419125-014	ES1419125-015	ES1419125-016	ES1419125-017
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		11.3	<0.5	----	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.7	0.6	----	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.3	1.2	----	1.2	1.2
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		79.0	83.8	----	77.4	86.4
2-Chlorophenol-D4	93951-73-6	0.1	%		84.2	90.3	----	83.7	91.8
2.4.6-Tribromophenol	118-79-6	0.1	%		75.2	81.5	----	71.0	84.4
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		90.6	93.1	----	88.8	95.2
Anthracene-d10	1719-06-8	0.1	%		86.2	99.8	----	93.2	101
4-Terphenyl-d14	1718-51-0	0.1	%		85.7	94.1	----	89.7	96.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QC3	----	----	----	----
				Client sampling date / time	[27-AUG-2014]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1419125-019	----	----	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		8.2	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	----	----	----	----
Asbestos Type	1332-21-4	-	--		-	----	----	----	----
Sample weight (dry)	----	0.01	g		45.1	----	----	----	----
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg		3	----	----	----	----
Copper	7440-50-8	5	mg/kg		10	----	----	----	----
Lead	7439-92-1	5	mg/kg		19	----	----	----	----
Nickel	7440-02-0	2	mg/kg		2	----	----	----	----
Zinc	7440-66-6	5	mg/kg		88	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		0.7	----	----	----	----
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		4.3	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		2.4	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		1.7	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		1.0	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		1.1	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		0.7	----	----	----	----
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	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QC3	----	----	----	----
				Client sampling date / time	[27-AUG-2014]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1419125-019	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	**11.9**	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.7**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.3**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%	**79.3**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**85.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**75.0**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%	**90.1**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**86.6**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**85.8**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QCB	QCC	----	----	----
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	----	----	----
Compound	CAS Number	LOR	Unit		ES1419125-011	ES1419125-012	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	1	µg/L		<1	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	----	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	----	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	----	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	----	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	----	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	----	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	----	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	----	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QCB	QCC	----	----	----
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	----	----	----
Compound	CAS Number	LOR	Unit		ES1419125-011	ES1419125-012	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2	1.0	µg/L		<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	<1	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QCB	QCC	----	----	----
				Client sampling date / time	[27-AUG-2014]	[27-AUG-2014]	----	----	----
Compound	CAS Number	LOR	Unit		ES1419125-011	ES1419125-012	----	----	----
EP080: BTEXN - Continued									
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**69.5**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**31.4**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**71.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**76.1**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**98.9**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%		**110**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		**111**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**96.3**	**75.1**	----	----	----
Toluene-D8	2037-26-5	0.1	%		**109**	**105**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**94.0**	**84.0**	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	SB07/0.4 - [27-AUG-2014]	Mid brown sandy soil with grey rocks plus a trace of vegetation.
EA200: Description	SB08/0.5 - [27-AUG-2014]	Mid brown sandy soil with grey rocks plus a trace of vegetation.
EA200: Description	SB10/0.5 - [27-AUG-2014]	Mid grey - brown sandy soil with a trace of vegetation.
EA200: Description	TP26/0.2 - [27-AUG-2014]	Dark grey - brown soil with some slag debris and a trace of vegetation.
EA200: Description	QC3 - [27-AUG-2014]	Dark grey - brown soil with a trace of vegetation.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	28.5	129
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27.4	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1419125**	Page	: 1 of 14
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
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Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 03-SEP-2014
Order number	: EN03269		
		No. of samples received	: 19
Quote number	: EN/003/14	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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

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 performed, 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 insufficient 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

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
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 3610586)									
ES1418969-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.1	6.8	4.0	0% - 20%
ES1418969-016	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.8	6.8	0.0	0% - 20%
EA055: Moisture Content (QC Lot: 3609668)									
ES1419071-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	15.9	15.8	0.8	0% - 50%
ES1419125-008	SB10/0.5	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	9.1	11.2	20.7	0% - 50%
EA055: Moisture Content (QC Lot: 3609669)									
ES1419133-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	8.6	9.3	7.1	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3612334)									
ES1419125-001	SB07/0.4	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	13	77.5	No Limit
ES1419125-013	TP26/0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	10	8	29.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	22	20	13.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	99	68	36.9	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3612335)									
ES1419125-001	SB07/0.4	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419125-013	TP26/0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3609092)									
ES1419125-008	SB10/0.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 3609058)									
ES1419125-007	SB11/0.5	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)A: Phenolic Compounds (QC Lot: 3609058) - continued									
ES1419125-007	SB11/0.5	EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
ES1419125-008	SB10/0.5	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3609058)									
ES1419125-007	SB11/0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1419125-008	SB10/0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3609058) - continued									
ES1419125-008	SB10/0.5	EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3609023)									
ES1418886-021	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1418969-007	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3609059)									
ES1419125-007	SB11/0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3609023)									
ES1418886-021	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES1418969-007	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3609059)									
ES1419125-007	SB11/0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3609023)									
ES1418886-021	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES1418969-007	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 3609023) - continued									
ES1418969-007	Anonymous	EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 3614347)									
ES1419125-011	QCB	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES1419175-005	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.006	0.007	18.1	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.006	0.009	47.3	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.027	0.054	65.8	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3614452)									
ES1418968-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES1419141-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3608997)									
ES1419125-011	QCB	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QC Lot: 3608997)									
ES1419125-011	QCB	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 3608997)									
ES1419125-011	QCB	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3612334)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	110	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	106	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	105	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	113	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	107	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	113	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	114	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3612335)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	95.6	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3609092)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	74.4	57.4	117
EP075(SIM)A: Phenolic Compounds (QCLot: 3609058)								
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	4 mg/kg	110	74	116
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	4 mg/kg	110	74	116
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	4 mg/kg	106	72	116
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1.0	mg/kg	<1	8 mg/kg	110	69	123
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	4 mg/kg	87.6	60.3	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	4 mg/kg	110	69	117
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	4 mg/kg	99.6	68	112
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	4 mg/kg	106	73	117
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg	<0.5	4 mg/kg	98.3	76.4	114
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	4 mg/kg	90.7	57	111
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	4 mg/kg	94.0	68.9	112
EP075(SIM): Pentachlorophenol	87-86-5	1.0	mg/kg	<1	8 mg/kg	25.9	10	57
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3609058)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	110	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	112	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	113	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	112	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	112	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	115	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	109	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	112	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	105	73	121

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3609058) - continued								
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	112	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	99.4	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	101	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	111	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	92.4	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	85.1	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	93.7	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609023)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	113	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609059)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	96.8	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	102	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	90.9	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3609023)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	107	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3609059)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	99.4	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	99.3	74	138
EP071: >C34 - C40 Fraction	----	50	mg/kg	<100	150 mg/kg	70.8	63	131
EP080: BTEXN (QCLot: 3609023)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	113	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	108	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	106	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	104	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	109	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	93.1	62	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 3614347)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	90.7	79	121
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.5	83	113
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.5	84	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.7	83	117
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	84	116
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.3	84	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	93.8	77	117

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3614452)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	91.6	77	115
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3608984)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	74.8	61.6	107
EP075(SIM)A: Phenolic Compounds (QCLot: 3608983)								
EP075(SIM): Phenol	108-95-2	0.2	µg/L	<1.0	5 µg/L	47.0	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	0.2	µg/L	<1.0	5 µg/L	70.1	63.8	110
EP075(SIM): 2-Methylphenol	95-48-7	0.2	µg/L	<1.0	5 µg/L	95.4	55.9	112
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	0.4	µg/L	<2.0	10 µg/L	71.8	42.5	114
EP075(SIM): 2-Nitrophenol	88-75-5	0.2	µg/L	<1.0	5 µg/L	81.6	62.7	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.2	µg/L	<1.0	5 µg/L	84.2	59.9	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.2	µg/L	<1.0	5 µg/L	62.0	59.3	122
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.2	µg/L	<1.0	5 µg/L	75.9	64.3	118
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.2	µg/L	<1.0	5 µg/L	76.5	63	119
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.2	µg/L	<1.0	5 µg/L	59.7	58.7	118
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.2	µg/L	<1.0	5 µg/L	76.7	50	108
EP075(SIM): Pentachlorophenol	87-86-5	0.4	µg/L	<2.0	10 µg/L	47.6	10	95
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3608983)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	<1.0	5 µg/L	67.2	58.6	119
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	<1.0	5 µg/L	69.0	63.6	114
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	<1.0	5 µg/L	65.4	62.2	113
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	<1.0	5 µg/L	69.1	63.9	115
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	<1.0	5 µg/L	88.3	62.6	116
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	<1.0	5 µg/L	72.6	64.3	116
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	<1.0	5 µg/L	69.5	63.6	118
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	<1.0	5 µg/L	70.8	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	<1.0	5 µg/L	70.1	64.1	117
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	<1.0	5 µg/L	69.7	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.2	µg/L	<1.0	5 µg/L	67.3	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	<1.0	5 µg/L	77.0	61.7	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	<0.5	5 µg/L	71.8	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	<1.0	5 µg/L	65.1	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	<1.0	5 µg/L	69.4	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	<1.0	5 µg/L	75.4	59.1	118
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3608982)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	98.9	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	99.4	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	96.4	62	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3608997)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	75.8	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3608997)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	80.1	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3608982)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	94.6	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	103	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	103	67	127
EP080: BTEXN (QCLot: 3608997)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	90.7	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	103	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	106	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	106	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	102	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	110	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 3612334)							
ES1419125-001	SB07/0.4	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	105	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	105	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	106	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	106	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	108	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3612335)							
ES1419125-001	SB07/0.4	EG035T: Mercury	7439-97-6	5 mg/kg	100	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3609092)							
ES1419125-008	SB10/0.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	86.4	70	130
EP075(SIM)A: Phenolic Compounds (QCLot: 3609058)							
ES1419125-007	SB11/0.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	113	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP075(SIM)A: Phenolic Compounds (QCLot: 3609058) - continued							
ES1419125-007	SB11/0.5	EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	114	70	130
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	102	60	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	107	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	86.8	20	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3609058)							
ES1419125-007	SB11/0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	106	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	118	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609023)							
ES1418886-021	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	119	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609059)							
ES1419125-007	SB11/0.5	EP071: C10 - C14 Fraction	----	560 mg/kg	92.7	73	137
		EP071: C15 - C28 Fraction	----	2370 mg/kg	109	53	131
		EP071: C29 - C36 Fraction	----	1695 mg/kg	125	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3609023)							
ES1418886-021	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	112	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3609059)							
ES1419125-007	SB11/0.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	101	73	137
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	115	53	131
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	116	52	132
EP080: BTEXN (QCLot: 3609023)							
ES1418886-021	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	112	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	105	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	105	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	104	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	107	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	84.3	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3614347)							
ES1419137-003	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	120	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	92.2	70	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	91.6	70	130
		EG020A-T: Copper	7440-50-8	1 mg/L	102	70	130
		EG020A-T: Lead	7439-92-1	1 mg/L	85.4	70	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	82.5	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 3614347) - continued							
ES1419137-003	Anonymous	EG020A-T: Zinc	7440-66-6	1 mg/L	91.8	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3614452)							
ES1419032-002	Anonymous	EG035T: Mercury	7439-97-6	0.010 mg/L	86.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3608997)							
ES1419125-011	QCB	EP080: C6 - C9 Fraction	----	325 µg/L	106	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3608997)							
ES1419125-011	QCB	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	107	70	130
EP080: BTEXN (QCLot: 3608997)							
ES1419125-011	QCB	EP080: Benzene	71-43-2	25 µg/L	91.8	70	130
		EP080: Toluene	108-88-3	25 µg/L	114	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	109	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	112	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	102	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	111	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPDs (%): Value	RPDs (%): Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609023)										
ES1418886-021	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	119	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3609023)										
ES1418886-021	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	112	----	70	130	----	----
EP080: BTEXN (QCLot: 3609023)										
ES1418886-021	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	112	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	105	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	105	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	104	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	107	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	84.3	----	70	130	----	----
EP075(SIM)A: Phenolic Compounds (QCLot: 3609058)										
ES1419125-007	SB11/0.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	113	----	70	130	----	----

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP075(SIM)A: Phenolic Compounds (QCLot: 3609058) - continued										
ES1419125-007	SB11/0.5	EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	114	----	70	130	----	----
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	102	----	60	130	----	----
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	107	----	70	130	----	----
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	86.8	----	20	130	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3609058)										
ES1419125-007	SB11/0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	106	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	118	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3609059)										
ES1419125-007	SB11/0.5	EP071: C10 - C14 Fraction	----	560 mg/kg	92.7	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	2370 mg/kg	109	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	1695 mg/kg	125	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3609059)										
ES1419125-007	SB11/0.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	101	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	115	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	116	----	52	132	----	----
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3609092)										
ES1419125-008	SB10/0.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	86.4	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3612334)										
ES1419125-001	SB07/0.4	EG005T: Arsenic	7440-38-2	50 mg/kg	102	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	105	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	105	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	106	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	106	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	108	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3612335)										
ES1419125-001	SB07/0.4	EG035T: Mercury	7439-97-6	5 mg/kg	100	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3608997)										
ES1419125-011	QCB	EP080: C6 - C9 Fraction	----	325 µg/L	106	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 (QCLot: 3608997)										
ES1419125-011	QCB	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	107	----	70	130	----	----
EP080: BTEXN (QCLot: 3608997)										
ES1419125-011	QCB	EP080: Benzene	71-43-2	25 µg/L	91.8	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	114	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3608997) - continued										
ES1419125-011	QCB	EP080: Ethylbenzene	100-41-4	25 µg/L	109	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	112	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	25 µg/L	102	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	111	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3614347)										
ES1419137-003	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	120	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	92.2	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1 mg/L	91.6	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1 mg/L	102	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1 mg/L	85.4	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1 mg/L	82.5	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1 mg/L	91.8	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3614452)										
ES1419032-002	Anonymous	EG035T: Mercury	7439-97-6	0.010 mg/L	86.0	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1419125**	Page	: 1 of 9
Client	: JACOBS GROUP (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-AUG-2014
Sampler	: GM	Issue Date	: 03-SEP-2014
Order number	: EN03269		
		No. of samples received	: 19
Quote number	: EN/003/14	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 Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SB20/0.5, SB19/0.5, SB08/0.5, SB18/0.5	**27-AUG-2014**	**01-SEP-2014**	03-SEP-2014	✓	**01-SEP-2014**	01-SEP-2014	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SB07/0.4, SB20/0.5, SB22/0.5, SB19/0.5, SB08/0.5, SB18/0.5, SB11/0.5, SB10/0.5, SB09/0.2, SB21/0.5, TP26/0.2, TP26/1.0, TP26/1.2, TP27/0.5, TP27/1.6, QC3	**27-AUG-2014**	**----**	----	----	**28-AUG-2014**	10-SEP-2014	✓
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag - Asbestos bag subsampled by ALS (EA200)							
SB07/0.4, SB08/0.5, SB10/0.5, TP26/0.2, QC3	**27-AUG-2014**	**---**	23-FEB-2015	----	**01-SEP-2014**	23-FEB-2015	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SB07/0.4, SB20/0.5, SB22/0.5, SB19/0.5, SB08/0.5, SB18/0.5, SB11/0.5, SB10/0.5, SB09/0.2, SB21/0.5, TP26/0.2, TP26/1.0, TP26/1.2, TP27/0.5, TP27/1.6, QC3	**27-AUG-2014**	**01-SEP-2014**	23-FEB-2015	✓	**01-SEP-2014**	23-FEB-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
SB07/0.4, SB20/0.5, SB22/0.5, SB19/0.5, SB08/0.5, SB18/0.5, SB11/0.5, SB10/0.5, SB09/0.2, SB21/0.5, TP26/0.2, TP26/1.0, TP26/1.2, TP27/0.5, TP27/1.6, QC3	**27-AUG-2014**	**01-SEP-2014**	24-SEP-2014	✓	**02-SEP-2014**	24-SEP-2014	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
SB10/0.5	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013							
Soil Glass Jar - Unpreserved (EP071)							
SB11/0.5, SB10/0.5	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP075(SIM)A: Phenolic Compounds							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB11/0.5, SB10/0.5	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB07/0.4, SB20/0.5, SB22/0.5, SB19/0.5, SB08/0.5, SB18/0.5, SB11/0.5, SB10/0.5, SB09/0.2, SB21/0.5, TP26/0.2, TP26/1.0, TP27/0.5, TP27/1.6, QC3	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
SB11/0.5, SB10/0.5	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**28-AUG-2014**	10-SEP-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
SB11/0.5, SB10/0.5	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**28-AUG-2014**	10-SEP-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
QCB	**27-AUG-2014**	**02-SEP-2014**	23-FEB-2015	✓	**02-SEP-2014**	23-FEB-2015	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
QCB	**27-AUG-2014**	**----**	----	----	**02-SEP-2014**	24-SEP-2014	✓
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066)							
QCB	**27-AUG-2014**	**28-AUG-2014**	03-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
QCB	**27-AUG-2014**	**28-AUG-2014**	03-SEP-2014	✓	**01-SEP-2014**	07-OCT-2014	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
QCB	**27-AUG-2014**	**28-AUG-2014**	03-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
QCB	**27-AUG-2014**	**28-AUG-2014**	03-SEP-2014	✓	**29-AUG-2014**	07-OCT-2014	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
QCB, QCC	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**28-AUG-2014**	10-SEP-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
QCB	**27-AUG-2014**	**28-AUG-2014**	10-SEP-2014	✓	**28-AUG-2014**	10-SEP-2014	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	3	29	10.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	19	10.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	2	18	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	25.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Total Mercury by FIMS	EG035T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP) - Continued							
TRH Volatiles/BTEX	EP080	1	9	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	**33.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
TRH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1419125**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	Page	: 1 of 3
Order number	: EN03269		
C-O-C number	: ----	Quote number	: EM2014SINKNI0446 (EN/003/14)
Site	: ----		
Sampler	: GM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 27-AUG-2014	Issue Date	: 28-AUG-2014 11:02
Client Requested Due Date	: 03-SEP-2014	Scheduled Reporting Date	: **03-SEP-2014**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 4.3'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 19
Security Seal	: Intact.	No. of samples analysed	: 18

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Insufficient sample volume to conduct Asbestos on sample QCB, Robert Gauthier informed 28/8/14.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
EA200 : Asbestos Identification in bulk solids		
SB07/0.4	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
SB08/0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
SB10/0.5	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
TP26/0.2	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received
QC3	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP066 (solids) Polychlorinated Biphenyls by GCMS	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - S-02 8 Metals (incl. Digestion)	SOIL - S-27 TRH/BTEXN/PAH/Phenols/8Metals
ES1419125-001	[27-AUG-2014]	SB07/0.4			✓	✓		✓	✓	
ES1419125-002	[27-AUG-2014]	SB20/0.5		✓	✓			✓	✓	
ES1419125-003	[27-AUG-2014]	SB22/0.5			✓			✓	✓	
ES1419125-004	[27-AUG-2014]	SB19/0.5		✓	✓			✓	✓	
ES1419125-005	[27-AUG-2014]	SB08/0.5		✓	✓	✓		✓	✓	
ES1419125-006	[27-AUG-2014]	SB18/0.5		✓	✓			✓	✓	
ES1419125-007	[27-AUG-2014]	SB11/0.5								✓
ES1419125-008	[27-AUG-2014]	SB10/0.5				✓	✓			✓
ES1419125-009	[27-AUG-2014]	SB09/0.2			✓			✓	✓	
ES1419125-010	[27-AUG-2014]	SB21/0.5			✓			✓	✓	
ES1419125-013	[27-AUG-2014]	TP26/0.2			✓	✓		✓	✓	
ES1419125-014	[27-AUG-2014]	TP26/1.0			✓			✓	✓	
ES1419125-015	[27-AUG-2014]	TP26/1.2			✓				✓	
ES1419125-016	[27-AUG-2014]	TP27/0.5			✓			✓	✓	
ES1419125-017	[27-AUG-2014]	TP27/1.6			✓			✓	✓	
ES1419125-018	[27-AUG-2014]	TP27/2.5	✓							
ES1419125-019	[27-AUG-2014]	QC3			✓	✓		✓	✓	

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP066-PCB-WA Polychlorinated Biphenyls (PCB)	WATER - EP080 BTEXN	WATER - W-27T TRH/BTEXN/PAH/Phenols/Total 8 Metals
ES1419125-011	[27-AUG-2014]	QCB	✓		✓
ES1419125-012	[27-AUG-2014]	QCC		✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com

MR ROBERT GAUTHIER

- *AU Certificate of Analysis - NATA (COA)	Email	rgauthier@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rgauthier@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rgauthier@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rgauthier@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	rgauthier@globalskm.com
- Chain of Custody (CoC) (COC)	Email	rgauthier@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	rgauthier@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	rgauthier@globalskm.com
- EDI Format - XTab (XTAB)	Email	rgauthier@globalskm.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

Split WO / Analysis: Asbestos

Organised By / Date:

Relinquished By / Date:

Courier:

WO No:

Attach to Report / Internal Sheet:

CLIENT: Jacobs	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	LABORATORY USE ONLY (Circle)	
OFFICE: Newcastle		Custody Seal Intact?	Yes / No / N/A
PROJECT: Formes RZM DSI PROJECT NO.: EN03269	ALS QUOTE NO.:	Free Ice / Frozen Ice bricks present upon	Yes / No / N/A
ORDER NUMBER: EN03269 PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Robert Gauthier	CONTACT PH: 0407 464 578		Other comment:
SAMPLER: Grant Moylan	SAMPLER MOBILE: 0408 728 184		
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed):			
Email Invoice to (will default to PM if no other addresses are listed):			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14 5p	DATE/TIME: 27/8/14 5:05	DATE/TIME:	DATE/TIME: 27/8/14 7:00 pm

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	metals (8)	PAH	asbestos	TRH	BTEX	PCBs	phenols	pH	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SB07/0.4	27/8/14	S	soil jar	1	✓	✓	✓						
2	SB20/0.5					✓	✓						✓	
3	SB22/0.5					✓	✓							
4	SB19/0.5					✓	✓						✓	
5	SB08/0.5					✓	✓	✓					✓	
6	SB18/0.5					✓	✓						✓	
7	SB11/0.5					✓	✓		✓	✓		✓		
8	SB10/0.5					✓	✓	✓	✓	✓	✓	✓		
9	SB09/0.2					✓	✓							
10	SB21/0.5					✓	✓							
11	QCB		W	2VS; 1AG; 1N	4	✓	✓	✓	✓	✓	✓	✓		
12	QCC			2VS	2					✓				
				TOTAL	16	11	11	4	3	4	2	3	4	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Form. Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Environmental Division Sydney

Work Order

ES1419125

Telephone : +61-2-8784 8555

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-16 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs

OFFICE: Newcastle

PROJECT: Formes RZM DSI — PROJECT NO.: EN03269

ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184

COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free Ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 27/8/14 5p	DATE/TIME: 27/8/14 1700	DATE/TIME:	DATE/TIME: 27/08/14

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAH	pH	Asbestos					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	TP26/0.2	27/8/14	S	Soil jar	1	✓	✓		✓					
14	TP26/1.0					✓	✓							
15	TP26/1.2					✓								
16	TP27/0.5					✓	✓							
17	TP27/1.6					✓	✓							
18	TP27/2.5					✓								
19	QC3					✓	✓		✓					
				TOTAL	7	6	5		2					

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; Lt = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1419628**	Page	: 1 of 23
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: EN03269		
C-O-C number	: ----	Date Samples Received	: 03-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Site	: ----		
		No. of samples received	: 63
Quote number	: EN/003/14	No. of samples analysed	: 38

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
- Descriptive Results
- Surrogate Control Limits

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 performed, 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 insufficient 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**
- **EA200 Legend**
- **EA200 'Am' Amosite (brown asbestos)**
- **EA200 'Ch' Chrysotile (white asbestos)**
- **EA200 'Cr' Crocidolite (blue asbestos)**
- **EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres**
- **EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.**
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly and NATA accreditation does not apply to analysis on these samples.**
- **EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.**
- **EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.**
- **EP080:The TRIP SPIKE and TRIP SPIKE CONTROL have been analysed for volatile TPH and BTEX only. The TRIP SPIKE and TRIP SPIKE CONTROL were prepared in the lab using reagent grade sand spiked with petrol. The TRIP SPIKE was dispatched from the lab and the TRIP SPIKE CONTROL retained. The spike samples were extracted and analysed concurrently with samples reported in this batch.**

NATA Accredited Laboratory 825

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
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Gerrad Morgan	Asbestos Identifier	Newcastle - Asbestos
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB10/1.5	SB16/0.5	SB16/1.1	SB17/0.5	SB17/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-001	ES1419628-002	ES1419628-003	ES1419628-004	ES1419628-005
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		19.7	12.2	17.4	14.1	13.5
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		3	3	11	4	<2
Copper	7440-50-8	5	mg/kg		<5	<5	<5	8	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	6	3	<2
Zinc	7440-66-6	5	mg/kg		<5	7	<5	26	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	<1	<1	<1	<1
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	87-86-5	2	mg/kg		<2	<2	<2	<2	<2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB10/1.5	SB16/0.5	SB16/1.1	SB17/0.5	SB17/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-001	ES1419628-002	ES1419628-003	ES1419628-004	ES1419628-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB10/1.5	SB16/0.5	SB16/1.1	SB17/0.5	SB17/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-001	ES1419628-002	ES1419628-003	ES1419628-004	ES1419628-005
EP080: BTEXN - Continued									
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		88.0	90.0	97.0	84.0	89.0
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		83.9	80.8	79.8	80.9	78.2
2-Chlorophenol-D4	93951-73-6	0.1	%		86.4	84.4	81.0	86.3	80.5
2.4.6-Tribromophenol	118-79-6	0.1	%		73.9	71.0	67.9	72.0	71.1
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		92.9	91.0	89.2	89.3	89.0
Anthracene-d10	1719-06-8	0.1	%		100	98.1	95.8	97.8	96.4
4-Terphenyl-d14	1718-51-0	0.1	%		97.7	97.2	94.2	95.5	94.0
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		92.4	85.2	89.1	89.8	93.5
Toluene-D8	2037-26-5	0.1	%		90.8	87.4	92.8	90.0	102
4-Bromofluorobenzene	460-00-4	0.1	%		93.1	89.8	93.5	91.4	106

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB17/SFC	SB09/1.0	SB11/2.0	SB15/0.5	SB18/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-006	ES1419628-007	ES1419628-008	ES1419628-009	ES1419628-010
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	----	----	----	5.3
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		9.4	26.4	18.4	11.8	25.1
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg		No	----	----	----	----
Asbestos Type	1332-21-4	-	--		-	----	----	----	----
Sample weight (dry)	----	0.01	g		57.3	----	----	----	----
APPROVED IDENTIFIER:	----	-	-		G.MORGAN	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		11	7	14	<2	4
Copper	7440-50-8	5	mg/kg		12	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		27	<5	6	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	<2	6	<2	3
Zinc	7440-66-6	5	mg/kg		163	<5	<5	7	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	<1	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	<2	<2	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	SB17/SFC	SB09/1.0	SB11/2.0	SB15/0.5	SB18/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
					ES1419628-006	ES1419628-007	ES1419628-008	ES1419628-009	ES1419628-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		**90**	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		**14300**	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		**960**	<100	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		**15400**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	<10	<10	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		**500**	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		**14700**	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		**170**	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**15400**	<50	<50	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB17/SFC	SB09/1.0	SB11/2.0	SB15/0.5	SB18/1.0
				Client sampling date / time	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00	01-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-006	ES1419628-007	ES1419628-008	ES1419628-009	ES1419628-010
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		**500**	<50	<50	----	----
EP080: BTEXN									
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	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**104**	**99.0**	**104**	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**84.7**	**80.6**	**90.9**	**88.2**	**83.4**
2-Chlorophenol-D4	93951-73-6	0.1	%		**87.2**	**84.6**	**98.2**	**92.1**	**90.6**
2.4.6-Tribromophenol	118-79-6	0.1	%		**89.3**	**75.4**	**76.3**	**76.6**	**65.7**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**98.1**	**84.0**	**99.4**	**93.8**	**93.6**
Anthracene-d10	1719-06-8	0.1	%		**104**	**93.2**	**108**	**106**	**100**
4-Terphenyl-d14	1718-51-0	0.1	%		**96.0**	**93.0**	**105**	**102**	**97.2**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**94.0**	**97.5**	**88.4**	----	----
Toluene-D8	2037-26-5	0.1	%		**98.6**	**98.8**	**92.0**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**94.3**	**103**	**92.8**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB24/0.5	SB24/2.0	SB05/0.5	SB05/2.0	SB06/0.5
				Client sampling date / time	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-011	ES1419628-012	ES1419628-013	ES1419628-014	ES1419628-015
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		15.8	18.9	15.0	22.2	7.2
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		8	14	3	2	5
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		14	11	<5	<5	7
Nickel	7440-02-0	2	mg/kg		<2	17	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		19	6	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB24/0.5	SB24/2.0	SB05/0.5	SB05/2.0	SB06/0.5
			Client sampling date / time	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00
Compound	CAS Number	LOR	Unit	ES1419628-011	ES1419628-012	ES1419628-013	ES1419628-014	ES1419628-015
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	85.1	87.8	87.8	86.8	82.9
2-Chlorophenol-D4	93951-73-6	0.1	%	88.5	89.7	89.8	92.7	85.0
2.4.6-Tribromophenol	118-79-6	0.1	%	66.1	73.0	66.6	80.7	70.3
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	94.0	93.1	93.0	93.1	90.0
Anthracene-d10	1719-06-8	0.1	%	104	103	102	97.9	96.5
4-Terphenyl-d14	1718-51-0	0.1	%	98.9	103	102	99.2	96.8

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06/2.0	SB08/2.0	SB21/2.0	SB20/2.0	SB23/0.5
				Client sampling date / time	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-016	ES1419628-017	ES1419628-018	ES1419628-019	ES1419628-020
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	5.2	----	5.7	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		18.3	20.1	21.9	16.0	21.1
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		2	9	6	4	3
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	5	<5	7	<5
Nickel	7440-02-0	2	mg/kg		<2	2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	<5	<5	<5	9
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	0.6	0.6	0.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06/2.0	SB08/2.0	SB21/2.0	SB20/2.0	SB23/0.5
				Client sampling date / time	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-016	ES1419628-017	ES1419628-018	ES1419628-019	ES1419628-020
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	1.2	1.2	1.2
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		----	85.2	85.1	83.6	87.3
2-Chlorophenol-D4	93951-73-6	0.1	%		----	89.4	89.1	87.3	90.3
2.4.6-Tribromophenol	118-79-6	0.1	%		----	62.3	62.0	57.8	67.0
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	95.8	93.6	93.2	93.3
Anthracene-d10	1719-06-8	0.1	%		----	103	102	100	103
4-Terphenyl-d14	1718-51-0	0.1	%		----	99.7	98.9	97.4	99.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB23/0.7	SB12/0.5	SB12/1.0	SB19/1.8	SB22/1.9
				Client sampling date / time	02-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-021	ES1419628-022	ES1419628-023	ES1419628-024	ES1419628-025
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	----	----	6.5	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		14.6	9.0	10.8	20.8	18.4
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		4	8	10	16	13
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	6
Lead	7439-92-1	5	mg/kg		<5	15	14	<5	13
Nickel	7440-02-0	2	mg/kg		<2	<2	3	9	5
Zinc	7440-66-6	5	mg/kg		<5	36	78	<5	52
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	<2	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB23/0.7	SB12/0.5	SB12/1.0	SB19/1.8	SB22/1.9
				Client sampling date / time	02-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-021	ES1419628-022	ES1419628-023	ES1419628-024	ES1419628-025
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
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	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		----	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	----	----
EP080: BTEXN									
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	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB23/0.7	SB12/0.5	SB12/1.0	SB19/1.8	SB22/1.9
				Client sampling date / time	02-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-021	ES1419628-022	ES1419628-023	ES1419628-024	ES1419628-025
EP080: BTEXN - Continued									
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	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		88.4	96.2	92.7	93.1	93.4
2-Chlorophenol-D4	93951-73-6	0.1	%		92.1	115	109	106	108
2.4.6-Tribromophenol	118-79-6	0.1	%		68.7	67.9	59.9	59.1	60.7
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		98.4	99.8	95.9	95.1	95.8
Anthracene-d10	1719-06-8	0.1	%		104	111	107	107	109
4-Terphenyl-d14	1718-51-0	0.1	%		102	112	108	109	108
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	97.7	88.9	----	----
Toluene-D8	2037-26-5	0.1	%		----	94.1	85.5	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	97.5	92.1	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB07/1.2	SB03/0.5	SB03/1.3	SB03/2.0	SB13/0.5
				Client sampling date / time	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-026	ES1419628-027	ES1419628-028	ES1419628-029	ES1419628-030
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		11.6	24.9	26.1	20.6	14.6
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	5	5	13	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		2	23	41	17	10
Copper	7440-50-8	5	mg/kg		<5	32	8	10	7
Lead	7439-92-1	5	mg/kg		<5	41	9	16	11
Nickel	7440-02-0	2	mg/kg		<2	6	11	2	6
Zinc	7440-66-6	5	mg/kg		<5	88	20	14	16
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	2.0	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	0.9	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	0.6	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	3.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB07/1.2	SB03/0.5	SB03/1.3	SB03/2.0	SB13/0.5
			Client sampling date / time	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit	ES1419628-026	ES1419628-027	ES1419628-028	ES1419628-029	ES1419628-030
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	86.3	81.7	90.5	90.7	91.4
2-Chlorophenol-D4	93951-73-6	0.1	%	92.1	69.3	91.9	105	105
2.4.6-Tribromophenol	118-79-6	0.1	%	60.2	46.6	59.9	70.9	84.5
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	91.5	93.7	95.1	94.3	90.5
Anthracene-d10	1719-06-8	0.1	%	107	97.8	109	105	107
4-Terphenyl-d14	1718-51-0	0.1	%	108	102	108	106	106

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB13/1.0	QC4	QC5	QC6	QC7
				Client sampling date / time	03-SEP-2014 15:00	01-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-031	ES1419628-032	ES1419628-033	ES1419628-034	ES1419628-035
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	----	----	----	**5.9**
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		**14.7**	**13.0**	**21.8**	**20.5**	**22.1**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**8**	<2	**6**	**7**	**16**
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	**5**	<5
Nickel	7440-02-0	2	mg/kg		**2**	<2	<2	**2**	**9**
Zinc	7440-66-6	5	mg/kg		**47**	<5	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	----	----	----
EP075(SIM)A: 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	1	mg/kg		----	<1	----	----	----
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	2	mg/kg		----	<2	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB13/1.0	QC4	QC5	QC6	QC7
				Client sampling date / time	03-SEP-2014 15:00	01-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-031	ES1419628-032	ES1419628-033	ES1419628-034	ES1419628-035
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		----	**100**	----	----	----
C15 - C28 Fraction	----	100	mg/kg		----	**9790**	----	----	----
C29 - C36 Fraction	----	100	mg/kg		----	**650**	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	**10500**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	----	----	----
>C10 - C16 Fraction	>C10_C16	50	mg/kg		----	**650**	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	**9780**	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	**200**	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	**10600**	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	**650**	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB13/1.0	QC4	QC5	QC6	QC7
				Client sampling date / time	03-SEP-2014 15:00	01-SEP-2014 15:00	02-SEP-2014 15:00	02-SEP-2014 15:00	03-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1419628-031	ES1419628-032	ES1419628-033	ES1419628-034	ES1419628-035
EP080: BTEXN - Continued									
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	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	----	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	94.5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		90.6	88.9	91.8	89.6	88.7
2-Chlorophenol-D4	93951-73-6	0.1	%		110	108	116	111	109
2.4.6-Tribromophenol	118-79-6	0.1	%		86.7	63.2	54.4	71.2	74.6
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		94.7	89.5	86.2	88.0	86.9
Anthracene-d10	1719-06-8	0.1	%		105	101	102	104	104
4-Terphenyl-d14	1718-51-0	0.1	%		105	99.4	100	102	102
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	87.6	----	----	----
Toluene-D8	2037-26-5	0.1	%		----	93.0	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		----	92.2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TRIP SPIKE	TSC	----	----	----
			Client sampling date / time	27-AUG-2014 15:00	27-AUG-2014 15:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1419628-037	ES1419628-038	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	**0.2**	**0.3**	----	----	----
Toluene	108-88-3	0.5	mg/kg	**7.9**	**10.4**	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	**1.0**	**1.2**	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	**5.1**	**6.5**	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	**2.1**	**2.6**	----	----	----
^ **Total Xylenes**	1330-20-7	0.5	mg/kg	**7.2**	**9.1**	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	**16.3**	**21.0**	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**82.4**	**87.1**	----	----	----
Toluene-D8	2037-26-5	0.1	%	**83.1**	**88.5**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**85.8**	**88.1**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QCD	----	----	----	----
				Client sampling date / time	01-SEP-2014 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1419628-036	----	----	----	----
EP080: BTEXN									
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	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**101**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%		**99.0**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**93.3**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	SB17/SFC - 01-SEP-2014 15:00	Mid brown sandy soil with plenty of fine vegetation.

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1419628**	Page	: 1 of 19
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 03-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Order number	: EN03269		
		No. of samples received	: 63
Quote number	: EN/003/14	No. of samples analysed	: 38

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

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 performed, 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 insufficient 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

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
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Gerrad Morgan	Asbestos Identifier	Newcastle - Asbestos
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 3622171)									
ES1419660-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.0	7.0	0.0	0% - 20%
EA002 : pH (Soils) (QC Lot: 3622240)									
ES1419504-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.2	8.3	0.0	0% - 20%
ES1419786-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.2	6.2	0.0	0% - 20%
EA055: Moisture Content (QC Lot: 3620993)									
ES1419559-102	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	44.9	37.9	17.0	0% - 20%
ES1419559-118	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	24.8	23.4	6.0	0% - 20%
EA055: Moisture Content (QC Lot: 3620994)									
ES1419628-007	SB09/1.0	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	26.4	29.3	10.6	0% - 20%
ES1419628-018	SB21/2.0	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	21.9	22.8	4.0	0% - 20%
EA055: Moisture Content (QC Lot: 3620995)									
ES1419628-027	SB03/0.5	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	24.9	23.6	5.6	0% - 20%
ES1419787-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	19.8	18.6	6.1	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 3622679)									
ES1419273-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	26	24	9.4	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	3	2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	28	23	18.1	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	8	24.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	16	14	10.4	No Limit
ES1419628-001	SB10/1.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3622681)									
ES1419628-011	SB24/0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	7	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	14	13	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 3622681) - continued									
ES1419628-011	SB24/0.5	EG005T: Zinc	7440-66-6	5	mg/kg	19	22	12.7	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3623894)									
ES1419567-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	20	20	0.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	5	6	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	9	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	44	50	13.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	134	144	7.4	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	59	54	8.4	0% - 50%
ES1419738-002	Anonymous	EG005T: Cadmium	7440-43-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	14	8.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	10	10	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	6	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	25	23	5.7	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	55	40	30.8	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	85	96	11.9	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 3624138)									
ES1419628-020	SB23/0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	8	16.6	No Limit
ES1419628-030	SB13/0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	10	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	7	7	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	11	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	16	16	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3622680)									
ES1419273-005	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419628-001	SB10/1.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3622682)									
ES1419628-011	SB24/0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3623895)									
ES1419567-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419738-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3624139)									
ES1419628-020	SB23/0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419628-030	SB13/0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3622687)									
ES1419628-001	SB10/1.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 3622265)									
ES1419628-001	SB10/1.5	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
ES1419628-011	SB24/0.5	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 3622267)									
ES1419628-022	SB12/0.5	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)A: Phenolic Compounds (QC Lot: 3622267) - continued									
ES1419628-022	SB12/0.5	EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
ES1419628-032	QC4	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622265)									
ES1419628-001	SB10/1.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1419628-011	SB24/0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622265) - continued									
ES1419628-011	SB24/0.5	EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622267)									
ES1419628-022	SB12/0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1419628-032	QC4	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622267) - continued									
ES1419628-032	QC4	EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3620986)									
ES1419628-001	SB10/1.5	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1419628-032	QC4	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3622264)									
ES1419628-001	SB10/1.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3622266)									
ES1419628-022	SB12/0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3620986)									
ES1419628-001	SB10/1.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES1419628-032	QC4	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3622264)									
ES1419628-001	SB10/1.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3622266)									
ES1419628-022	SB12/0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3620986)									
ES1419628-001	SB10/1.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 3620986) - continued									
ES1419628-001	SB10/1.5	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES1419628-032	QC4	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 3621142)									
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EW1402705-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3622679)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	108	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	111	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	107	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	103	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	112	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	108	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3622681)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	118	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	116	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	118	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	115	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	119	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	119	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3623894)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	120	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	108	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	113	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	112	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	117	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	118	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	113	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3624138)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	110	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	104	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	119	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	116	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	106	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	114	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	112	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622680)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	85.1	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622682)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622682) - continued								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	87.8	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3623895)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	83.6	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	93.1	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3622687)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	83.0	57.4	117
EP075(SIM)A: Phenolic Compounds (QCLot: 3622265)								
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	4 mg/kg	99.0	74	116
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	4 mg/kg	102	74	116
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	4 mg/kg	100	72	116
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1.0	mg/kg	<1	8 mg/kg	101	69	123
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	4 mg/kg	84.7	60.3	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	4 mg/kg	109	69	117
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	4 mg/kg	94.1	68	112
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	4 mg/kg	99.4	73	117
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg	<0.5	4 mg/kg	97.3	76.4	114
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	4 mg/kg	85.4	57	111
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	4 mg/kg	84.2	68.9	112
EP075(SIM): Pentachlorophenol	87-86-5	1.0	mg/kg	<1	8 mg/kg	20.7	10	57
EP075(SIM)A: Phenolic Compounds (QCLot: 3622267)								
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	4 mg/kg	94.5	74	116
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	4 mg/kg	105	74	116
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	4 mg/kg	93.1	72	116
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1.0	mg/kg	<1	8 mg/kg	93.0	69	123
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	4 mg/kg	80.7	60.3	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	4 mg/kg	100	69	117
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	4 mg/kg	83.5	68	112
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	4 mg/kg	84.7	73	117
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.5	mg/kg	<0.5	4 mg/kg	83.0	76.4	114
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	4 mg/kg	67.0	57	111
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	4 mg/kg	73.0	68.9	112
EP075(SIM): Pentachlorophenol	87-86-5	1.0	mg/kg	<1	8 mg/kg	14.5	10	57
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622265)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	105	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	108	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	113	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	108	77	123

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622265) - continued								
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	109	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	111	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	112	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	112	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	104	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	111	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	103	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	113	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	110	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	102	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	100	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	102	72.4	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	100	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	97.2	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	106	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	97.1	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	101	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	106	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	100	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	99.8	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	89.9	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	111	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	81.6	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	103	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	95.2	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	78.5	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	74.6	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	82.0	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3620986)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	110	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622264)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	108	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	101	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	96.9	64	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622266)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	110	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	117	74	138

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622266) - continued								
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	113	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3620986)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	109	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622264)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	101	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	106	74	138
EP071: >C34 - C40 Fraction	----	50	mg/kg	<100	150 mg/kg	102	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622266)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	112	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	117	74	138
EP071: >C34 - C40 Fraction	----	50	mg/kg	<100	150 mg/kg	95.6	63	131
EP080: BTEXN (QCLot: 3620986)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	108	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	98.0	62	128
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	95.6	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	96.4	60	120
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	100	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	87.8	62	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3621142)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	102	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	84.1	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	93.3	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	88.2	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	96.9	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3622679)							
ES1419273-005	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.8	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.0	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	127	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	109	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	99.3	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	104	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	99.6	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3622681)							
ES1419628-011	SB24/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	72.8	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	109	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	109	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	109	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	110	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	111	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	111	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3623894)							
ES1419567-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	113	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	108	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	111	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	108	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	113	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	107	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	109	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3624138)							
ES1419628-020	SB23/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	105	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	107	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	109	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	107	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	106	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622680)							
ES1419273-005	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	96.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622682)							
ES1419628-011	SB24/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	94.2	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3623895)							
ES1419567-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.2	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)							
ES1419628-020	SB23/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	103	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3622687)							
ES1419628-001	SB10/1.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	92.0	70	130
EP075(SIM)A: Phenolic Compounds (QCLot: 3622265)							
ES1419628-001	SB10/1.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	96.3	70	130
		EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	98.5	70	130
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	86.0	60	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	98.2	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	49.1	20	130
EP075(SIM)A: Phenolic Compounds (QCLot: 3622267)							
ES1419628-022	SB12/0.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	99.1	70	130
		EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	112	70	130
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	102	60	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	93.2	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	65.1	20	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622265)							
ES1419628-001	SB10/1.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	106	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	113	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)							
ES1419628-022	SB12/0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	103	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	101	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3620986)							
ES1419628-001	SB10/1.5	EP080: C6 - C9 Fraction	----	32.5 mg/kg	106	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622264)							
ES1419628-001	SB10/1.5	EP071: C10 - C14 Fraction	----	560 mg/kg	81.6	73	137
		EP071: C15 - C28 Fraction	----	2370 mg/kg	90.9	53	131
		EP071: C29 - C36 Fraction	----	1695 mg/kg	95.2	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622266)							
ES1419628-022	SB12/0.5	EP071: C10 - C14 Fraction	----	560 mg/kg	86.8	73	137
		EP071: C15 - C28 Fraction	----	2370 mg/kg	98.2	53	131
		EP071: C29 - C36 Fraction	----	1695 mg/kg	108	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3620986)							
ES1419628-001	SB10/1.5	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	104	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622264)							
ES1419628-001	SB10/1.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	81.8	73	137
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	95.0	53	131

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622264) - continued							
ES1419628-001	SB10/1.5	EP071: >C34 - C40 Fraction	----	1087 mg/kg	99.8	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622266)							
ES1419628-022	SB12/0.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	89.3	73	137
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	106	53	131
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	96.5	52	132
EP080: BTEXN (QCLot: 3620986)							
ES1419628-001	SB10/1.5	EP080: Benzene	71-43-2	2.5 mg/kg	90.7	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	93.8	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	96.3	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	96.4	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	100	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	88.6	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP080: BTEXN (QCLot: 3621142)							
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.3	70	130
		EP080: Toluene	108-88-3	25 µg/L	88.6	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	96.9	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.5	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	99.6	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%) MS	Spike Recovery (%) MSD	Recovery Limits (%) Low	Recovery Limits (%) High	RPDs (%) Value	RPDs (%) Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3620986)										
ES1419628-001	SB10/1.5	EP080: C6 - C9 Fraction	----	32.5 mg/kg	106	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3620986)										
ES1419628-001	SB10/1.5	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	104	----	70	130	----	----
EP080: BTEXN (QCLot: 3620986)										

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3620986) - continued										
ES1419628-001	SB10/1.5	EP080: Benzene	71-43-2	2.5 mg/kg	90.7	----	70	130	----	----
		EP080: Toluene	108-88-3	2.5 mg/kg	93.8	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	96.3	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	96.4	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	100	----	70	130	----	----
		EP080: Naphthalene	91-20-3	2.5 mg/kg	88.6	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622264)										
ES1419628-001	SB10/1.5	EP071: C10 - C14 Fraction	----	560 mg/kg	81.6	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	2370 mg/kg	90.9	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	1695 mg/kg	95.2	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622264)										
ES1419628-001	SB10/1.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	81.8	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	95.0	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	99.8	----	52	132	----	----
EP075(SIM)A: Phenolic Compounds (QCLot: 3622265)										
ES1419628-001	SB10/1.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	96.3	----	70	130	----	----
		EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	98.5	----	70	130	----	----
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	86.0	----	60	130	----	----
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	98.2	----	70	130	----	----
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	49.1	----	20	130	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622265)										
ES1419628-001	SB10/1.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	106	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	113	----	70	130	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3622266)										
ES1419628-022	SB12/0.5	EP071: C10 - C14 Fraction	----	560 mg/kg	86.8	----	73	137	----	----
		EP071: C15 - C28 Fraction	----	2370 mg/kg	98.2	----	53	131	----	----
		EP071: C29 - C36 Fraction	----	1695 mg/kg	108	----	52	132	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3622266)										
ES1419628-022	SB12/0.5	EP071: >C10 - C16 Fraction	>C10_C16	902 mg/kg	89.3	----	73	137	----	----
		EP071: >C16 - C34 Fraction	----	3190 mg/kg	106	----	53	131	----	----
		EP071: >C34 - C40 Fraction	----	1087 mg/kg	96.5	----	52	132	----	----
EP075(SIM)A: Phenolic Compounds (QCLot: 3622267)										
ES1419628-022	SB12/0.5	EP075(SIM): Phenol	108-95-2	10 mg/kg	99.1	----	70	130	----	----
		EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	112	----	70	130	----	----
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	102	----	60	130	----	----
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	93.2	----	70	130	----	----
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	65.1	----	20	130	----	----

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)										
ES1419628-022	SB12/0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	103	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	101	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3622679)										
ES1419273-005	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.8	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.0	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	127	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	109	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	99.3	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	104	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	99.6	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622680)										
ES1419273-005	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	96.4	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3622681)										
ES1419628-011	SB24/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	72.8	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	109	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	109	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	109	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	110	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	111	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	111	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3622682)										
ES1419628-011	SB24/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	94.2	----	70	130	----	----
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3622687)										
ES1419628-001	SB10/1.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	92.0	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3623894)										
ES1419567-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	113	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	108	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	111	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	108	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	113	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	107	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	109	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3623895)										
ES1419567-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.2	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3624138)										
ES1419628-020	SB23/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	105	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	107	----	70	130	----	----

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG005T: Total Metals by ICP-AES (QCLot: 3624138) - continued										
ES1419628-020	SB23/0.5	EG005T: Copper	7440-50-8	250 mg/kg	109	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	107	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	106	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	107	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)										
ES1419628-020	SB23/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	103	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3621142)										
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.3	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	88.6	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	96.9	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.5	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	99.6	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1419628**	Page	: 1 of 11
Client	: JACOBS GROUP (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Sydney
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Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 03-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Order number	: EN03269		
		No. of samples received	: 63
Quote number	: EN/003/14	No. of samples analysed	: 38

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 Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SB18/1.0	**01-SEP-2014**	**08-SEP-2014**	08-SEP-2014	✓	**08-SEP-2014**	08-SEP-2014	✓
Soil Glass Jar - Unpreserved (EA002)							
SB08/2.0, SB20/2.0	**02-SEP-2014**	**08-SEP-2014**	09-SEP-2014	✓	**08-SEP-2014**	08-SEP-2014	✓
Soil Glass Jar - Unpreserved (EA002)							
SB19/1.8, QC7	**03-SEP-2014**	**08-SEP-2014**	10-SEP-2014	✓	**08-SEP-2014**	08-SEP-2014	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, SB15/0.5, SB18/1.0, QC4	**01-SEP-2014**	**----**	----	----	**05-SEP-2014**	15-SEP-2014	✓
Soil Glass Jar - Unpreserved (EA055-103)							
SB24/0.5, SB24/2.0, SB05/0.5, SB05/2.0, SB06/0.5, SB06/2.0, SB08/2.0, SB21/2.0, SB20/2.0, SB23/0.5, SB23/0.7, QC5, QC6	**02-SEP-2014**	**----**	----	----	**05-SEP-2014**	16-SEP-2014	✓
Soil Glass Jar - Unpreserved (EA055-103)							
SB12/0.5, SB12/1.0, SB19/1.8, SB22/1.9, SB07/1.2, SB03/0.5, SB03/1.3, SB03/2.0, SB13/0.5, SB13/1.0, QC7	**03-SEP-2014**	**----**	----	----	**05-SEP-2014**	17-SEP-2014	✓
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag - Asbestos bag subsampled by ALS (EA200)							
SB17/SFC	**01-SEP-2014**	**---**	28-FEB-2015	----	**11-SEP-2014**	28-FEB-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, SB15/0.5, SB18/1.0	**01-SEP-2014**	**08-SEP-2014**	28-FEB-2015	✓	**09-SEP-2014**	28-FEB-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
QC4	**01-SEP-2014**	**09-SEP-2014**	28-FEB-2015	✓	**10-SEP-2014**	28-FEB-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
SB24/0.5, SB24/2.0, SB05/0.5, SB05/2.0, SB06/0.5	**02-SEP-2014**	**08-SEP-2014**	01-MAR-2015	✓	**09-SEP-2014**	01-MAR-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
SB06/2.0, SB08/2.0, SB21/2.0, SB20/2.0	**02-SEP-2014**	**09-SEP-2014**	01-MAR-2015	✓	**09-SEP-2014**	01-MAR-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
SB23/0.5, SB23/0.7, QC5, QC6	**02-SEP-2014**	**09-SEP-2014**	01-MAR-2015	✓	**10-SEP-2014**	01-MAR-2015	✓
Soil Glass Jar - Unpreserved (EG005T)							
SB12/0.5, SB12/1.0, SB19/1.8, SB22/1.9, SB07/1.2, SB03/0.5, SB03/1.3, SB03/2.0, SB13/0.5, SB13/1.0, QC7	**03-SEP-2014**	**09-SEP-2014**	02-MAR-2015	✓	**10-SEP-2014**	02-MAR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, SB15/0.5, SB18/1.0	**01-SEP-2014**	**08-SEP-2014**	29-SEP-2014	✓	**09-SEP-2014**	29-SEP-2014	✓
Soil Glass Jar - Unpreserved (EG035T)							
QC4	**01-SEP-2014**	**09-SEP-2014**	29-SEP-2014	✓	**10-SEP-2014**	29-SEP-2014	✓
Soil Glass Jar - Unpreserved (EG035T)							
SB24/0.5, SB24/2.0, SB05/0.5, SB05/2.0, SB06/0.5	**02-SEP-2014**	**08-SEP-2014**	30-SEP-2014	✓	**09-SEP-2014**	30-SEP-2014	✓
Soil Glass Jar - Unpreserved (EG035T)							
SB06/2.0, SB08/2.0, SB21/2.0, SB20/2.0	**02-SEP-2014**	**09-SEP-2014**	30-SEP-2014	✓	**09-SEP-2014**	30-SEP-2014	✓
Soil Glass Jar - Unpreserved (EG035T)							
SB23/0.5, SB23/0.7, QC5, QC6	**02-SEP-2014**	**09-SEP-2014**	30-SEP-2014	✓	**10-SEP-2014**	30-SEP-2014	✓
Soil Glass Jar - Unpreserved (EG035T)							
SB12/0.5, SB12/1.0, SB19/1.8, SB22/1.9, SB07/1.2, SB03/0.5, SB03/1.3, SB03/2.0, SB13/0.5, SB13/1.0, QC7	**03-SEP-2014**	**09-SEP-2014**	01-OCT-2014	✓	**10-SEP-2014**	01-OCT-2014	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, QC4	**01-SEP-2014**	**09-SEP-2014**	15-SEP-2014	✓	**10-SEP-2014**	19-OCT-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**09-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP071)							
QC4	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP071)							
SB12/0.5, SB12/1.0	**03-SEP-2014**	**08-SEP-2014**	17-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)A: Phenolic Compounds							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**09-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
QC4	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB12/0.5, SB12/1.0	**03-SEP-2014**	**08-SEP-2014**	17-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, SB15/0.5, SB18/1.0	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**09-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
QC4	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB24/0.5, SB24/2.0, SB05/0.5, SB05/2.0, SB06/0.5, SB08/2.0, SB21/2.0, SB20/2.0, SB23/0.5, SB23/0.7	**02-SEP-2014**	**08-SEP-2014**	16-SEP-2014	✓	**09-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
QC5, QC6	**02-SEP-2014**	**08-SEP-2014**	16-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB12/0.5, SB12/1.0, SB19/1.8, SB22/1.9, SB07/1.2, SB03/0.5, SB03/1.3, SB03/2.0, SB13/0.5, SB13/1.0, QC7	**03-SEP-2014**	**08-SEP-2014**	17-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, QC4	**01-SEP-2014**	**05-SEP-2014**	15-SEP-2014	✓	**06-SEP-2014**	15-SEP-2014	✓
Soil Glass Jar - Unpreserved (EP080)							
SB12/0.5, SB12/1.0	**03-SEP-2014**	**05-SEP-2014**	17-SEP-2014	✓	**06-SEP-2014**	17-SEP-2014	✓
Soil Glass Jar - Unpreserved (EP080)							
TRIP SPIKE, TSC	**27-AUG-2014**	**05-SEP-2014**	10-SEP-2014	✓	**06-SEP-2014**	10-SEP-2014	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
SB10/1.5, SB16/0.5, SB16/1.1, SB17/0.5, SB17/1.0, SB17/SFC, SB09/1.0, SB11/2.0, QC4	**01-SEP-2014**	**05-SEP-2014**	15-SEP-2014	✓	**06-SEP-2014**	15-SEP-2014	✓
Soil Glass Jar - Unpreserved (EP080)							
SB12/0.5, SB12/1.0	**03-SEP-2014**	**05-SEP-2014**	17-SEP-2014	✓	**06-SEP-2014**	17-SEP-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
QCD	**01-SEP-2014**	**08-SEP-2014**	15-SEP-2014	✓	**08-SEP-2014**	15-SEP-2014	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	6	60	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	4	37	**10.8**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	3	23	**13.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	7	65	**10.8**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	7	65	**10.8**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	11	**18.2**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	37	**5.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	11	**18.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	37	**5.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	11	**18.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	37	**5.4**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	65	**6.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	11	**18.2**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
TRH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in bulk solids	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
TRH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1419628**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	Page	: 1 of 4
Order number	: EN03269		
C-O-C number	: ----	Quote number	: EM2014SINKNI0446 (EN/003/14)
Site	: ----		
Sampler	: GM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 03-SEP-2014	Issue Date	: 05-SEP-2014 15:23
Client Requested Due Date	: 11-SEP-2014	Scheduled Reporting Date	: **11-SEP-2014**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.4'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 63
Security Seal	: Intact.	No. of samples analysed	: 38

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
EA200 : Asbestos Identification in bulk solids		
SB17/SFC	- Snap Lock Bag - Asbestos bag subsampled by ALS	- Snap Lock Bag - Separate asbestos bag received

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP066 (solids) Polychlorinated Biphenyls by GCMS	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - EP080 BTEXN	SOIL - S-02 8 Metals (incl. Digestion)	SOIL - S-27 TRH/BTEXN/PAH/Phenols/8Metals
ES1419628-001	01-SEP-2014 15:00	SB10/1.5				✓				✓
ES1419628-002	01-SEP-2014 15:00	SB16/0.5				✓				✓
ES1419628-003	01-SEP-2014 15:00	SB16/1.1				✓				✓
ES1419628-004	01-SEP-2014 15:00	SB17/0.5				✓				✓
ES1419628-005	01-SEP-2014 15:00	SB17/1.0				✓				✓
ES1419628-006	01-SEP-2014 15:00	SB17/SFC			✓	✓				✓
ES1419628-007	01-SEP-2014 15:00	SB09/1.0				✓				✓
ES1419628-008	01-SEP-2014 15:00	SB11/2.0				✓				✓
ES1419628-009	01-SEP-2014 15:00	SB15/0.5					✓		✓	
ES1419628-010	01-SEP-2014 15:00	SB18/1.0		✓			✓		✓	
ES1419628-011	02-SEP-2014 15:00	SB24/0.5					✓		✓	
ES1419628-012	02-SEP-2014 15:00	SB24/2.0					✓		✓	
ES1419628-013	02-SEP-2014 15:00	SB05/0.5					✓		✓	
ES1419628-014	02-SEP-2014 15:00	SB05/2.0					✓		✓	
ES1419628-015	02-SEP-2014 15:00	SB06/0.5					✓		✓	
ES1419628-016	02-SEP-2014 15:00	SB06/2.0							✓	
ES1419628-017	02-SEP-2014 15:00	SB08/2.0		✓			✓		✓	
ES1419628-018	02-SEP-2014 15:00	SB21/2.0					✓		✓	
ES1419628-019	02-SEP-2014 15:00	SB20/2.0		✓			✓		✓	
ES1419628-020	02-SEP-2014 15:00	SB23/0.5					✓		✓	
ES1419628-021	02-SEP-2014 15:00	SB23/0.7					✓		✓	
ES1419628-022	03-SEP-2014 15:00	SB12/0.5								✓
ES1419628-023	03-SEP-2014 15:00	SB12/1.0								✓
ES1419628-024	03-SEP-2014 15:00	SB19/1.8		✓			✓		✓	
ES1419628-025	03-SEP-2014 15:00	SB22/1.9					✓		✓	
ES1419628-026	03-SEP-2014 15:00	SB07/1.2					✓		✓	
ES1419628-027	03-SEP-2014 15:00	SB03/0.5					✓		✓	
ES1419628-028	03-SEP-2014 15:00	SB03/1.3					✓		✓	
ES1419628-029	03-SEP-2014 15:00	SB03/2.0					✓		✓	
ES1419628-030	03-SEP-2014 15:00	SB13/0.5					✓		✓	
ES1419628-031	03-SEP-2014 15:00	SB13/1.0					✓		✓	
ES1419628-032	01-SEP-2014 15:00	QC4				✓				✓
ES1419628-033	02-SEP-2014 15:00	QC5					✓		✓	

			(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA200 Asbestos Identification in Soils	SOIL - EP066 (solids) Polychlorinated Biphenyls by GCMS	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - EP080 BTEXN	SOIL - S-02 8 Metals (incl. Digestion)	SOIL - S-27 TRH/BTEXN/PAH/Phenols/8Metals
ES1419628-034	02-SEP-2014 15:00	QC6					✓		✓	
ES1419628-035	03-SEP-2014 15:00	QC7		✓			✓		✓	
ES1419628-037	27-AUG-2014 15:00	TRIP SPIKE						✓		
ES1419628-038	27-AUG-2014 15:00	TSC						✓		
ES1419628-039	01-SEP-2014 15:00	SB10/1.0	✓							
ES1419628-040	01-SEP-2014 15:00	SB10/2.0	✓							
ES1419628-041	01-SEP-2014 15:00	SB16/1.5	✓							
ES1419628-042	01-SEP-2014 15:00	SB17/2.0	✓							
ES1419628-043	01-SEP-2014 15:00	SB09/2.0	✓							
ES1419628-044	01-SEP-2014 15:00	SB11/1.0	✓							
ES1419628-045	01-SEP-2014 15:00	SB15/1.0	✓							
ES1419628-046	01-SEP-2014 15:00	SB15/2.0	✓							
ES1419628-047	01-SEP-2014 15:00	SB15/2.8	✓							
ES1419628-048	01-SEP-2014 15:00	SB18/2.0	✓							
ES1419628-049	01-SEP-2014 15:00	SB18/3.0	✓							
ES1419628-050	02-SEP-2014 15:00	SB24/1.0	✓							
ES1419628-051	02-SEP-2014 15:00	SB05/1.0	✓							
ES1419628-052	02-SEP-2014 15:00	SB06/1.0	✓							
ES1419628-053	02-SEP-2014 15:00	SB08/1.0	✓							
ES1419628-054	02-SEP-2014 15:00	SB08/3.0	✓							
ES1419628-055	02-SEP-2014 15:00	SB21/1.0	✓							
ES1419628-056	02-SEP-2014 15:00	SB21/3.0	✓							
ES1419628-057	02-SEP-2014 15:00	SB20/1.0	✓							
ES1419628-058	02-SEP-2014 15:00	SB23/2.5	✓							
ES1419628-059	03-SEP-2014 15:00	SB12/2.0	✓							
ES1419628-060	03-SEP-2014 15:00	SB19/1.0	✓							
ES1419628-061	03-SEP-2014 15:00	SB22/1.0	✓							
ES1419628-062	03-SEP-2014 15:00	SB07/2.0	✓							
ES1419628-063	03-SEP-2014 15:00	SB13/2.0	✓							

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP080 BTEXN
ES1419628-036	01-SEP-2014 15:00	QCD	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com

MR ROBERT GAUTHIER

- *AU Certificate of Analysis - NATA (COA)	Email	rgauthier@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rgauthier@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rgauthier@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rgauthier@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	rgauthier@globalskm.com
- Chain of Custody (CoC) (COC)	Email	rgauthier@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	rgauthier@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	rgauthier@globalskm.com
- EDI Format - XTab (XTAB)	Email	rgauthier@globalskm.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Former RZM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: (1) 2 3 4 5 6 7
OF: 1 2 3 4 5 (6) 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 3/9/14 5.40p	DATE/TIME: 3/9/14 1740.	DATE/TIME: 4/9/14 1700	DATE/TIME: 4/9 1940

Environmental Division
Sydney
Work Order
ES1419628

Telephone : +61-2-8784 8555

Subcon / Forward Lab / Split WO
Lab / Analysis: Newcastle / Asbestos
Organised By / Date: (6)
Relinquished By / Date:
Connote / Courier: TYPE & PRESERVATIVE (refer to codes below)
WO No:
Attach By PO / Internal Sheet:

ALS USE ONLY	SAMPLE MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION			ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price. Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								
LAB ID	SAMPLE ID				TOTAL BOTTLES	Heavy Metals (8)	PAHs	TRH/BTEX	Asbestos	Phenols	PCB's		
(39)	SB10 1.0	1/9/14	Soil	Soil jar	1								
1	SB10 1.5					✓	✓	✓		✓	✓		HOLD
(40)	SB10 2.0												
2	SB16 0.5					✓	✓	✓		✓	✓		HOLD
3	SB16 1.1					✓	✓	✓		✓	✓		
(41)	SB16 1.5												
4	SB17 0.5					✓	✓	✓		✓	✓		HOLD
5	SB17 1.0					✓	✓	✓		✓	✓		
(42)	SB17 2.0												
6	SB17 SFC					✓	✓	✓	✓	✓	✓		HOLD
7	SB09 1.0					✓	✓	✓		✓	✓		
(43)	SB09 2.0												HOLD
					TOTAL 12	7	7	7	1	7	7		

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; I = Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
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WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RZM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carthier — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 3/9/14 5:40p	DATE/TIME: 3/9/14 1740	DATE/TIME: 4/9/14 1740	DATE/TIME: 4/9 1940

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAHs	TRH/BTEX	Asbestos	Phenols	PCB's	pH		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
44	SB11/1.0	1/9/14	Soil	Soil jar	1									
8	SB11/2.0					✓	✓	✓		✓	✓			HOLD
9	SB15/0.5					✓	✓							
45	SB15/1.0													HOLD
46	SB15/2.0													HOLD
47	SB15/2.8													HOLD
10	SB18/1.0					✓	✓					✓		
48	SB18/2.0													HOLD
49	SB18/3.0													HOLD
11	SB24/0.5	2/9/14				✓	✓							
50	SB24/1.0													HOLD
12	SB24/2.0					✓	✓							
					TOTAL	12	5	5	1	-	1	1	1	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RZM DSI
PROJECT NO.: EN03269
ORDER NUMBER: EN03269
PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carthier
CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan
SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO)
EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 2 (3) 4 5 6 7
OF: 1 2 3 4 5 (6) 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY: [signature]
DATE/TIME: 3/9/14 5:40p

RECEIVED BY: [signature]
DATE/TIME: 3/9/14 1740

RELINQUISHED BY: [signature]
DATE/TIME: 4/9/14 17a

RECEIVED BY: Dan
DATE/TIME: 4/9 1440

ALS USE ONLY	SAMPLE DETAILS Matrix: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAHs	TRH/BTEX	Asbestos	Phenols	PCB's	pH		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	SB05/0.5	2/9/14	Soil	soil jar	1	✓	✓							
(S1)	SB05/1.0													
14	SB05/2.0					✓	✓							HOLD
15	SB06/0.5					✓	✓							
(S2)	SB06/1.0													
16	SB06/2.0					✓								HOLD
(S3)	SB08/1.0													
17	SB08/2.0					✓	✓					✓		
(S4)	SB08/3.0													
(S5)	SB21/1.0													HOLD
18	SB21/2.0					✓	✓							HOLD
(S6)	SB21/3.0													
														HOLD
					TOTAL	12	6	5	-	-	-	-	1	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 1/26 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7855 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RAM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carthier — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY: DATE/TIME: 3/9/14 5.40p
RECEIVED BY: GD DATE/TIME: 3/9/14 1740
RELINQUISHED BY: DATE/TIME: 4/9/14 1740
RECEIVED BY: Dan DATE/TIME: 4/9 1440

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (6)	PAH's	TRH/BTEX	Asbestos	Phenols	PCB's	pH.		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
(57)	SB20/1.0	2/9/14	Soil	Soil jar & ice	1									
19	SB20/2.0					✓	✓					✓		HOLD
20	SB23/0.5					✓	✓							
21	SB23/0.7					✓	✓							
(58) 9	SB22/2.5													
22	SB12/0.5	3/9/14				✓	✓	✓		✓				HOLD
23	SB12/1.0					✓	✓	✓		✓				
(59) (59)	SB12/2.0													
(59) (60)	SB19/1.0													HOLD
24	SB19/1.8					✓	✓			[redacted]		✓		HOLD
(60) (61)	SB22/1.0													
25	SB22/1.9					✓	✓							HOLD
					TOTAL	7	7	2	-	2	-	2		

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; U = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ENFM (29412)

Approved Date: 08/02/2014

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RZM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carruthers — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 (5) 6 7
OF: 1 2 3 4 5 (6) 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 3/9/14 5.40p	DATE/TIME: 3/9/14 1740.	DATE/TIME: 4/9/14 1705	DATE/TIME: David 4/9 1440

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAH's	TRH/BTEX	Asbestos	Phenols	PCBs	pH		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
26	SB07/1.2	3/9/14	Soil	Soil Jar & Ice	1	✓	✓							
(57) (62)	SB07/2.0					·								
27	SB03/0.5					✓	✓							HOLD
28	SB03/1.3					✓	✓							
29	SB03/2.0					✓	✓							
30	SB13/0.5					✓	✓							
31	SB13/1.0					✓	✓							
(62) (63)	SB13/2.0					✓	✓							
32	QC4	1/9/14												HOLD
33	QC5	2/9/14				✓	✓	✓		✓	✓			
34	QC6	↓				✓	✓							
35	QC7	3/9/14				✓	✓							
						✓	✓					✓		
					TOTAL	12	10	10	1	-	1	1	1	

EMAILED

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; L = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs

OFFICE: Newcastle

PROJECT: Formes RZM DSI PROJECT NO.: EN03269

ORDER NUMBER: EN03269 PURCHASE ORDER NO.:

PROJECT MANAGER: Robert Carruthers CONTACT PH: 0407 464 578

SAMPLER: Grant Moylan SAMPLER MOBILE: 0408 728 184

COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed):

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)

☑ Standard TAT (List due date):

☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free Ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY: DATE/TIME: 3/9/14 5.40p

RECEIVED BY: DATE/TIME: 3/9/14 1740.

RELINQUISHED BY: Ice DATE/TIME: 4/9/14 1700

RECEIVED BY: Daud DATE/TIME: 4/9 1am

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	BTEX								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
36	QCD	1/9/14	Water	2V	2	✓								
37	Trip Spike	27/8/14	Soil	soil jar & ice	1	✓								
38	TSC													
				TOTAL	3	2								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1419871**	Page	: 1 of 11
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: EN03269		
C-O-C number	: ----	Date Samples Received	: 04-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Site	: ----		
		No. of samples received	: 21
Quote number	: EN/003/14	No. of samples analysed	: 17

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

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 performed, 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 insufficient 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.**

NATA Accredited Laboratory 825

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dian Dao	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01/0.5	SB01/1.1	SB02/0.5	SB02/1.9	SB04/0.5
				Client sampling date / time	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]
Compound	CAS Number	LOR	Unit		ES1419871-001	ES1419871-002	ES1419871-004	ES1419871-006	ES1419871-007
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		6.6	6.8	5.0	7.6	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		25.7	26.6	9.8	22.7	3.9
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		40	26	11	17	4
Copper	7440-50-8	5	mg/kg		27	13	6	10	<5
Lead	7439-92-1	5	mg/kg		8	8	10	6	7
Nickel	7440-02-0	2	mg/kg		53	19	4	29	<2
Zinc	7440-66-6	5	mg/kg		68	38	9	52	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<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+j)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
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	----	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	----	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	----	0.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB01/0.5	SB01/1.1	SB02/0.5	SB02/1.9	SB04/0.5
			Client sampling date / time	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]
Compound	CAS Number	LOR	Unit	ES1419871-001	ES1419871-002	ES1419871-004	ES1419871-006	ES1419871-007
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	----	----	----	1.2
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	----	----	----	----	89.5
2-Chlorophenol-D4	93951-73-6	0.1	%	----	----	----	----	114
2.4.6-Tribromophenol	118-79-6	0.1	%	----	----	----	----	86.4
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	----	----	----	----	91.0
Anthracene-d10	1719-06-8	0.1	%	----	----	----	----	103
4-Terphenyl-d14	1718-51-0	0.1	%	----	----	----	----	102

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB04/2.7	S1	S2	S3	S4
				Client sampling date / time	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]
Compound	CAS Number	LOR	Unit		ES1419871-010	ES1419871-011	ES1419871-012	ES1419871-013	ES1419871-014
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	8.7	8.1	8.4	8.1
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1.0	%		18.4	44.9	48.5	40.2	38.4
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		10	6	8	6	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		16	65	64	48	57
Copper	7440-50-8	5	mg/kg		7	45	46	33	40
Lead	7439-92-1	5	mg/kg		<5	12	14	22	13
Nickel	7440-02-0	2	mg/kg		3	67	64	50	55
Zinc	7440-66-6	5	mg/kg		7	77	81	110	86
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<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+j)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	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB04/2.7	S1	S2	S3	S4
			Client sampling date / time	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]
Compound	CAS Number	LOR	Unit	ES1419871-010	ES1419871-011	ES1419871-012	ES1419871-013	ES1419871-014
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	87.9	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	112	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	91.0	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	90.1	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	99.8	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	102	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S5	S6	S7	S8	S9
			Client sampling date / time	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]	[04-SEP-2014]
Compound	CAS Number	LOR	Unit	ES1419871-015	ES1419871-016	ES1419871-017	ES1419871-018	ES1419871-019
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.1	8.6	7.6	8.0	7.4
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	55.5	51.2	55.4	54.7	54.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	14	7	10	8	7
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	65	80	72	44	42
Copper	7440-50-8	5	mg/kg	39	53	44	30	28
Lead	7439-92-1	5	mg/kg	31	14	30	24	31
Nickel	7440-02-0	2	mg/kg	59	78	79	39	17
Zinc	7440-66-6	5	mg/kg	189	87	236	195	196
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S10	----	----	----	----
			Client sampling date / time	[04-SEP-2014]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1419871-020	----	----	----	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	**8.7**	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	**23.7**	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**29**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**13**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**7**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**8**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**17**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<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+j)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	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S10	----	----	----	----
			Client sampling date / time	[04-SEP-2014]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1419871-020	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**90.3**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**115**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**113**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**89.2**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**104**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**103**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QCE	----	----	----	----
				Client sampling date / time	[04-SEP-2014]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1419871-021	----	----	----	----
EP080: BTEXN									
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	----	----	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**93.8**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%		**98.9**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		**93.5**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1419871**	Page	: 1 of 9
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Order number	: EN03269		
		No. of samples received	: 21
Quote number	: EN/003/14	No. of samples analysed	: 17

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

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 performed, 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 insufficient 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

NATA Accredited Laboratory 825

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
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dian Dao	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
		Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 3622240)									
ES1419504-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.2	8.3	0.0	0% - 20%
ES1419786-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.2	6.2	0.0	0% - 20%
EA002 : pH (Soils) (QC Lot: 3622246)									
ES1419871-012	S2	EA002: pH Value	----	0.1	pH Unit	8.1	8.1	0.0	0% - 20%
ES1419935-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.9	6.9	0.0	0% - 20%
EA055: Moisture Content (QC Lot: 3621003)									
ES1419854-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	19.2	19.4	1.6	0% - 50%
ES1419871-013	S3	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	40.2	39.1	2.9	0% - 20%
EA055: Moisture Content (QC Lot: 3621006)									
ES1419933-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	3.0	3.2	4.6	No Limit
ES1419936-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	13.6	13.4	1.5	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 3624138)									
ES1419628-020	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	8	16.6	No Limit
ES1419628-030	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	10	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	7	7	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	11	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	16	16	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 3624140)									
ES1419871-007	SB04/0.5	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	6	17.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
ES1419871-019	S9	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 3624140) - continued									
ES1419871-019	S9	EG005T: Chromium	7440-47-3	2	mg/kg	42	38	10.4	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	17	24	32.8	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	9	15.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	28	35	21.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	31	35	11.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	196	226	14.5	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3624139)									
ES1419628-020	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419628-030	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3624141)									
ES1419871-007	SB04/0.5	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1419871-019	S9	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622267)									
ES1419628-022	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1419628-032	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3622267) - continued									
ES1419628-032	Anonymous	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 3621142)									
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EW1402705-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 3624138)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	110	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	104	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	119	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	116	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	106	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	114	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	112	81	133
EG005T: Total Metals by ICP-AES (QCLot: 3624140)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	113	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	106	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	120	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32.0 mg/kg	115	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40.0 mg/kg	108	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.0 mg/kg	118	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	116	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	93.1	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624141)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	86.8	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	100	80	124
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	97.2	77	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	106	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	97.1	77	123
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	101	79	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	106	79	123
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	100	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	99.8	79	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	89.9	73	121
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	111	81	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	81.6	70	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	103	77	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	95.2	76	122
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	78.5	71	113

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267) - continued								
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	74.6	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	82.0	72.4	114

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3621142)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	102	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	84.1	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	93.3	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	88.2	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	96.9	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 3624138)							
ES1419628-020	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	105	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	107	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	109	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	107	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	106	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG005T: Total Metals by ICP-AES (QCLot: 3624140)							
ES1419871-007	SB04/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	90.9	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	110	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	111	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	112	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	112	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	112	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	112	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139) - continued							
ES1419628-020	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	103	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624141)							
ES1419871-007	SB04/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	102	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)							
ES1419628-022	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	103	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	101	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 3621142)							
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.3	70	130
		EP080: Toluene	108-88-3	25 µg/L	88.6	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	96.9	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.5	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	99.6	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report: Spike Concentration	Spike Recovery (%): MS	Spike Recovery (%): MSD	Recovery Limits (%): Low	Recovery Limits (%): High	RPDs (%): Value	RPDs (%): Control Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3622267)										
ES1419628-022	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	103	----	70	130	----	----
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	101	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3624138)										
ES1419628-020	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	105	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	107	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	109	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	107	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	106	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	107	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139)										

Sub-Matrix: **SOIL**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624139) - continued										
ES1419628-020	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	103	----	70	130	----	----
EG005T: Total Metals by ICP-AES (QCLot: 3624140)										
ES1419871-007	SB04/0.5	EG005T: Arsenic	7440-38-2	50 mg/kg	90.9	----	70	130	----	----
		EG005T: Cadmium	7440-43-9	50 mg/kg	110	----	70	130	----	----
		EG005T: Chromium	7440-47-3	50 mg/kg	111	----	70	130	----	----
		EG005T: Copper	7440-50-8	250 mg/kg	112	----	70	130	----	----
		EG005T: Lead	7439-92-1	250 mg/kg	112	----	70	130	----	----
		EG005T: Nickel	7440-02-0	50 mg/kg	112	----	70	130	----	----
		EG005T: Zinc	7440-66-6	250 mg/kg	112	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3624141)										
ES1419871-007	SB04/0.5	EG035T: Mercury	7439-97-6	5 mg/kg	102	----	70	130	----	----

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080: BTEXN (QCLot: 3621142)										
ES1419870-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	92.3	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	88.6	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	96.9	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.5	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	99.6	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1419871**	Page	: 1 of 6
Client	: JACOBS GROUP (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 04-SEP-2014
Sampler	: GM	Issue Date	: 11-SEP-2014
Order number	: EN03269		
		No. of samples received	: 21
Quote number	: EN/003/14	No. of samples analysed	: 17

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 Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SB01/0.5, SB01/1.1, SB02/0.5, SB02/1.9, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	**04-SEP-2014**	**08-SEP-2014**	11-SEP-2014	✓	**08-SEP-2014**	08-SEP-2014	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SB01/0.5, SB01/1.1, SB02/0.5, SB02/1.9, SB04/0.5, SB04/2.7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	**04-SEP-2014**	**----**	----	----	**05-SEP-2014**	18-SEP-2014	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SB01/0.5, SB01/1.1, SB02/0.5, SB02/1.9, SB04/0.5, SB04/2.7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	**04-SEP-2014**	**09-SEP-2014**	03-MAR-2015	✓	**10-SEP-2014**	03-MAR-2015	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
SB01/0.5, SB01/1.1, SB02/0.5, SB02/1.9, SB04/0.5, SB04/2.7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	**04-SEP-2014**	**09-SEP-2014**	02-OCT-2014	✓	**10-SEP-2014**	02-OCT-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
SB04/0.5, SB04/2.7, S10	**04-SEP-2014**	**08-SEP-2014**	18-SEP-2014	✓	**10-SEP-2014**	18-OCT-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
QCE	**04-SEP-2014**	**08-SEP-2014**	18-SEP-2014	✓	**08-SEP-2014**	18-SEP-2014	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	38	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	17	**11.8**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	40	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	40	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
TRH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	(APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1419871**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: FORMER RZM DSI EN03269	Page	: 1 of 3
Order number	: EN03269		
C-O-C number	: ----	Quote number	: EM2014SINKNI0446 (EN/003/14)
Site	: ----		
Sampler	: GM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 04-SEP-2014	Issue Date	: 05-SEP-2014 12:26
Client Requested Due Date	: 11-SEP-2014	Scheduled Reporting Date	: **11-SEP-2014**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.7'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 21
Security Seal	: Intact.	No. of samples analysed	: 17

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - S-02 8 Metals (incl. Digestion)
ES1419871-001	[04-SEP-2014]	SB01/0.5		✓		✓
ES1419871-002	[04-SEP-2014]	SB01/1.1		✓		✓
ES1419871-003	[04-SEP-2014]	SB01/2.0	✓			
ES1419871-004	[04-SEP-2014]	SB02/0.5		✓		✓
ES1419871-005	[04-SEP-2014]	SB02/1.0	✓			
ES1419871-006	[04-SEP-2014]	SB02/1.9		✓		✓
ES1419871-007	[04-SEP-2014]	SB04/0.5			✓	✓
ES1419871-008	[04-SEP-2014]	SB04/1.0	✓			
ES1419871-009	[04-SEP-2014]	SB04/1.8	✓			
ES1419871-010	[04-SEP-2014]	SB04/2.7			✓	✓
ES1419871-011	[04-SEP-2014]	S1		✓		✓
ES1419871-012	[04-SEP-2014]	S2		✓		✓
ES1419871-013	[04-SEP-2014]	S3		✓		✓
ES1419871-014	[04-SEP-2014]	S4		✓		✓
ES1419871-015	[04-SEP-2014]	S5		✓		✓
ES1419871-016	[04-SEP-2014]	S6		✓		✓
ES1419871-017	[04-SEP-2014]	S7		✓		✓
ES1419871-018	[04-SEP-2014]	S8		✓		✓
ES1419871-019	[04-SEP-2014]	S9		✓		✓
ES1419871-020	[04-SEP-2014]	S10		✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP080 BTEXN
ES1419871-021	[04-SEP-2014]	QCE	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com
MR ROBERT GAUTHIER		
- *AU Certificate of Analysis - NATA (COA)	Email	rgauthier@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rgauthier@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rgauthier@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rgauthier@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	rgauthier@globalskm.com
- Chain of Custody (CoC) (COC)	Email	rgauthier@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	rgauthier@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	rgauthier@globalskm.com
- EDI Format - XTab (XTAB)	Email	rgauthier@globalskm.com

(ALS) ALS Laboratory: please tick →

☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5500 E: gladstone@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☑ Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Formes RZM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Gauthier — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: (1) 2 3 4 5 6 7
OF: 1 (2) 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free Ice / Frozen Ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 2.4 °C
Other comment: Client drop off.

RELINQUISHED BY: DATE/TIME: 4/9/14 1:49p
RECEIVED BY: DATE/TIME: 4/9/14 13.50
RELINQUISHED BY: GD. DATE/TIME: 4/9/14 1700.
RECEIVED BY: telfon DATE/TIME: 04/09/14 1940.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).				Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	PAHs	pH		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SB01/0.5	4/9/14	Soil	soil jar & ice	1	✓		✓		
2	SB01/1.1					✓		✓		
3	SB01/2.0					✓		✓		HOLD
4	SB02/0.5					✓		✓		
5	SB02/1.0									HOLD
6	SB02/1.9					✓		✓		
7	SB04/0.5					✓	✓			
8	SB04/1.0									HOLD
9	SB04/1.8									HOLD
10	SB04/2.7					✓	✓			
11	S1					✓		✓		
12	S2					✓		✓		
					TOTAL	12	8	2	6	

Environmental Division Sydney
Work Order
ES1419871
Telephone : + 61-2-8784 8555

Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

EMAILED

ALS Laboratory: please tick →

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/26 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: Formes RZM DSI PROJECT NO.: EN03269	ALS QUOTE NO.:		Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: EN03269 PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Robert Gauthier	CONTACT PH: 0407 464 578	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Grant Moylan	SAMPLER MOBILE: 0408 728 184		
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed):			
Email Invoice to (will default to PM if no other addresses are listed):			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 4/9/14 1.49p	DATE/TIME: 4/9/14 1700	DATE/TIME:	DATE/TIME:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Heavy Metals (8)	pH	BTEX	PAH					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	S3	4/9/14	Soil	Soil jar & ice	1	✓	✓							ES1419871
14	S4					✓	✓							2/2
15	S5					✓	✓							
16	S6					✓	✓							
17	S7					✓	✓							
18	S8					✓	✓							
19	S9					✓	✓							
20	S10					✓	✓		✓					
21	QCE		Water	2V	2			✓						
				TOTAL		8	8	1	1					

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; L = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ENFORM (09/13)

Form Page 1 of 1

Approved Date: 18/03/2014

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1420371**	Page	: 1 of 15
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: EN03269		
C-O-C number	: ----	Date Samples Received	: 10-SEP-2014
Sampler	: GM	Issue Date	: 18-SEP-2014
Site	: ----		
		No. of samples received	: 19
Quote number	: EN/003/14	No. of samples analysed	: 19

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 WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

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*
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics
Wisam Marassa	Inorganics Coordinator	Sydney 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 performed, 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 insufficient 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.**
- **EP080:Sample TRIP SPIKE contains volatile compounds spiked into the sample containers prior to dispatch from the laboratory. BTEX compounds spiked at 20 ug/L.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	MW05
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
					ES1420371-001	ES1420371-002	ES1420371-003	ES1420371-004	ES1420371-005
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	**0.004**	<0.001	**0.002**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		**0.0002**	**0.0003**	**0.0003**	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.003**	<0.001	<0.001	**0.003**	**0.002**
Copper	7440-50-8	0.001	mg/L		**0.008**	**0.002**	**0.001**	**0.005**	**0.003**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.006**	**0.041**	**0.015**	**0.005**	**0.005**
Zinc	7440-66-6	0.005	mg/L		**0.095**	**0.040**	**0.078**	**0.017**	**0.026**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<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	<1.0
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<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	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<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	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<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	<1.0
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<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	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW01	MW02	MW03	MW04	MW05
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
					ES1420371-001	ES1420371-002	ES1420371-003	ES1420371-004	ES1420371-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(b+j)fluoranthene	205-99-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
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	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP075(SIM)S: Phenolic Compound Surrogates									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW01	MW02	MW03	MW04	MW05
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1420371-001	ES1420371-002	ES1420371-003	ES1420371-004	ES1420371-005
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
Phenol-d6	13127-88-3	0.1	%		23.0	19.8	17.6	39.0	17.6
2-Chlorophenol-D4	93951-73-6	0.1	%		43.6	37.8	35.3	50.2	27.4
2.4.6-Tribromophenol	118-79-6	0.1	%		53.2	51.8	55.0	42.5	38.7
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		58.4	55.6	51.4	40.1	38.9
Anthracene-d10	1719-06-8	0.1	%		64.8	59.8	78.5	51.1	67.4
4-Terphenyl-d14	1718-51-0	0.1	%		64.2	60.0	68.4	54.0	49.0
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		101	104	95.8	104	110
Toluene-D8	2037-26-5	0.1	%		112	114	107	117	120
4-Bromofluorobenzene	460-00-4	0.1	%		105	109	99.9	109	115

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW06	MW07	MW08	MW09	MW10
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00
					ES1420371-006	ES1420371-007	ES1420371-008	ES1420371-009	ES1420371-010
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.004**	**0.002**	**0.005**	**0.002**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0001**	<0.0001	**0.0002**	**0.0001**
Chromium	7440-47-3	0.001	mg/L		**0.002**	**0.003**	<0.001	**0.002**	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.003**	**0.116**	**0.005**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.002**	**0.001**	**0.014**	**0.001**
Zinc	7440-66-6	0.005	mg/L		**0.012**	**0.012**	**0.013**	**0.018**	**0.114**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	1	µg/L		----	----	----	----	<1
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<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	<1.0
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<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	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<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	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<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	<1.0
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<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	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW06	MW07	MW08	MW09	MW10
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00
					ES1420371-006	ES1420371-007	ES1420371-008	ES1420371-009	ES1420371-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
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	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW06	MW07	MW08	MW09	MW10
				Client sampling date / time	10-SEP-2014 15:00	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00
Compound	CAS Number	LOR	Unit		ES1420371-006	ES1420371-007	ES1420371-008	ES1420371-009	ES1420371-010
EP080: BTEXN - Continued									
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	----	----	**91.7**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**17.4**	**22.6**	**46.7**	**16.4**	**18.4**
2-Chlorophenol-D4	93951-73-6	0.1	%		**28.4**	**44.8**	**64.4**	**30.5**	**37.1**
2.4.6-Tribromophenol	118-79-6	0.1	%		**58.6**	**57.8**	**63.4**	**39.3**	**32.5**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**54.8**	**72.4**	**60.0**	**42.5**	**43.0**
Anthracene-d10	1719-06-8	0.1	%		**64.0**	**76.9**	**65.3**	**61.0**	**66.6**
4-Terphenyl-d14	1718-51-0	0.1	%		**67.2**	**66.1**	**60.9**	**50.9**	**52.9**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**110**	**87.4**	**99.9**	**98.3**	**98.6**
Toluene-D8	2037-26-5	0.1	%		**98.6**	**83.7**	**111**	**113**	**112**
4-Bromofluorobenzene	460-00-4	0.1	%		**102**	**83.8**	**106**	**106**	**104**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW11	MW12	MW13	W1	W2
				Client sampling date / time	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
					ES1420371-011	ES1420371-012	ES1420371-013	ES1420371-014	ES1420371-015
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.001**	**0.001**	<0.001	**0.001**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.005**	**0.002**	**0.005**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.003**	**0.002**	**0.003**	**0.007**	**0.003**
Zinc	7440-66-6	0.005	mg/L		**0.010**	**0.022**	**0.033**	**0.038**	**0.008**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		----	----	----	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		----	----	----	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		----	----	----	<0.001	**0.002**
Copper	7440-50-8	0.001	mg/L		----	----	----	<0.001	**0.002**
Nickel	7440-02-0	0.001	mg/L		----	----	----	**0.007**	**0.003**
Lead	7439-92-1	0.001	mg/L		----	----	----	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		----	----	----	**0.039**	**0.008**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	----	<0.0001	<0.0001
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<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	<1.0
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<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	**8.7**
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<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	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<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	<1.0
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<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	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MW11	MW12	MW13	W1	W2
				Client sampling date / time	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
					ES1420371-011	ES1420371-012	ES1420371-013	ES1420371-014	ES1420371-015
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
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	<50
C15 - C28 Fraction	----	100	µg/L		**200**	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		**200**	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		**210**	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		**210**	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: MW11	MW12	MW13	W1	W2
				Client sampling date / time: 09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	10-SEP-2014 15:00	10-SEP-2014 15:00
				ES1420371-011	ES1420371-012	ES1420371-013	ES1420371-014	ES1420371-015
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**14.9**	**15.3**	**28.1**	**27.0**	**23.6**
2-Chlorophenol-D4	93951-73-6	0.1	%	**32.3**	**28.4**	**52.1**	**54.2**	**47.6**
2.4.6-Tribromophenol	118-79-6	0.1	%	**61.8**	**39.8**	**54.4**	**67.5**	**51.6**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**52.8**	**47.5**	**67.0**	**74.7**	**71.3**
Anthracene-d10	1719-06-8	0.1	%	**75.9**	**41.2**	**88.8**	**81.2**	**71.7**
4-Terphenyl-d14	1718-51-0	0.1	%	**59.0**	**43.5**	**75.2**	**78.5**	**73.0**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**106**	**97.7**	**106**	**106**	**123**
Toluene-D8	2037-26-5	0.1	%	**106**	**108**	**111**	**111**	**111**
4-Bromofluorobenzene	460-00-4	0.1	%	**106**	**113**	**108**	**107**	**115**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	W3	QC8	QCF	TRIP SPIKE	----
				Client sampling date / time	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1420371-016	ES1420371-017	ES1420371-018	ES1420371-019	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.006**	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0002**	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.002**	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.001**	**0.111**	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	**0.001**	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.014**	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.014**	**0.026**	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.010**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.017**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	----	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	W3	QC8	QCF	TRIP SPIKE	----
				Client sampling date / time	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	----
					ES1420371-016	ES1420371-017	ES1420371-018	ES1420371-019	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L		<0.5	<0.5	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L		<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	W3	QC8	QCF	TRIP SPIKE	----
				Client sampling date / time	10-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	09-SEP-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1420371-016	ES1420371-017	ES1420371-018	ES1420371-019	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	**16**	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	**16**	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	**16**	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	**16**	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	**17**	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	**33**	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	**81**	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	**18**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**22.4**	**16.2**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**40.2**	**30.3**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**42.4**	**53.7**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**53.8**	**47.0**	----	----	----
Anthracene-d10	1719-06-8	0.1	%		**59.5**	**51.6**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		**56.4**	**50.4**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**118**	**105**	**106**	**134**	----
Toluene-D8	2037-26-5	0.1	%		**115**	**104**	**102**	**103**	----
4-Bromofluorobenzene	460-00-4	0.1	%		**114**	**100**	**102**	**116**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	28.5	129
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10.0	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27.4	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

QUALITY CONTROL REPORT

Work Order	: **ES1420371**	Page	: 1 of 8
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 10-SEP-2014
Sampler	: GM	Issue Date	: 18-SEP-2014
Order number	: EN03269		
		No. of samples received	: 19
Quote number	: EN/003/14	No. of samples analysed	: 19

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

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 ir compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics
Wisam Marassa	Inorganics Coordinator	Sydney 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 performed, 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 insufficient 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.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3633860)									
ES1420371-003	MW03	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0003	0.0003	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.015	0.017	8.4	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.078	0.075	3.9	0% - 50%
ES1420371-012	MW12	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.002	0.003	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.022	0.025	9.2	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3633864)									
ES1420371-014	W1	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.039	0.041	5.1	No Limit
ES1420539-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	<0.001	122	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.012	0.009	29.9	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3633859)									
ES1420371-001	MW01	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES1420371-011	MW11	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3636214)									
EP1407217-003	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES1420365-004	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3633159)									
ES1420371-001	MW01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES1420371-011	MW11	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3633159)									
ES1420371-001	MW01	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES1420371-011	MW11	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 3633159)									
ES1420371-001	MW01	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES1420371-011	MW11	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3633860)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	101	80	118
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	91.9	82	112
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	97.8	81	113
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	79	113
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.4	81	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.8	81	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	80	116
EG020T: Total Metals by ICP-MS (QCLot: 3633864)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	92.3	79	121
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	90.0	83	113
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.2	84	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.7	83	117
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.4	84	116
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.1	84	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	87.6	77	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3633859)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	88.0	78	114
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3636214)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	88.7	77	115
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3630256)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	95.6	61.6	107
EP075(SIM)A: Phenolic Compounds (QCLot: 3630255)								
EP075(SIM): Phenol	108-95-2	0.2	µg/L	<1.0	5 µg/L	29.1	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	0.2	µg/L	<1.0	5 µg/L	70.6	63.8	110
EP075(SIM): 2-Methylphenol	95-48-7	0.2	µg/L	<1.0	5 µg/L	77.8	55.9	112
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	0.4	µg/L	<2.0	10 µg/L	66.1	42.5	114
EP075(SIM): 2-Nitrophenol	88-75-5	0.2	µg/L	<1.0	5 µg/L	77.7	62.7	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.2	µg/L	<1.0	5 µg/L	67.3	59.9	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.2	µg/L	<1.0	5 µg/L	77.8	59.3	122
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.2	µg/L	<1.0	5 µg/L	78.3	64.3	118
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	0.2	µg/L	<1.0	5 µg/L	70.7	63	119
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.2	µg/L	<1.0	5 µg/L	79.8	58.7	118
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.2	µg/L	<1.0	5 µg/L	82.0	50	108
EP075(SIM): Pentachlorophenol	87-86-5	0.4	µg/L	<2.0	10 µg/L	24.3	10	95

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3630255)								
EP075(SIM): Naphthalene	91-20-3	0.2	µg/L	<1.0	5 µg/L	72.0	58.6	119
EP075(SIM): Acenaphthylene	208-96-8	0.2	µg/L	<1.0	5 µg/L	80.5	63.6	114
EP075(SIM): Acenaphthene	83-32-9	0.2	µg/L	<1.0	5 µg/L	76.4	62.2	113
EP075(SIM): Fluorene	86-73-7	0.2	µg/L	<1.0	5 µg/L	81.1	63.9	115
EP075(SIM): Phenanthrene	85-01-8	0.2	µg/L	<1.0	5 µg/L	81.5	62.6	116
EP075(SIM): Anthracene	120-12-7	0.2	µg/L	<1.0	5 µg/L	80.5	64.3	116
EP075(SIM): Fluoranthene	206-44-0	0.2	µg/L	<1.0	5 µg/L	88.0	63.6	118
EP075(SIM): Pyrene	129-00-0	0.2	µg/L	<1.0	5 µg/L	84.1	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	0.2	µg/L	<1.0	5 µg/L	85.8	64.1	117
EP075(SIM): Chrysene	218-01-9	0.2	µg/L	<1.0	5 µg/L	89.7	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.2	µg/L	<1.0	5 µg/L	83.7	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.2	µg/L	<1.0	5 µg/L	98.1	61.7	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.2	µg/L	<0.5	5 µg/L	76.0	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.2	µg/L	<1.0	5 µg/L	77.5	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.2	µg/L	<1.0	5 µg/L	76.7	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.2	µg/L	<1.0	5 µg/L	74.0	59.1	118
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3630254)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	81.3	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	88.2	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	79.1	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3633159)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	112	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3630254)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	81.5	58.9	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	91.6	73.9	138
EP071: >C34 - C40 Fraction	----	50	µg/L	<100	1500 µg/L	72.8	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3633159)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	118	75	127
EP080: BTEXN (QCLot: 3633159)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	106	70	124
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	110	65	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	110	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	110	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	107	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	87.4	70	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3633860)							
ES1420371-004	MW04	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	118	70	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	117	70	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	109	70	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	111	70	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	100	70	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	104	70	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	118	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3633864)							
ES1420371-015	W2	EG020A-T: Arsenic	7440-38-2	1 mg/L	102	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	101	70	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	97.0	70	130
		EG020A-T: Copper	7440-50-8	1 mg/L	103	70	130
		EG020A-T: Lead	7439-92-1	1 mg/L	95.5	70	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	92.5	70	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	97.2	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3633859)							
ES1420371-002	MW02	EG035F: Mercury	7439-97-6	0.0100 mg/L	73.8	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3636214)							
EP1407217-006	Anonymous	EG035T: Mercury	7439-97-6	0.010 mg/L	92.2	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3633159)							
ES1420371-001	MW01	EP080: C6 - C9 Fraction	----	325 µg/L	118	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3633159)							
ES1420371-001	MW01	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	120	70	130
EP080: BTEXN (QCLot: 3633159)							
ES1420371-001	MW01	EP080: Benzene	71-43-2	25 µg/L	101	70	130
		EP080: Toluene	108-88-3	25 µg/L	102	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	105	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	104	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	83.4	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3633159)										
ES1420371-001	MW01	EP080: C6 - C9 Fraction	----	325 µg/L	118	----	70	130	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3633159)										
ES1420371-001	MW01	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	120	----	70	130	----	----
EP080: BTEXN (QCLot: 3633159)										
ES1420371-001	MW01	EP080: Benzene	71-43-2	25 µg/L	101	----	70	130	----	----
		EP080: Toluene	108-88-3	25 µg/L	102	----	70	130	----	----
		EP080: Ethylbenzene	100-41-4	25 µg/L	105	----	70	130	----	----
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	104	----	70	130	----	----
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	----	70	130	----	----
		EP080: Naphthalene	91-20-3	25 µg/L	83.4	----	70	130	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 3633859)										
ES1420371-002	MW02	EG035F: Mercury	7439-97-6	0.0100 mg/L	73.8	----	70	130	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 3633860)										
ES1420371-004	MW04	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	118	----	70	130	----	----
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	117	----	70	130	----	----
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	109	----	70	130	----	----
		EG020A-F: Copper	7440-50-8	0.2 mg/L	111	----	70	130	----	----
		EG020A-F: Lead	7439-92-1	0.2 mg/L	100	----	70	130	----	----
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	104	----	70	130	----	----
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	118	----	70	130	----	----
EG020T: Total Metals by ICP-MS (QCLot: 3633864)										
ES1420371-015	W2	EG020A-T: Arsenic	7440-38-2	1 mg/L	102	----	70	130	----	----
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	101	----	70	130	----	----
		EG020A-T: Chromium	7440-47-3	1 mg/L	97.0	----	70	130	----	----
		EG020A-T: Copper	7440-50-8	1 mg/L	103	----	70	130	----	----
		EG020A-T: Lead	7439-92-1	1 mg/L	95.5	----	70	130	----	----
		EG020A-T: Nickel	7440-02-0	1 mg/L	92.5	----	70	130	----	----
		EG020A-T: Zinc	7440-66-6	1 mg/L	97.2	----	70	130	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3636214)										
EP1407217-006	Anonymous	EG035T: Mercury	7439-97-6	0.010 mg/L	92.2	----	70	130	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1420371**	Page	: 1 of 8
Client	: JACOBS GROUP (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 10-SEP-2014
Sampler	: GM	Issue Date	: 18-SEP-2014
Order number	: EN03269		
		No. of samples received	: 19
Quote number	: EN/003/14	No. of samples analysed	: 19

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 Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**---**	08-MAR-2015	----	**16-SEP-2014**	08-MAR-2015	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**---**	09-MAR-2015	----	**16-SEP-2014**	09-MAR-2015	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
W1, W2, W3	**10-SEP-2014**	**16-SEP-2014**	09-MAR-2015	✓	**16-SEP-2014**	09-MAR-2015	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**---**	07-OCT-2014	----	**17-SEP-2014**	07-OCT-2014	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**---**	08-OCT-2014	----	**17-SEP-2014**	08-OCT-2014	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
W1, W2, W3	**10-SEP-2014**	**----**	----	----	**17-SEP-2014**	08-OCT-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066)							
MW10	**09-SEP-2014**	**12-SEP-2014**	16-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**12-SEP-2014**	16-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
Amber Glass Bottle - Unpreserved (EP071)							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**12-SEP-2014**	17-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**12-SEP-2014**	16-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**12-SEP-2014**	17-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**12-SEP-2014**	16-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓
Amber Glass Bottle - Unpreserved (EP075(SIM))							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**12-SEP-2014**	17-SEP-2014	✓	**16-SEP-2014**	22-OCT-2014	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
MW08, MW09, MW10, MW11, MW12, MW13, QC8, QCF, TRIP SPIKE	**09-SEP-2014**	**16-SEP-2014**	23-SEP-2014	✓	**16-SEP-2014**	23-SEP-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**16-SEP-2014**	24-SEP-2014	✓	**16-SEP-2014**	24-SEP-2014	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
MW08, MW09, MW10, MW11, MW12, MW13, QC8	**09-SEP-2014**	**16-SEP-2014**	23-SEP-2014	✓	**16-SEP-2014**	23-SEP-2014	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MW01, MW02, MW03, MW04, MW05, MW06, MW07, W1, W2, W3	**10-SEP-2014**	**16-SEP-2014**	24-SEP-2014	✓	**16-SEP-2014**	24-SEP-2014	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	17	**5.9**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	1	**100.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP075(SIM)S: Phenolic Compound Surrogates	ES1420371-008	MW08	**Phenol-d6**	13127-88-3	46.7 %	10.0-44 %	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES1420371**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ROBERT GAUTHIER	Contact	: Client Services
Address	: 710 HUNTER STREET NEWCASTLE WEST NSW, AUSTRALIA 2302	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: rgauthier@globalskm.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 02 4979 2600	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4979 2666	Facsimile	: +61-2-8784 8500
Project	: EN03269 FORMER RZM DSI	Page	: 1 of 2
Order number	: EN03269		
C-O-C number	: ----	Quote number	: EM2014SINKNI0446 (EN/003/14)
Site	: ----		
Sampler	: GM	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 10-SEP-2014	Issue Date	: 12-SEP-2014 11:17
Client Requested Due Date	: 18-SEP-2014	Scheduled Reporting Date	: **18-SEP-2014**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 5.2'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 19
Security Seal	: Intact.	No. of samples analysed	: 19

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP066-PCB-WA Polychlorinated Biphenyls (PCB)	WATER - EP080 BTEXN	WATER - W-02T 8 metals (Total)	WATER - W-27 TRH/BTEXN/PAH/Phenols/8 Metals
ES1420371-001	10-SEP-2014 15:00	MW01				✓
ES1420371-002	10-SEP-2014 15:00	MW02				✓
ES1420371-003	10-SEP-2014 15:00	MW03				✓
ES1420371-004	10-SEP-2014 15:00	MW04				✓
ES1420371-005	10-SEP-2014 15:00	MW05				✓
ES1420371-006	10-SEP-2014 15:00	MW06				✓
ES1420371-007	10-SEP-2014 15:00	MW07				✓
ES1420371-008	09-SEP-2014 15:00	MW08				✓
ES1420371-009	09-SEP-2014 15:00	MW09				✓
ES1420371-010	09-SEP-2014 15:00	MW10	✓			✓
ES1420371-011	09-SEP-2014 15:00	MW11				✓
ES1420371-012	09-SEP-2014 15:00	MW12				✓
ES1420371-013	09-SEP-2014 15:00	MW13				✓
ES1420371-014	10-SEP-2014 15:00	W1			✓	✓
ES1420371-015	10-SEP-2014 15:00	W2			✓	✓
ES1420371-016	10-SEP-2014 15:00	W3			✓	✓
ES1420371-017	09-SEP-2014 15:00	QC8				✓
ES1420371-018	09-SEP-2014 15:00	QCF		✓		
ES1420371-019	09-SEP-2014 15:00	TRIP SPIKE		✓		

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com

MR ROBERT GAUTHIER

- *AU Certificate of Analysis - NATA (COA)	Email	rgauthier@globalskm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	rgauthier@globalskm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	rgauthier@globalskm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	rgauthier@globalskm.com
- A4 - AU Tax Invoice (INV)	Email	rgauthier@globalskm.com
- Chain of Custody (CoC) (COC)	Email	rgauthier@globalskm.com
- EDI Format - ENMRG (ENMRG)	Email	rgauthier@globalskm.com
- EDI Format - ESDAT (ESDAT)	Email	rgauthier@globalskm.com
- EDI Format - XTab (XTAB)	Email	rgauthier@globalskm.com

ALS Laboratory: please tick →

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Former RAM DSI — PROJECT NO.: EN03269
ORDER NUMBER: EN03269 — PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Carruthers — CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan — SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) — EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: (1) 2 3 4 5 6 7
OF: 1 (2) 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: 0.4 °C
Other comment: Client drop off

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 10/9/14 5.05pm	DATE/TIME: 10/9/14 17.10	DATE/TIME:	DATE/TIME: 7:29am 11/9/14

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price)								Additional Information
						Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Metals (dissolved)	Metals (total)	TRH/BTEX	PAH	Phenols	PCB			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01	10/9/14	Water	2VS; 1PN; 1AG	4	✓		✓	✓	✓				
2	MW02					✓		✓	✓	✓				
3	MW03					✓		✓	✓	✓				
4	MW04					✓		✓	✓	✓				
5	MW05					✓		✓	✓	✓				
6	MW06					✓		✓	✓	✓				
7	MW07					✓		✓	✓	✓				
8	MW08	9/9/14				✓		✓	✓	✓				
9	MW09					✓		✓	✓	✓				
10	MW10					✓		✓	✓	✓	✓			
11	MW11					✓		✓	✓	✓				
12	MW12					✓		✓	✓	✓				
				TOTAL	48	12	0	12	12	12	1			

Environmental Division
Sydney
Work Order
ES1420371
Telephone : +61-2-8784 8555

E-MAILED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐BRISBANE 2 Byth Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680
Ph: 07 7471 5600 E: gladstone@alsglobal.com

Ph: 07 4944 0177 E: mackay@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☑NEWCASTLE 6/585 Maitland Road Mayfield West NSW 2304
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541
Ph: 02 4423 2063 E: nowra@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Jacobs
OFFICE: Newcastle
PROJECT: Former RZM DS1 PROJECT NO.: EN03269
ORDER NUMBER: EN03269 PURCHASE ORDER NO.:
PROJECT MANAGER: Robert Gauthier CONTACT PH: 0407 464 578
SAMPLER: Grant Moylan SAMPLER MOBILE: 0408 728 184
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):
Email Invoice to (will default to PM if no other addresses are listed):
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☑ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.:
COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: 1 (2) 3 4 5 6 7
OF: 1 (2) 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 10/9/14. 5.05p	DATE/TIME:	DATE/TIME:	DATE/TIME: 7:20am 11/9/14

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Metals (dissolved)	Metals (total)	TRH/BTEX	PAH	Phenols	PCB	BTEX only		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	MW13	9/9/14	water	2VS; 1PN; 1AG	4	✓	✓	✓	✓	✓				
14	W1	10/9/14		2VS; 2PN; 1AG	5	✓	✓	✓	✓	✓				
15	W2	↓		↓	↓	✓	✓	✓	✓	✓				
16	W3	↓		↓	↓	✓	✓	✓	✓	✓				
17	QC8	9/9/14		2VS; 1PN; 1AG	4	✓		✓	✓	✓				
18	QCF	↓		2VS	2							✓		
19	Trip Spike	↓	↓	1V	1							✓		14 NEO 49 W
														ES1420371
														page 2 of 2.
				TOTAL	26	5	3	5	5	5	0	2		

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 115240

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West
NSW 2302

Attention: Grant Moylan, Robert Gauthier

Sample log in details:

Your Reference:	**EN03269, RMS-RZM DS1**
No. of samples:	2 Soils
Date samples received / completed instructions received	28/08/2014 / 28/08/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	4/09/14 / 2/09/14
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

PAHs in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	115240-1 QC1A 26/08/2014 Soil	115240-2 QC2A 26/08/2014 Soil
Date extracted	-	29/08/2014	29/08/2014
Date analysed	-	29/08/2014	29/08/2014
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Benzo(a)pyrene TEQ NEPM B1	mg/kg	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	102	103

Acid Extractable metals in soil			
Our Reference:	UNITS	115240-1	115240-2
Your Reference	----------	QC1A	QC2A
Date Sampled	----------	26/08/2014	26/08/2014
Type of sample		Soil	Soil
Date digested	-	29/08/2014	29/08/2014
Date analysed	-	29/08/2014	29/08/2014
Arsenic	mg/kg	<4	5
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	35	34
Copper	mg/kg	22	11
Lead	mg/kg	8	7
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	25	9
Zinc	mg/kg	40	16

Moisture			
Our Reference:	UNITS	115240-1	115240-2
Your Reference	----------	QC1A	QC2A
Date Sampled	----------	26/08/2014	26/08/2014
Type of sample		Soil	Soil
Date prepared	-	29/08/2014	29/08/2014
Date analysed	-	1/09/2014	1/09/2014
Moisture	%	24	25

Method ID	Methodology Summary
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			29/08/2014	[NT]	[NT]	LCS-2	29/08/2014
Date analysed	-			29/08/2014	[NT]	[NT]	LCS-2	29/08/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	104%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	101%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	101%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	104%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	104%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	99%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-2	105%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	94	[NT]	[NT]	LCS-2	107%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			29/08/2014	[NT]	[NT]	LCS-6	29/08/2014
Date analysed	-			29/08/2014	[NT]	[NT]	LCS-6	29/08/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-6	95%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-6	104%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	99%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	99%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	96%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-6	90%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	100%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-6	99%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West NSW 2302

ph: 02 4979 2600
Fax:

Attention: Grant Moylan, Robert Gauthier

Sample log in details:

Your reference:	**EN03269, RMS-RZM DS1**
Envirolab Reference:	**115240**
Date received:	28/08/2014
Date results expected to be reported:	**4/09/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	2 Soils
Turnaround time requested:	Standard
Temperature on receipt (°C)	13.3
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

CHAIN OF CUSTODY - Client

17421

ENVIROLAB GROUP - National Phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Lab - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Lab - Envirolab Services
7 Palmerton Road Windsor Gardens, SA 5087
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Jacobs	**Client Project Name / Number / Site etc (ie report title):** RMS - RZM DSI
Contact Person: Grant Moylan	**PO No.:** ENO3269
Project Mgr: Robert Canthier	**Envirolab Quote No. :**
Sampler: Grant Moylan / Robert Canthier	**Date results required:**
Address: L2 710 Hunter St Newcastle West, NSW, 2302	**Or choose:** standard / same day / 1 day / 2 day / 3 day
Phone: **Mob:** 0408 728 184	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Fax:	**Lab comments:**
Email: Grant.Moylan@jacobs.com	

Sample information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Heavy Metals (9)	HAH	Comments
1	QC1A		26/8/14	Soil	✓	✓	Provide as much information about the sample as you can
2	QC2A		↓	↓	✓	✓	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 145240
Date Received: 28/8/14
Time Received: 9.00
Received by: LSB
Temp: Cool/Ambient
Cooling: Ice/Icepack melted
Security: Intact/Broken/None

Relinquished by (company):	Jacobs	**Received by (company):**	ELS
Print Name:	Grant Moylan	**Print Name:**	LSB
Date & Time:	27/8/14 7.45a	**Date & Time:**	28/8/14
Signature:		**Signature:**	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
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enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 115328

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West
NSW 2302

Attention: Grant Moylan, Robert Gauthier

Sample log in details:

Your Reference:	**EN03269, RMS-RZM DS1**
No. of samples:	1 Soil
Date samples received / completed instructions received	29/08/2014 / 29/08/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	5/09/14 / 5/09/14
Date of Preliminary Report:	Not Issued

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Results Approved By:

Jacinta Hurst
Laboratory Manager

PAHs in Soil		
Our Reference:	UNITS	115328-1
Your Reference	----------	QC3A
Date Sampled	----------	27/08/2014
Type of sample		Soil
Date extracted	-	1/09/2014
Date analysed	-	1/09/2014
Naphthalene	mg/kg	1.2
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	0.2
Fluorene	mg/kg	0.5
Phenanthrene	mg/kg	5.4
Anthracene	mg/kg	0.5
Fluoranthene	mg/kg	2.6
Pyrene	mg/kg	1.8
Benzo(a)anthracene	mg/kg	1.4
Chrysene	mg/kg	1.3
Benzo(b,j+k)fluoranthene	mg/kg	1.0
Benzo(a)pyrene	mg/kg	0.49
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3
Benzo(a)pyrene TEQ NEPM B1	mg/kg	0.8
Total Positive PAHs	mg/kg	17
Surrogate p-Terphenyl-d14	%	95

Acid Extractable metals in soil		
Our Reference:	UNITS	115328-1
Your Reference	----------	QC3A
Date Sampled	----------	27/08/2014
Type of sample		Soil
Date digested	-	1/09/2014
Date analysed	-	1/09/2014
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	5
Copper	mg/kg	8
Lead	mg/kg	17
Mercury	mg/kg	<0.1
Nickel	mg/kg	3
Zinc	mg/kg	69

Moisture		
Our Reference:	UNITS	115328-1
Your Reference	----------	QC3A
Date Sampled	----------	27/08/2014
Type of sample		Soil
Date prepared	-	1/09/2014
Date analysed	-	2/09/2014
Moisture	%	12

Asbestos ID - soils		
Our Reference:	UNITS	115328-1
Your Reference	----------	QC3A
Date Sampled	----------	27/08/2014
Type of sample		Soil
Date analysed	-	4/09/2014
Sample mass tested	g	Approx 40g
Sample Description	-	Black coarse grain soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			1/09/2014	[NT]	[NT]	LCS-2	1/09/2014
Date analysed	-			01/09/2014	[NT]	[NT]	LCS-2	01/09/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	92%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	87%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	90%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	90%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	91%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-2	85%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-2	99%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	97	[NT]	[NT]	LCS-2	102%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			01/09/2014	[NT]	[NT]	LCS-2	01/09/2014
Date analysed	-			01/09/2014	[NT]	[NT]	LCS-2	01/09/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-2	96%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-2	106%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	98%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	99%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	98%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-2	90%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	98%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-2	98%

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Asbestos ID was analysed by Approved Identifier: Paul Ching
Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West NSW 2302

ph: 02 4979 2600
Fax:

Attention: Grant Moylan, Robert Gauthier

Sample log in details:

Your reference:	**EN03269, RMS-RZM DS1**
Envirolab Reference:	**115328**
Date received:	29/08/2014
Date results expected to be reported:	**5/09/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	1 Soil
Turnaround time requested:	Standard
Temperature on receipt (°C)	8.3
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

CHAIN OF CUSTODY - Client

17422

ENVIROLAB GROUP - National Phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Lab - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Lab - Envirolab Services
7 Palmerton Road Windsor Gardens, SA 5087
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Jacobs	**Client Project Name / Number / Site etc (ie report title):** RMS - RZM DSI
Contact Person: Grant Moylan	**PO No.:** EN03269
Project Mgr: Robert Gaothier	**Envirolab Quote No. :**
Sampler: Grant Moylan	**Date results required:**
Address: L2, 710 Hunter St Newcastle West, NSW, 2302	**Or choose:** standard / same day / 1 day / 2 day / 3 day
Phone: **Mob:** 0408728184	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Fax:	**Lab comments:**
Email: Grant.Moylan@jacobs.com	

Sample information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Heavy Metals (8)	PAH	Asbestos	Provide as much information about the sample as you can
1	QC3A		27/8/14	soil	✓	✓	✓	

Envirolab Service:
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 115328
Date Received: 29/08
Time Received: 8:00
Received by: SK
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company): Jacobs	**Received by (company):** ELS
Print Name: Grant Moylan	**Print Name:** Sophie
Date & Time: 28/8/14	**Date & Time:** 29/08
Signature:	**Signature:** SK

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 115668

Client:
Jacobs Group (Australia) Pty Ltd
100 Christie St
St Leonards
NSW 2065

Attention: Grant Moylan

Sample log in details:

Your Reference:	**EN03269, RMS-Former RZM DSI**
No. of samples:	3 Soils
Date samples received / completed instructions received	05/09/2014 / 05/09/2014

QC4A jar broken in transit. None recovered# Percent recovery not available due to sample matrix.

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	12/09/14 / 9/09/14
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

PAHs in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	115668-1 QC5A 2/09/2014 Soil	115668-2 QC6A 2/09/2014 Soil	115668-3 QC7A 3/09/2014 Soil
Date extracted	-	08/09/2014	08/09/2014	08/09/2014
Date analysed	-	09/09/2014	09/09/2014	09/09/2014
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ NEPM B1	mg/kg	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	92	92	106

Acid Extractable metals in soil				
Our Reference:	UNITS	115668-1	115668-2	115668-3
Your Reference	----------	QC5A	QC6A	QC7A
Date Sampled	----------	2/09/2014	2/09/2014	3/09/2014
Type of sample		Soil	Soil	Soil
Date digested	-	8/09/2014	8/09/2014	8/09/2014
Date analysed	-	8/09/2014	8/09/2014	8/09/2014
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	8	12	16
Copper	mg/kg	<1	<1	<1
Lead	mg/kg	2	3	3
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	1	3	7
Zinc	mg/kg	<1	2	3

Miscellaneous Inorg - soil		
Our Reference:	UNITS	115668-3
Your Reference	----------	QC7A
Date Sampled	----------	3/09/2014
Type of sample		Soil
Date prepared	-	05/09/2014
Date analysed	-	05/09/2014
pH 1:5 soil:water	pH Units	7.1

Moisture				
Our Reference:	UNITS	115668-1	115668-2	115668-3
Your Reference	----------	QC5A	QC6A	QC7A
Date Sampled	----------	2/09/2014	2/09/2014	3/09/2014
Type of sample		Soil	Soil	Soil
Date prepared	-	8/09/2014	8/09/2014	8/09/2014
Date analysed	-	9/09/2014	9/09/2014	9/09/2014
Moisture	%	22	18	27

Method ID	Methodology Summary
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			08/09/2014	[NT]	[NT]	LCS-5	08/09/2014
Date analysed	-			08/09/2014	[NT]	[NT]	LCS-5	08/09/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	105%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	97%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	98%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	102%
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	102%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	LCS-5	92%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	[NT]	[NT]	LCS-5	125%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	99	[NT]	[NT]	LCS-5	103%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			08/09/2014	[NT]	[NT]	LCS-1	08/09/2014
Date analysed	-			08/09/2014	[NT]	[NT]	LCS-1	08/09/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-1	85%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-1	88%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	90%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	87%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	85%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-1	90%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	88%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-1	87%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			08/09/2014	[NT]	[NT]	LCS-W1	05/09/2014
Date analysed	-			08/09/2014	[NT]	[NT]	LCS-W1	05/09/2014
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-W1	101%

Report Comments:

Sample QC4A broke during transport.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Jacobs Group (Australia) Pty Ltd
100 Christie St
St Leonards NSW 2065

ph: 9928 2100
Fax: 9928 2504

Attention: Grant Moylan

Sample log in details:

Your reference:	**EN03269, RMS-Former RZM DSI**
Envirolab Reference:	**115668**
Date received:	05/09/2014
Date results expected to be reported:	**12/09/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	3 Soils
Turnaround time requested:	Standard
Temperature on receipt (°C)	3.2
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

QC4A jar broken in transit. None recovered

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

CHAIN OF CUSTODY - Client

17423

ENVIROLAB GROUP - National Phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Lab - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Lab - Envirolab Services
7 Palmerton Road Windsor Gardens, SA 5087
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Jacobs	**Client Project Name / Number / Site etc (ie report title):** RMS - Former RZM DSI
Contact Person: Grant Moylan	**PO No.:** EN03269
Project Mgr: Robert Gauthier	**Envirolab Quote No. :**
Sampler: Grant Moylan	**Date results required:**
Address: L2, 710 Hunter St Newcastle West, NSW, 2302	**Or choose:** standard / same day / 1 day / 2 day / 3 day
Phone: [redacted] 4979 2656 **Mob:** 0408 728 184	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Fax: 4979 2666	**Lab comments:**
Email: Grant.Moylan@jacobs.com	

Sample Information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Heavy Metals (8)	PAHs	TRH/BTEX	Phenols	PCB's	pH	Comments
[4] Broken	QC4A	–	1/9/14	soil	✓	✓	✓	✓	✓		Provide as much information about the sample as you can
1	QC5A	–	2/9/14	↓	✓	✓					
2	QC6A	–	↓		✓	✓					
3	QC7A	–	3/9/14		✓	✓				✓	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 145668
Date Received: 05/09
Time Received: 8:00
Received by: SK
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company): Jacobs	**Received by (company):** ELS	**Lab use only:**
Print Name: Grant Moylan	**Print Name:** Sophie	**Samples Received: Cool or Ambient (circle one)**
Date & Time: [redacted] 4/9/14 7:30a	**Date & Time:** 05/09	**Temperature Received at:** (if applicable)
Signature:	**Signature:** SK	**Transported by: Hand delivered / courier**

Moylan, Grant

From: Sophie Keritz <skeritz@envirolab.com.au>
Sent: Friday, 5 September 2014 9:44 AM
To: grant.moylan@jacobs.com
Subject: Broken Jar, RMS-Former RZM DSI

Hi Grant,

We received your RMS-Former RZM DSI job this morning, unfortunately one of the jars (QC4A) broke in transit. Would you be able to send another or would you like us to continue the job without it?

Sophie Keritz | Sample Receipt | Envirolab Services Pty Ltd

Great Chemistry, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 F 612 9910 6201
skeritz@envirolab.com.au | www.envirolab.com.au

Follow this link to provide feedback on our service.

Latest Links Below:

Information on QA/QC requirements and Temperature Recording of Samples on receipt at the laboratory

Our "RECOMMENDED PRESERVATION & HOLDING TIMES (RHT)" chart that includes minimal sample volumes required

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

ENVIROLAB SERVICES — A division of Envirolab Group — ENVIROLAB GROUP

Sydney	Perth	Melbourne	Adelaide	Brisbane
National Ph	1300 42 43 44			
Envirolab Services	MPL Laboratories	Envirolab Services	Envirolab Services	Envirolab Services
12 Ashley St	16-18 Hayden Court,	1 Dalmore Drive	7a The Parade	Unit 20a, 10-20 Depot St,
Chatswood NSW 2067	Myaree WA 6154	Scoresby VIC 3179	Norwood SA 5067	Banyo QLD 4014
T 02 9910 6200	T 08 9317 2505	T 03 9763 2500	T 08 7087 6800	T 07 3266 9532
F 02 9910 6299	F 089317 4163	F 03 9763 2633	F 08 8362 1776	F 07 3256 9411
sydney@envirolab.com.au	lab@mpl.com.au	melbourne@envirolab.com.au	adelaide@envirolab.com.au	brisbane@envirolab.com.au

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Thank you.

This e-mail message has been scanned for Viruses

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 115981

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West
NSW 2302

Attention: Grant Moylan

Sample log in details:

Your Reference:	**RMS-Former RZM DS1**
No. of samples:	1 Water
Date samples received / completed instructions received	11/09/2014 / 11/09/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	18/09/14 / 17/09/14
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference:	UNITS	115981-1
Your Reference	----------	QC8A
Date Sampled	----------	9/09/2014
Type of sample		Water
Date extracted	-	15/09/2014
Date analysed	-	16/09/2014
TRHC$_6$ - C$_9$	µg/L	<10
TRHC$_6$ - C$_{10}$	µg/L	<10
TRHC$_6$ - C$_{10}$ less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	106
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	97

svTRH (C10-C40) in Water		
Our Reference:	UNITS	115981-1
Your Reference	----------	QC8A
Date Sampled	----------	9/09/2014
Type of sample		Water
Date extracted	-	15/09/2014
Date analysed	-	16/09/2014
TRHC$_{10}$ - C$_{14}$	µg/L	<50
TRHC$_{15}$ - C$_{28}$	µg/L	<100
TRHC$_{29}$ - C$_{36}$	µg/L	<100
TRH>C$_{10}$ - C$_{16}$	µg/L	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	µg/L	<50
TRH>C$_{16}$ - C$_{34}$	µg/L	<100
TRH>C$_{34}$ - C$_{40}$	µg/L	<100
Surrogate o-Terphenyl	%	105

PAHs in Water		
Our Reference:	UNITS	115981-1
Your Reference	----------	QC8A
Date Sampled	----------	9/09/2014
Type of sample		Water
Date extracted	-	15/09/2014
Date analysed	-	15/09/2014
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	140

Total Phenolics in Water		
Our Reference:	UNITS	115981-1
Your Reference	----------	QC8A
Date Sampled	----------	9/09/2014
Type of sample		Water
Date extracted	-	12/09/2014
Date analysed	-	12/09/2014
Total Phenolics (as Phenol)	mg/L	<0.05

HM in water - dissolved		
Our Reference:	UNITS	115981-1
Your Reference	----------	QC8A
Date Sampled	----------	9/09/2014
Type of sample		Water
Date prepared	-	12/09/2014
Date analysed	-	12/09/2014
Arsenic-Dissolved	µg/L	6
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	2
Copper-Dissolved	µg/L	130
Lead-Dissolved	µg/L	<1
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	15
Zinc-Dissolved	µg/L	18

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/09/2014	[NT]	[NT]	LCS-W1	15/09/2014
Date analysed	-			15/09/2014	[NT]	[NT]	LCS-W1	15/09/2014
TRH C_6 - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	104%
TRH C_6 - C_{10}	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	104%
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	105%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	103%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	104%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	105%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	104%
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	98	[NT]	[NT]	LCS-W1	102%
Surrogate toluene-d8	%		Org-016	97	[NT]	[NT]	LCS-W1	101%
Surrogate 4-BFB	%		Org-016	97	[NT]	[NT]	LCS-W1	96%
QUALITY CONTROL svTRH (C10-C40) in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/09/2014	[NT]	[NT]	LCS-W2	15/09/2014
Date analysed	-			16/09/2014	[NT]	[NT]	LCS-W2	16/09/2014
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W2	97%
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	94%
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	85%
TRH>C_{10} - C_{16}	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W2	97%
TRH>C_{16} - C_{34}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	94%
TRH>C_{34} - C_{40}	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W2	85%
Surrogate o-Terphenyl	%		Org-003	106	[NT]	[NT]	LCS-W2	78%
QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			15/09/2014	[NT]	[NT]	LCS-W2	15/09/2014
Date analysed	-			15/09/2014	[NT]	[NT]	LCS-W2	15/09/2014
Naphthalene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	87%
Acenaphthylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Fluorene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	87%
Phenanthrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	81%

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	92%
Pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	91%
Benzo(a)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	86%
Benzo(b,j+k) fluoranthene	µg/L	2	Org-012 subset	<2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	LCS-W2	95%
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	1	Org-012 subset	<1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	122	[NT]	[NT]	LCS-W2	117%
QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/09/2014	[NT]	[NT]	LS-W1	12/09/2014
Date analysed	-			12/09/2014	[NT]	[NT]	LS-W1	12/09/2014
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	LS-W1	99%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/09/2014	[NT]	[NT]	LCS-W1	12/09/2014
Date analysed	-			12/09/2014	[NT]	[NT]	LCS-W1	12/09/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	96%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	101%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	98%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	100%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Jacobs Group (Australia) Pty Ltd (Newcastle)
710 Hunter St
Newcastle West NSW 2302

ph: 02 4979 2600
Fax:

Attention: Grant Moylan

Sample log in details:

Your reference:	**RMS-Former RZM DS1**
Envirolab Reference:	**115981**
Date received:	11/09/2014
Date results expected to be reported:	**18/09/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	1 Water
Turnaround time requested:	Standard
Temperature on receipt (°C)	16.9
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

CHAIN OF CUSTODY - Client

17424

ENVIROLAB GROUP - National Phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Lab - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Lab - Envirolab Services
7 Palmerton Road Windsor Gardens, SA 5087
Ph 0406 350 706 / adelaide@envirolab.com.au

Client:	Jacobs
Contact Person:	Grant Moylan
Project Mgr:	Robert Chauthier
Sampler:	Grant Moylan
Address:	L2, 710, Hunter St Newcastle West NSW 2302
Phone:	**Mob:** 0408 728 184
Fax:	
Email:	Grant.Moylan@jacobs.com

Client Project Name / Number / Site etc (ie report title):	RMS- Former RTM DSI.
PO No.:	EN03269
Envirolab Quote No. :	
Date results required:	
Or choose:	standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Lab comments:	

Sample information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Heavy Metals (dissolved)	TRH/BTEX	PAHs	Phenols	Comments
1	QC8A		9/9/14	water	✓	✓	✓	✓	

Provide as much information about the sample as you can

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 115981
Date Received: 11/9/14
Time Received: 9.30
Received by: LSB
Temp: Cool/Ambient
Cooling: (Ice)/Icepack melted
Security: Intact/Broken/None

Relinquished by (company):	Jacobs
Print Name:	Grant Moylan
Date & Time:	9/9/14 4.45p
Signature:	

Received by (company):	ELS
Print Name:	LSB
Date & Time:	11/9/14 9.00
Signature:	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Australian Government
Australian Radiation Protection and Nuclear Safety Agency
Personal Radiation Monitoring Service

619 Lower Plenty Road, Yallambie, Victoria 3085 Phone: (03) 9433 2211 Fax: (03) 9432 1835 FREECALL: 1800 678 112 E-mail: prms@arpansa.gov.au

CENTRE No. 12225

Forensic and Scientific Services
Attn: Michelle Warry
Queensland Department of Health
PO Box 594
ARCHERFIELD QLD 4108

NATA Accredited Laboratory
Number: 14442

Accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to national standards.

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COPY OF DOSE REPORT

Monitor Type : Special TLD

Report Number : 1

Report Date : 06/08/2014

$ Control monitor reported a dose of 209µSv
% Monitors assessed as environmental monitors. Background only subtracted from transit portion of the : Monitors assessed as environmental monitors. Background only subtracted from transit portion of the issue date to read date.

Gordon Gee
PRMS Operations Manager

Document ID: Dose Report Form PRMS-FORM-1020A

Australian Government
Australian Radiation Protection and Nuclear Safety Agency
Personal Radiation Monitoring Service

619 Lower Plenty Road, Yallambie, Victoria 3085 Phone: (03) 9433 2211 Fax: (03) 9432 1835 FREECALL: 1800 678 112 E-mail: prms@arpansa.gov.au

COPY OF DOSE REPORT

Report Number : 1
Centre Number : 12225

Monitor Number	Wearer Name	Wearer ID	Actual Wearing Period From	To	Radiation Type	Monitor Dose	Comments
M1415-78844	CONTROL		14/04/2014	23/07/2014			$
M1415-78845	Boundary West		14/04/2014	23/07/2014	Photon	750 µGy	%
M1415-78846	Boundary AC Lab		14/04/2014	23/07/2014	Photon	1430 µGy	%
M1415-78847	Boundary Gate Stockpile 2		14/04/2014	23/07/2014	Photon	1940 µGy	%
M1415-78848	Boundary East @ Wier		14/04/2014	23/07/2014	Photon	4500 µGy	%
M1415-78849	Boundary Shed		14/04/2014	23/07/2014	Photon	1770 µGy	%

Australian Government
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COPY OF DOSE REPORT

Report Number : 1
Centre Number : 12225

EXPLANATION OF COMMENTS

Where the following comment symbols are marked on the report form for an individual monitor,***the assessment may be in error.***

A This monitor was not accompanied by a control from the same issue of monitors. The control monitor is used for assessing the normal background radiation and for accurate assessments, the control and worn monitors must have been issued at the same time.

B The control associated with this monitor appeared to have been exposed to radiation. Please check the storage of all monitors to ensure that they are not accidentally exposed whilst not in use. The control monitor is used for assessing the normal background radiation and for accurate assessments, the control must be stored well away from any source of radiation.

C The measurements made on the monitor suggest that it had been exposed within the direct radiation beam.

D The measurements made on the monitor suggest that it had received some radiation exposure from an oblique angle.

E The measurements made on the monitor suggest that it had received some radiation exposure through the back of the holder. Please ensure that the holder is worn so that the front of the holder faces the source of radiation.

F The measurements made on the monitor suggest that it had been partially covered by a radiation absorbing object during exposure.

G The measurements made on the monitor suggest that it had been placed in the holder incorrectly. The monitor number should be visible through the open window of the holder.

H The measurements made on the monitor suggest that it was exposed to radiation whilst not in a holder. For the most accurate assessment, the monitor must be worn in a holder during exposure to radiation.

I The measurements made on the monitor suggest that it had been contaminated by a radioactive substance. Please check that the holder has not been contaminated to avoid contaminating future monitors.

J The measurements made on the monitor suggest that it was not stored with its appropriate control whilst not being worn. Please ensure that all monitors are stored with their relevant controls when they are not in use.

K The envelope containing the TLD card had been opened prior to receipt at the Laboratory Do not open the TLD envelopes as the TLD card is adversely affected by exposure to ultraviolet light or handling.

DOSE REPORT INFORMATION

- Controls are used in the assessment of doses received by other monitors and serve as a means of determining background levels to which the batch of monitors as a whole is exposed and to assist in determining if the batch might have been accidentally exposed to radiation at any time. Controls must be returned with the batch with which they are issued. If not returned with the batch, there could be increased errors in the dose assessments.
- The reported dose is calculated by subtracting the readout of the control from the readout of the monitor and by using various factors which relate to the type and energy of the radiation.
- Unless otherwise stated all doses are photon doses only.
- The minimum reported non-zero dose is 10 microsieverts (μSv).
- Natural background radiation to which everybody is exposed from the environment is of the order of 2,000 μSv per year.
- ARPANSA and The National Occupational Health and Safety Commission(NOHSC) recommend that people who are occupationally exposed should keep their radiation doses below a limit of 20,000 μSv per year.
- The “Dose Last 12 Months” listed for a wearer on this form is the total dose reported by ARPANSA in the 12 month period immediately prior to the date of this report. This dose should be compared with the recommended dose limit.

TECHNICAL DATA

- All monitors are measured and assessed using the PRMS standard operating procedures listed below.
- Where monitors have been worn, the dose is reported in terms of personal dose equivalent, Hp(0.07), with a least uncertainty of measurement as listed in the PRMS Scope of Service.
- To convert the reported dose to Effective Dose or Hp(10), please refer to the conversion tables listed in the PRMS Technical Report available from the Service
- Unless otherwise stated, the monitors were received by PRMS in good condition.

Monitor Type	Monitor Prefix Identification	Method of Test
Special TLD	M	PRMS-SOP-0700

Australian Government
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Personal Radiation Monitoring Service

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CENTRE No. 12225

JacobsSKM
Attn: Robert Gauthier
710 Hunter St
NEWCASTLE WEST NSW 2302

NATA Accredited Laboratory
Number: 14442

Accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to national standards.

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COPY OF DOSE REPORT

Monitor Type : Special TLD

Report Number : 1

Report Date : 06/08/2014

$ Control monitor reported a dose of 209µSv
% Monitors assessed as environmental monitors. Background only subtracted from transit portion of the : Monitors assessed as environmental monitors. Background only subtracted from transit portion of the issue date to read date.

Gordon Gee
PRMS Operations Manager

Document ID: Dose Report Form PRMS-FORM-1020A

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COPY OF DOSE REPORT

Report Number : 1
Centre Number : 12225

Monitor Number	Wearer Name	Wearer ID	Actual Wearing Period From	To	Radiation Type	Monitor Dose	Comments
M1415-78844	CONTROL		14/04/2014	23/07/2014			$
M1415-78845	Boundary West		14/04/2014	23/07/2014	Photon	750 µGy	%
M1415-78846	Boundary AC Lab		14/04/2014	23/07/2014	Photon	1430 µGy	%
M1415-78847	Boundary Gate Stockpile 2		14/04/2014	23/07/2014	Photon	1940 µGy	%
M1415-78848	Boundary East @ Wier		14/04/2014	23/07/2014	Photon	4500 µGy	%
M1415-78849	Boundary Shed		14/04/2014	23/07/2014	Photon	1770 µGy	%

Australian Government
Australian Radiation Protection and Nuclear Safety Agency
Personal Radiation Monitoring Service

619 Lower Plenty Road, Yallambie, Victoria 3085 Phone: (03) 9433 2211 Fax: (03) 9432 1835 FREECALL: 1800 678 112 E-mail: prms@arpansa.gov.au

COPY OF DOSE REPORT

Report Number : 1
Centre Number : 12225

EXPLANATION OF COMMENTS

Where the following comment symbols are marked on the report form for an individual monitor,***the assessment may be in error.***

A This monitor was not accompanied by a control from the same issue of monitors. The control monitor is used for assessing the normal background radiation and for accurate assessments, the control and worn monitors must have been issued at the same time.

B The control associated with this monitor appeared to have been exposed to radiation. Please check the storage of all monitors to ensure that they are not accidentally exposed whilst not in use. The control monitor is used for assessing the normal background radiation and for accurate assessments, the control must be stored well away from any source of radiation.

C The measurements made on the monitor suggest that it had been exposed within the direct radiation beam.

D The measurements made on the monitor suggest that it had received some radiation exposure from an oblique angle.

E The measurements made on the monitor suggest that it had received some radiation exposure through the back of the holder. Please ensure that the holder is worn so that the front of the holder faces the source of radiation.

F The measurements made on the monitor suggest that it had been partially covered by a radiation absorbing object during exposure.

G The measurements made on the monitor suggest that it had been placed in the holder incorrectly. The monitor number should be visible through the open window of the holder.

H The measurements made on the monitor suggest that it was exposed to radiation whilst not in a holder. For the most accurate assessment, the monitor must be worn in a holder during exposure to radiation.

I The measurements made on the monitor suggest that it had been contaminated by a radioactive substance. Please check that the holder has not been contaminated to avoid contaminating future monitors.

J The measurements made on the monitor suggest that it was not stored with its appropriate control whilst not being worn. Please ensure that all monitors are stored with their relevant controls when they are not in use.

K The envelope containing the TLD card had been opened prior to receipt at the Laboratory Do not open the TLD envelopes as the TLD card is adversely affected by exposure to ultraviolet light or handling.

DOSE REPORT INFORMATION

- Controls are used in the assessment of doses received by other monitors and serve as a means of determining background levels to which the batch of monitors as a whole is exposed and to assist in determining if the batch might have been accidentally exposed to radiation at any time. Controls must be returned with the batch with which they are issued. If not returned with the batch, there could be increased errors in the dose assessments.
- The reported dose is calculated by subtracting the readout of the control from the readout of the monitor and by using various factors which relate to the type and energy of the radiation.
- Unless otherwise stated all doses are photon doses only.
- The minimum reported non-zero dose is 10 microsieverts (μSv).
- Natural background radiation to which everybody is exposed from the environment is of the order of 2,000 μSv per year.
- ARPANSA and The National Occupational Health and Safety Commission(NOHSC) recommend that people who are occupationally exposed should keep their radiation doses below a limit of 20,000 μSv per year.
- The “Dose Last 12 Months” listed for a wearer on this form is the total dose reported by ARPANSA in the 12 month period immediately prior to the date of this report. This dose should be compared with the recommended dose limit.

TECHNICAL DATA

- All monitors are measured and assessed using the PRMS standard operating procedures listed below.
- Where monitors have been worn, the dose is reported in terms of personal dose equivalent, Hp(0.07), with a least uncertainty of measurement as listed in the PRMS Scope of Service.
- To convert the reported dose to Effective Dose or Hp(10), please refer to the conversion tables listed in the PRMS Technical Report available from the Service
- Unless otherwise stated, the monitors were received by PRMS in good condition.

Monitor Type	Monitor Prefix Identification	Method of Test
Special TLD	M	PRMS-SOP-0700

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Personal Radiation Monitoring Service

619 Lower Plenty Road, Yallambie, Victoria 3085 Phone: (03) 9433 2211 FAX: (03) 9432 1835 FREECALL: 1800 678 112 E-mail: prms@health.gov.au

M2003/824

Att Mr Drew Watson
Forensic and Scientific Services
Queensland Department of Health
PO Box 594
ARCHERFIELD QLD 4108

Dear Drew

Please find enclosed the report on the radon monitors received by the Personal Radiation Monitoring Service from Jacobs SKM.

The reported radon level and background will include any radon and background dose accumulated between the time that the monitor was prepared for issue and when the radon plaque was etched or the gamma monitor read out, including that received during transit. The dates of preparation and etching are listed on the report. The average concentration of radon in Australian homes is about 12 Bq/m3 and this number can be used to subtract from the total radon level measured to take into account the exposure received in transit. Similarly, the normal background radiation exposure can be taken to be approximately 1000 μGy per year.

The actual radon concentration can be estimated in the following manner :

$$R_a = \frac{(R - 0.012 * n)}{m}$$

where : R_a is the average radon concentration at the monitor position

R is the Radon Level listed in the report and is the integrated concentration in terms of kBq.days/m3

n is the number of days the monitor was in transit

m is the number of days the monitor was in position.

Similarly, the pro-rata background dose can be subtracted from the reported background dose.

If you require any further information, please do not hesitate in contacting me.

Yours sincerely

KATHERINE GOUIN
SCIENTIFIC OFFICER
PERSONAL RADIATION MONITORING SERVICE

12 September 2014

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Personal Radiation Monitoring Service

619 Lower Plenty Road, Yallambie, Victoria 3085 Phone: (03) 9433 2211 FAX: (03) 9432 1835 FREECALL: 1800 678 112 E-mail: prms@health.gov.au

M2003/824

Report on Doses received by Radon Monitors

Monitor Numbers	Monitor Preparation date	Monitor Etching Date	Monitor Location	Dates that Monitors were in place	Radon Level (kBq.day/m^3)	Comment
1416-6360	10/04/14	18/08/14	Boundary East at Wier	14/04/14 – 23/07/14	9.7	
1416-6361	10/04/14	18/08/14	Boundary Shed	14/04/14 – 23/07/14	4.9	
1416-6362	10/04/14	18/08/14	Boundary West	14/04/14 – 23/07/14	19.1	
1416-6363	10/04/14	18/08/14	Boundary 2C lab	14/04/14 – 23/07/14	6.7 *	* Radon Monitor damaged upon receipt in PRMS (appears to have been chewed by an animal). Accuracy of the dose reported for this monitor will be greater than ± 20% stated below due to greater air and alpha diffusion into the monitor.
1416-6364	10/04/14	18/08/14	Boundary gate stockpile 2	14/04/14 – 23/07/14	2.4	

NOTE: **All reported doses are accurate to within ± 20 %.**

KATHERINE GOUIN
SCIENTIFIC OFFICER
PERSONAL RADIATION MONITORING SERVICE

12 September 2014

Appendix F. Calibration Certificates

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 09K101346

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		LK1839	pH 9.88
2. pH 7.00		pH 7.00		LF1041	pH 7.08
3. pH 4.00		pH 4.00		LD1784	pH 4.12
4. mV		240.6mV		KH1997/KH1995	240.7mV
5. EC		2.76 mS		LG1689	2.75mS
6. D.O		0.00 ppm		939	0.00ppm
7. Temp		17.7°C		MultiTherm	17.7°C

Calibrated by: Jacob Arnott

Calibration date: 3/09/2014

Next calibration due: 3/10/2014

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105523

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 ev			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	SY21		100.7 ppm

Calibrated by: Jacob Arnott

Calibration date: 18/08/2014

Next calibration due: 17/09/2014

JACOBS® XRF Calibration Log

Project Name: Former RZM site, Detailed Site	Employee: Grant Moyle
Project Number: EN03269	Date: 26/8/14

Date	Time	System Check Completed	Unit Check Completed
26/8/14	8.21a	OK.	Yes
27/8/14	9.17a	OK.	Yes
29/8/14	1.32p	OK	Yes
1/9/14	9.48a	OK	Yes
2/9/14	7.41a	OK	Yes
3/9/14	7.45a	OK	Yes.
4/9/14	8.07a	OK	Yes

Appendix G. Queensland Government, Radiological Detailed Site Investigation Report

Queensland Government, Health Services Support Agency (HSSA), *Environmental Radioactivity Assessment: Radiological Detailed Site Investigation, Tomago, NSW*, November 2014, Ref: 14PX82.

CLIENT: Jacobs SKM
700 Hunter Street
Newcastle West NSW

ATTN: Robert Gauthier

RE: Environmental Radioactivity Assessment 13PX530 – interpretation and summary

In summary *Environmental Radioactivity Report No. 13PX530* serves to aid in the calculation of a 'ballpark' external exposure dose that a worker/s may have received in lieu of their having worn personal dosimeters whilst performing highway lighting works.

This report provides an example of the calculation of the external exposure that a worker may receive for a given occupancy. The air kerma rates adopted for the example included in the conclusion of this report were based on in-situ measured values.

Much of the preamble to this example dose calculation is scientific qualification to the measurement process and noting of the known limitations. A multitude of unknown and often unquantifiable variables influence the accuracy of an estimated dose, such as were cabling trenches dug by hand with a worker predominantly bent over closer to the ground than an assumed standing position, or with a worker on a 'dingo' or similar machinery where the worker is elevated and somewhat shielded by the machinery from terrestrial gamma radiation. Where it was recognised that there were compounding factors that may influence the measurement process (such as vegetation, topography and soil moisture content) these were stated for the sake of completeness. The outcome is that the reported values should be considered indicative, and given the very low magnitude of the likely doses compared with relevant dose limits, then indicative results is sufficient for this circumstance.

The example dose calculation in the conclusion was for a presumed occupancy by a worker. It demonstrates that such activities would result in a worker receiving an occupational exposure significantly below the regulatory limit of 1 mSv/y.

To clarify, the derived dose constraint of 300 μSv/y is a value put forth by international radiation protection organisations as guidance for use in a broad range of exposure scenarios such as projects or activities, and is in recognition that individuals may be involved in multiple projects or activities, etc; and strives to limit the likelihood that cumulative doses would result in regulatory limits being exceeded.

The target level of 10 μSv/week is a value recommended by Radiation and Nuclear Sciences and is based on the use of this value in aspects of Queensland's *Radiation Safety Standards* whereby it provides guidance to prevent radiation practices resulting in short-term elevated exposures, such as a worker receiving a large proportion of an annual exposure limit within a few weeks.

It is recommended that estimated doses be compared with regulatory limits, however it is recognised that perspective is gained by comparison with understood or accepted exposure circumstances such as a typical background doses, air travel, and medical exposures like chest x-rays. A useful source of this information can be found at the following website published by ARPANSA.
http://www.arpansa.gov.au/radiationprotection/Factsheets/is_rad.cfm#7

.....
Drew Watson
Senior Health Physicist, Radiation and Nuclear Science
17th April 2014

Ross Kleinschmidt
Principal Health Physicist
Health Physics Unit

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported)

Enquiries Ross Kleinschmidt
Phone (+61 7) 3274 9124
Email Ross_Kleinschmidt@health.qld.gov.au

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Phone (+61 7) 3274 9103
Fax (+61 7) 3000 9344
Email FSS-RadiationScience@health.qld.gov.au

Queensland Government

HSSA | Health Services Support Agency

Environmental Radioactivity Assessment

VEGETATION BUFFER between PACIFIC HWY and FORMER RZM SITE

Tomago, New South Wales

Queensland Government

The information contained within this report relates to the following site:

Vegetation Buffer between Pacific Highway and Former RZM Site, Tomago, NSW

SITE OWNER

Transport, Roads and Maritime Services,

New South Wales Government

This report has been prepared for:

Client: **Robert Gauthier**

Jacobs Sinclair Knight Merz, Newcastle

Report: **13PX530**

Date: April 2014

Queensland Government

Radiation & Nuclear Science Unit

Forensic & Scientific Services

Queensland Department of Health

39 Kessels Road

Coopers Plains Q 4108 Australia

PO Box 594

Archerfield Q 4108 Australia

Telephone: +61 7 3274 9124

Facsimile: +61 7 3000 9344

Email: ross_kleinschmidt@health.qld.gov.au

This report has been prepared in accordance within the scope of services described, in consultation between the Radiation and Nuclear Science Unit, Queensland Health Forensic and Scientific Services and the client. The report may rely on information, data, surveys and results provided by the client and the client shall assume responsibility for the accuracy of the supplied information.

This document shall not be reproduced, except in full, without the written consent of Queensland Department of Health.

Author: **Drew Watson,** BAppSci(Hons) MARPS, MSPERA, MEIANZ
Senior Health Physicist

Signed: ….....

Date: 16 / 04 / 2014

Reviewer: **Dr Ross Kleinschmidt**, PhD, MIP, MARPS, MSPERA, MIUR
Principal Health Physicist

Signed: ….....

Date: 14 / 05 / 2014

Distribution: Radiation & Nuclear Sciences, QHFSS

Sinclair Knight Merz (Newcastle)

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1 PROJECT

1.1 Site Description

The subject site is a portion of land between the former RZM site located at 9-11 Pacific Highway, Tomago, New South Wales and the Pacific Highway sealed surface. The former RZM site, the Pacific Highway and the portion of land in between is owned by Transport, Roads and Maritime Services, New South Wales Government, (RMS). The subject site is limited to the portion of land where highway lighting upgrades are currently in progress.

1.2 Purpose

Radiation and Nuclear Sciences (RNS), Queensland Department of Health Forensic & Scientific Services, was engaged by Jacobs Sinclair Knight Merz, Newcastle (JacobsSKM) to perform this environmental radioactivity assessment.

The former RZM site is known to contain elevated terrestrial air kerma rates in some areas of its fenceline adjacent the Pacific Highway. RMS has recently (during March and April 2014) installed highway lighting on the unsealed land between the highway and former RZM site border. The purpose of this investigation is to determine the external exposure rates where workers occupied during this process, for comparison against radiological dose criteria established for the former RZM site.

1.3 Scope

This environmental radioactivity assessment was limited to surface gamma radiation measurements over the subject site. Consideration of the reported exposure rates in conjunction with occupancy will provide a measure of the exposure of individuals involved in the highway lighting installations.

Radiological exposure of non-human species was not included within the scope of this assessment, nor was assessment of non-radiological contaminants.

2 SITE HISTORY

The former RZM site is known to contain elevated terrestrial air kerma rates in some areas of its fenceline adjacent the Pacific Highway. This was identified during a limited radiological assessment summarised *Environmental Radioactivity Assessment Report 13PX363/364* prepared by RNS[1]. The associated material of enhanced radioactivity is a legacy of the former RZM site having been used for processing mineral sands.

Transport, Roads and Maritime Services are currently installing lighting for the Pacific Highway adjacent the former RZM site. The following is based on site observations and advice from RMS workers present at the time of investigation:

- At the time of investigation, lights were installed, however an under-boring process remains to be conducted which will require laying cabling subsurface between an electrical pole and the highway.
- Subsurface earthing rods have already been installed within approximately 6m of the electrical pole. This work is in the vicinity of the previously identified elevated terrestrial air kerma rates. No soils were removed during this process.
- Installation of each light involved excavating a pit for each light which was subsequently filled with concrete. Excavated soils were stockpiled on a concrete pad within the former RZM site.

3 ASSESSMENT OF RADIOLOGICALLY CONTAMINATED LAND

The former RZM site at Tomago is currently undergoing contaminated land assessments, whereby JacobsSKM is the environmental consultant contracted by the land owner, and RNS has been subcontracted by JacobsSKM for assessment of radiological contaminants. The investigation summarised in this report is in response to the lighting installations adjacent the former RZM site and the potential for that site to impact on the region where works are currently undertaken. The landowners and consultants are the same as those involved in the former RZM site and by way of extension this investigation was conducted under the auspices of the governance processes applicable to assessment of the former RZM site; namely the Site Background, Demolition and DSI Planning SAQP (16 December 2013)[2].

4 RADIOLOGICAL EXPOSURE LIMITS

Radiological exposure limits have been established for the former RZM site project and can be applied to this circumstance of RMS employees installing highway lighting. These exposure limits are as follows:

> The legislative 'member of public' annual occupational exposure limit of 1 mSv/y should not be exceeded by workers at this site. Moreover, a derived dose constraint of 300 µSv/y is recommended and a weekly maximum total exposure of 10 µSv is an appropriate target.

5 METHODOLOGY

5.1 Exposure Pathways

Radioactive material can pose an exposure hazard to humans via internal and external exposure pathways. This investigation measures external exposure pathways.

5.2 Surface Radiological Survey

The surface gamma radiation levels were measured using two Radiation Solutions RS-220 gamma surveyor instruments (S/N: 6215 and 6146)[3]. These instruments are calibrated by RNS, traceable to the primary Australian Standard, specifically for environmental radiation (air kerma rate) measurements in units of nanoGray per hour (nGy/h). In addition to this, the response of these instruments to Naturally Occurring Radioactive Materials (NORM) has been assessed through measurements over concrete calibration pads with known concentrations of uranium, thorium and potassium[4].

All site radiation level measurements were performed approximately one metre above the ground surface. Using this measurement geometry and with typical soil densities, approximately 90% of the measured exposure rate originates from the top 200mm of material over an 8m radii.

The geographical location of recorded surface gamma radiation levels were measured using global positioning systems (GPS) of type Holux model M-1200E.

5.3 Surface Gamma Dose Rate

For this assessment, the background surface gamma radiation levels shall be defined as the air kerma rate, in units of nGy/h, resulting from the summation of a location dependant cosmic component and a terrestrial component associated with NORM. The NORM component consists of naturally occurring uranium, thorium and potassium, including respective decay progeny (assumed to be in secular equilibrium with the parent radionuclide) as appropriate.

5.4 Cosmic Component

The cosmic radiation component of natural background is latitude, longitude and altitude dependent; and has been calculated using United States Federal Aviation Administration Civil Aerospace Medical Institute software 'CARI-6'[5]. The mean cosmic surface air kerma rate for December 2013 was 39 nGy/h at 32.814 S, 151.700 E, elevation of 9 m, using a dose conversion factor of 1Sv/Gy[6].

5.5 Portability of Surface Radiological Survey Results

Recorded surface gamma air kerma rate results have been corrected for instrument cosmic radiation response. The reported values are terrestrial air kerma rates inclusive of background and in units of nGy/h. The total gamma air kerma rate can be calculated by addition of the cosmic exposure rate of 39 nGy/h to the respective terrestrial air kerma rate. The total gamma exposure rate can be converted to units of nSv/h using a conversion factor of 0.7 Sv/Gy for the terrestrial component and 1 Sv/Gy for the cosmic component[6].

5.6 Background Terrestrial Air Kerma Rate

A background assessment was performed local to the former RZM, Tomago, NSW site previously and is reported within *Environmental Radioactivity Assessment Report 13PX363/364* written by RNS[1]. This report summarised that the natural background value of 100 nGy/h (understood to be inclusive of cosmic radiation) that has been previously used for the assessment of contaminated land in NSW is appropriate for this site and is comparable to the highest terrestrial air kerma rate of the local background areas[7]. Consequently the background terrestrial air kerma rate adopted for this site is 60 nGy/h (corrected for cosmic component).

5.7 Area Radiation Monitors

Three area radiation monitors have been located on the fenceline of the former RZM site. These monitors are of type *Instadose* and supplied by SGS-ARS. Two of these monitors were installed within the region where the highway lights were recently installed. It should be noted however that the most suitable location for installation was on the fence and that the highway lighting works was closer to the sealed highway.

These monitors are located at 1.5 to 1.7m elevation and consequently may vary slightly from survey results which are based on 1m elevation.

It is intended that these monitors remain in-situ for a minimum of one week, after which the accumulated dose can be read; thereby these monitors provide an additional assessment of external gamma exposure rates, albeit with some limitations to their efficacy at representing the dose to workers. Table 1 lists the area monitor locations.

TABLE 1. Area Monitors

MonitoringLocation	Details	Location (degrees)	
		Latitude	Longitude
4	Instadose (sn: 1036644)	-32.81303	151.69782
5	Instadose (sn: 1038650)	-32.81483	151.69941
6	Instadose (sn: 1036839)	-32.81587	151.69714

6 RESULTS

6.1 Inspection / Observations

The subject site was assessed by D Watson of RNS on the 14th April 2014 with assistance from G Moylan of JacobsSKM. Appendix A.1 contains photographs of the subject site at the time of assessment.

6.2 Surface Radiological Survey

Vegetation between the highway and the former RZM site fence was predominantly dense with long grasses and shrubs to the extent that some areas were inaccessible. It is understood that these densely vegetated areas were not accessed during the highway lighting works and that the accessed areas were closer to the sealed shoulder of the highway.

The dense vegetation adds uncertainty to reported terrestrial air kerma rates due to attenuation of gamma radiation. Similarly a drainage depression ran parallel to the highway and this topography will also add uncertainty to reported terrestrial air kerma rates. Terrestrial air kerma rates have not been corrected for soil moisture content. The terrestrial air kerma rates have been reported within colour coded ranges (refer to Appendix A.2) and it is expected that the aforementioned uncertainties associated with the survey, may result in misclassification of some data points.

A stockpile of approximately 21 m^3 of soil excavated during the installation of lights adjacent the highway was located on the RZM allotment. Air kerma rates measured around and over the stockpile were consistent with the surrounding environs and not indicative of enhanced concentrations of radioactivity.

Surface terrestrial air kerma rates in the subject site ranged from values consistent with background to a maximum of approximately 1200 nGy/h. This maximum value was in the vicinity of the installed subsurface earthing rods and reduced to approximately 1000 nGy/h at the electrical pole from which the earthing rods are connected to. The dose rates in the vicinity of the installed lights ranged from background to approximately 200 nGy/h.

Appendix A.2 illustrates terrestrial air kerma rates. This figure was generated and provided by JacobsSKM; inclusive of base imagery, plotted radiological data and all associated legend information. The radiological data plotted was measured by RNS on 14th April 2014 and on the 18th December 2013 (during the demolition and detailed site investigation planning survey for the former RZM site).

6.3 Subsurface Radiological Survey

Radiological assessment of subsurface material has not been conducted. However, three samples were collected via hand-auguring adjacent to where earthing rods were installed (during recent highway lighting upgrades) and where cabling will be installed (as part of a planned under-boring process). Table 2 lists the sample details.

TABLE 2. Sampled Soils

Sample	Description	Depth (m)	Location (degrees)	
			Latitude	Longitude
SP1	topsoil, dark brown, moist, loose, aggregated	0.1	-32.81565	151.69766
SP2	sand, grey, moist, loose, coarse grains	0.45	-32.81566	151.69770
SP3	sand, grey, fine, loose, dry	0.5	-32.81569	151.69776

6.4 Laboratory Analysis of Sampled Material

The aforementioned samples can be analysed by high resolution gamma spectrometry to identify the activity concentrations of uranium-238, thorium-232 and potassium-40 if required.

7 CONCLUSIONS

Elevated terrestrial air kerma rates are present within some parts of the subject site where highway lighting work has been undertaken. The external exposure of workers can be estimated based on the measured terrestrial air kerma rates and the occupancy; and dose estimates can be compared with the radiation exposure values stated in Section 4 of this report. For example:

> *Suppose a worker spent 4 x 8 hour working days installing the lights in a region of 200 nGy/h, and 1 x 8 hour working day installing the earthing rods in a region of 1200 nGy/h. After correction for a terrestrial background air kerma rate of 60 nGy/h and with conversion to Sieverts (Sv) based on 0.7 Sv/Gy, then the external exposure received by this worker due to the radiological contaminants is approximately 9.5 µSv. Therefore the dose received by this worker is significantly below the regulatory annual limit of 1 mSv/y (1000 µSv/y) and the 300 µSv/y derived dose constraint. The dose received by this worker would be comparable to the target value of 10 µSv/week. It should be noted that this target value has been recommended on the premise that individuals may routinely be exposed to radiation as opposed to a once-off task.*

8 RECOMMENDATIONS

It is recommended that any further highway lighting or similar activities which impact on the land between the Pacific Highway and the former RZM site be conducted with activities being planned based on consideration of the aforementioned recommended radiological exposure limits. Furthermore, it is recommended that radiological exposures be kept as low as reasonably achievable, economic and social factors being taken into consideration (this is known as the ALARA principle)[8]. It is also recommended that soils disturbed during activities in this area be managed in a manner appropriate to radiologically contaminated soils.

9 LIMITATIONS

Radiation and Nuclear Sciences have prepared this document for Jacobs Sinclair Knight Merz in accordance with generally accepted consulting practice. The content of this report may not contain sufficient information for the purposes of other parties or other uses.

The report shall not be used for advertising purposes or reproduced, other than in full, without the written consent of the Queensland Department of Health.

This report pertains only to radiological assessments, and has been limited in scope to align with the client's objectives.

10 REFERENCES

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A.1 APPENDIX: Site Photographs



FIGURE 1 Stockpile of soils excavated for installation of highway lights.



FIGURE 2 Subject Site (facing north-east); illustrates the sealed shoulder of the Pacific Highway and the densely vegetated land between the highway and the former RZM site.



FIGURE 3 One of recently installed lights.



FIGURE 4 Clearing where cabling is yet to be installed between the electricity pole and proposed road under-boring (location of sample SP1).

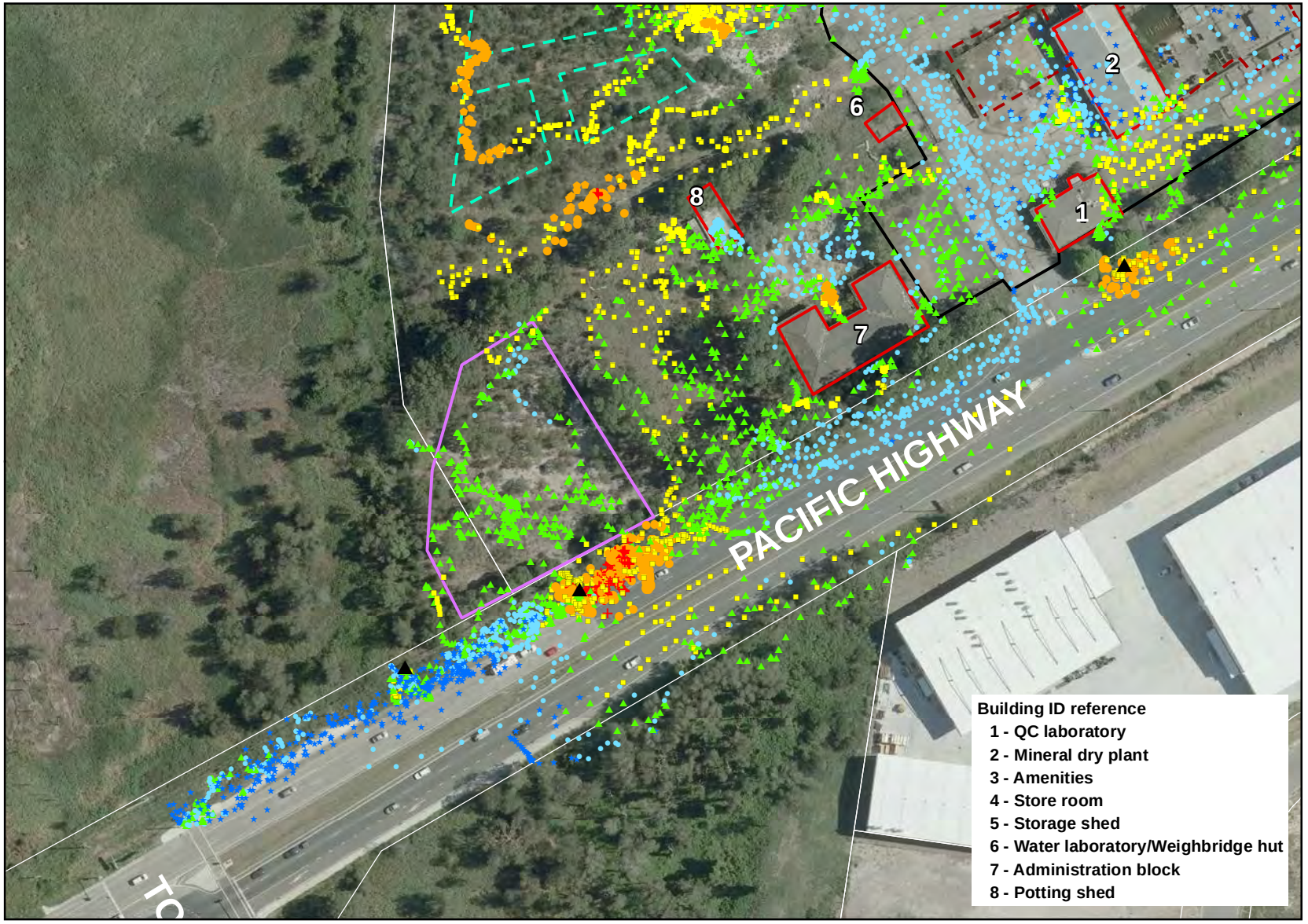


FIGURE 5 Photograph illustrating the cleared area where subsurface electrical earthing rods were installed adjacent to the electricity pole. A gate to the former RZM site is also visible.

A.2 APPENDIX: Terrestrial Air Kerma Rates

The figure overpage was generated and provided by JacobsSKM; inclusive of base imagery, plotted radiological data and all associated legend information. The radiological data plotted was measured by RNS on 14th April 2014 and on the 18th December 2013 (during the demolition and detailed site investigation planning survey for the former RZM site).

FIGURE A | TERRESTRIAL AIR KERMA RATES



Building ID reference

1 - QC laboratory
2 - Mineral dry plant
3 - Amenities
4 - Store room
5 - Storage shed
6 - Water laboratory/Weighbridge hut
7 - Administration block
8 - Potting shed

LEGEND

- Building ID
- Building - existing
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former

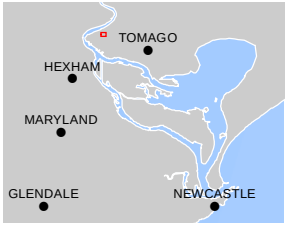
Terrestrial air kerma rates nGy/h

- 38 - 60
- 61 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 2000
- Instadose Locations

Sinclair Knight Merz does not warrant that this document is definitive nor free of error and does not accept liability for any loss caused or arising from reliance upon information provided herein.

DATA SOURCES
AUSIMAGE
LPMA 2010
SKM

0 50
Metres



Vegetation Buffer between Pacific Highway and Former RZM Site, Tomago, NSW

AUSIMAGE SKM

Attachment C. Summary Analytical Results for Metals Samples – Jacobs. 2019

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Subject	**Summary Analytical Results for Metals Samples**	**Project Name**	Former RZM Site DSI Recommendations Project
Attention		**Project No.**	IA198300
From			
Date	8 August 2019		
Copies to			

1. Introduction

The NSW Roads and Maritime Services (RMS) has engaged Jacobs Group (Australia) Pty Ltd (Jacobs) to undertake a series of staged contamination assessment works associated with the former Rutile Zircon Mines (RZM) Mineral Sand processing site and surrounding areas (the Site). The total size of the former operational areas of the Site is approximately 6 hectares, described as Lot 101, Deposited Plan (DP) 1038663, and portions of Lot 102, DP 1038663, in the Local Government Area (LGA) of Port Stephens, and is located at 1877 Pacific Highway, Tomago NSW (see **Attachments A** at the end of this letter). The site is currently zoned as "SP2 – Infrastructure, RU2 – Rural Landscape, and E2 – Environmental Conservation" under the Port Stephens Council Local Environmental Plan (LEP 2013).

The study area that is associated with the former operations and potential impacts relating to the RZM site include the main operational area (Lot 101), the open drainage channel that would deliver operations water from Lot 101 through Lot 102 and into receiving waters at Lot 7310 and the Hunter River, and a small drainage ditch on Lot 51 that interacts with the open drainage channel on Lot 102.

This letter report presents the summary heavy metal analytical results obtained from the recent site field works (June to July 2019) undertaken as part of the Detailed Site Investigation (DSI) Recommendations Project (2019). Procedures and results pertaining to the radionuclide portion of the project undertaken during the June to July 2019 sampling event are not discussed in this factual letter report.

Conclusions contained in the Jacobs DSI report (2016) a number of data gaps were identified which require additional data in order to support future decisions and options for the ongoing management of the site., including:

1) Additional shallow soil quality analytical data within 3 previously identified elevated radiation and contaminant Hot Spots on Lot 101 (**Figure 1 to Figure 3**);

2) Additional groundwater quality analytical data at existing groundwater wells on Lot 102 (**Figure 4)**

3) Additional groundwater quality analytical data at existing groundwater wells on Lot 101 (**Figure 5**);

4) Additional surface water quality analytical data at surface water collection locations on Lot 101, Lot 102 and within the Hunter River (**Figure 4** and **Figure 5**); and

5) Additional sediment quality analytical data at sediment collection locations on Lot 101, Lot 102 and within the Hunter River (**Figure 4** and **Figure 5**).

2. Sampling, Analysis and Quality Plan (SAQP 2019)

The SAQP describes the sampling and analysis methodologies that were adopted for the purposes of further refining the understanding of the extent and significance of previously identified Naturally Occurring Radioactive Materials (NORM) and metals contamination across key areas of Lot 101, Lot 102 and Lot 7310 properties (i.e. Hotspot areas on the Lot 101 property, groundwater sample locations and surface water and sediment samples from on-site drainage lines and channels and within the Hunter River) associated with potential impacts from the RZM mineral sand processing operations. The SAQP was approved by the NSW EPA accredited contaminated site auditor (Ross McFarland) on 21 June 2019.

3. Objectives

The objective of the SAQP (Jacobs 2019) was to collect sufficient data to address the data gaps identified in Jacobs (2016) DSI report and to allow the completion of the Human Health Risk Assessment (Draft HRA 2018) and Ecological Risk Assessment (Draft ERA) radiological studies that will ultimately feed into the Consolidated Risk Management (CRM) Report (anticipated for completion in late 2019). The objective of the CRM Report is to consider the possible controls required to be protective of human health and the environment for the Lot 101, Lot 102, Lot 51 and Lot 7310 and foreshore areas of the Hunter River under the current land usages.

The objective of this factual letter report is to provide RMS and the EPA with the analytical data that has been obtained during the latest sampling event undertaken in June and July 2019, as requested by NSW EPA in their email to RMS dated 26 June 2019, specifically:

> *"We (EPA) request that the metals data be processed (tabulated and compared to site assessment criteria) and provided to us at the earliest opportunity (upon completion of all proposed sampling locations) with an associated site plan showing sample locations. This should be accompanied by a factual letter outlining methods and reference to the SAQP. Review and endorsement of this letter by the Auditor is not necessary. Upon receipt of this information it is considered likely that we will be able to complete our assessment for the site*."

Accordingly, the analytical results and discussions contained in this factual letter refer to heavy metal results only.

4. Scope of works

Site sampling works detailed in SAQP (Jacobs 2019) were carried out at the Site between the 24 June 2019 and 5 July 2019. Works included the following:

- Shallow soil sampling at 3 previously radiological screened hotspots (Hotspot 1, Hotspot 2 and Hotspot 3);
- Groundwater sampling at 13 existing monitoring wells (MW01 to MW13)
- Sediment and surface water sampling at 31 co-located locations (SED-01 to SED-31 / SW-01 to SED-31) across on-site drainage lines, channels and the Hunter River foreshore as well as 6 background locations (SEB-B01 to SED-B06 / SW-B01 to SW-B06) situated east and west of the open channel mouth leading to the Hunter River;
- Surface water sampling at 3 stand-alone surface water sample locations (SW-34 to SW-36) situated in the open channel leading to the Hunter River;

Soil, groundwater, sediment and surface water sample locations are presented in **Figures 1** to **5**.

5. Fieldwork Procedures

All sampling completed as part of the Site sampling event were undertaken in general accordance with the approved SAQP (Jacobs 2019). Procedures discussed in **Section 6** are specific to the methods adopted for heavy metal sampling and analysis. Variations between the procedures adopted for heavy metals and radionuclides sample collection and analysis are not discussed here or sections/sub-sections that follow. The field procedures for each component of works are discussed in the following sub-sections:

5.1 Soil Sampling

5.1.1 Sample collection

Soil sampling was undertaken across 3 hotspot areas (**Figure 1** to **Figure 3**) using hand augers to reach maximum depth of 0.5 metres below ground surface (mbgs) or upon refusal of the hand auger, in accordance with the approved SAQP.

The shallow soil profile at each location was logged by Jacobs field staff. The soil profile at each location was assessed for evidence of contamination and one sample per location, consisting of one 250ml glass jar, was selected for heavy metal analysis by a National Association of Testing Authority (NATA) accredited laboratory. The selected laboratory for heavy metal soil analysis was Australian laboratory services (ALS). Following collection, each sample was placed within esky for transport to the laboratory.

Jars were labelled with the sample ID, project number and date. This information was repeated on the chain of custody (COC).

Standard documentation, such as CoC, was adopted and submitted with samples to the nominated NATA accredited laboratory for heavy metal analysis (ALS).

Given the nature and behaviour of the contamination in shallow soils (previously demonstrated to not easily partition from the soil sands into water), and the proposed analytical regime for radioactive components and metals in soils, hand augers were appropriately decontaminated prior to sampling

each auger location by washing in laboratory supplied deionised water and Decon 90 decontamination solution with a dedicated brush and then rinsing in deionised water. Nitrile gloves worn during sampling and decontamination were replaced with new gloves between each location.

Rinsate blanks from hand augers were collected at the completion of each day of sampling to test Jacobs decontamination procedures and to understand the potential for cross-contamination during soil sampling works. Rinsate blank samples were submitted to ALS for the same metals analytical suite applied for soil samples.

5.1.2 Sampling density

Based on the broad hot spot area volumes as defined from previous very intensive radiological screening and the very limited analytical details, Jacobs have assumed that each hot spot is approximately 2,500m2 in area.

On this basis, Jacobs adopted a sampling density to collect shallow soil samples at each every node of a square grid, with a spacing of approximately 10m. This sampling density was calculated to allow for the detection of a hot spot of 5m, with only a 5% probability of missing a hot spot if one existed in the sampling area. The number of samples required, based on the grid unit spacing and the total sampling area for each hotspot (Hot spot 1, 2 and 3), was 40 samples each. Therefore, a total of approximately 120 soil samples were proposed for this scope of works. Due to access restrictions and vegetation overgrowth, (specifically the heavy overgrowth of impenetrable Lantana), even distribution of sample locations within each hotspot was not always achievable. As a result, the follow sampling density within each hotspot locations was achieved:

- Hotspot 1 – 31 samples were collected (HS1-01 to HS1-31).
- Hotspot 2 – 40 samples were collected (HS2-01 to HS2-40)
- Hotspot 3 – 45 samples were collected (HS3-01 to HS3-45)

5.2 Groundwater Sampling

Groundwater monitoring wells were installed across the former RZM site footprint on Lot 101 and Lot 102 as part of the Jacobs DSI assessment and report issued in 2016. As part of the scope of works one round of sampling and analysis was undertaken and report upon.

As part of the scope of works completed in June 2019 to July 2019, all 13 existing wells on Lot 101 and Lot 102 (MW01 to MW13) were sampled.

At each monitoring well, groundwater sampling was undertaken in accordance with the approved SAQP sampling methodology, including:

- Each groundwater well was gauged to determine groundwater depth using a decontaminated water level meter;

- Each well was purged by removing at least 3 well volumes per well using a low flow peristaltic groundwater pump and associated LDPE tubing. Purged groundwater water was allowed to re-infiltrate into the surrounding ground surface;

- One groundwater sample was collected from each monitoring well using a low flow peristaltic groundwater sampling pump. The electrodes of a calibrated water quality meter were used to measure pH, redox potential (Eh), electrical conductivity, dissolved oxygen, and temperature in water purged and sampled from the wells. Samples were collected following the removal of the 3 well volumes and in general the stabilisation of these water quality parameters (± 10%);

- Groundwater samples were collected in containers provided by the laboratory and stored in an esky for transport. The heavy metal sample containers consisted of a 60ml plastic bottle containing nitric acid preservative. Containers were labelled with the sample ID, project number and date. This information was repeated on the chain of custody (COC);

- Each sample was field filtered using 0.45 µm filters for dissolved metals analysis;

- Standard documentation, such as CoC, was adopted and submitted with samples to the nominated NATA accredited laboratory for heavy metal analysis (ALS);

- Groundwater sampling was undertaken using dedicated tubing within each well, and no decontamination was required for tubing. The water level meter used measure depth to water at each location was decontaminated by washing in laboratory supplied deionised water and Decon 90 decontamination solution and then rinsing in deionised water. Nitrile gloves worn during sampling and decontamination were replaced with new gloves between each location;

- Rinsate blanks from the water level meter were collected at the completion of each day of sampling to test Jacobs decontamination procedures and to understand the potential for cross-contamination during soil sampling works, with rinsate blank samples submitted to ALS for the same metals analytical suite applied for water samples;

- The groundwater monitoring wells were previously surveyed in Australian Height Datum (AHD) by a licensed surveyor to allow assessment of groundwater flow direction. Groundwater flow direction calculations have previously been reported in the Jacobs DSI report (2016) and once calculated from this event in 2019, will be included in the Consolidated Risk Management report.

5.3 Sediment Sampling

Sediment samples were collected from the river foreshore, drainage lines and the open channel leading to the Hunter River in accordance with the approved SAQP, as follows:

- Sampling in the Hunter River, along the foreshore was undertaken at periods of low or falling tides (where possible). Sampling with in the open channel and drainage lines was undertaken at times of flow when water was travelling towards the Hunter River.

- Samples were collected from just below the surface using a decontaminated multi-stage sediment sampler (and dedicated sample catchers) or using a decontaminated hand auger. The sampling method used at each location was dependent on access, depth of water and depth of sediment.
- Samples were placed into laboratory prepared sampling jars (250ml glass) and placed into an esky for transport to the laboratory.
- Jars were labelled with the sample ID, project number and date. This information was repeated on the chain of custody (COC).
- The samples were sent to the NATA accredited laboratory (ALS) for heavy metal analysis under chain of custody documentation.

In addition to the collection of samples, a description of the sediment properties encountered at each sample location was noted on field logs.

Decontamination of sediment sampling equipment was undertaken by washing in laboratory supplied deionised water and Decon 90 decontamination solution with a dedicated brush and then rinsing in deionised water. Nitrile gloves worn during sampling and decontamination were replaced with new gloves between each location.

Rinsate blanks from the multi-stage sediment sampler or hand auger were collected at the completion of each day of sampling to test Jacobs decontamination procedures and to understand the potential for cross-contamination during soil sampling works. Rinsate blank samples were submitted to ALS for the same metals analytical suite applied for sediment samples.

Indicative sediment sample locations are shown on **Figure 4** and **Figure 5**.

5.4 Surface Water Sampling

With the exception of 3 sample locations (SW-34 to SW-36), all surface water sample locations were co-located with corresponding sediment sample locations. Given the potential for disturbance of sediments during sediment sampling, all surface water sampling was undertaken prior to the collection of sediment samples at each location and up-gradient of the previously sampled location.

Surface was sample locations (SW-01 to SW-20 and SW-34 to SW-36) were situated within the open channel (Lot 102 and 7310) and the drainage lines on Lot 51 (adjacent to site), Lot 101 and Lot 102 which feed into the open channel. Sample locations within the open channel and drainage lines were identified opportunistically and were dependant on overland water flows and wet weather events that occurred during the sampling event. Surface water sampling was also undertaken along the Hunter River foreshore in conjunction with sediment sampling and consisted of the sampling of SW-21 to SW-31 and SW-B01 to SW-B06 (background sample locations)

As per the procedures adopted for sediment sampling, surface water sampling in the Hunter River, (from the foreshore) was undertaken at periods of low or falling tides (where possible). Sampling with

in the open channel and drainage lines was undertaken at times of flow when water was travelling towards the Hunter River.

Indictive surface water sample locations are indicated on **Figure 4** and **Figure 5.**

Surface water samples were collected by using a new dedicated laboratory supplied 1L sample container at each location that was attached to decontaminated extendable grab sampler. Following the collection of the sample from the surface water body, the sample was placed directly into a laboratory supplied sample container for heavy metal analysis (60ml bottle containing nitric acid preservative). One surface water sample was collected from each location. Containers were labelled with the sample ID, project number and date. This information was repeated on the chain of custody (COC).

As per groundwater water sampling, each surface water sample was field filtered using 0.45 µm filters for dissolved metals analysis.

In addition to the collection of samples, the electrodes of a calibrated water quality meter were used to measure pH, redox potential (Eh), electrical conductivity, dissolved oxygen, and temperature for each location. Notations regarding tide, presence of flow and strength of flow were also recorded.

Surface water sampling equipment was single use directly into laboratory sample jars and therefore no decontamination or cross contamination checks were undertaken as part of surface water sampling.

6. Laboratory Analysis and Methods

The methods described below, refer the methods applied for heavy metal analysis only.

For heavy metal analysis, Jacobs engaged Australian Laboratory Services to undertake the primary analysis of samples, blind-duplicate analysis and rinsate blank analysis. Eurofins MGT were used to provide inter-laboratory QAQC analysis of split-duplicate samples only.

The analysis density undertaken by ALS and Eurofins consisted of the following:

- 116 primary soil samples (ALS); 6 blind duplicate samples (ALS) and 6 split duplicate samples (Eurofins)
- 13 primary groundwater samples (ALS), 1 blind duplicate sample (ALS) and 1 split duplicate sample (Eurofins)
- 37 primary sediment samples (ALS) 3 blind duplicate samples (ALS) and 2 split duplicate samples (Eurofins)
- 40 primary surface water samples (ALS), 3 blind duplicate samples (ALS) and 2 split duplicate samples (Eurofins)

6.1 Heavy Metals Analysis

Analytical laboratory testing of environmental and QAQC samples was conducted by NATA accredited laboratories (ALS as the primary laboratory and Eurofins as the secondary laboratory) using appropriate analytical methods (method reference codes in accordance with relevant ALS/Eurofins Suite codes and/or USEPA method reference). The proposed analytical program for metals is provided below:

- Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg)

All soil, sediment, surface water and groundwater samples were analysed for the above metals suite, with groundwater and surface water samples analysed for dissolved metals. This analytical suite was based on the previous suite for metals analysis from the DSI (2016) reporting and allows comparability for a more robust and repeatable data assessment.

6.2 Quality Assurance/Quality Control (QA/QC)

The field QA/QC procedures adopted by Jacobs during the DSI recommendations program have been summarised in **Table 6**.1

Table 6.1: DSI Recommendations Field QA/QC procedures

Field Procedure	QA Procedure Description
Sampling Team	Site personnel comprised professionally qualified environmental scientists and engineers trained in conducting site contamination investigations. In completing the field investigation, the SAQP and EHS Plan provide a framework for meeting the Data Quality Objectives.
Equipment Calibration	All equipment was calibrated as specified in relevant operator's manuals. The water quality meter was calibrated by an experienced person prior to the investigation event.
Chain of Custody Forms	All samples were logged and transferred under appropriately completed Chain of Custody Forms.
Preservation	All samples were received at the laboratory in appropriately preserved containers, with preservation including packing samples within eskies for analysis schedules.
Rinsate Blanks	Rinsate blanks were collected each day from hand augurs and sediment samplers when in use to determine if any cross contamination may have occurred during sampling, as specified given in Section 8 of Australian Standard AS4482.1-2005. Rinsate blanks were analysed for contaminants of concern.
Field Duplicates (for testing by Primary Lab)	Field duplicate (blind duplicates) samples were prepared in accordance with procedures given in Section 8 of Australian Standard AS4482.1-2005. The frequency of field duplicate testing corresponded to at least 5% for soil, groundwater, sediment and surface water samples (i.e. 1 in 20 samples). Field duplicates were analysed for contaminants of concern.
Inter-laboratory duplicate (for testing by Secondary Lab)	Inter-laboratory samples were prepared in accordance with procedures given in Section 8 of Australian Standard AS4482.1-2005. The frequency of split duplicate testing corresponded to at least 5% for soil, groundwater, sediment and surface water samples (i.e. 1 in 20 samples). Split duplicate samples were analysed for contaminants of concern.

Field Procedure	QA Procedure Description
Trip Spikes	No trip spike was submitted for analysis as volatile compounds (BTEXN, TRH C6-C9 / C6-C10) were not included with the analytical suite
Trip Blank	NO trip blank was submitted for analysis as volatile compounds (BTEXN, TRH C6-C9 / C6-C10) were not included with the analytical suite

6.2.1 Laboratory QA/QC

All laboratories used for sample analysis were NATA registered for the specified tests undertaken. All tests were undertaken in accordance with the NEPM (1999) quality guidelines.

A data validation process was used to assess the effectiveness of the overall analytical process. **Table 6.2** outlines the data validation criteria, qualifications to the data and the overall QA/QC procedures used for the laboratory testing program and to assess the data provided:

Table 6.2: Laboratory QA/QC procedures

Protocol	Description
Holding Times	Holding times are the maximum permissible elapsed time in days from the collection of the sample to its extraction and/or analysis. All extraction and analyses were completed within standard guidelines.
Reagent Blanks	The reagent blank sample is a laboratory prepared sample containing the reagents used to prepare the sample for final analysis. The purpose of this procedure is to identify contamination in the reagent materials and assess potential bias in the sample analysis due to contaminated reagents. The QC criterion is no detectable contamination in the reagents. Each analysis procedure was subject to a reagent blank analysis.
Laboratory Duplicates	Laboratory duplicates are field samples that are split in the laboratory and subsequently analysed a number of times in the same batch. These sub-samples are selected by the laboratory to assess the accuracy and precision of the analytical method. ALS Global undertake QA/QC procedures such as intra-laboratory duplicates at a frequency of 1 per 10 samples.
Laboratory Control Standard	A laboratory control standard is a standard reference material used in preparing primary standards. The concentration should be equivalent to a mid range standard to confirm the primary calibration. Laboratory control samples are performed on a frequency of 1 per 20 samples or at least one per analytical run.
Matrix Spikes / Matrix Spike Duplicates (MS/MSD)	MS/MSDs are field samples to which a predetermined stock solution of known concentration has been added. The samples are then analysed for recovery of the known addition. Recoveries should be within the stated laboratory control limits and duplicates should have RPDs of less than 50%.
Surrogate Spikes	Surrogate spikes provide a means of checking, for every analysis that no gross errors have occurred at any stage of the procedure leading to significant analyte loss. Recoveries should be within the stated laboratory control limits.
QA/QC Conclusion	The QA/QC indicators should either all comply with the required standards or showed no variations that would have a significant effect on the quality of the data.

7. Quality Assurance / Quality Control (QAQC)

The QA/QC methods implemented throughout the sampling event have not been assessed as part of this factual letter, rather the Jacobs and the laboratories QA/QC assessment will be detailed in the DSI Recommendations Investigation Report to be issued upon receipt and subsequent assessment of the radionuclide results from ANSTO. The QA/QC assessment will include assessment of the Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) parameters as outlined in the data quality objectives (DQOs) detailed in the approved SAQP (Jacobs 2019).

8. Adopted Assessment Criteria

The primary guideline to be used in the assessment of contamination in soils, sediments, surface water and groundwater at the site is the National Environment Protection Council's (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999), amended 2013 (NEPC, 2013), which provides human health and environment-based levels to assess selected organic and inorganic chemicals against.

The adopted site assessment criteria detailed below refers to the criteria adopted for heavy metal analysis only. The criteria, where relevant to heavy metals, have been adopted directly from the approved SAQP (Jacobs 2019) developed for this scope of works.

8.1 Soils

The soil chemical analyses have previously been assessed (as a Tier 1 assessment) against the investigation and screening levels in Schedule B1 of the NEPC, 2013. This guideline has been endorsed by the NSW EPA under the Contaminated Land Management (CLM) Act 1997. Schedule B1, NEPC (2013) provides investigation and screening levels for commonly encountered contaminants which are applicable to generic land uses and include consideration of, where relevant, the soil type and the depth of contamination.

8.1.1 Health Investigation and screening levels

The health investigation levels (HILs) are scientifically based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use scenarios. Given the existing and proposed land use of the site (disused industrial land to form part of the Pacific Highway upgrade works), the HILs for commercial / industrial sites, column D of Table 1A(1) of NEPC (2013) have been adopted (HIL D).

8.1.2 Ecological Investigation and screening levels

Ecological Investigation Levels (EILs) have been developed and discussed in NEPC (2013) for selected metals including zinc, copper, chromium, nickel, lead and arsenic. Given the existing land use of the site (disused former industrial land), the EIL for commercial / industrial sites, of Table 1B(1) to Table 1B(5) of NEPC (2013) has been adopted. The pH, cation exchange capacity (CEC) and Clay Content (CC) values are used within some of the EIL's to determine the correct investigation level. These

parameters have previously been assessed as part of the DSI (2016) program. These results have subsequently been reapplied to this data set to enable an assessment of the EIL's against the respective metal compounds.

8.2 Groundwater and Surface Water

The Groundwater Investigation Levels (GILs) adopted in NEPC (2013) are based on:

- ANZECC & ARMCANZ (2000), National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality, Australian and New Zealand Conservation Council & Agriculture, and Resource Management Council of Australia and New Zealand; and
- NHMRC (2011), National water quality management strategy, Australian drinking water guidelines, National Health and Medical Research Council and National Resource Management Ministerial Council, Australia.

In 2018, a revision of the ANZECC & ARMCANZ (2000) guidelines was issued. The Australian and New Zealand Guideline (ANZG 2018) for fresh and marine water quality provided authoritative guidance on the management of water quality for natural and semi-natural water resources in Australia and New Zealand. The ANZG (2018) were designed to provide an update to the ANZECC & ARMCANZ (2000) guidelines. Included within the revisions and specific to this sampling event is the provision of new and revised toxicant default guideline values (DGVs). A review of the of the ANZG (2018) where relevant to heavy metals, and specifically the heavy metals analysed as part of this sampling event has identified no changes between the guideline values present in the ANZECC & ARMCANZ (2000) guidelines and those in ANZG (2018) for heavy metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc).

For assessing groundwater and surface water quality, the potential uses of groundwater at, or down-gradient of, the site have also been considered. Potential uses at, or down-gradient of, the site may include:

- The groundwater discharging to a water body sustaining an aquatic ecosystem. The Hunter River is the receptor of groundwater from the site;
- Extraction for irrigation purposes (the PSI identified one groundwater bore (GW079605) down-gradient of the site, however the purpose of the bore was not detailed); and
- Potential potable use (considered extremely unlikely, given the proximity to the Hunter River and potential influence of saline waters).

It should be noted that comparison to the drinking water investigation levels would allow comparison of results for the water to be used for irrigation (based on the contaminants tested, not the physical characteristics of the water). On the basis of the identified potential human and ecological receptors, the adopted GILs are as follows:

- For the purposes of this study, Recreational Water criteria have been applied to analytical results.

- In order to assess whether the groundwater or surface water may impact on aquatic life within the aquatic ecosystems associated with the Hunter River, the groundwater and surface water test results were assessed against the available Trigger Values in ANZECC & ARMCANZ (2000) for a slightly / moderately disturbed marine water system, at a general protection level of protection of 95% of species.

- Although the potential potable groundwater uses in the vicinity of the site is 'extremely low', guidelines adopted from the Australian Drinking Water Guidelines (2018) have been applied.

8.3 Sediment

The sediment quality investigation included sampling of surficial sediment; and comparison of analytical results to the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC) (2013) sediment quality guideline values (SQGV).

The ANZECC/ARMCANZ (2000) guidelines provided sediment quality guideline (SQG) values (a Trigger/Screening value and a High value) for a range of common contaminants. These SQG values were intended for use in the screening level assessment and to assist decisions when accompanied by additional lines of evidence, e.g. bioavailability and ecotoxicology data.

The ANZECC/ARMCANZ (2000) SQG values are based on the effects of sediment contaminants on benthic organisms. The interim SQG trigger value (TV or ISQG-Low) is based on the lower 10th percentile of an effects database (ANZECC/ARMCANZ, 2000). This is used as a screening value that if exceeded, triggers additional investigations to determine whether there is indeed a risk posed by the guideline exceedance. A second upper guideline value, the ISQG-high, is also derived from the median of the effects data. This value has no particular significance except as being indicative of a value above which there is a high probability of toxicity to benthic organisms.

The application of sediment guidelines involves a tiered, decision-tree approach in which the total concentrations of contaminants are compared to SQG values. The initial comparison is usually made with the ISQG-Low values. If the contaminant concentrations exceed the TVs, further investigations should be initiated to determine whether there is indeed an environmental risk associated with the exceedance. Importantly the TVs were not intended for use as a pass/fail basis, but as a means of identifying contaminants of potential concern (COPCs).

As per the revision discussed in **Section 8.2**, the SQG values detailed In ANZECC (2013) underwent a revision in 2018. Similarly, a review of the of the ANZG (2018) where relevant to heavy metals, and specifically the heavy metals analysed as part of this sampling event has identified no changes between the guideline values present in the ANZECC & ARMCANZ (2000) guidelines and those in ANZG (2018) for heavy metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc) in sediment.

Table 8.1: Analytical Requirements for Chemical Analyses

Analyte	LOR Achieved	Unit	ANZG (2018) DGVs	ANZG (2018) DGV-High
Arsenic (As)	0.4	mg/kg	20	70
Cadmium (Cd)	0.1	mg/kg	1.5	10
Chromium (Cr)	0.1	mg/kg	80	370
Copper (Cu)	0.1	mg/kg	65	270
Lead (Pb)	0.5	mg/kg	50	220
Nickel (Ni)	0.1	mg/kg	21	52
Zinc (Zn)	0.5	mg/kg	200	410

DGVs for toxicants in sediment are listed in **Table 8.1**. As per the DGVs applied for water, the DGVs for toxicants in sediment indicate the concentrations below which there is a low risk of unacceptable effects occurring (ANZG 2018) and are used to help ensure the protection of aquatic ecosystems. In comparison, the 'upper' guideline values (DGV-high), also listed in **Table 8.1**, provide an indication of concentrations at which you might already expect to observe toxicity-related adverse effects (ANZG 2018). As such, the ANZG (2018) states the DGV-high value should only be used as an indicator of potential high-level toxicity problems and not as a guideline value to ensure protection of ecosystems.

9. Heavy Metal Analytical results

9.1 Soil Assessment Results

A total of 116 primary soil samples across 3 hotspots (Hotspot 1 to Hotspot 3) and 12 QAQC samples (6 x blind duplicate samples, 6 x split duplicate samples) were submitted for laboratory analysis as part of the soil assessment.

Soil samples were analysed for the following heavy metals:

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

Heavy metal concentrations in all soil samples analysed were detected at concentrations below the adopted assessment criteria and/or the laboratory limits of reporting.

Soil sample locations are illustrated in **Figure 1** to **Figure 3**. Laboratory results for soil samples screened against adopted assessment criteria are presented in **Table A**.

9.2 Groundwater Assessment Results

A total of 13 primary groundwater samples and 2 QA/QC samples (1 x blind duplicate, 1 x split duplicate) were submitted for laboratory analysis as part of the groundwater investigation.

The groundwater samples were analysed for the following heavy metals:

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

Heavy metal concentrations in all groundwater samples analysed were detected at concentrations below the assessment criteria and/or the laboratory limits of reporting, with the exception of the following:

- Dissolved arsenic:
  - MW06 (10µg/L) exceeded the ADGW 2018 Health guideline (10µg/L).
  - MW09 (17µg/L) exceeded the ADGW 2018 Health guideline (10µg/L).
- Dissolved cadmium:
  - in MW04 (0.6µg/L) exceeded the ANZG (2018) DGV for Freshwater guideline of 0.2µg/L.
  - MW13 (0.2µg/L) exceeded the ANZG (2018) DGV for Freshwater guideline of 0.2µg/L.
- Dissolved copper:
  - in MW03 (2µg/L) exceeded the ANZG (2018) DGV for Freshwater (1.4µg/L) and Marine Water (1.3µg/L).
  - MW04 (19µg/L) exceeded the ANZG (2018) DGV for Freshwater (1.4µg/L) and Marine Water (1.3µg/L).

- MW13 (2µg/L) exceeded the ANZG (2018) DGV for Freshwater (1.4µg/L) and Marine Water (1.3µg/L).

- Dissolved nickel:
  - MW01 (11µg/L) exceeded the ANZG (2018) DGV for Freshwater (11µg/L) and the GIL for Marine Water (7µg/L).
  - MW02 (34µg/L) exceeded the ANZG (2018) DGV for Freshwater (11µg/L), the GIL for Marine Water (7µg/L) and the ADWG 2018 Health guideline (20µg/L).
  - MW03 (15µg/L) exceeded the ANZG (2018) DGV for Freshwater (11µg/L) and the GIL for Marine Water (7µg/L).
  - MW04 (70µg/L) exceeded the ANZG (2018) DGV for Freshwater (11µg/L) and Marine Water (70µg/L), the GIL for Marine Water (7µg/L) and the ADWG 2018 Health guideline (20µg/L).
  - MW05 (29µg/L) exceeded the ANZG (2018) DGV for Freshwater (11µg/L), the GIL for Marine Water (7µg/L) and the ADWG 2018 Health guideline (20µg/L).

- Dissolved zinc:
  - MW01 (218µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW02 (8µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L).
  - MW03 (114µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW04 (607µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW05 (20 µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW06 (49µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW12 (481µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).
  - MW13 (164 µg/L) exceeded the ANZG (2018) DGV for Freshwater (8µg/L) and Marine Water (15µg/L).

The above groundwater samples that exceeded the adopted assessment criteria are illustrated in **Figure 6.1** and **Figure 6.2**. Laboratory results for groundwater samples screened against adopted assessment criteria are presented in **Table B**.

9.3 Sediment Assessment Results

A total of 37 primary sediment samples (SED-01 to SED-31 and background locations SED-B01 to SED-B06) from the on-site open channel, drainage lines and the Hunter River and 5 QAQC samples (3x blind duplicate samples, 2x split duplicate samples) were submitted for laboratory analysis as part of the sediment assessment.

Sediment samples were analysed for the following heavy metals:

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

Heavy metal concentrations in all sediment samples analysed were detected at concentrations below the adopted assessment criteria and/or the laboratory limits of reporting, with the exception of the following:

- Arsenic
  - SED-01 (20mg/kg) exceeded the ANZG (2018) DGV (20mg/kg).
- Cadmium
  - SED-06 (5mg/kg) exceeded the ANZG (2018) DGV (1.5mg/kg).
- Copper
  - SED-06 (114mg/kg) exceeded the ANZG (2018) DGV (65mg/kg).
- Lead
  - SED-03 (245mg/kg) exceeded the ANZG (2018) DGV (50mg/kg) and the DGV-High (220mg/kg)
  - SED-06 (122mg/kg) exceeded the ANZG (2018) DGV (50mg/kg).
  - SED-07 (53mg/kg) exceeded the ANZG (2018) DGV (50mg/kg).

- SED-14 (82mg/kg) exceeded the ANZG (2018) DGV (50mg/kg).
- SED-17 (128mg/kg) exceeded the ANZG (2018) DGV (50mg/kg).

- Mercury
  - SED-06 (0.3mg/kg) exceeded the ANZG (2018) DGV (0.15mg/kg).
  - SED-09 (0.2mg/kg) exceeded the ANZG (2018) DGV (0.15mg/kg).
  - SED-14 (0.2mg/kg) exceeded the ANZG (2018) DGV (0.15mg/kg).
  - SED-16 (0.2mg/kg) exceeded the ANZG (2018) DGV (0.15mg/kg).
- Nickel
  - SED-01 (23mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-11 (42mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-13 (37mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-14 (29mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-16 (42mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-17 (27mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-19 (24mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-21 (47mg/kg exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-22 (36mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-23 (54mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
  - SED-24 (61mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
  - SED-25 (58mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
  - SED-26 (70mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
  - SED-27 (48mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-28 (38mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
  - SED-29 (47mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).

- SED-30 (68 mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
- SED-31 (47mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
- SED-B01 (55mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
- SED-B02 (41mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
- SED-B03 (64mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
- SED-B04 (47mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).
- SED-B05 (56mg/kg) exceeded the ANZG (2018) DGV (21mg/kg) and the DGV-High (52mg/kg).
- SED-B06 (21mg/kg) exceeded the ANZG (2018) DGV (21mg/kg).

- Zinc
  - SED-06 (825mg/kg) exceeded the ANZG (2018) DGV (200mg/kg) and the DGV-High (410mg/kg).
  - SED-07 (330mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-11 (211mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-13 (291mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-14 (377mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-16 (265mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-17 (273mg/kg) exceeded the ANZG (2018) DGV (200mg/kg).
  - SED-19 (461mg/kg) exceeded the ANZG (2018) DGV (200mg/kg) and the DGV-High (410mg/kg).

The above sediment samples that exceeded the adopted assessment criteria are illustrated in **Figure 7.1** and **Figure 7.2**. Laboratory results for sediment samples screened against adopted assessment criteria are presented in **Table C**.

9.4 Surface Water Assessment Results

A total of 40 primary sediment samples (SW-01 to SW-31, SW-34 to SW-36 and background locations SW-B01 to SW-B06) from the on-site open channel, drainage lines and the Hunter River and 5 QAQC samples (3x blind duplicate samples, 2x split duplicate samples) were submitted for laboratory analysis as part of the surface water assessment.

Surface water samples were analysed for the following heavy metals:

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

Heavy metal concentrations in all surface water samples analysed were detected at concentrations below the adopted assessment criteria and/or the laboratory limits of reporting, with the exception of the following:

- Dissolved Cadmium
  - SW-04 (0.3µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
  - SW-05 (0.3µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
  - SW-09 (0.8µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
  - SW-10 (0.6µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
  - SW-17 (0.2µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
  - SW-20 (0.5µg/L) exceeded the ANZG (2018) DGV for freshwater (0.2µg/L).
- Dissolved Copper
  - SW-01 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
  - SW-02 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
  - SW-03 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
  - SW-04 (2µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
  - SW-05 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).

- SW-06 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-07 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-08 (2µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-09 (6µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-11 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-12 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-13 (2µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-14 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-15 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-26 (3µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).
- SW-34 (4µg/L) exceeded the ANZG (2018) DGV for freshwater (1.4µg/L) and marine water (1.3µg/L).

- Dissolved Nickel
  - SW-09 (16µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
  - SW-10 (47µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
  - SW-16(34µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
  - SW-17 (43µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
  - SW-18 (41µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
  - SW-19 (42µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).

- SW-20 (38µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
- SW-35 (40µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).
- SW-36 (42µg/L) exceeded the ANZG (2018) DGV for freshwater (11µg/L).

- Dissolved Zinc
  - SW-01 (54µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-02 (63µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-03 (51µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-04 (311µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-05 (605µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-06 (115µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-07 (35µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-08 (129µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-09 (1200µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-10 (2140µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-11 (59µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-12 (112µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
  - SW-13 (234µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).

- SW-14 (24µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-15 (29µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-16 (1500µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-17 (1740µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-18 (1710µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-19 (1910µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-20 (1850µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-22 (10µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L).
- SW-34 (31µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-35 (1290µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-36 (1880µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L) and marine water (15µg/L).
- SW-B06 (8µg/L) exceeded the ANZG (2018) DGV for freshwater (8µg/L).

The above surface water samples that exceeded the adopted assessment criteria are illustrated in **Figure 8.1** and **Figure 8.2**. Laboratory results for surface water samples screened against adopted assessment criteria are presented in **Table D**.

10. Summary Discussion

The following summary discussion comments are based on the review of heavy metal analytical results for soil, groundwater, sediment and surface water obtained during the Site Contaminated Assessment completed in June and July 2019. The discussion also provides a brief comparison of current results to results obtained and presented in the Jacobs DSI report (Jacobs 2016),

10.1 Soil Summary

Results for soil collected and analysed for heavy metals as part of the June to July 2019 sampling event indicated there were no exceedances of adopted assessment criteria in any of the samples collected from the Hotspot areas (Hotspot 1 to Hotspot 3).

Comparisons to the analytical results presented in the Jacobs (2016) DSI indicate a general consistency in heavy metal concentrations between soil samples collected during the June to July 2019 sampling event and those reported in the Jacobs (2016) DSI. As per the results presented in this report, heavy metal concentrations in soil samples reported on in the Jacobs (DSI) report were all below the adopted assessment criteria.

10.2 Groundwater Summary

Dissolved heavy metals were detected at concentrations exceeding the adopted criteria at all groundwater monitoring locations, with the exception MW07, MW08, MW10 and MW11. A summary of the findings for each heavy metal is provided below:

- Dissolved arsenic was reported above the ADWG (2018) criteria for human health at two locations (MW06 and MW09) in Lot 102 of the site. Both locations are located on the southern boundary of the site, with MW06 situated towards the south west corner and MW09 situated in the north east corner. Although the ADWG (2018) guideline was not applied to Jacobs (2016) DSI results, a comparison to between the June to July 2019 data to that reported in Jacobs (2016) DSI report, indicate that arsenic would not have exceeded the ADWG (2018) guideline if it was applied to the Jacobs (2016) DSI data.

- Dissolved cadmium was reported above the ANZG (2018) DGV for freshwater at two locations (MW04 and MW13) in Lot 102 of the Site. Whilst MW04 was located on the western boundary of the Site, MW13 (near the eastern drainage line) was located on the eastern boundary of the Site. Comparison with the Jacobs (2016) DSI indicated dissolved cadmium did not exceed at either of these locations during for the Jacobs (2016) DSI but did exceed at MW01, MW02, MW03 and MW09.

- Dissolved copper was reported above the ANZG (2018) DGV for freshwater at three locations (MW03, MW04 and MW13) in Lot 102 of the Site. MW03 was located on the northern corner of Lot 102. Comparison with the Jacobs (2016) DSI indicated dissolved copper not only exceeded at all three of these locations during for the Jacobs (2016) DSI but also at all other locations, with the exception of MW06 and MW07.

- Dissolved lead was reported below all criteria in all samples collected as part of the June to July 2019 monitoring round. Comparisons to the analytical results presented in the Jacobs (2016) DSI indicate a general consistency in lead concentrations between groundwater samples collected during the June to July 2019 sampling event and those reported in the Jacobs (2016) DSI. As per the results presented in this report, lead concentrations in all groundwater samples reported on in the Jacobs (DSI) report were below the adopted assessment criteria.

- Dissolved mercury was reported below the LOR in all samples collected as part of the June to July 2019 monitoring round. Comparisons to the analytical results presented in the Jacobs (2016) DSI indicate a consistency in mercury concentrations between groundwater samples collected during the June to July 2019 sampling event and those reported in the Jacobs (2016) DSI report. As per the results presented in this report, mercury concentrations in all groundwater samples reported on in the Jacobs (DSI) report were below the LOR.

- Dissolved nickel concentrations were reported above the ANZG (2018) DGV for freshwater and NEPM (2013) GIL for marine water at five locations (MW01 to MW05), above the ANZG (2018) DGV for marine water at one location (MW04) and above the ADWG (2018) for health at three locations (MW02, MW04 and MW05). Both MW01 and MW02 were located in the north of the Site in Lot 101 towards the Hunter River whilst MW05 was located in Lot 102 in the south west corner. Comparison with the Jacobs (2016) DSI indicate that of the five location which reported exceedances of nickel in the June to July 2019 sampling event, only two (MW02 and MW03) reported a similar exceedance of the ANZG (2018) DGV in the Jacobs (2016) DSI. However, an additional exceedance above the ANZG (2018) DGV for Nickel was reported at MW09 in the Jacobs (2016) DSI.

- Dissolved zinc concentrations were reported above the ANZG (2018) DGV for freshwater at eight locations (MW01 to MW06 and MW12 to MW13) and above the ANZG (2018) DGV for marine water at seven locations (MW01, MW03 to MW06, MW12 to MW13). MW12 is located on eastern boundary of Lot 102, adjacent to the neighbouring property (Lot 51). Comparison with the Jacobs (2016) DSI indicated similar exceedances of zinc at all the locations which exceeded in the June to July 2019 sampling event. However, whilst MW07 to MW11, all reported exceedances for zinc in the Jacobs (2016) DSI report, in the June to July 2019 sampling event, concentrations of zinc at these locations were all below the LOR.

10.3 Sediment Summary

With the exception of chromium, exceedances were detected above the adopted criteria for all heavy metals analysed in sediment samples. Of the sediment sample locations, only SED-01, SED-04, SED-05, SED-08, SED-12, SED-15, SED-18 and SED-20 did not report a heavy metal exceedance above the adopted criteria. A summary of the findings for each heavy metal is provided below:

- Arsenic was reported above the ANZG (2018) DGV for sediment at only one location (SED-03) during the June to July 2019 sampling event. SED-03 was located in the drainage line in south east corner of Lot 102, which runs parallel the boundary line dividing Lot 101/Lot102 from Lot 51. Comparison with the Jacobs (2016) DSI indicated no sediment locations that reported an exceedance of arsenic.

- Cadmium was reported above the ANZG (2018) DGV for sediment at only one location (SED-06) during the June to July 2019 sampling event. SED-05 was located in the drainage line situated on the perimeter of Lot 102 and Lot 51 (the adjacent property to the east). Comparison with the Jacobs (2016) DSI indicated no sediment locations which reported an exceedance of cadmium.

- Copper was reported above the ANZG (2018) DGV for sediment at only one location (SED-06) during the June to July 2019 sampling event. SED-06 was located in the drainage line located on the perimeter of Lot 102 and Lot 51 (the adjacent property to the eastComparison with the Jacobs (2016) DSI indicated no sediment locations which reported an exceedance of copper.

- Lead was reported above the ANZG (2018) DGV for sediment at five locations (SED-03, SED-06, SED-07, SED-14 and SED-17) and above the ANZG (2018) DGV-High at one location (SED-03) during the June to July 2019 sampling event. Whilst SED-03, SED-06 and SED-07 were all located in the drainage line which runs in northerly direction along the perimeter of Lot 101/Lot 102 and Lot 53 (the adjacent property to the east), SED-14 and SED-17 were both located in the open channel that runs through Lot 102 into the Hunter River. Comparison with the Jacobs (2016) DSI indicated no sediment locations which reported an exceedance of lead.

- Mercury was reported above the ANZG (2018) DGV for sediment at four locations (SED-06, SED-09, SED-14 and SED-16) during the June to July 2019 sampling event. Whilst SED-06 and SED-09 were located in the drainage line which runs in a northerly direction along the perimeter of Lot 101/Lot 102 and Lot 53 (the adjacent property to the east), SED-14 and SED-16 were located in the open channel that runs through Lot 102 into the Hunter River. Comparison with the Jacobs (2016) DSI indicated no sediment locations which reported an exceedance of mercury.

- Nickel was reported above the ANZG (2018) DGV for sediment at twenty-four locations and above the ANZG (2018) DGV-High at eight locations during the June to July 2019 sampling event. In terms of the location of these exceedances, only seven samples were located within the on-site drainage lines (SED-02) or the open channel (SED-11, SED-13, SED-14, SED-16, SED-17 and SED-19). All concentrations for Nickel in these samples were below the ANZG (2018) DGV-High. All remaining exceedances were in samples collected from sediments located in the Hunter River. Of these locations, only SED-23 to SED-26, SED-30, SED-B01, SED-B03 and SED-B05 reported concentrations above the ANZG (2018) DGV-High. Comparison with the Jacobs (2016) DSI report indicated a correlation between nickel concentrations in samples collected from the Hunter River during June to July 2019 sampling event and those reported in the Jacobs (2016) DSI.

- Zinc was reported above the ANZG (2018) DGV for sediment at eight locations (SED-06, SED-07, SED-11, SED-13, SED-14, SED-16, SED-17 and SED-19) and above the ANZG (2018) DGV-High at two locations during the June to July 2019 sampling event. Whilst only two samples (SED-06 and SED-07), were located in the drainage line which runs in a northerly direction along the perimeter of Lot 101 / Lot 102 and Lot 53 (the adjacent property to the east), the remaining six samples were all located in the open channel that runs through Lot 102 into the Hunter River. Comparison with the Jacobs (2016) DSI indicated only one sediment location reported an exceedance of zinc (S7) during the Jacobs (2016) DSI. Located towards the mouth of the open channel which runs towards the Hunter River, the closest sample from the June to July 2019 sampling event, which corresponds to the S7 sample from the Jacobs (2016) DSI report, was SED-11. Comparisons between the results for each of the samples indicate both samples (SED-11 with 211mg/kg and S7 with 200mg/kg) exceeded or were equal to the ANZG (2018) DGV (200mg/kg).

At the time of sampling, surface water was observed flowing in a northern direction towards the Hunter River.

10.4 Surface Water Summary

Dissolved heavy metals were detected at concentrations exceeding the adopted assessment criteria at all surface water sample locations, with the exception SW-21 to SW-25, SW-27 to SW-31 and SW-B01 to SW-B05. A summary of the findings for each heavy metal is provided below:

- Dissolved arsenic, lead and mercury were reported below the LOR and/or below all assessment criteria at all sample locations during the June to July 2019 sampling event. Only three surface water samples were previously collected from on-site sample locations as part of the Jacobs (2016) DSI report. Of these three samples, two (W1 and W2) were located in the open channel located in Lot 102. As per the June to July 2019 sampling event, no exceedances of arsenic, lead and mercury were reported in surface water samples collected as part of the Jacobs (2016) DSI report.

- Dissolved cadmium was reported above the ANZG (2018) DGV for freshwater at six sample locations (SW-04, SW-05, SW09, SW-10, SW-17 and SW-20) during the June to July 2019 sampling event. Of these samples, three (SW-04, SW-05, SW09) were located in the drainage line situated on the perimeter of Lot 102/Lot 101 and Lot 51 (the adjacent property to the east) and three were located in open channel of Lot 102. Comparison with the Jacobs (2016) DSI indicated there were no surface water sample locations which reported an exceedance of cadmium. Of the three samples collected as part of the Jacobs (2016) DSI, only two (W1 and W2) were located in the open channel located in Lot 102. No exceedances of cadmium were reported in surface water samples collected as part of the Jacobs (2016) DSI report.

- Dissolved copper was reported above the ANZG (2018) DGV for freshwater at sixteen sample locations (SW-01 to SW09, SW-11 to SW-15, SW-26 and SW-34) during the June to July 2019 sampling event. Of these samples, nine (SW-01-SW-09) were located in the drainage line situated on the perimeter of Lot 102/Lot 101 and Lot 51 (the adjacent property to the east), six (SW-11 to SW-15, SW-26) were located in open channel of Lot 102 and one (SW-26) was located in the Hunter River. Comparison with the Jacobs (2016) DSI indicated there were no surface water sample locations which reported an exceedance of cadmium. Of the three samples collected as part of the Jacobs (2016) DSI, only two (W1 and W2) were located in the open channel located in Lot 102. One exceedance of copper (2µg/L) was reported in surface water sample collected from W2 as part of the Jacobs (2016) DSI report.

- Dissolved nickel was reported above the ANZG (2018) DGV for freshwater at nine sample locations (SW-09, SW-10, SW-16 to SW-20, SW-35 and SW-36) during the June to July 2019 sampling event. Of these samples, one (SW-09) was located in the drainage line situated on the perimeter of Lot 102/Lot 101 and Lot 51 (the adjacent property to the east) and eight (SW-10, SW-16 to SW-20, SW-35 and SW-36) were located in open channel of Lot 102. Of the three samples collected as part of the Jacobs (2016) DSI, only two (W1 and W2) were located in the open channel located in Lot 102. No exceedances of nickel were reported in surface water samples collected as part of the Jacobs (2016) DSI report.

- Dissolved zinc was reported above the ANZG (2018) DGV for freshwater at twenty-five sample locations (SW-01 to SW-22, SW-34 to SW-36 and SW-B06) and above the ANZG (2018) DGV for marine water at twenty-three sample locations (SW-01 to SW-20, and SW-34 to SW-36) during the June to July 2019 sampling event. Of these samples, only two (SW-22 and SW-B06) were located in the Hunter River, with the remainder located in either the on-site drainage lines (SW01-SW09) situated on the perimeter of Lot 102/Lot 101 and Lot 51 (the adjacent property to the east) and in the open channel of Lot 102 (SW-10 to SW-20 and SW-34 to SW-36). Of the three samples collected as part of the Jacobs (2016) DSI, only two (W1 and W2) were located in the open channel located in Lot 102. Two exceedances of zinc were reported in surface water samples collected as part of the Jacobs (2016) DSI report.

At the time of sampling, surface water was observed flowing in a northern direction towards the Hunter River. All on-site (not including the Hunter River) surface water samples (SW-01 to SW-20 and SW-34-SW-35) were collected during a rainfall event. Between the 24 June to 27 June 2019, approximately 68.4 mm of rain fell on-site. It is likely this rainfall directly contributed to not only increase surface water and overland flows but volumes of water within on-site surface water bodies.

Attachment A includes the Figures for this factual letter, while **Attachment B** includes analytical data in reduced tables.

ATTACHMENT A – Figures

Figure 1 –

Figure 2 –

Figure 3 –

Figure 4 –

Figure 5 –

Figure 6.1 –

Figure 6.2 –

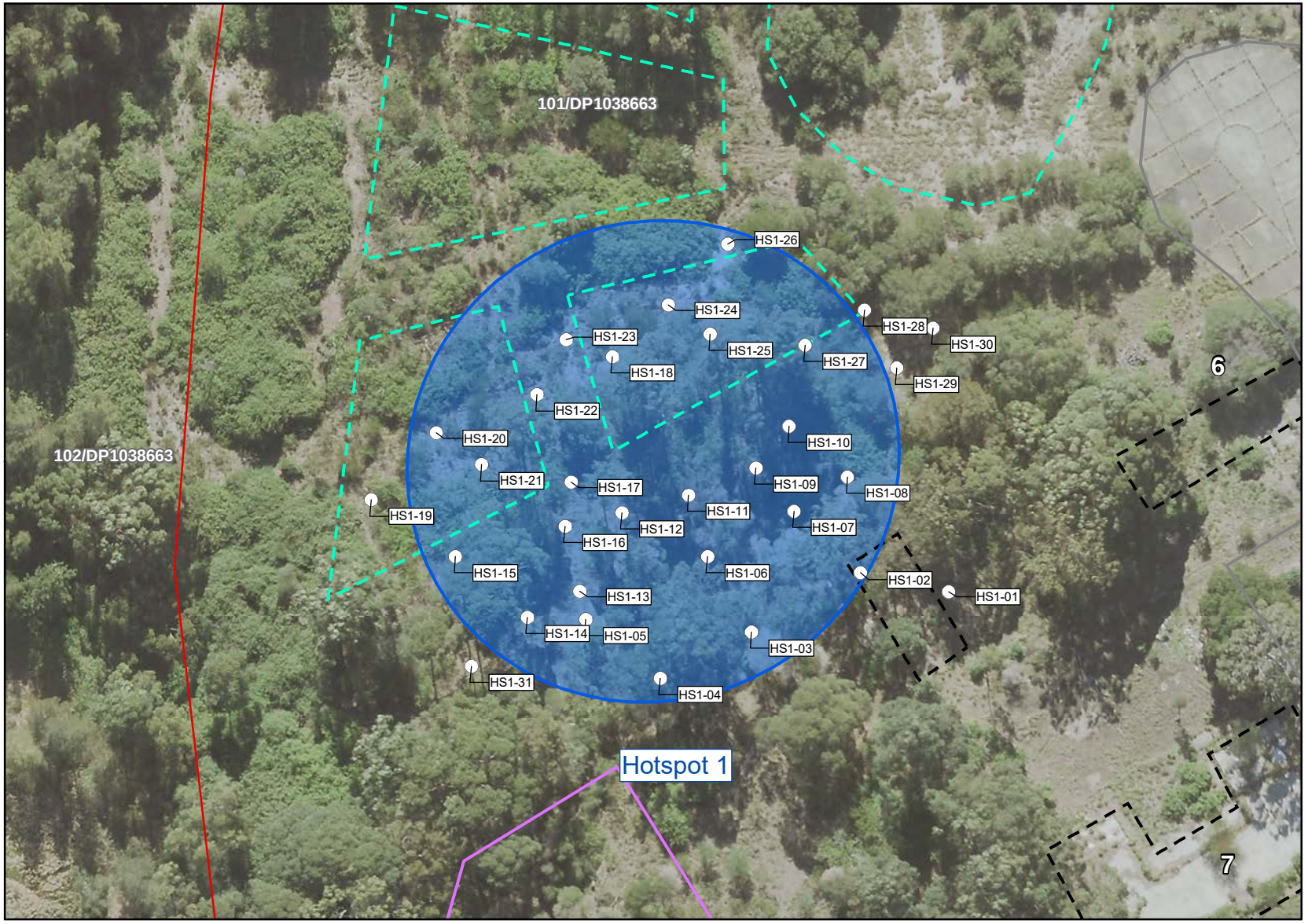
Figure 7.1 –

Figure 7.2 –

Figure 8.1 –

Figure 8.2 –

Figure 1 – Hotspot 1 Soil Sample Locations



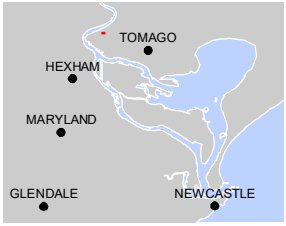
LEGEND

- Building ID
- Lot 101/DP1038663
- Soil hotspot
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Soil hotspot sample location

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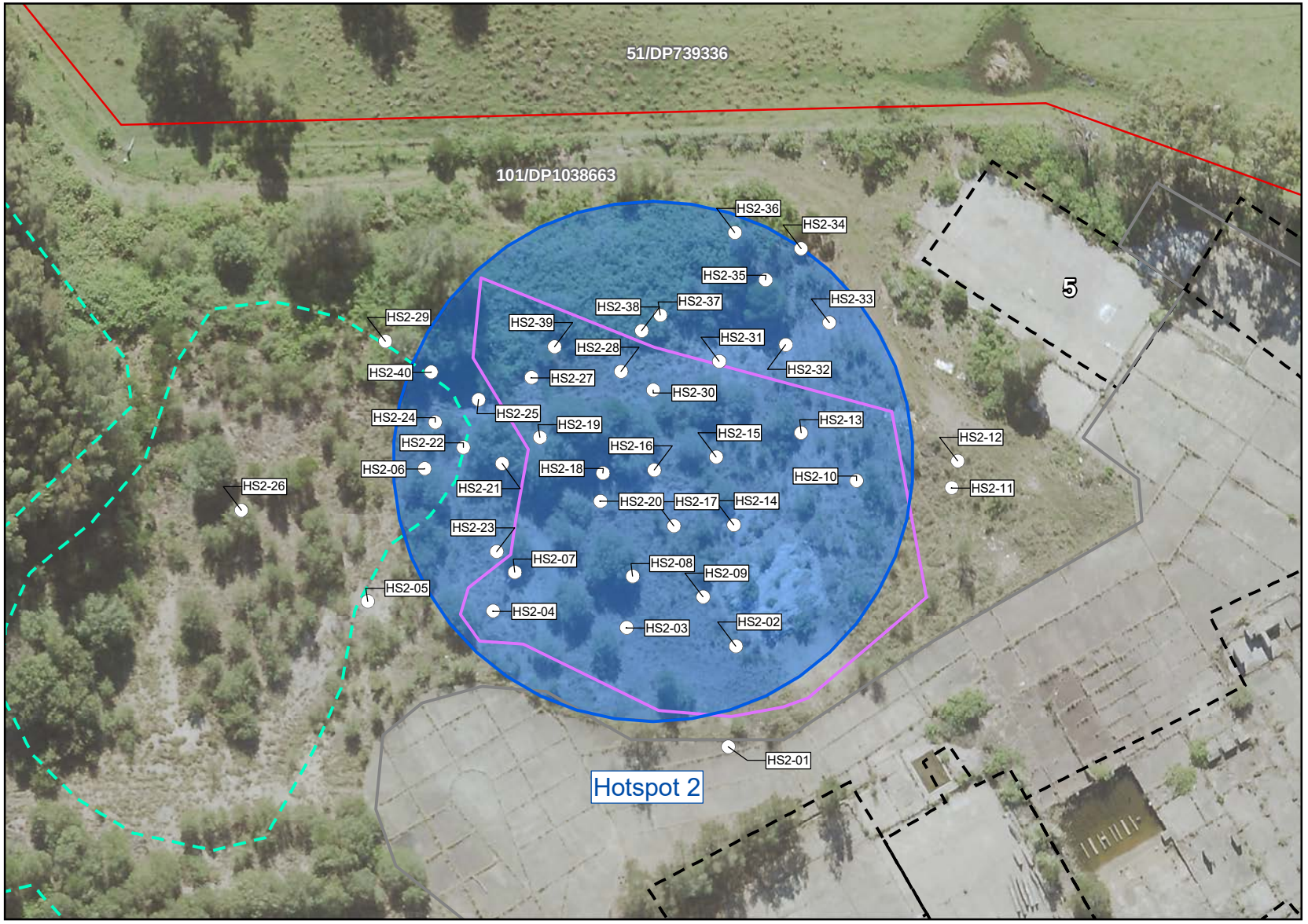


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Newcastle Spatial Team - Prepared by : KM
Checked by : LW

Figure 2 – Hotspot 2 Soil Sample Locations



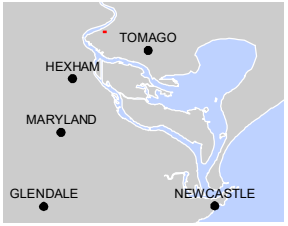
LEGEND

- Building ID
- Lot 101/DP1038663
- Soil hotspot
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Soil hotspot sample location

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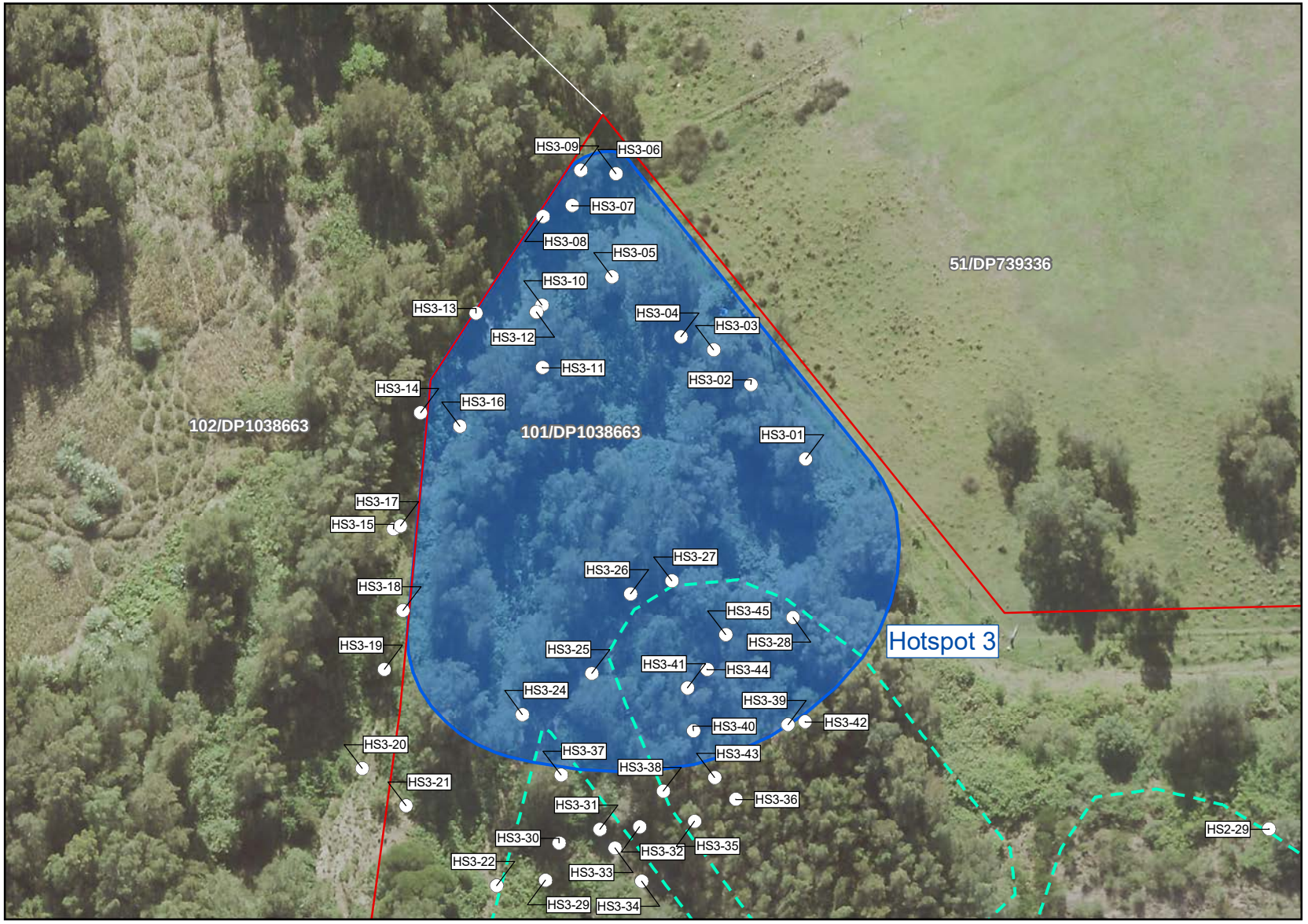


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Figure 3 – Hotspot 3 Soil Sample Locations



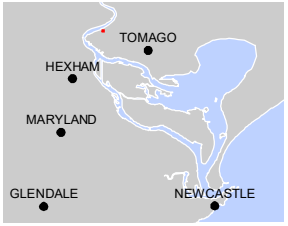
LEGEND

- Building ID
- Lot 101/DP1038663
- Soil hotspot
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Soil hotspot sample location

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Figure 4 – Lot 101 Groundwater, Sediment and Surface Water Locations



LEGEND

- Building ID
- Lot 101/DP1038663
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Garnet slots
- Groundwater sample location
- Sediment and surface water sample location

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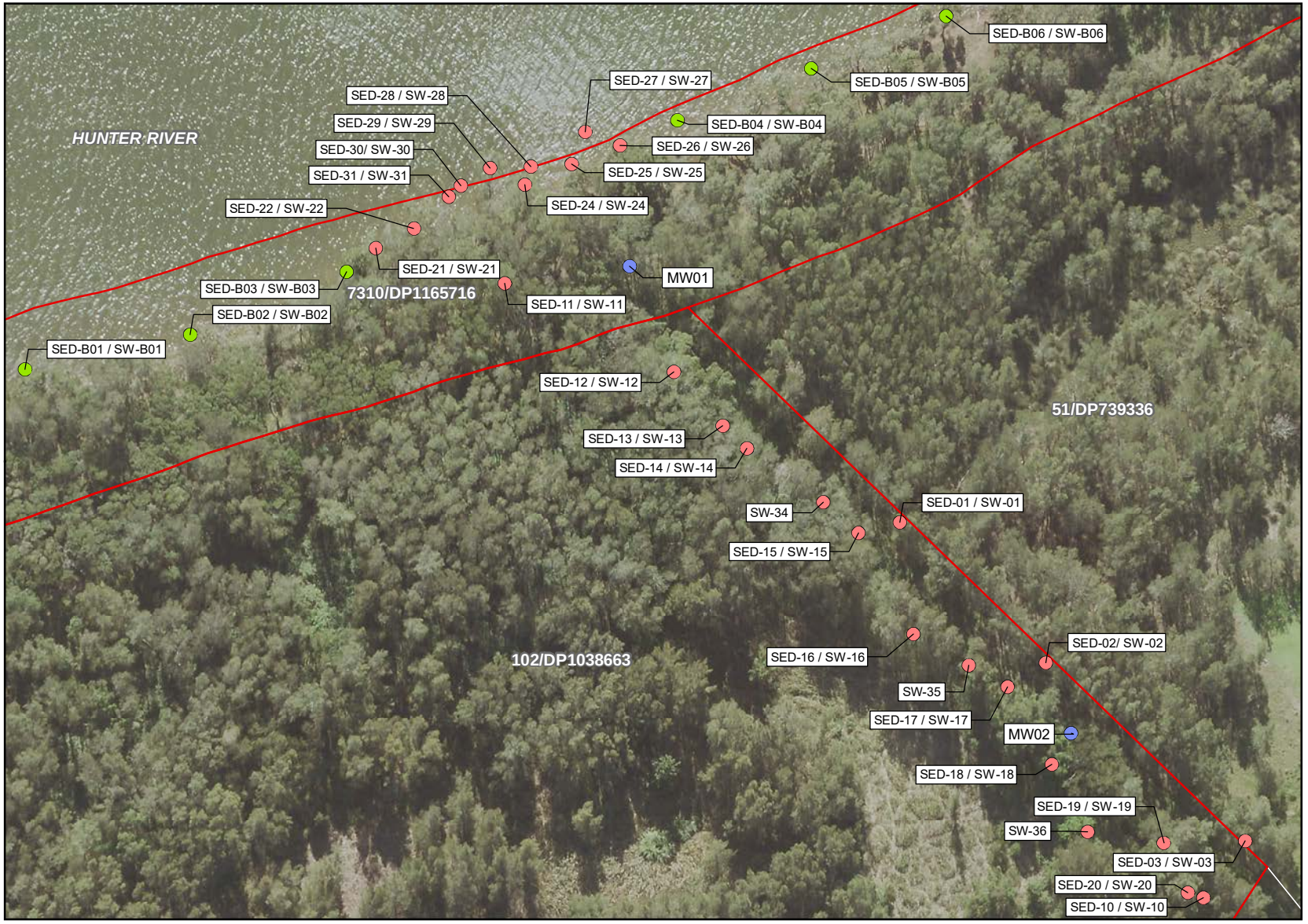


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Figure 5 – Lot 102 and 7310 Groundwater, Surface Water and Sediment Sample Locations



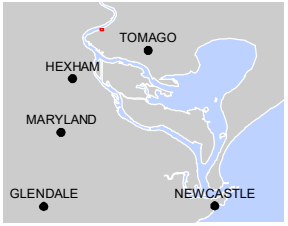
LEGEND

- Lot 102/DP1038663 and Lot 7310/DP1165716
- Groundwater sample location
- Sediment and surface water sample location
- Background sediment and surface water sample location

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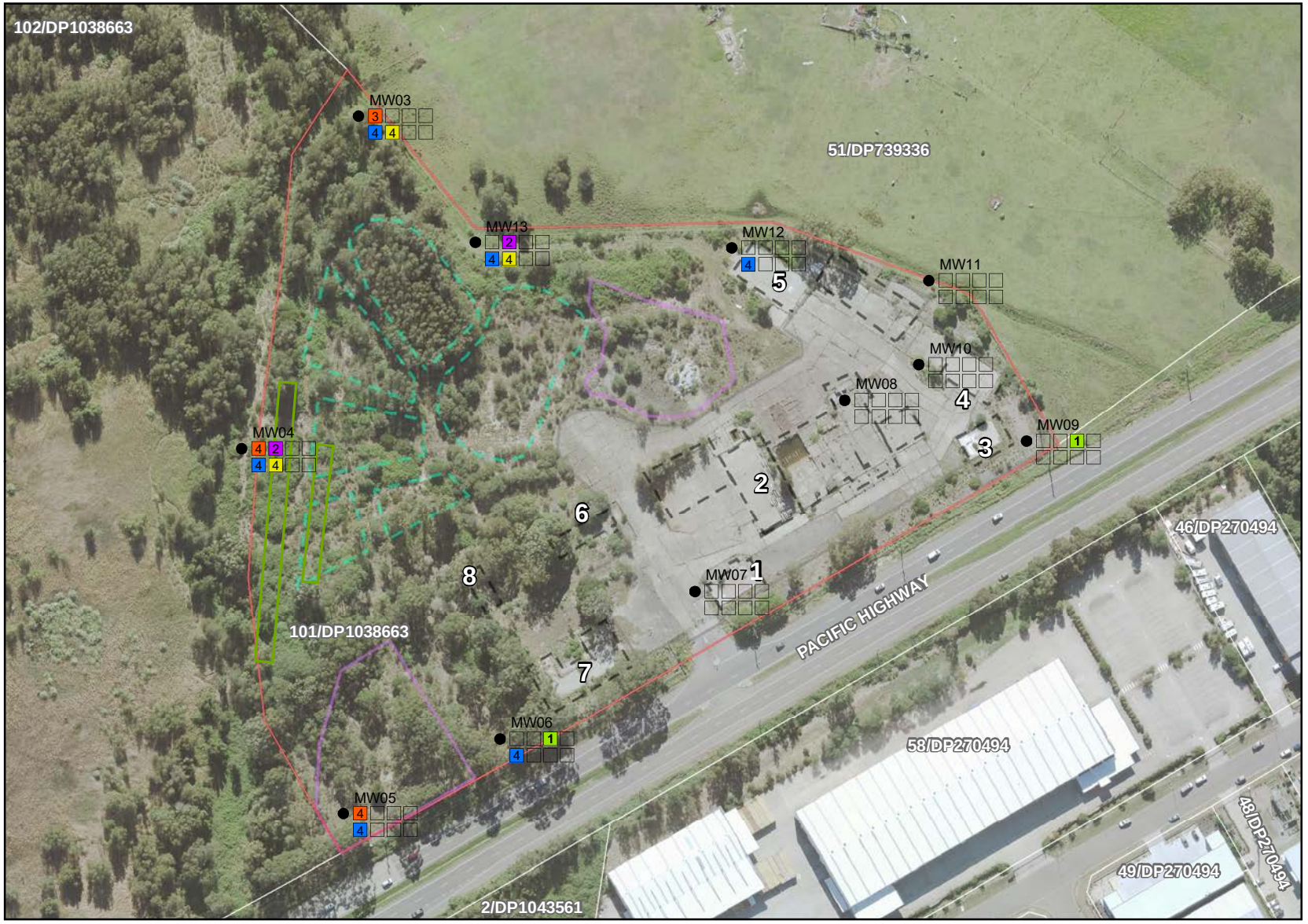


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Figure 6.1 – Heavy metals exceedances in Groundwater (Lot 101)



LEGEND

- Building ID
- Lot 101/DP1038663
- Building - former
- Dewatering pond - former
- Concrete
- Stockpile area - former
- Garnet slots
- Groundwater sample location

Ni Cd As Pb
n
Zn Cu Hg Cr

- Number of criteria exceeded
- Coloured block indicates at least one exceedance for this metal
- Clear block indicates no exceedance for this metal

Note: *Refer to Table B for analytical results and details of each exceedance*

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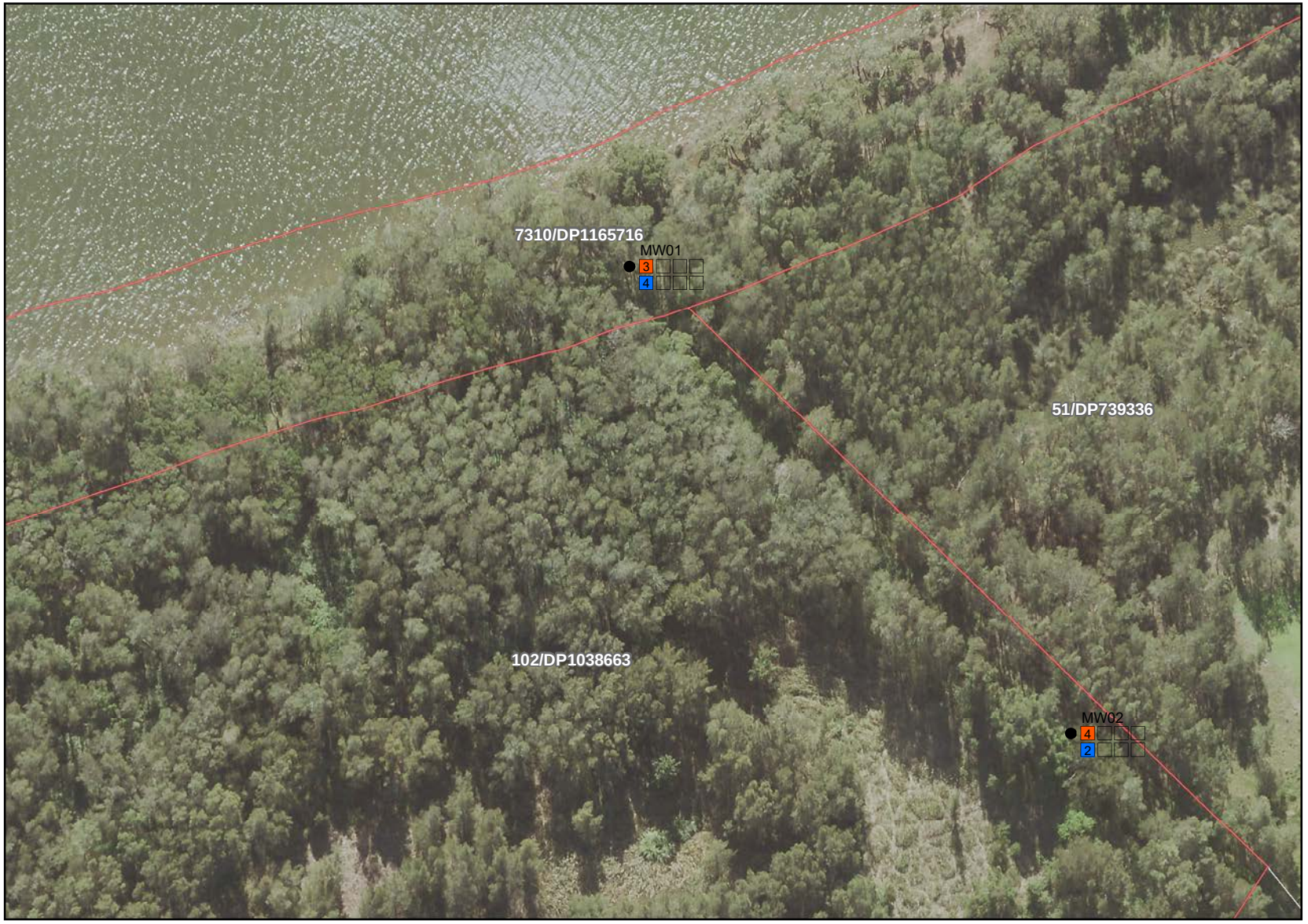
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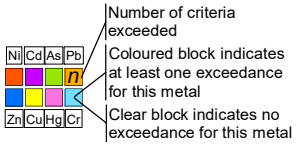
Figure 6.2 – Heavy metal exceedances in Groundwater (Lot 102 and 7310)



LEGEND

Lot 102/DP1038663 and Lot 7310/DP1165716

Groundwater sample location

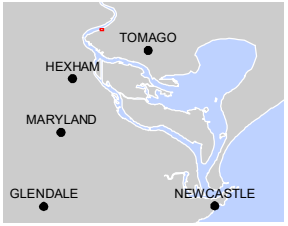


Note: *Refer to Table B for analytical results and details of each exceedance*

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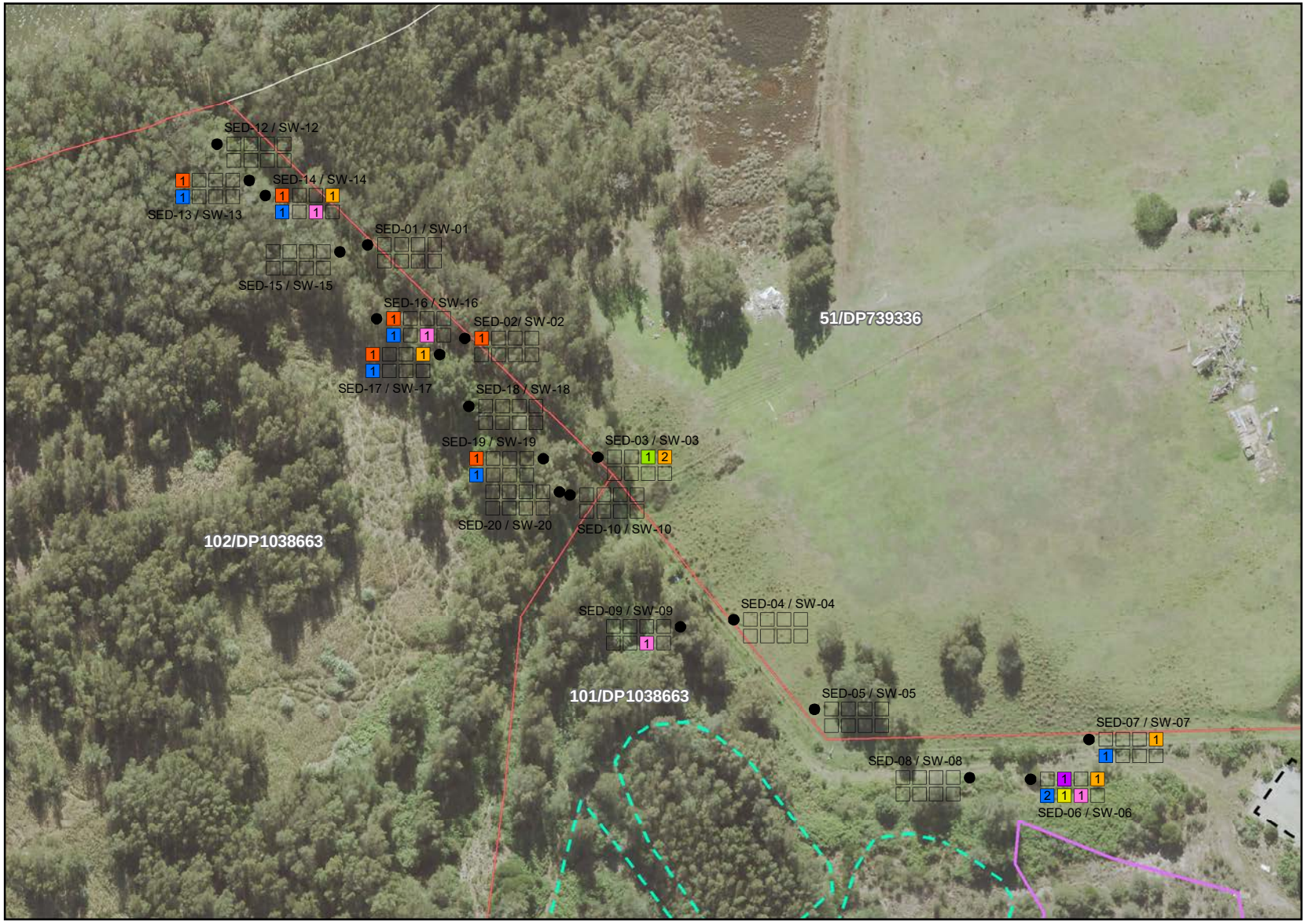
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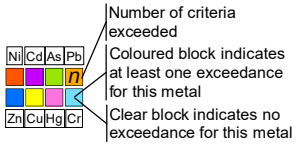
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Figure 7.1 – Heavy metal exceedance in Sediment (Lot 101 and Lot 102)



LEGEND

- Building ID
- Lot 101/DP1038663 and Lot 102/DP1038663
- Building - former
- Dewatering pond - former
- Stockpile area - former
- Sediment sample location

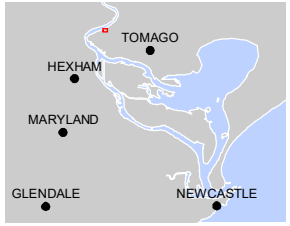


Note: *Refer to Table C for analytical results and details of each exceedance*

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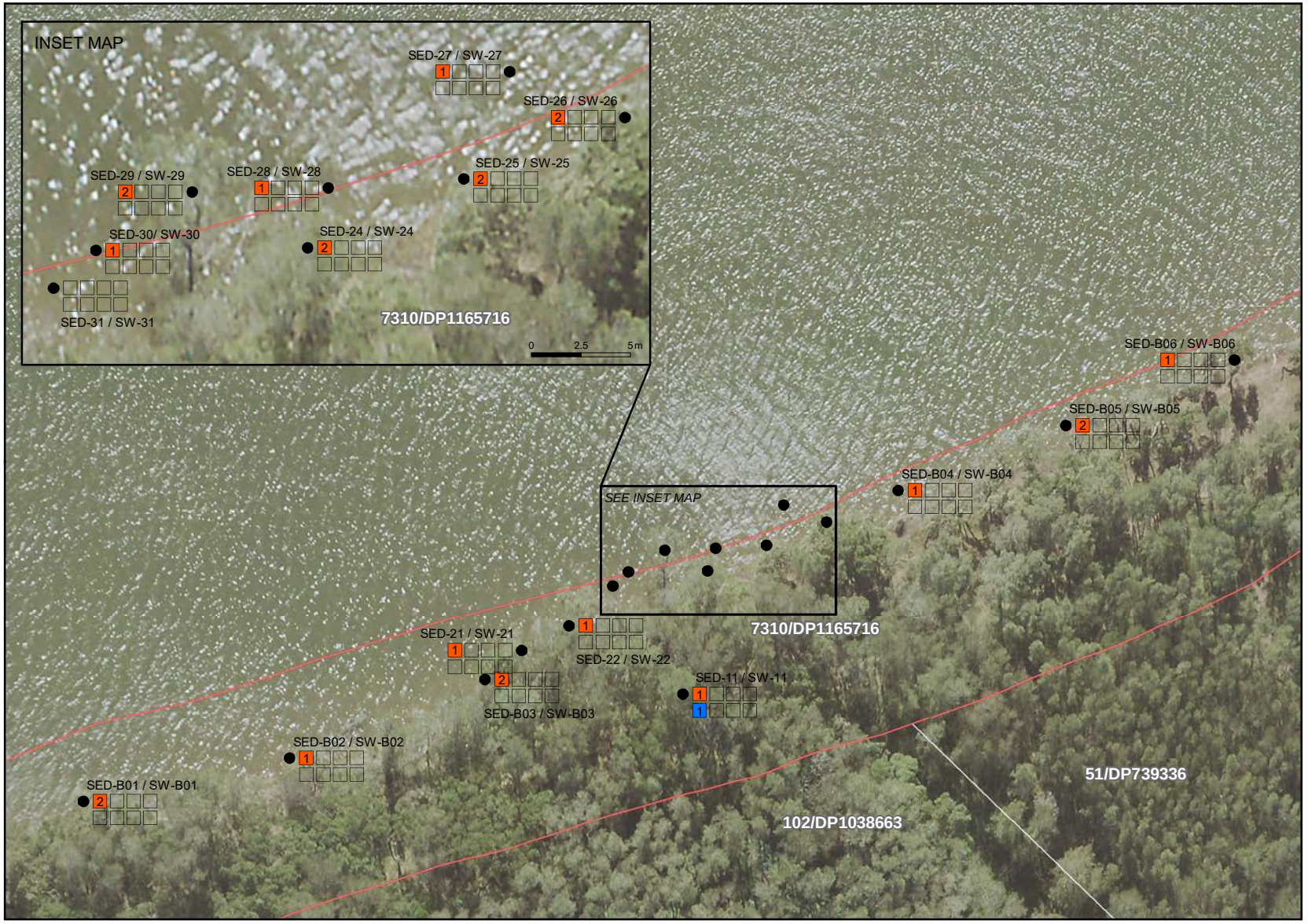
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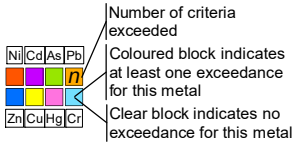
Figure 7.2 – Heavy metal exceedances in Sediment (Lot 7310)



LEGEND

Lot 7310/DP1165716

Sediment sample location

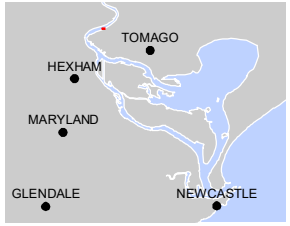


Note: *Refer to Table C for analytical results and details of each exceedance*

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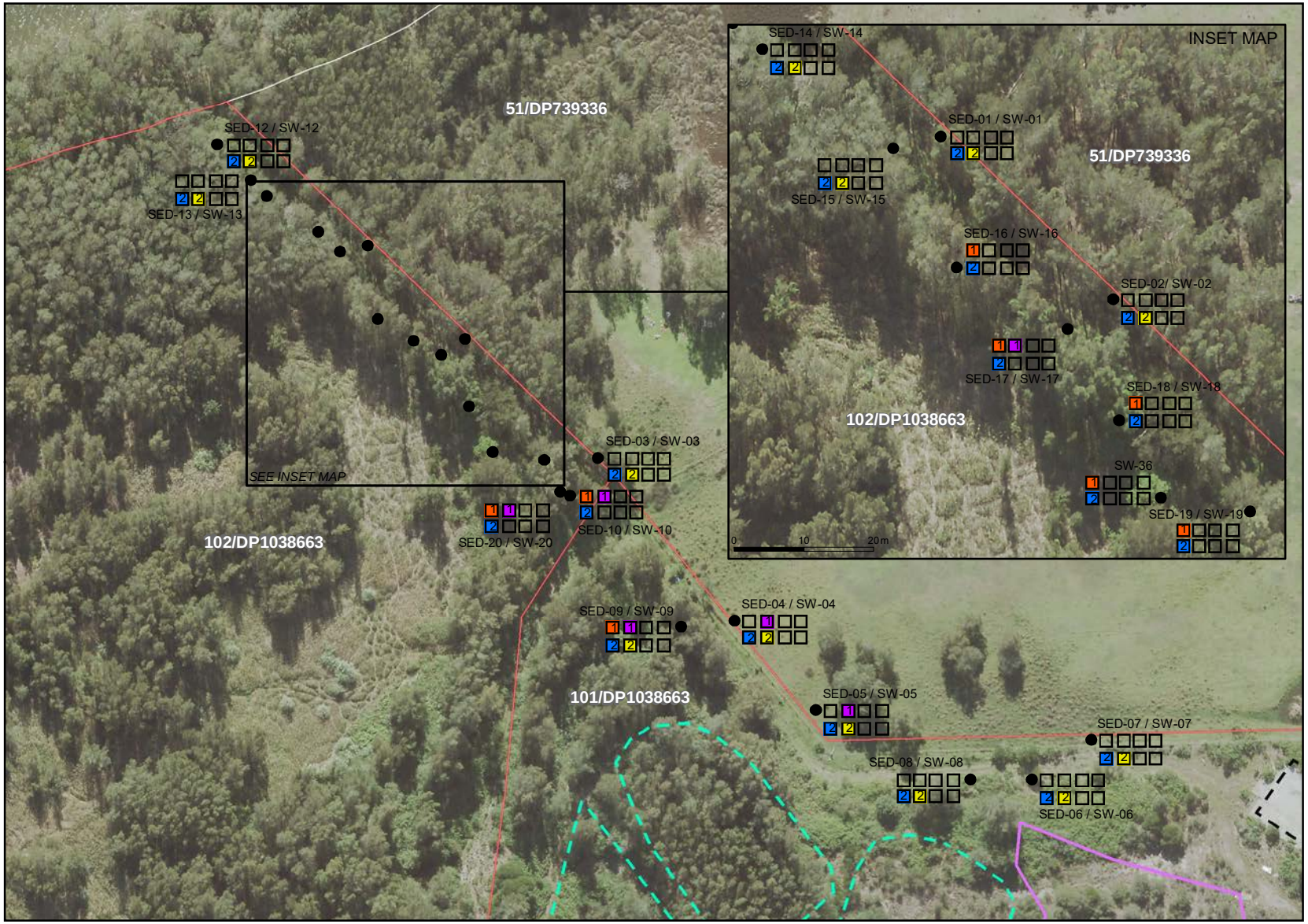
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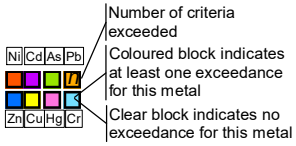
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Figure 8.1 – Heavy metal exceedance in Surface Water (Lot 101 and Lot 102)



LEGEND

- Lot 101/DP1038663 and Lot 102/DP1038663
- Building - former
- Dewatering pond - former
- Stockpile area - former
- Surface water sample location

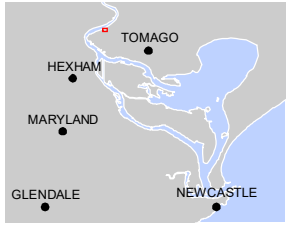


Note: *Refer to Table D for analytical results and details of each exceedance*

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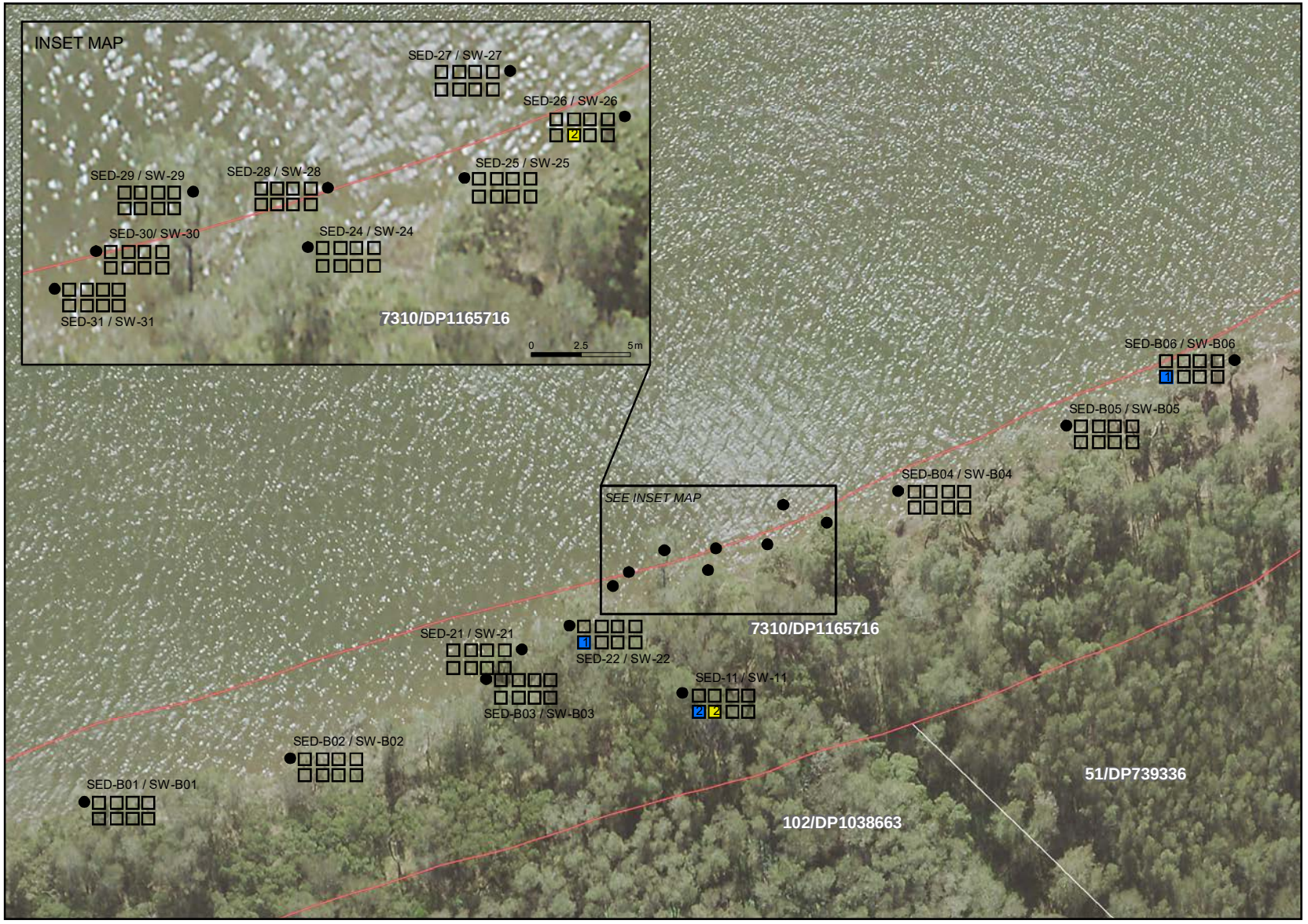
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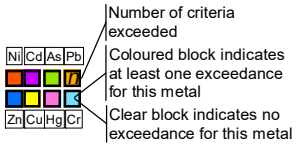
Figure 8.2 – Heavy metal exceedances in Surface Water (Lot 7310)



LEGEND

Lot 7310/DP1165716

Sediment sample location

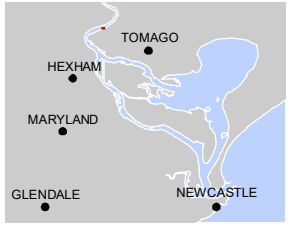


Note: *Refer to Table D for analytical results and details of each exceedance*

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Checked by : LW

ATTACHMENT B – Analytical Tables

Table A.1 –

Table A.2 –

Table A.3 –

Table B –

Table C –

Table D -

		Moisture Content	Heavy Metals							
		Moisture Content	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		1	5	1	2	5	5	0.1	2	5
NEPM 2013 Table 1A(1) HIL D Soil			3000	900		240000	1500	730	6000	400000
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)			160			280	1800		460	920
Field_ID	**Location_Code**	**Matrix_Description**	**Sample_Date**							
HS1-01	HS1-01	Soil	4/07/2019	9.9	<5	<1	6	<5	8	<0.1	<2	25
HS1-02	HS1-02	Soil	4/07/2019	3.2	<5	<1	3	<5	5	<0.1	<2	49
HS1-03	HS1-03	Soil	4/07/2019	4.1	<5	<1	3	<5	<5	<0.1	<2	6
HS1-04	HS1-04	Soil	5/07/2019	5.4	<5	<1	4	<5	6	<0.1	<2	7
HS1-05	HS1-05	Soil	5/07/2019	12.8	<5	<1	9	<5	7	<0.1	9	16
HS1-06	HS1-06	Soil	5/07/2019	7.9	<5	<1	9	<5	10	<0.1	<2	9
HS1-07	HS1-07	Soil	5/07/2019	5.7	<5	<1	8	<5	13	<0.1	2	29
HS1-08	HS1-08	Soil	5/07/2019	4.3	<5	<1	15	<5	16	<0.1	<2	14
HS1-09	HS1-09	Soil	5/07/2019	1.9	<5	<1	6	<5	12	<0.1	<2	32
HS1-10	HS1-10	Soil	5/07/2019	8.8	<5	<1	10	<5	12	<0.1	<2	29
HS1-11	HS1-11	Soil	5/07/2019	10.7	<5	<1	17	23	26	<0.1	3	162
HS1-12	HS1-12	Soil	5/07/2019	6.3	<5	<1	6	<5	8	<0.1	<2	12
HS1-13	HS1-13	Soil	5/07/2019	4.6	<5	<1	4	<5	5	<0.1	<2	11
HS1-14	HS1-14	Soil	5/07/2019	6.7	<5	<1	26	21	33	<0.1	<2	18
HS1-15	HS1-15	Soil	5/07/2019	2.9	<5	<1	2	<5	<5	<0.1	<2	<5
HS1-16	HS1-16	Soil	5/07/2019	5.5	<5	<1	13	13	19	<0.1	<2	8
HS1-17	HS1-17	Soil	5/07/2019	2.8	<5	<1	11	<5	28	<0.1	<2	<5
HS1-18	HS1-18	Soil	5/07/2019	3.2	<5	<1	18	<5	24	<0.1	<2	6
HS1-19	HS1-19	Soil	5/07/2019	4.2	<5	<1	15	<5	9	<0.1	<2	32
HS1-20	HS1-20	Soil	5/07/2019	3.6	<5	<1	5	<5	8	<0.1	<2	9
HS1-21	HS1-21	Soil	5/07/2019	4.3	<5	<1	8	<5	10	<0.1	<2	14
HS1-22	HS1-22	Soil	5/07/2019	5.5	<5	<1	5	<5	9	<0.1	<2	12
HS1-23	HS1-23	Soil	5/07/2019	1	<5	<1	2	<5	<5	<0.1	<2	<5
HS1-24	HS1-24	Soil	5/07/2019	5.8	<5	<1	6	<5	<5	<0.1	<2	9
HS1-25	HS1-25	Soil	5/07/2019	3.8	<5	<1	16	<5	19	<0.1	<2	7
HS1-26	HS1-26	Soil	5/07/2019	2.9	<5	<1	4	<5	<5	<0.1	<2	<5
HS1-27	HS1-27	Soil	5/07/2019	5.3	<5	<1	23	<5	25	<0.1	<2	6
HS1-28	HS1-28	Soil	5/07/2019	7.3	<5	<1	9	<5	10	<0.1	<2	<5
HS1-29	HS1-29	Soil	5/07/2019	8.5	<5	<1	6	<5	6	<0.1	2	12
HS1-30	HS1-30	Soil	5/07/2019	4.1	<5	<1	7	<5	11	<0.1	<2	<5
HS1-31	HS1-31	Soil	5/07/2019	3.6	<5	<1	20	<5	20	<0.1	<2	6

		Moisture Content	Heavy Metals							
		Moisture Content	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		1	5	1	2	5	5	0.1	2	5
NEPM 2013 Table 1A(1) HIL D Soil			3000	900		240000	1500	730	6000	400000
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)			160			280	1800		460	920
Field_ID	**Location_Code**	**Matrix_Description**	**Sample_Date**							
HS2-01	HS2-01	Soil	27/06/2019	12	<5	<1	15	5	19	<0.1	<2	45
HS2-02	HS2-02	Soil	27/06/2019	9.7	<5	<1	22	<5	22	<0.1	<2	6
HS2-03	HS2-03	Soil	27/06/2019	8.8	<5	<1	19	<5	22	<0.1	<2	8
HS2-04	HS2-04	Soil	27/06/2019	6.4	<5	<1	17	<5	18	<0.1	<2	11
HS2-05	HS2-05	Soil	28/06/2019	8.2	<5	<1	17	<5	16	<0.1	<2	<5
HS2-06	HS2-06	Soil	28/06/2019	6.2	<5	<1	10	<5	11	<0.1	<2	<5
HS2-07	HS2-07	Soil	28/06/2019	12.8	<5	<1	6	<5	6	<0.1	<2	<5
HS2-08	HS2-08	Soil	28/06/2019	8.3	<5	<1	17	<5	20	<0.1	<2	<5
HS2-09	HS2-09	Soil	28/06/2019	5.5	<5	<1	18	<5	20	<0.1	<2	5
HS2-10	HS2-10	Soil	28/06/2019	10.2	<5	<1	10	<5	7	<0.1	<2	<5
HS2-11	HS2-11	Soil	1/07/2019	13.3	<5	<1	11	<5	19	<0.1	<2	34
HS2-12	HS2-12	Soil	1/07/2019	8.1	<5	<1	9	<5	15	<0.1	<2	20
HS2-13	HS2-13	Soil	1/07/2019	12.2	<5	<1	10	8	11	<0.1	7	65
HS2-14	HS2-14	Soil	1/07/2019	5.5	<5	2	10	157	339	0.1	<2	392
HS2-15	HS2-15	Soil	1/07/2019	9.1	<5	2	14	28	139	<0.1	<2	316
HS2-16	HS2-16	Soil	1/07/2019	5.1	<5	<1	17	<5	32	<0.1	<2	19
HS2-17	HS2-17	Soil	1/07/2019	2.6	<5	<1	17	<5	20	<0.1	<2	9
HS2-18	HS2-18	Soil	1/07/2019	7.1	<5	<1	8	<5	12	<0.1	<2	14
HS2-19	HS2-19	Soil	1/07/2019	3.8	<5	<1	8	<5	16	<0.1	<2	8
HS2-20	HS2-20	Soil	1/07/2019	6.5	<5	<1	24	<5	26	<0.1	<2	9
HS2-21	HS2-21	Soil	1/07/2019	4.7	<5	<1	18	<5	20	<0.1	<2	<5
HS2-22	HS2-22	Soil	1/07/2019	5.2	<5	<1	17	<5	31	<0.1	<2	6
HS2-23	HS2-23	Soil	1/07/2019	9.1	<5	<1	22	<5	37	<0.1	<2	<5
HS2-24	HS2-24	Soil	1/07/2019	3	<5	<1	19	<5	21	<0.1	<2	31
HS2-25	HS2-25	Soil	1/07/2019	3.9	<5	<1	16	<5	20	<0.1	<2	5
HS2-26	HS2-26	Soil	1/07/2019	7.7	<5	<1	18	<5	20	<0.1	<2	<5
HS2-27	HS2-27	Soil	1/07/2019	1.2	<5	<1	11	<5	34	<0.1	<2	12
HS2-28	HS2-28	Soil	1/07/2019	7.6	<5	<1	10	8	23	<0.1	2	111
HS2-29	HS2-29	Soil	1/07/2019	7.3	<5	<1	3	<5	<5	<0.1	<2	<5
HS2-30	HS2-30	Soil	1/07/2019	6.9	<5	<1	9	<5	16	<0.1	<2	22
HS2-31	HS2-31	Soil	1/07/2019	8.7	<5	<1	21	9	38	<0.1	<2	26
HS2-32	HS2-32	Soil	1/07/2019	6.8	<5	<1	4	<5	5	<0.1	<2	8
HS2-33	HS2-33	Soil	1/07/2019	9.7	<5	<1	25	<5	26	<0.1	<2	10
HS2-34	HS2-34	Soil	1/07/2019	6.8	<5	<1	9	20	17	<0.1	2	100
HS2-35	HS2-35	Soil	2/07/2019	7.3	<5	<1	18	<5	40	<0.1	<2	26
HS2-36	HS2-36	Soil	2/07/2019	4.1	<5	<1	49	<5	10	<0.1	21	26
HS2-37	HS2-37	Soil	2/07/2019	6.7	<5	<1	21	<5	21	<0.1	<2	62
HS2-38	HS2-38	Soil	2/07/2019	3.9	<5	<1	9	14	26	<0.1	<2	58
HS2-39	HS2-39	Soil	2/07/2019	5.9	<5	<1	6	31	67	<0.1	<2	108
HS2-40	HS2-40	Soil	2/07/2019	3.6	<5	<1	3	<5	5	<0.1	<2	<5

		Moisture Content	Heavy Metals							
		Moisture Content	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		1	5	1	2	5	5	0.1	2	5
NEPM 2013 Table 1A(1) HIL D Soil			3000	900		240000	1500	730	6000	400000
NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)			160			280	1800		460	920
Field_ID	**Location_Code**	**Matrix_Description**	**Sample_Date**							
HS3-01	HS3-01	Soil	2/07/2019	11.6	<5	<1	13	10	16	<0.1	7	63
HS3-02	HS3-02	Soil	2/07/2019	8.4	<5	<1	8	7	17	<0.1	3	57
HS3-03	HS3-03	Soil	2/07/2019	13.4	<5	<1	11	6	9	<0.1	4	23
HS3-04	HS3-04	Soil	2/07/2019	15.7	<5	<1	11	5	12	<0.1	3	28
HS3-05	HS3-05	Soil	2/07/2019	14.7	6	<1	22	12	13	<0.1	9	49
HS3-06	HS3-06	Soil	2/07/2019	12	<5	<1	6	6	8	<0.1	2	85
HS3-07	HS3-07	Soil	2/07/2019	12.4	<5	<1	10	6	12	<0.1	4	44
HS3-08	HS3-08	Soil	3/07/2019	7.8	<5	<1	4	5	11	<0.1	<2	26
HS3-09	HS3-09	Soil	3/07/2019	1.8	<5	<1	5	<5	10	<0.1	2	30
HS3-10	HS3-10	Soil	3/07/2019	5.3	<5	<1	6	<5	30	<0.1	<2	<5
HS3-11	HS3-11	Soil	3/07/2019	6.8	<5	<1	9	<5	7	<0.1	4	64
HS3-12	HS3-12	Soil	3/07/2019	5.2	<5	<1	9	8	24	<0.1	3	165
HS3-13	HS3-13	Soil	3/07/2019	8.5	<5	<1	7	7	10	<0.1	2	80
HS3-14	HS3-14	Soil	3/07/2019	1.4	<5	<1	8	<5	<5	<0.1	<2	8
HS3-15	HS3-15	Soil	3/07/2019	3	<5	<1	4	<5	<5	<0.1	<2	<5
HS3-16	HS3-16	Soil	3/07/2019	7.4	<5	<1	24	41	32	<0.1	6	218
HS3-17	HS3-17	Soil	3/07/2019	8.6	<5	<1	11	<5	11	<0.1	3	23
HS3-18	HS3-18	Soil	3/07/2019	4.6	<5	<1	8	<5	9	<0.1	<2	10
HS3-19	HS3-19	Soil	3/07/2019	5.2	<5	<1	6	<5	<5	<0.1	<2	7
HS3-20	HS3-20	Soil	3/07/2019	6.1	<5	<1	8	<5	10	<0.1	<2	6
HS3-21	HS3-21	Soil	3/07/2019	3.3	<5	<1	5	<5	<5	<0.1	<2	8
HS3-22	HS3-22	Soil	3/07/2019	5.1	<5	<1	10	<5	9	<0.1	<2	6
HS3-23	HS3-23	Soil	3/07/2019	5.6	<5	<1	8	<5	8	<0.1	3	16
HS3-24	HS3-24	Soil	3/07/2019	1.8	<5	<1	4	<5	5	<0.1	<2	<5
HS3-25	HS3-25	Soil	3/07/2019	3.8	<5	<1	14	<5	17	<0.1	<2	12
HS3-26	HS3-26	Soil	3/07/2019	2.6	<5	<1	5	<5	6	<0.1	<2	10
HS3-27	HS3-27	Soil	4/07/2019	5.3	<5	<1	17	6	23	<0.1	<2	82
HS3-28	HS3-28	Soil	4/07/2019	4	<5	<1	16	<5	32	<0.1	<2	13
HS3-29	HS3-29	Soil	4/07/2019	5.1	<5	<1	8	<5	<5	<0.1	<2	<5
HS3-30	HS3-30	Soil	4/07/2019	6.5	<5	<1	4	<5	<5	<0.1	<2	11
HS3-31	HS3-31	Soil	4/07/2019	7	<5	<1	5	<5	7	<0.1	<2	7
HS3-32	HS3-32	Soil	4/07/2019	4.8	<5	<1	10	<5	10	<0.1	<2	6
HS3-33	HS3-33	Soil	4/07/2019	5.8	<5	<1	7	<5	7	<0.1	<2	10
HS3-34	HS3-34	Soil	4/07/2019	3.5	<5	<1	6	<5	8	<0.1	<2	<5
HS3-35	HS3-35	Soil	4/07/2019	6.2	<5	<1	2	<5	5	<0.1	<2	<5
HS3-36	HS3-36	Soil	4/07/2019	8.7	<5	<1	<2	<5	<5	<0.1	<2	<5
HS3-37	HS3-37	Soil	4/07/2019	8.2	<5	<1	6	<5	<5	<0.1	<2	<5
HS3-38	HS3-38	Soil	4/07/2019	11.4	<5	<1	10	<5	5	<0.1	2	7
HS3-39	HS3-39	Soil	4/07/2019	10.7	8	<1	29	7	9	<0.1	6	24
HS3-40	HS3-40	Soil	4/07/2019	1.9	<5	<1	5	<5	7	<0.1	<2	<5
HS3-41	HS3-41	Soil	4/07/2019	2.5	<5	<1	6	6	11	<0.1	<2	12
HS3-42	HS3-42	Soil	4/07/2019	4.7	<5	<1	24	<5	19	<0.1	3	12
HS3-43	HS3-43	Soil	4/07/2019	5.9	<5	<1	18	<5	18	<0.1	<2	11
HS3-44	HS3-44	Soil	4/07/2019	2.2	<5	<1	21	<5	22	<0.1	<2	8
HS3-45	HS3-45	Soil	4/07/2019	2.8	<5	<1	20	<5	19	<0.1	2	9

	Heavy Metals							
	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL								
ANZG (2018) Freshwater 95% toxicant DGVs		0.2		1.4	3.4	0.6	11	8
ANZG (2018) Marine water 95% toxicant DGVs		5.5		1.3	4.4	0.4	70	15
ADWG 2018 Health	10	2		2000	10	1	20	
NEPM 2013 Table 1C GILs, Fresh Waters		0.2		1.4	3.4	0.06	11	8
NEPM 2013 Table 1C GILs, Marine Waters		0.7		1.3	4.4	0.1	7	15
Site_ID	Field_ID	Sampled_Date_Time	Matrix_Type								
IA198300 - RZM	MW01	25/06/2019	WATER	3	<0.1	<1	1	<1	<0.1	11	218
IA198300 - RZM	MW02	25/06/2019	WATER	2	<0.1	<1	1	<1	<0.1	34	8
IA198300 - RZM	MW03	27/06/2019	WATER	2	<0.1	<1	2	<1	<0.1	15	114
IA198300 - RZM	MW04	28/06/2019	WATER	2	0.6	8	19	1	<0.1	70	607
IA198300 - RZM	MW05	28/06/2019	WATER	<1	<0.1	3	<1	<1	<0.1	29	20
IA198300 - RZM	MW06	28/06/2019	WATER	10	<0.1	6	<1	<1	<0.1	6	49
IA198300 - RZM	MW07	26/06/2019	WATER	2	<0.1	2	<1	<1	<0.1	<1	<5
IA198300 - RZM	MW08	26/06/2019	WATER	<1	<0.1	<1	<1	<1	<0.1	<1	<5
IA198300 - RZM	MW09	26/06/2019	WATER	17	<0.1	2	<1	<1	<0.1	5	<5
IA198300 - RZM	MW10	26/06/2019	WATER	<1	<0.1	<1	<1	<1	<0.1	<1	<5
IA198300 - RZM	MW11	27/06/2019	WATER	<1	<0.1	<1	<1	<1	<0.1	<1	<5
IA198300 - RZM	MW12	27/06/2019	WATER	1	<0.1	<1	1	<1	<0.1	3	481
IA198300 - RZM	MW13	27/06/2019	WATER	<1	0.2	<1	2	<1	<0.1	4	164

	Moisture Content	Total Heavy Metals							
	Moisture Content	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	1	5	1	2	5	5	0.1	2	5
ANZG (2018) - Sediment DGV High		70	10	370	270	220	1	52	410
ANZG (2018) - Sediment DGV		20	1.5	80	65	50	0.15	21	200

Field_ID	Location_Code	Matrix_Description	Sample_Date								
SED-01	SED-01	Sediment	24/06/2019	44.1	<5	<1	22	13	14	<0.1	16	102
SED-02	SED-02	Sediment	24/06/2019	44	6	<1	29	21	18	<0.1	23	146
SED-03	SED-03	Sediment	24/06/2019	62.9	20	<1	22	20	245	<0.1	11	134
SED-04	SED-04	Sediment	24/06/2019	44.1	<5	<1	14	10	15	<0.1	6	113
SED-05	SED-05	Sediment	24/06/2019	34.4	<5	<1	11	9	13	<0.1	4	121
SED-06	SED-06	Sediment	24/06/2019	58.2	14	5	63	114	122	0.3	15	825
SED-07	SED-07	Sediment	24/06/2019	28.4	<5	<1	22	40	53	<0.1	9	330
SED-08	SED-08	Sediment	24/06/2019	51.6	<5	<1	14	26	29	<0.1	4	129
SED-09	SED-09	Sediment	24/06/2019	31.7	<5	<1	7	<5	9	0.2	4	94
SED-10	SED-10	Sediment	26/06/2019	37.6	<5	<1	25	19	31	<0.1	6	150
SED-11	SED-11	Sediment	24/06/2019	71.1	9	<1	38	29	20	0.1	42	211
SED-12	SED-12	Sediment	24/06/2019	35.4	6	<1	40	17	15	<0.1	14	40
SED-13	SED-13	Sediment	24/06/2019	77.2	6	<1	35	31	20	<0.1	37	291
SED-14	SED-14	Sediment	24/06/2019	68.1	10	<1	68	53	82	0.2	29	377
SED-15	SED-15	Sediment	25/06/2019	37.2	<5	<1	12	10	8	<0.1	12	87
SED-16	SED-16	Sediment	26/06/2019	67.1	15	<1	53	39	38	0.2	42	265
SED-17	SED-17	Sediment	26/06/2019	47	8	<1	59	31	128	0.1	27	273
SED-18	SED-18	Sediment	26/06/2019	41.9	<5	<1	24	14	16	<0.1	8	50
SED-19	SED-19	Sediment	26/06/2019	67.6	9	<1	13	37	9	<0.1	24	461
SED-20	SED-20	Sediment	26/06/2019	20.2	<5	<1	16	11	6	<0.1	3	10
SED-21	SED-21	Sediment	3/07/2019	50.3	7	<1	46	34	12	0.1	47	94
SED-22	SED-22	Sediment	2/07/2019	63.4	7	<1	37	25	16	<0.1	36	154
SED-23	SED-23	Sediment	2/07/2019	46.5	5	<1	50	34	10	<0.1	54	64
SED-24	SED-24	Sediment	2/07/2019	41.1	<5	<1	55	37	7	<0.1	61	66
SED-25	SED-25	Sediment	2/07/2019	44.5	6	<1	56	39	11	0.1	58	75
SED-26	SED-26	Sediment	2/07/2019	42.6	5	<1	63	41	8	<0.1	70	64
SED-27	SED-27	Sediment	2/07/2019	48.4	6	<1	48	35	13	0.1	48	69
SED-28	SED-28	Sediment	2/07/2019	46.4	10	<1	36	28	14	0.1	38	72
SED-29	SED-29	Sediment	2/07/2019	48.8	6	<1	48	34	14	0.1	47	68
SED-30	SED-30	Sediment	3/07/2019	47.2	<5	<1	65	44	9	<0.1	68	71
SED-31	SED-31	Sediment	3/07/2019	52.8	8	<1	44	35	14	0.1	47	82
SED-B01	SED-B01	Sediment	3/07/2019	44.1	6	<1	51	36	12	<0.1	55	74
SED-B02	SED-B02	Sediment	3/07/2019	39.6	11	<1	34	23	8	<0.1	41	65
SED-B03	SED-B03	Sediment	3/07/2019	47.2	8	<1	64	46	14	0.1	64	80
SED-B04	SED-B04	Sediment	4/07/2019	43.6	8	<1	45	33	16	<0.1	47	68
SED-B05	SED-B05	Sediment	4/07/2019	41.8	5	<1	50	39	8	<0.1	56	60
SED-B06	SED-B06	Sediment	4/07/2019	27.8	<5	<1	22	18	6	<0.1	21	36

Comments:
ANZG (2018) - Defualt guideline values for sediment are a revision of the ANZECC 2000 ISQG Low and High Trgger Values for Sediment

				Dissolved Heavy Metals							
				Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL											
ANZG (2018) Freshwater 95% toxicant DGVs					0.2		1.4	3.4	0.6	11	8
ANZG (2018) Marine water 95% toxicant DGVs					5.5		1.3	4.4	0.4	70	15
Site_ID	**Field_ID**	**Matrix**	**Sampled_Date**								
IA198300	SW-01	Surface Water	24/06/2019	<1	<0.1	<1	4	<1	<0.1	1	54
IA198300	SW-02	Surface Water	24/06/2019	<1	<0.1	1	4	1	<0.1	2	63
IA198300	SW-03	Surface Water	24/06/2019	<1	<0.1	<1	4	1	<0.1	2	51
IA198300	SW-04	Surface Water	24/06/2019	<1	0.3	<1	2	<1	<0.1	2	311
IA198300	SW-05	Surface Water	24/06/2019	<1	0.3	<1	3	<1	<0.1	8	605
IA198300	SW-06	Surface Water	24/06/2019	<1	0.1	<1	4	<1	<0.1	1	115
IA198300	SW-07	Surface Water	24/06/2019	<1	<0.1	<1	4	<1	<0.1	<1	35
IA198300	SW-08	Surface Water	24/06/2019	<1	<0.1	<1	2	<1	<0.1	2	129
IA198300	SW-09	Surface Water	24/06/2019	<1	0.8	<1	6	<1	<0.1	16	1200
IA198300	SW-10	Surface Water	25/06/2019	<1	0.6	<1	<1	<1	<0.1	47	2140
IA198300	SW-11	Surface Water	24/06/2019	<1	<0.1	<1	3	<1	<0.1	4	59
IA198300	SW-12	Surface Water	24/06/2019	<1	<0.1	<1	3	<1	<0.1	6	112
IA198300	SW-13	Surface Water	24/06/2019	<1	<0.1	<1	2	<1	<0.1	9	234
IA198300	SW-14	Surface Water	24/06/2019	<1	<0.1	1	3	<1	<0.1	2	24
IA198300	SW-15	Surface Water	25/06/2019	<1	0.1	<1	3	<1	<0.1	4	29
IA198300	SW-16	Surface Water	25/06/2019	<1	<0.1	<1	<1	<1	<0.1	34	1500
IA198300	SW-17	Surface Water	25/06/2019	<1	0.2	<1	<1	<1	<0.1	43	1740
IA198300	SW-18	Surface Water	25/06/2019	<1	<0.1	<1	<1	<1	<0.1	41	1710
IA198300	SW-19	Surface Water	25/06/2019	<1	<0.1	<1	<1	<1	<0.1	42	1910
IA198300	SW-20	Surface Water	25/06/2019	<1	0.5	<1	<1	<1	<0.1	38	1850
IA198300	SW-21	Surface Water	3/07/2019	<1	<0.1	<1	<1	<1	<0.1	2	6
IA198300	SW-22	Surface Water	2/07/2019	<1	<0.1	<1	<1	<1	<0.1	2	10
IA198300	SW-23	Surface Water	2/07/2019	<1	<0.1	<1	<1	<1	<0.1	2	5
IA198300	SW-24	Surface Water	2/07/2019	<1	<0.1	<1	<1	<1	<0.1	2	6
IA198300	SW-25	Surface Water	2/07/2019	<1	<0.1	<1	<1	<1	<0.1	3	<5
IA198300	SW-26	Surface Water	2/07/2019	1	<0.1	<1	3	<1	<0.1	2	6
IA198300	SW-27	Surface Water	2/07/2019	1	<0.1	<1	<1	<1	<0.1	2	5
IA198300	SW-28	Surface Water	2/07/2019	1	<0.1	<1	1	<1	<0.1	2	5
IA198300	SW-29	Surface Water	2/07/2019	1	<0.1	<1	<1	<1	<0.1	2	<5
IA198300	SW-30	Surface Water	2/07/2019	1	<0.1	<1	<1	<1	<0.1	1	<5
IA198300	SW-31	Surface Water	3/07/2019	<1	<0.1	<1	<1	<1	<0.1	2	5
IA198300	SW-34	Surface Water	25/06/2019	<1	<0.1	<1	4	<1	<0.1	3	31
IA198300	SW-35	Surface Water	25/06/2019	<1	<0.1	<1	<1	<1	<0.1	40	1290
IA198300	SW-36	Surface Water	25/06/2019	<1	<0.1	<1	<1	<1	<0.1	42	1880
IA198300	SW-B01	Surface Water	3/07/2019	1	<0.1	<1	1	<1	<0.1	2	7
IA198300	SW-B02	Surface Water	3/07/2019	1	<0.1	<1	<1	<1	<0.1	2	7
IA198300	SW-B03	Surface Water	3/07/2019	<10	<1	<10	<10	<10	<0.1	<10	<50
IA198300	SW-B04	Surface Water	4/07/2019	<10	<1	<10	<10	<10	<0.1	<10	<50
IA198300	SW-B05	Surface Water	4/07/2019	2	<0.1	<1	<1	<1	<0.1	2	7
IA198300	SW-B06	Surface Water	4/07/2019	2	<0.1	<1	<1	<1	<0.1	2	8

Comments:
ANZG (2018) Guidelines are a revision of the ANZECC and ARMCANZ (2000) Guidelines

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