REPORT TO

MERIDEN SCHOOL

ON

SOIL CONTAMINATION SCREENING

FOR

PROPOSED ADMINISTRATION AND STUDENT CENTRE OF MERIDEN SCHOOL

AT

16 MARGARET STREET, STRATHFIELD, NSW 2135

Date: 30 May 2019

Ref: E30910KGrpt2

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Report prepared by:

Para Bokalawela
Senior Environment Engineer

Report reviewed by:

Adrian Kingswell
Principal Environment Consultant

For and on behalf of
EIS
PO BOX 976
NORTH RYDE BC NSW 1670

Executive Summary

Allen Jack+Cottier (AJC) on behalf of Meriden School ('the client') commissioned Environmental Investigation Services (EIS)[1] to undertake a Soil Contamination Screening (Screening) for the proposed Administration and Student Centre of Meriden School located within the property at 16 Margaret Street, Strathfield. For the purpose of this report, the screening area has been referred to as 'the site', whilst the whole property at 16 Margaret Street, Strathfield has been referred to as 'the property'. The site location is shown on Figure 1 and the assessment was confined to the approximate site boundaries as shown on Figure 2.

EIS have undertaken a Preliminary Environmental Site Assessment at the wider property and a report (Ref: E30910KGrpt[2]) was issued on 3 November 2017. EIS understand that the site (which forms a part of the property) covers an area of approximately 500m^2.

EIS understand that the proposed development includes demolition of the existing building, removal of some of the trees within the site and construction of a new two storey building, designed for administration and student centre, with no basement.

The primary aims of the screening were to identify potentially contaminating activities based on the information provided in EIS 2017 report and make a screening of the soil contamination conditions. Due to the access restrictions for a drill-rig, the groundwater investigation has been excluded from the scope of work. The screening was undertaken generally in accordance with an EIS proposal (Ref: EP49475BG-Rev) of 14 May 2019 and written acceptance from the client of 15 May 2019.

The EIS 2017 report was prepared for the wider property that covers an area of approximately 3,610m^2. The report identified elevated lead concentrations in samples obtained from fill-soil at the western section of the property (outside of the current investigation area). The report recommended additional works to be undertaken in order to make the property suitable for the proposed development. EIS were not involved in this project after the preparation of the EIS 2017 report.

The site is located in a predominantly residential area of Strathfield. The site is located approximately 385m to the south of a stormwater channel that runs into Powells Creek and eventually into Homebush Bay. At the time of the soil sampling on 16 May 2019 the site was occupied by a single storey brick/fibro building with tile roof at the southern section of the site. The building was used as an office (the business services centre for the school). A concrete paved access path to the building was located along the eastern boundary of the site. The eastern section of the site was generally grass covered with a few large trees along the eastern boundary. The western section of the site was undergoing some new landscaping activities. Apart from the eastern boundary the other boundaries of the site were not defined or fenced. Selected site photographs obtained during the soil sampling are attached in the appendices.

A time line summary of the historical land uses and activities extracted from the EIS 2017 report is presented in the table below:

Year(s)	Potential Land Use / Activities
1810	Part of original larger land grant.
1894 to 1944	Residential with landscaped gardens.
1944 to present	School.

The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated. Pesticides may have been used beneath the buildings and/or around the site. Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/ structures on site.

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] EIS 2017 Report

Samples were obtained from four locations (BH201, BH202, BH203 and SS1) as shown on the attached Figure 2 for the current screening in 2019. Samples were also obtained from within this area from two locations (BH1 and BH2) during the 2017 investigation. This number of locations (both 2017 and 2019 together) met the minimum sampling density as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[3].

Drill rig access was restricted by the ongoing landscaping activities to the immediate west of the site. Therefore samples were collected using a hand auger and the installation of groundwater wells was not possible. Soil samples were obtained on 16 May 2019 in accordance with the standard sampling procedure (SSP) attached in the appendices. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP. On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

The data collected from the site indicated the presence of targeted contaminants in fill and natural soils above the assessment criteria. The identified soil impact is likely to be associated with impacted fill soil imported on to the site.

The screening has identified the following data gaps:

- Assessment of groundwater contamination conditions; and
- The presence or otherwise of hazardous building materials in the existing building has not been assessed.

Based on the findings of the screening, EIS are of the opinion that the site can be made suitable for the proposed development subject to successful implementation of following recommendations:

- Undertake groundwater contamination assessment;
- A Hazardous Building Material assessment should be undertaken of the building prior to demolition. If the presence of this material is confirmed it should be removed as soon as possible and validate (i.e. issue a clearance certificate);
- Prepare a Remediation Action Plan (RAP) to include a procedure for removing and of the identified contamination; and
- Once all the contamination issue identified in the RAP has been addressed (i.e. removed and validated) prepare a site validation report in order to demonstrate the identified contamination has no longer a risk.

Undertaking a waste classification for the off-site disposal of the material in accordance with the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014)[4] will be required during the site remediation process.

In the event unexpected conditions are encountered during development work or between sampling locations that may pose a contamination risk, all works should stop and an environmental consultant should be engaged to inspect the site and address the issue.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.

[3] NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines.* (referred to as EPA Sampling Design Guidelines 1995)

[4] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

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Attachments

Abbreviations

Asbestos Fines/Fibrous Asbestos	AF/FA
Ambient Background Concentrations	ABC
Added Contaminant Limits	ACL
Asbestos Containing Material	ACM
Area of Environmental Concern	AEC
Australian Height Datum	AHD
Acid Sulfate Soil	ASS
Below Ground Level	BGL
Benzo(a)pyrene Toxicity Equivalent Factor	BaP TEQ
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Contaminated Land Management	CLM
Contaminant(s) of Potential Concern	CoPC
Chain of Custody	COC
Conceptual Site Model	CSM
Data Quality Indicator	DQI
Data Quality Objective	DQO
Ecological Investigation Level	EIL
Environmental Investigation Services	EIS
Ecological Screening Level	ESL
Environmental Management Plan	EMP
Excavated Natural Material	ENM
Environment Protection Authority	EPA
Environmental Site Assessment	ESA
Ecological Screening Level	ESL
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General Approval of Immobilisation	GAI
Health Investigation Level	HILs
Health Screening Level	HSLs
International Organisation of Standardisation	ISO
Lab Control Spike	LCS
Map Grid of Australia	MGA
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCP
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Polychlorinated Biphenyls	PCBs
Photo-ionisation Detector	PID
Protection of the Environment Operations	POEO
Practical Quantitation Limit	PQL
Quality Assurance	QA
Quality Control	QC
Remediation Action Plan	RAP
Relative Percentage Difference	RPD
Site Assessment Criteria	SAC
Sampling, Analysis and Quality Plan	SAQP
Site Specific Assessment	SSA
Source, Pathway, Receptor	SPR
Specific Contamination Concentration	SCC
Standard Sampling Procedure	SSP
Trip Blank	TB
Total Recoverable Hydrocarbons	TRH
Volatile Organic Compounds	VOC

World Health Organisation	**WHO**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millivolts	**mV**
Millilitres	**ml or mL**
Milliequivalents	**meq**
micro Siemens per Centimetre	**µS/cm**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Allen Jack+Cottier (AJC) on behalf of Meriden School ('the client') commissioned Environmental Investigation Services (EIS)[5] to undertake a Soil Contamination Screening (Screening) for the proposed Administration and Student Centre of Meriden School located within the property at 16 Margaret Street, Strathfield.

For the purpose of this report, the screening area has been referred to as 'the site', whilst the whole property at 16 Margaret Street, Strathfield has been referred to as 'the property'. The site location is shown on Figure 1 and the assessment was confined to the approximate site boundaries as shown on Figure 2.

EIS have undertaken a Preliminary Environmental Site Assessment at the wider property and a report (Ref: E30910KGrpt[6]) was issued on 3 November 2017. EIS understand that the site (which forms a part of the property) covers an area of approximately 500m^2.

EIS are currently in a transitional phase of re-branding and will commence trading as JK Environments in 2019. JK Environments, like EIS, will function as the environmental division of Jeffery and Katauskas Pty Ltd and will continue to operate alongside JK Geotechnics.

1.1 Proposed Development Details

EIS understand that the proposed development includes demolition of the existing building, removal of some of the trees within the site and construction of a new two storey building, designed for administration and student centre, with no basement.

1.2 Aims and Objectives

The primary aims of the screening were to identify potentially contaminating activities based on the information provided in EIS 2017 report and make a screening of the soil contamination conditions. Due to the access restrictions for a drill-rig, the groundwater investigation has been excluded from the scope of work.

The screening objectives were to:

- Assess the soil contamination conditions via implementation of a soil sampling and analysis program;
- Extract the conceptual site model (CSM) from the EIS 2017 report;
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether further intrusive investigation and/or remediation is required.

[5] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[6] EIS 2017 Report

1.3 Scope of Work

The screening was undertaken generally in accordance with an EIS proposal (Ref: EP49475BG-Rev) of 14 May 2019 and written acceptance from the client of 15 May 2019. The scope of work included the following:

- Review of previous investigation report prepared by EIS in 2017;
- Extract the CSM and other relevant information from the EIS 2017 report;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[7], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[8] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[9]. A list of reference documents/guidelines is included in the appendices.

[7] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[8] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[9] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Background

2.1.1 Preliminary Environmental Site Assessment – EIS 2017

The EIS 2017 report was prepared for the wider property that covers an area of approximately 3,610m^2. The report identified elevated lead concentrations in samples obtained from fill-soil at the western section of the property (outside of the current investigation area). The report recommended additional works to be undertaken in order to make the property suitable for the proposed development. EIS were not involved in this project after the preparation of the EIS 2017 report.

2.2 Site Identification

Table 2-1: Site Identification

Site Address:	16 Margaret Street, Strathfield, NSW 2135
Lot & Deposited Plan:	Part of the Lot 1 in DP723946
Current Land Use:	School (landscaped area)
Proposed Land Use:	School (Administration and Student Centre)
Local Government Authority:	Strathfield council
Site Area (m^2):	Approximately 500m^2
RL (AHD in m) (approx.):	23
Geographical Location (decimal degrees) (approx.):	Latitude: -33. 784843 Longitude: 151. 091377
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.3 Site Location and Regional Setting

The site is located in a predominantly residential area of Strathfield. The site is located approximately 385m to the south of a stormwater channel that runs into Powells Creek and eventually into Homebush Bay.

2.4 Topography

The site is situated within gently undulating topography on a hillside that gently slopes down to the north-east at approximately 3° to 4°. The site has a northern frontage on Margaret Street.

2.5 Site Inspection

At the time of the soil sampling on 16 May 2019 the site was occupied by a single storey brick/fibro building with tile roof at the southern section of the site. The building was used as an office (the business services centre for the school). A concrete paved access path to the building was located along the eastern boundary of the site. The eastern section of the site was generally grass covered with a few large trees along the eastern boundary. The western section of the site was undergoing some new landscaping activities. Apart from the eastern boundary the other boundaries of the site were not defined or fenced.

Selected site photographs obtained during the soil sampling are attached in the appendices.

2.5.1 Boundary Conditions, Soil Stability and Erosion

Obvious soil erosion was not observed at the approximate site boundaries.

2.5.2 Visible or Olfactory Indicators of Contamination

Visible signs or olfactory indicators of contamination were not observed within the site.

2.5.3 Presence of Drums/Chemicals, Waste and Fill Material

Drums, chemicals, waste material or fill material were not observed within the site.

2.5.4 Drainage and Services

Surface water from the site is likely to flow into a low lying area at the north of the site and eventually flow into Cataract River.

2.5.5 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds.

2.5.6 Landscaped Areas and Visible Signs of Plant Stress

The majority of the site was grassed. Large trees were located along the eastern section of the site. Obvious tree dieback or areas of stressed vegetation were not observed within the site.

2.6 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – Margaret Street and Meriden Senior School beyond the street;
- South – Meriden Prep School and associated building;
- East – Residential properties; and
- West – Driveway and landscaped areas of the Meriden Prep School (under construction) and residential properties beyond that.

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.7 Underground Services

The 'Dial Before You Dig' (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. No major services were identified that would be expected to act as preferential pathways for contamination migration.

3 SUMMARY OF SITE HISTORY INFORMATION

A time line summary of the historical land uses and activities extracted from the EIS 2017 report is presented in the table below:

Table 3-1: Summary of Historical Land Uses

Year(s)	Potential Land Use / Activities
1810	Part of original larger land grant.
1894 to 1944	Residential with landscaped gardens.
1944 to present	School.

4 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is extracted from the EIS 2017 report. A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 8.

4.1 Potential Contamination Sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are presented in the following table:

Table 4-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material – The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site.	Heavy metals and OCPs
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/ structures on site.	Asbestos, lead and PCBs

4.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 4-2: CSM

Potential mechanism for contamination	Potential mechanisms for contamination include: • Fill material – importation of impacted material, 'top-down' impacts (e.g. placement of fill, leaching from surficial material etc.), or sub-surface release (e.g. impacts from buried material); • Use of pesticides – 'top-down' and spills (e.g. during normal use, application and/or improper storage); and • Hazardous building materials – 'top-down' (e.g. demolition resulting in surficial impacts in unpaved areas).
Affected media	Soil and groundwater have been identified as potentially affected media.

Receptor identification	Human receptors include site occupants/users, construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users, and recreational water users within Homebush Bay. Ecological receptors include freshwater ecology in Homebush Bay.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and use of unpaved areas (i.e. the gardens) and basement (i.e. vapour inhalation or incidental contact with groundwater seepage). Potential exposure pathways for ecological receptors include primary contact and ingestion.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into the proposed building (either from soil contamination or volatilisation of contaminants from groundwater); and • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas.

5 SAMPLING, ANALYSIS AND QUALITY PLAN

5.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[10]. The seven-step DQO approach for this project is outlined in the following sub-sections. The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 7.1 and the detailed evaluation is provided in the appendices.

5.1.1 Step 1 - State the Problem

The CSM identified potential sources of contamination/AEC at the site that may pose a risk to human health and the environment. Investigation data is required to assess the contamination status of the site, assess the risks posed by the contaminants in the context of the proposed development/intended land use, and assess whether remediation is required.

5.1.2 Step 2 - Identify the Decisions of the Study

The objectives of the assessment are outlined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?
- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is remediation required?
- Is the site characterisation sufficient to provide adequate confidence in the above decisions?
- Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

5.1.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant environmental data from previous reports;
- Site information, including site observations and site history documentation;
- Sampling of potentially affected media (soil);
- Observations of sub-surface variables such as soil type, photo-ionisation detector (PID) concentrations, odours and staining;
- Laboratory analysis of soils for the CoPC identified in the CSM; and
- Field and laboratory QA/QC data.

[10] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

5.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the approximate site boundaries as shown in Figure 2 (spatial boundary). The sampling was completed on 16 May 2019 (temporal boundary). The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary. Sampling was not undertaken within the existing building footprint due to access constraints.

5.1.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

5.1.5.1 Tier 1 Screening Criteria

The laboratory data will be assessed against relevant Tier 1 screening criteria (referred to as SAC), as outlined in Section 6. Exceedances of the SAC do not necessarily indicate a requirement for remediation or a risk to human health and/or the environment. Exceedances are considered in the context of the CSM and valid SPR-linkages.

For this assessment, the individual results have been assessed as either above or below the SAC. Statistical evaluation of the dataset via calculation of mean values and/or 95% upper confidence limit (UCL) values has not been undertaken due to the spatial distribution of the data and the number of samples submitted for analysis.

5.1.5.2 Field and Laboratory QA/QC

Field QA/QC included analysis of intra-laboratory duplicate and trip blank samples. Further details regarding the sampling and analysis undertaken, and the acceptable limits adopted, is provided in the Data Quality (QA/QC) Evaluation in the appendices.

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the attached laboratory reports. These criteria were developed and implemented in accordance with the laboratory's National Association of Testing Authorities, Australia (NATA) accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, EIS typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

5.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

The PQLs of the analytical methods are considered in relation to the SAC to confirm that the PQLs are less than the SAC. In cases where the PQLs are greater than the SAC, a discussion of this is provided.

5.1.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For this assessment, the null hypothesis has been adopted which is that, there is considered to be a complete SPR linkage for the CoPC identified in the CSM unless this linkage can be proven not to (or unlikely to) exist. The null hypothesis has been adopted for this assessment.

5.1.7 Step 7 - Optimise the Design for Obtaining Data

The most resource-effective design will be used in an optimum manner to achieve the assessment objectives. Adjustment of the assessment design can occur following consultation or feedback from project stakeholders. For this investigation, the design was optimised via consideration of the various lines of evidence used to select the sample locations, the media being sampled, and also by the way in which the data were collected. The sampling plan and methodology are outlined in the following sub-sections.

5.2 Soil Sampling Plan and Methodology

The soil sampling plan and methodology adopted for this assessment is outlined in the table below:

Table 5-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	Samples were obtained from four locations (BH201, BH202, BH203 and SS1) as shown on the attached Figure 2 for the current screening in 2019. Samples were also obtained from within this area from two locations (BH1 and BH2) during the 2017 investigation. This number of locations (both 2017 and 2019 together) met the minimum sampling density as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)[11].
Sampling Plan	The sampling locations were placed on a judgemental sampling plan and were broadly positioned for site coverage. This sampling plan was considered suitable to make a screening of potential risks associated with the AEC and CoPC identified in the CSM, and assess whether further investigation is warranted.
Set-out and Sampling Equipment	Sampling locations were cleared for underground services by an external contractor prior to sampling as outlined in the SSP. Drill rig access was restricted by the ongoing landscaping activities to the immediate west of the site. Therefore samples were collected using a hand auger and the installation of groundwater wells was not possible.

[11] NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines.* (referred to as EPA Sampling Design Guidelines 1995)

Aspect	Input
Sample Collection and Field QA/QC	Soil samples were obtained on 16 May 2019 in accordance with the standard sampling procedure (SSP) attached in the appendices. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis.
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by EIS. Soil at the sampling locations was visually inspected during the works for the presence of fibre cement fragments.
Decontamination and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP. On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

5.3 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 5-2: Analytical Schedule

Analyte/CoPC	Fill Samples	Natural Soil Samples
Heavy Metals	5	1
TRH/BTEX	5	1
PAHs	5	0
OCPs/OPPs	4	1
PCBs	3	0
Asbestos	3	0

5.3.1 Laboratory Analysis

Samples were analysed by an appropriate, NATA Accredited laboratory using the analytical methods detailed in Schedule B(3) of NEPM 2013. Reference should be made to the laboratory reports attached in the appendices for further details.

Table 5-3: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicate and trip blank samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	217649 and 217649-A

6 SITE ASSESSMENT CRITERIA (SAC)

The SAC were derived from the NEPM 2013 and other guidelines as discussed in the following sub-sections. The guideline values for individual contaminants are presented in the attached report tables and further explanation of the various criteria adopted is provided in the appendices.

6.1 Soil

Soil data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013) as outlined below.

6.1.1 Human Health

- Health Investigation Levels (HILs) for a 'residential with accessible soils' exposure scenario (HIL-A). These guidelines are also considered appropriate for primary schools and day-care centres;
- Health Screening Levels (HSLs) for a 'low-high density residential' exposure scenario (HSL-A & HSL-B). HSLs were calculated based on the soil type and the depth of the sample from the existing ground surface as the proposed building floor level is expected to be constructed approximately at the existing grade;
- Where exceedances of the HSLs were reported for hydrocarbons (TRH/BTEX and naphthalene), the soil health screening levels for direct contact presented in the CRC Care Technical Report No. 10 – Heath screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)[12] were considered; and
- Asbestos was assessed on the basis of presence/absence. Asbestos HSLs were not adopted as detailed asbestos quantification was not undertaken.

6.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for an 'urban residential and public open space' (URPOS) exposure scenario. These have only been applied to the top 2m of soil as outlined in NEPM (2013); and
- ESLs were calculated based on the soil type. EILs for selected metals were calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)[13]. This method is considered to be adequate for the Tier 1 screening.

[12] Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), (2011). Technical Report No. 10 - *Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document*

[13] Olszowy, H., Torr, P., and Imray, P., (1995), *Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4*. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission.

6.1.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered (if required) following evaluation of human health and ecological risks, and risks to groundwater.

7 RESULTS

7.1 Summary of Data (QA/QC) Evaluation

The data evaluation is presented in the appendices. In summary, EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

7.2 Subsurface Conditions

A summary of the subsurface conditions encountered during the 2019 soil contamination screening is presented in the table below. Reference should be made to the borehole logs (BH201, BH202 and BH203) attached in the appendices for further details.

Table 7-1: Summary of Subsurface Conditions

Profile	Description
Fill	Fill (including mulch cover on the surface in BH202) was encountered at the surface in all boreholes and extended to depths of approximately 0.3m to 0.7m. The fill typically comprised silty clay, sand and silty sand with inclusions of ironstone gravel and ash.
Natural Soil	Natural soil (silty clay) was encountered beneath the fill in the boreholes.
Bedrock	Bedrock was not encountered in the boreholes.
Groundwater	Groundwater seepage was not encountered in the boreholes during drilling. All boreholes remained dry on completion of drilling and a short time after.

7.3 Field Screening

PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. The results ranged from 0ppm to 151ppm isobutylene equivalents which indicates the presence of PID detectable VOCs in soil samples at the depths not deeper than 1m from the existing surface levels.

7.4 Soil Laboratory Results

The soil laboratory results have been compared to the relevant SAC in the attached report tables and include the results for BH1 and BH2 that were sampled in 2017. The soil laboratory results for the EIS 2017 report also attached. Borehole BH1 and BH2 were drilled in 2017 within the current investigation area (the site). Both the 2019 and 2017 drilling locations are shown on Figure 2. A summary of the results for 2019 and 2017 investigations assessed against the SAC is presented below:

7.4.1 Human Health and Environmental (Ecological) Assessment

Table 7-2: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

<table>
<tr><th>Analyte</th><th>Results Compared to SAC</th></tr>
<tr><td>Heavy Metals</td><td>Zinc in the surface soil sample SS1 (0 - 0.1m) encountered concentration of 330mg/kg above the SAC of 192mg/kg.

All other heavy metals results were below the SAC.</td></tr>
<tr><td>TRH</td><td>Three samples contained TRH concentrations above the ecological SAC as summarised below:
<table>
<tr><th>Analyte</th><th>Sample/Depth</th><th>Description</th><th>SAC (mg/kg)</th><th>Concentration (mg/kg)</th></tr>
<tr><td>TRH C_{16}-C_{34}</td><td>BH202 (0.1-0.2m)</td><td>Fill-silty sand</td><td>300</td><td>410</td></tr>
<tr><td>TRH C_{10}-C_{16}</td><td>BH202 (0.6-0.7m)</td><td>Nat-silty clay</td><td>120</td><td>130</td></tr>
<tr><td>TRH C_{16}-C_{34}</td><td>BH203 (0-0.2m)</td><td>Fill-silty sand</td><td>300</td><td>980</td></tr>
</table>
Sample BH202 (0.4-0.2m) contained a TRH >C_{10}-C_{16} fraction concentration of 120mg/kg that was greater than the health based SAC of 110mg/kg. The sample BH202 (0.4-0.2m) also contained a TRH >C_{16}-C_{34} fraction concentration of 590mg/kg that was greater than the ecological SAC of 300mg/kg. EIS requested the laboratory to undertake silica gel clean-up for the sample. After the silica gel clean-up the TRH concentrations in sample BH202 (0.4-0.2) were below the health and ecological SAC.

All the remaining TRH results were below the SAC.</td></tr>
<tr><td>BTEX</td><td>All BTEX results were below the SAC.</td></tr>
<tr><td>PAHs</td><td>Elevated concentrations of B(a)P TEQ (Carcinogenic PAHs) were encountered above the Health based assessment criteria as outlined below:
<table>
<tr><th>Analyte</th><th>Sample/Depth</th><th>Description</th><th>SAC (mg/kg)</th><th>Concentration (mg/kg)</th></tr>
<tr><td>Carcinogenic PAHs</td><td>BH201 (0-0.2m)</td><td>Fill-silty clay</td><td>3</td><td>30</td></tr>
<tr><td>Carcinogenic PAHs</td><td>BH202 (0.1-0.2m)</td><td>Fill-silty sand</td><td>3</td><td>6.4</td></tr>
<tr><td>Carcinogenic PAHs</td><td>BH202 (0.4-0.2m)</td><td>Fill-silty sand</td><td>3</td><td>6.9</td></tr>
<tr><td>Carcinogenic PAHs</td><td>BH203 (0.2-0.3m)</td><td>Fill-silty clay</td><td>3</td><td>5.6</td></tr>
</table>
EIS note that the PAH results for primary sample BH201 (0-0.2m) have been substituted with the results from the internal laboratory duplicate that were higher.

All the remaining PAH results were below the SAC.</td></tr>
<tr><td>OCPs and OPPs</td><td>All OCP and OPP results were below the SAC.</td></tr>
<tr><td>PCBs</td><td>All PCB results were below the SAC. All PCB concentrations were below the laboratory PQLs.</td></tr>
<tr><td>Asbestos</td><td>All asbestos results were below the SAC (i.e. asbestos was absent in the samples analysed for the investigation).</td></tr>
</table>

8 DISCUSSION AND CONCLUSIONS

8.1 Tier 1 Risk Assessment and Review of CSM

For a contaminant to represent a risk to a receptor, the following three conditions must be present:

1. Source – The presence of a contaminant;
2. Pathway – A mechanism or action by which a receptor can become exposed to the contaminant; and
3. Receptor – The human or ecological entity which may be adversely impacted following exposure to contamination.

If one of the above components is missing, the potential for adverse risks is relatively low.

8.1.1 Soil

The data collected from the site indicated the presence of targeted contaminants in fill and natural soils above the assessment criteria. The identified soil impact is likely to be associated with impacted fill soil imported on to the site.

8.2 Decision Statements

The decision statements are addressed below:

Did the site inspection, or does the historical information identify potential contamination sources/AEC at the site?

Yes. The site had been used as a landscaped garden at least since 1894. Contaminated fill soil may have brought into the site between the recent past and 1894.

Are any results above the SAC?
Do potential risks associated with contamination exist, and if so, what are they?

Yes. Some results were above the SAC. Potential risks associated with the elevated concentrations of carcinogenic PAHs, TRHs and zinc exist in the soil samples. The risk to and from groundwater was not assessed.

Is remediation required?

Yes. Remediation will be required to remove the sources of contamination.

Is the site characterisation sufficient to provide adequate confidence in the above decisions?

The soil characterisation is sufficient to provide the above decision however the absence of a groundwater assessment remains as a data gap.

Is the site suitable for the proposed development, or can the site be made suitable subject to further characterisation and/or remediation?

The site can made suitable for proposed development subject to remediation and validation.

8.3 Data Gaps

The screening has identified the following data gaps:

- Assessment of groundwater contamination conditions; and
- The presence or otherwise of hazardous building materials in the existing building has not been assessed.

9 CONCLUSIONS AND RECOMMENDATIONS

EIS consider that the report objectives outlined in Section 1.2 have been addressed.

Based on the findings of the screening, EIS are of the opinion that the site can be made suitable for the proposed development subject to successful implementation of following recommendations:

- Undertake groundwater contamination assessment;
- A Hazardous Building Material assessment should be undertaken of the building prior to demolition. If the presence of this material is confirmed it should be removed as soon as possible and validate (i.e. issue a clearance certificate);
- Prepare a Remediation Action Plan (RAP) to include a procedure for removing and of the identified contamination; and
- Once all the contamination issue identified in the RAP has been addressed (i.e. removed and validated) prepare a site validation report in order to demonstrate the identified contamination has no longer a risk.

Undertaking a waste classification for the off-site disposal of the material in accordance with the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014)[14] will be required during the site remediation process.

In the event unexpected conditions are encountered during development work or between sampling locations that may pose a contamination risk, all works should stop and an environmental consultant should be engaged to inspect the site and address the issue.

[14] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

10 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors

This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions

Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data

Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations

Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report

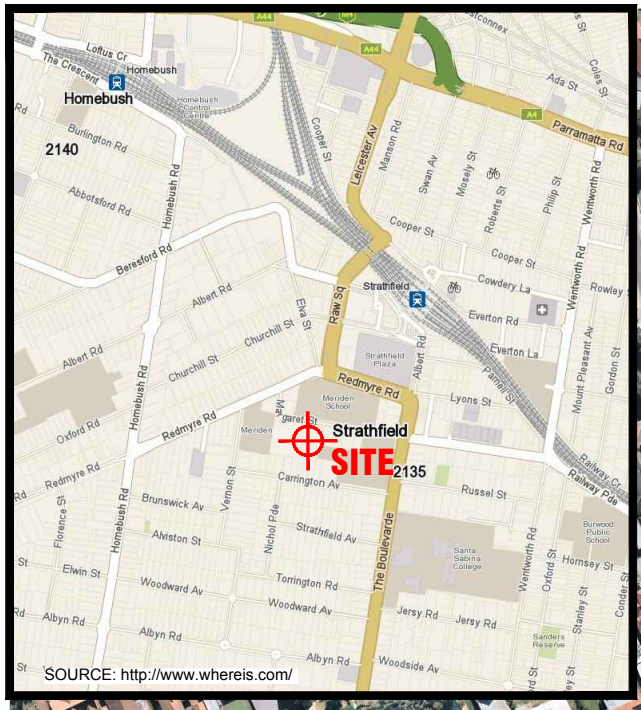
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 12 MAY 2019.

This plan should be read in conjunction with the Environmental report.

Title: **SITE LOCATION PLAN**

Location: 16 MARGARET STREET
STRATHFIELD, NSW

Report No: E30910KG

Figure No: 1

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PLOT DATE: 30/05/2019 3:20:24 PM DWG FILE: S:\5 EIS\5C EIS JOBS\30000\SIE30910KG STRATHFIELD\CAD\E30910KG_ESA.DWG

BH203	0.2-0.3
B(a)P TEQ	5.6
TRH C_{16}-C_{34}	980

SS1	-
ZINC	330

BH202	0.1-0.2	0.4-0.2	0.6-0.7
B(a)P TEQ	6.4	6.9	
TRH C_{16}-C_{34}	410		
TRH C_{10}-C_{16}			130

BH201	0.0-0.2
B(a)P TEQ	30

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (2017)
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (2019)
- SS — SURFACE SOIL SAMPLE

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

- SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (mg/kg)
- SOIL CONTAMINATION ABOVE SAC FOR ENVIRONMENTAL RISK (mg/kg)

SCALE 1:300 @A3 METRES (0 3 6 9 12 15)

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN (2019)**

Location: 16 MARGARET STREET STRATHFIELD, NSW

Report No: E30910KG

Figure No: 2

JKEnvironments

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Appendix B: Site Photos

Selected Site Photos

Photograph 1: View of the site from Margaret Street.

Photograph 2: Landscaping activities to the immediate west of the site.

Photograph 3: The building located at the south section of the site.

Photograph 4: The view of the Property from Margaret Street.

Appendix C: Laboratory Summary Tables

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ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration
ACM:	Asbestos Containing Material
ADWG:	AustralianDrinking Water Guidelines
AF:	Asbestos Fines
ANZECC:	Australian and New Zealand Environment Conservation Council
B(a)P:	Benzo(a)pyrene
CEC:	Cation Exchange Capacity
CRC:	Cooperative Research Centre
CT:	Contaminant Threshold
EILs:	Ecological Investigation Levels
ESLs:	Ecological Screening Levels
FA:	Fibrous Asbestos
GIL:	Groundwater Investigation Levels
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit
OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
pH_{KCL} :	pH of filtered 1:20, 1M KCL extract, shaken overnight
pH_{ox} :	pH of filtered 1:20 1M KCl after peroxide digestion
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
S_{Cr}:	Chromium reducible sulfur
S_{POS}:	Peroxide oxidisable Sulfur
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
TAA:	Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TCLP:	Toxicity Characteristics Leaching Procedure
TPA:	Total Potential Acidity, 1M KCL peroxide digest
TS:	Trip Spike
TRH:	Total Recoverable Hydrocarbons
TSA:	Total Sulfide Acidity (TPA-TAA)
UCL:	Upper Level Confidence Limit on Mean Value
USEPA	United States Environmental Protection Ag
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with high traffic have been quoted).

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TABLE A

SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.

HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			100	20	100	6000	300	40	400	7400	300	3	10	270	300	6	50	240	6	160	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH1	0.1-0.3	Fill-Clay	8	<0.4	13	16	70	<0.1	5	35	15	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH1	0.5-0.95	Nat-Clay	7	<0.4	11	13	12	<0.1	3	25	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH2	0-0.2	Fill-Clay	6	<0.4	12	22	140	0.1	6	63	20	2.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH201	0.0-0.2	Fill-silty clay	11	<0.4	22	24	120	0.1	7	100	253	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	Not Detected
BH202	0.1-0.2	Fill-silty sand	6	<0.4	15	29	150	<0.1	9	120	58	6.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH202	0.4-0.2	Fill-silty sand	7	<0.4	14	31	160	0.1	9	130	62	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH202	0.6-0.7	Silty CLAY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
BH203	0.0-0.2	Fill-silty sand	6	<0.4	20	88	66	0.2	7	140	10	1.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH203	0.2-0.3	Fill-silty clay	9	<0.4	21	37	230	0.2	8	90	40	5.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SS1	0-0.1	Fill-silty sand	8	0.6	17	49	270	0.2	9	330	NA	NA	<0.1	<0.1	<0.1	1.5	<0.1	<0.1	<0.1	<0.1	NA	NA
Total Number of Samples			6	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	5	5	3	3
Maximum Value			11	0.6	22	88	270	0.2	9	330	253	30	<PQL	<PQL	<PQL	1.5	<PQL	<PQL	<PQL	<PQL	<PQL	NC

Concentration above the SAC **VALUE**

Soil Contamination Screening - Proposed Admin and Student Centre
Meriden School - 16 Margaret Street, Strathfield, NSW 2135
Job No: E30910KGrpt2

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TABLE B
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH1	0.1-0.3	Fill-Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<0.1	0
BH1	0.5-0.95	Nat-Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<0.1	0
BH2	0-0.2	Fill-Clay	0m to < 1m	Clay	<25	<50	<0.2	<0.5	<1	<2	<0.1	0
BH201	0.0-0.2	Fill-silty clay	0m to < 1m	Clay	<25	54	<0.2	<0.5	<1	<2	0.2	1.6
BH202	0.1-0.2	Fill-silty sand	0m to < 1m	Sand	<25	96	<0.2	<0.5	<1	<2	0.2	7.2
BH202	0.4-0.2	Fill-silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	0.2	38
BH202	0.6-0.7	Silty CLAY	0m to < 1m	Clay	<25	130	<0.2	<0.5	<1	<2	<1	151
BH203	0.0-0.2	Fill-silty sand	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	<0.1	0
BH203	0.2-0.3	Fill-silty clay	0m to < 1m	Sand	<25	<50	<0.2	<0.5	<1	<2	0.2	3
SS1	0-0.1	Fill-silty sand	0m to < 1m	Sand	NA	NA	NA	NA	NA	NA	NA	0
Total Number of Samples					9	9	9	9	9	9	9	10
Maximum Value					<PQL	130	<PQL	<PQL	<PQL	<PQL	0.2	151

Concentration above the SAC **VALUE**

The guideline corresponding to the elevated value is highlighted in grey in the Site Assessment Criteria Table below

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1
NEPM 2013 HSL Land Use Category					**HSL-A/B:LOW/HIGH DENSITY RESIDENTIAL**						
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**							
BH1	0.1-0.3	Fill-Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH1	0.5-0.95	Nat-Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH2	0-0.2	Fill-Clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH201	0.0-0.2	Fill-silty clay	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH202	0.1-0.2	Fill-silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH202	0.4-0.2	Fill-silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH202	0.6-0.7	Silty CLAY	0m to < 1m	Clay	50	280	0.7	480	NL	110	5
BH203	0.0-0.2	Fill-silty sand	0m to < 1m	Sand	45	110	0.5	160	55	40	3
BH203	0.2-0.3	Fill-silty clay	0m to < 1m	Sand	45	110	0.5	160	55	40	3
SS1	0-0.1	Fill-silty sand	0m to < 1m	Sand	NA	NA	NA	NA	NA	NA	NA

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TABLE C
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH1	0.1-0.3	Fill-Clay	Fine	NA	NA	NA	8	13	16	70	5	35	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	1.2
BH1	0.5-0.95	Nat-Clay	Fine	NA	NA	NA	7	11	13	12	3	25	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05
BH2	0-0.2	Fill-Clay	Fine	NA	NA	NA	6	12	22	140	6	63	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	1.8
BH201	0.0-0.2	Fill-silty clay	Fine	NA	NA	NA	10	15	24	110	6	100	0.2	<0.1	<25	<50	780	210	<0.2	<0.5	<1	<3	17
BH202	0.1-0.2	Fill-silty sand	Coarse	NA	NA	NA	6	15	29	150	9	120	0.2	<0.1	<25	96	410	130	<0.2	<0.5	<1	<3	4.7
BH202	0.4-0.2	Fill-silty sand	Coarse	NA	NA	NA	7	14	31	160	9	130	0.2	NA	<25	<50	200	<100	<0.2	<0.5	<1	<3	5
BH202	0.6-0.7	Silty CLAY	Fine	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1	<0.1	<25	130	110	<100	<0.2	<0.5	<1	<3	NA
BH203	0.0-0.2	Fill-silty sand	Coarse	NA	NA	NA	6	20	88	66	7	140	<0.1	<0.1	<25	<50	980	350	<0.2	<0.5	<1	<3	0.91
BH203	0.2-0.3	Fill-silty clay	Fine	NA	NA	NA	9	21	37	230	8	90	0.2	NA	<25	<50	360	140	<0.2	<0.5	<1	<3	4
SS1	0-0.1	Fill-silty sand	Coarse	NA	NA	NA	8	17	49	270	9	330	NA	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Number of Samples				0	0	0	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	8
Maximum Value				<PQL	<PQL	<PQL	10	21	88	270	9	330	0.2	<PQL	<PQL	130	980	350	<PQL	<PQL	<PQL	<PQL	17

Concentration above the SAC — VALUE

The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																		
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC ($cmol_c/kg$)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	0.1	0.1	25	50	100	100	0.2	0.5	1	3	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																			
BH1	0.1-0.3	Fill-Clay	Fine	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	1300	5600	60	105	125	45	20
BH1	0.5-0.95	Nat-Clay	Fine	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	1300	5600	60	105	125	45	20
BH2	0-0.2	Fill-Clay	Fine	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	1300	5600	60	105	125	45	20
BH201	0.0-0.2	Fill-silty clay	Fine	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	1300	5600	60	105	125	45	20
BH202	0.1-0.2	Fill-silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
BH202	0.4-0.2	Fill-silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	300	2800	50	85	70	105	20
BH202	0.6-0.7	Silty CLAY	Fine	NA	NA	NA	--	--	--	--	--	--	170	180	180	120	1300	5600	60	105	125	45	--
BH203	0.0-0.2	Fill-silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	170	180	180	120	300	2800	50	85	70	105	20
BH203	0.2-0.3	Fill-silty clay	Fine	NA	NA	NA	100	203	88	1263	35	192	170	--	180	120	1300	5600	60	105	125	45	20
SS1	0-0.1	Fill-silty sand	Coarse	NA	NA	NA	100	203	88	1263	35	192	--	180	--	--	--	--	--	--	--	--	--

TABLE D
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
BH1	0.1-0.3	Fine	<25	<50	<100	<100
BH1	0.5-0.95	Fine	<25	<50	<100	<100
BH2	0-0.2	Fine	<25	<50	<100	<100
BH201	0.0-0.2	Fine	<25	<50	780	210
BH202	0.1-0.2	Coarse	<25	96	410	130
BH202	0.4-0.2	Coarse	<25	120	590	190
BH202	0.6-0.7	Fine	<25	130	110	<100
BH203	0.0-0.2	Coarse	<25	<50	980	350
BH203	0.2-0.3	Fine	<25	<50	360	140
SS1	0-0.1	Coarse	NA	NA	NA	NA
Total Number of Samples			9	9	9	9
Maximum Value			<PQL	130	980	350

Concentration above the SAC VALUE

			C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			**RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE**			
Sample Reference	**Sample Depth**	**Soil Texture**				
BH1	0.1-0.3	Fine	800	1000	3500	10000
BH1	0.5-0.95	Fine	800	1000	3500	10000
BH2	0-0.2	Fine	800	1000	3500	10000
BH201	0.0-0.2	Fine	800	1000	3500	10000
BH202	0.1-0.2	Coarse	700	1000	2500	10000
BH202	0.4-0.2	Coarse	700	1000	2500	10000
BH202	0.6-0.7	Fine	800	1000	3500	10000
BH203	0.0-0.2	Coarse	700	1000	2500	10000
BH203	0.2-0.3	Fine	800	1000	3500	10000
SS1	0-0.1	Coarse	--	--	--	--

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TABLE E
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	3	1	
CRC 2011 -Direct contact Criteria		4,400	3,300	4,500	6,300	100	14,000	4,500	12,000	1,400	
Site Use		**RESIDENTIAL WITH ACCESSIBLE SOIL- DIRECT SOIL CONTACT**									
Sample Reference	**Sample Depth**										
BH1	0.1-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	0
BH1	0.5-0.95	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	0
BH2	0-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	0
BH201	0.0-0.2	<25	<50	780	210	<0.2	<0.5	<1	<2	0.2	1.6
BH202	0.1-0.2	<25	96	410	130	<0.2	<0.5	<1	<2	0.2	7.2
BH202	0.4-0.2	<25	120	590	190	<0.2	<0.5	<1	<2	0.2	37.8
BH202	0.6-0.7	<25	130	110	<100	<0.2	<0.5	<1	<2	<1	151
BH203	0.0-0.2	<25	<50	980	350	<0.2	<0.5	<1	<2	<0.1	0
BH203	0.2-0.3	<25	<50	360	140	<0.2	<0.5	<1	<2	0.2	3
SS1	0-0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
Total Number of Samples		9	9	9	9	9	9	9	9	9	
Maximum Value		<PQL	130	980	350	<PQL	<PQL	<PQL	<PQL	0.2	

Concentration above the SAC **VALUE**

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TABLE F
SOIL INTRA-LABORATORY DUPLICATE RESULTS & RPD CALCULATIONS
All results in mg/kg unless stated otherwise

SAMPLE	ANALYSIS	Envirolab PQL	INITIAL	REPEAT	MEAN	RPD %
Sample Ref = BH203 (0.2-0.3m)	Arsenic	4	9	8	8.5	12
Dup Ref = MP Dup1	Cadmium	0.4	<0.4	<0.4	NC	NC
	Chromium	1	21	20	21	5
Envirolab Report: 217649	Copper	1	37	35	36	6
	Lead	1	230	240	235	4
	Mercury	0.1	0.2	0.2	0.2	0
	Nickel	1	8	8	8.0	0
	Zinc	1	90	85	88	6
	Naphthalene	0.1	0.2	0.2	0.2	0
	Acenaphthylene	0.1	0.7	1.1	0.9	44
	Acenaphthene	0.1	<0.1	0.1	0.1	NC
	Fluorene	0.1	0.3	0.6	0.5	67
	Phenanthrene	0.1	3.7	6	4.9	47
	Anthracene	0.1	0.9	1.2	1.1	29
	Fluoranthene	0.1	6.5	8.3	7.4	24
	Pyrene	0.1	6.2	7.8	7.0	23
	Benzo(a)anthracene	0.1	3.5	4.1	3.8	16
	Chrysene	0.1	3.9	4.7	4.3	19
	Benzo(b,j+k)fluoranthene	0.2	6	6.9	6.5	14
	Benzo(a)pyrene	0.05	4	4.5	4.3	12
	Indeno(123-cd)pyrene	0.1	1.9	2	2.0	5
	Dibenzo(ah)anthracene	0.1	0.3	0.3	0.3	0
	Benzo(ghi)perylene	0.1	2.3	2.5	2.4	8
	TRH C_6-C_{10} (F1)	25	<25	<25	NC	NC
	TRH >C_{10}-C_{16} (F2)	50	<50	<50	NC	NC
	TRH >C_{16}-C_{34} (F3)	100	360	300	330	18
	TRH >C_{34}-C_{40} (F4)	100	140	100	120	33
	Benzene	0.2	<0.2	<0.2	NC	NC
	Toluene	0.5	<0.5	<0.5	NC	NC
	Ethylbenzene	1	<1	<1	NC	NC
	m+p-xylene	2	<2	<2	NC	NC
	o-xylene	1	<1	<1	NC	NC

Explanation:

The RPD value is calculated as the absolute value of the difference between the initial and repeat results divided by the average value expressed as a percentage. The following acceptance criteria will be used to assess the RPD results:

Results > 10 times PQL = RPD value <= 50% are acceptable

Results between 5 & 10 times PQL = RPD value <= 75% are acceptable

Results < 5 times PQL = RPD value <= 100% are acceptable

If result is LPQL then 50% of the PQL is used for the calculation

RPD Results Above the Acceptance Criteria VALUE

TABLE G
SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	Envirolab PQL		TB1[S]
			16/05/2019
	mg/kg	µg/L	mg/kg
Benzene	1	0.2	<0.2
Toluene	1	0.5	<0.5
Ethylbenzene	1	1	<1
m+p-xylene	2	2	<2
o-xylene	1	1	<1

Explanation:

[S] Sample type (sand)

BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

Appendix D: Borehole Logs

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 1
1/1

Client: MERIDEN SCHOOL
Project: PROPOSED ALTERATIONS AND ADDITIONS
Location: 16 MARGARET STREET, STRATHFIELD, NSW

Job No. 30910ZR
Date: 27-9-17
Method: SPIRAL AUGER JK308
Logged/Checked by: A.F./P.R.
R.L. Surface: ≈ 19.8m
Datum: AHD

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			TOPSOIL: Silty clay, low to medium plasticity, brown, trace of roots and root fibres, ash and fine to medium grained sand.	MC>PL			GRASS COVER
					N = 8 3,3,5	1		CH	SILTY CLAY: high plasticity, orange brown, trace of ironstone gravel.	MC>PL	VSt	250 280 300	RESIDUAL
					N = 18 5,8,10	2		-	SHALE: grey brown, with iron indurated bands and clay bands.	XW	H EL	420 420 420	VERY LOW 'TC' BIT RESISTANCE
						3				DW	VL		VERY LOW TO LOW 'TC' BIT RESISTANCE
						4			as above, but without iron indurated bands, dark grey.		L-M		LOW TO MODERATE RESISTANCE
						5				SW	M		MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 2
1/1

Client: MERIDEN SCHOOL
Project: PROPOSED ALTERATIONS AND ADDITIONS
Location: 16 MARGARET STREET, STRATHFIELD, NSW

Job No. 30910ZR
Date: 27-9-17
Method: SPIRAL AUGER JK308
Logged/Checked by: A.F./P.R.
R.L. Surface: ≈ 20.4m
Datum: AHD

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION & AFTER 1 HR	■			■	N = 12 4,6,6	0			TOPSOIL: Silty clay, low to medium plasticity, brown, trace of fine grained sand and root fibres.	MC<PL			GRASS COVER
								CH	SILTY CLAY: high plasticity, orange brown, trace of fine grained ironstone gravel.	MC≈PL	H	400 >600 >600	RESIDUAL
				■	N = 22 7,11,11	1							
						2		-	SHALE: grey brown, with iron indurated bands.	XW	EL		VERY LOW 'TC' BIT RESISTANCE
				■		3			as above, but without iron indurated bands.	DW	L-M		LOW RESISTANCE
				■		4				SW	M		MODERATE RESISTANCE
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

JKEnvironments
ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. 201 1/1

Client: MERIDEN SCHOOL

Project: PROPOSED ADMINISTRATION & STUDENT CENTRE

Location: 16 MARGARET STREET, STRATHFIELD, NSW

Job No.: E30910KG **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/5/19 **Datum:**

Plant Type: **Logged/Checked by:** M.M.P./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■	■					0			FILL: Silty clay, low to medium plasticity, orange brown, trace of ironstone gravel and ash.	w<PL			
							0.5							
	■	■							CL	Silty CLAY: low to medium plasticity, orange brown mottled grey, trace of ironstone gravel.	w<PL			RESIDUAL
							1							
										END OF BOREHOLE AT 1.3m				
							1.5							
							2							
							2.5							
							3							
							3.5							

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ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. 202 1/1

Client: MERIDEN SCHOOL

Project: PROPOSED ADMINISTRATION & STUDENT CENTRE

Location: 16 MARGARET STREET, STRATHFIELD, NSW

Job No.: E30910KG **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/5/19 **Datum:**

Plant Type: **Logged/Checked by:** M.M.P./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			MULCH COVER: 100mm.t				
									-	FILL: Sand, fine to medium grained, dark brown, trace of organic material, mulch and ironstone gravel.	D			
							0.5			FILL: Silty clay, low to medium plasticity, dark orange brown, trace of ironstone gravel and ash.	w<PL			
									CL-CI	Silty CLAY: low to medium plasticity, orange brown, trace of ironstone gravel.	w<PL			RESIDUAL
							1			END OF BOREHOLE AT 1.1m				
							1.5							
							2							
							2.5							
							3							
							3.5							

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ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. 203 1/1

Client: MERIDEN SCHOOL

Project: PROPOSED ADMINISTRATION & STUDENT CENTRE

Location: 16 MARGARET STREET, STRATHFIELD, NSW

Job No.: E30910KG **Method:** HAND AUGER **R.L. Surface:** N/A

Date: 16/5/19 **Datum:**

Plant Type: **Logged/Checked by:** M.M.P./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		-	FILL: Silty sand, fine to medium grained, dark brown, trace of mulch, organic material, ironstone gravel.	D			
										FILL: Silty clay, low to medium plasticity, brown mottled orange brown, trace of ironstone gravel and ash.	w<PL			
									CL-CI	Silty CLAY: low to medium plasticity, grey mottled orange brown, trace of ironstone gravel.	w<PL			RESIDUAL
							0.5							
							1							
										END OF BOREHOLE AT 1.2m				
							1.5							
							2							
							2.5							
							3							
							3.5							

ENVIRONMENTAL LOGS EXPLANATORY NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

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

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it 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 and may not be the same at the time of construction.
- 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 be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to 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 perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

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SYMBOL LEGENDS

SOIL


FILL


TOPSOIL


CLAY (CL, CI, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CI, CH)


SILTY CLAY (CL, CI, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CI, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML, MH)


PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK


CONGLOMERATE


SANDSTONE


SHALE/MUDSTONE


SILTSTONE


CLAYSTONE


COAL


LAMINITE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

OTHER MATERIALS


BRICKS OR PAVERS


CONCRETE


ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10}\ D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

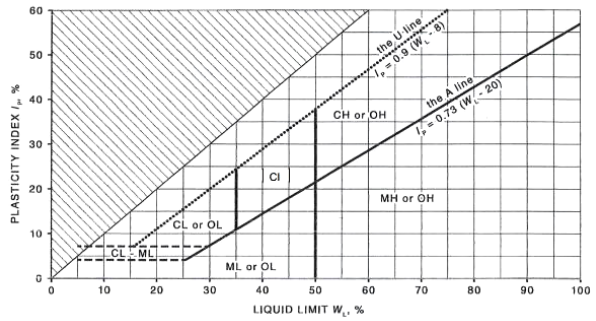
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

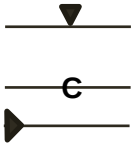
3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown. Extent of borehole/test pit collapse shortly after drilling/excavation. Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES U50 DB DS ASB ASS SAL	Sample taken over depth indicated, for environmental analysis. Undisturbed 50mm diameter tube sample taken over depth indicated. Bulk disturbed sample taken over depth indicated. Small disturbed bag sample taken over depth indicated. Soil sample taken over depth indicated, for asbestos analysis. Soil sample taken over depth indicated, for acid sulfate soil analysis. Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL $w \approx$ PL w < PL $w \approx$ LL w > LL	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D M W	DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 — 0 – 4 LOOSE > 15 and ≤ 35 — 4 – 10 MEDIUM DENSE > 35 and ≤ 65 — 10 – 30 DENSE > 65 and ≤ 85 — 30 – 50 VERY DENSE > 85 — > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.

Log Column	Symbol	Definition
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as:
		RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock.
		EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock.
		ALLUVIAL – soil deposited by creeks and rivers.
		ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents.
		MARINE – soil deposited in a marine environment.
		AEOLIAN – soil carried and deposited by wind.
		COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits.
		LITTORAL – beach deposited soil.

Classification of Material Weathering

Term		Abbreviation		Definition
Residual Soil		RS		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately Weathered		MW		The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh		FR		Rock shows no sign of decomposition of individual minerals or colour changes.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Appendix E: Laboratory Reports & COC Documents

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 177105

Client Details

Client	Environmental Investigation Services
Attention	Para Bokalawela
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30910KG, Strathfield**
Number of Samples	17 samples
Date samples received	05/10/2017
Date completed instructions received	05/10/2017

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	12/10/2017
Date of Issue	12/10/2017

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Matt Tang
Authorised by Asbestos Approved Signatory: Paul Ching

Results Approved By
Dragana Tomas, Senior Chemist
Long Pham, Team Leader, Metals
Paul Ching, Senior Analyst
Steven Luong, Chemist

Authorised By

David Springer, General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	87	118	89	76

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	121	69	85	87	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	09/10/2017	09/10/2017	09/10/2017	09/10/2017	09/10/2017
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	0.8
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	98	92	92	70	126

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		177105-16	177105-17
Your Reference	UNITS	Dup1	TB 1
Depth		-	-
Date Sampled		04/10/2017	04/10/2017
Type of sample		Soil	Soil
Date extracted	-	06/10/2017	06/10/2017
Date analysed	-	09/10/2017	09/10/2017
TRH C_6 - C_9	mg/kg	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	[NA]
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
naphthalene	mg/kg	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	70	94

svTRH (C10-C40) in Soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	120	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	130	<100	120	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	130	<50	120	<50	<50
Surrogate o-Terphenyl	%	102	92	105	105	101

svTRH (C10-C40) in Soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	130	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	150	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	150	<50
Surrogate o-Terphenyl	%	107	117	102	104	115

svTRH (C10-C40) in Soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	130	<100	<100	110
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	150	<100	<100	110
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	150	<50	<50	110
Surrogate o-Terphenyl	%	107	111	99	100	104

svTRH (C10-C40) in Soil		
Our Reference		177105-16
Your Reference	UNITS	Dup1
Depth		-
Date Sampled		04/10/2017
Type of sample		Soil
Date extracted	-	06/10/2017
Date analysed	-	06/10/2017
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	100

PAHs in Soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.2	<0.1	0.2	0.2	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Phenanthrene	mg/kg	1.5	<0.1	1.8	1.3	1.6
Anthracene	mg/kg	0.4	<0.1	0.4	0.3	0.4
Fluoranthene	mg/kg	2.7	<0.1	3.6	2.0	2.0
Pyrene	mg/kg	2.8	<0.1	3.7	2.0	1.8
Benzo(a)anthracene	mg/kg	1.2	<0.1	1.7	0.9	0.9
Chrysene	mg/kg	1.2	<0.1	1.7	0.8	0.8
Benzo(b,j+k)fluoranthene	mg/kg	2.0	<0.2	2.9	1	1
Benzo(a)pyrene	mg/kg	1.2	<0.05	1.8	0.87	0.74
Indeno(1,2,3-c,d)pyrene	mg/kg	0.6	<0.1	0.9	0.4	0.3
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	0.3	0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.8	<0.1	1.2	0.5	0.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.8	<0.5	2.6	1.3	1
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.8	<0.5	2.6	1.3	1
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.8	<0.5	2.6	1.3	1
Total +ve PAH's	mg/kg	15	<0.05	20	11	11
Surrogate p-Terphenyl-d14	%	99	95	100	96	93

PAHs in Soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.9	<0.1	0.1	0.3	<0.1
Anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.6	<0.1	0.2	0.6	<0.1
Pyrene	mg/kg	1.5	<0.1	0.2	0.6	<0.1
Benzo(a)anthracene	mg/kg	0.8	<0.1	0.1	0.4	<0.1
Chrysene	mg/kg	0.7	<0.1	0.1	0.3	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	<0.2	0.6	<0.2
Benzo(a)pyrene	mg/kg	0.82	<0.05	0.1	0.4	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	<0.1	<0.1	0.2	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	<0.1	0.2	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.2	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.2	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.2	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	9.0	<0.05	0.94	3.5	<0.05
Surrogate p-Terphenyl-d14	%	94	94	93	92	97

PAHs in Soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	0.9	0.2	0.2	0.4
Anthracene	mg/kg	<0.1	0.3	<0.1	<0.1	0.1
Fluoranthene	mg/kg	<0.1	2.0	0.4	0.4	0.9
Pyrene	mg/kg	<0.1	2.1	0.5	0.4	0.8
Benzo(a)anthracene	mg/kg	<0.1	1.1	0.2	0.2	0.5
Chrysene	mg/kg	<0.1	1.1	0.2	0.2	0.4
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	2	0.4	0.3	0.8
Benzo(a)pyrene	mg/kg	<0.05	1.2	0.3	0.2	0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.6	0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.8	0.2	0.1	0.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	1.8	<0.5	<0.5	0.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	1.8	<0.5	<0.5	0.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	1.8	<0.5	<0.5	0.6
Total +ve PAH's	mg/kg	<0.05	12	2.6	1.9	4.9
Surrogate p-Terphenyl-d14	%	94	95	92	92	95

PAHs in Soil		
Our Reference		177105-16
Your Reference	UNITS	Dup1
Depth		-
Date Sampled		04/10/2017
Type of sample		Soil
Date extracted	-	06/10/2017
Date analysed	-	06/10/2017
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.4
Anthracene	mg/kg	0.1
Fluoranthene	mg/kg	0.9
Pyrene	mg/kg	0.9
Benzo(a)anthracene	mg/kg	0.4
Chrysene	mg/kg	0.4
Benzo(b,j+k)fluoranthene	mg/kg	0.8
Benzo(a)pyrene	mg/kg	0.5
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 calc (zero)	mg/kg	0.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.6
Total +ve PAH's	mg/kg	5.0
Surrogate p-Terphenyl-d14	%	88

Organochlorine Pesticides in soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	97	90	91	100	95

Organochlorine Pesticides in soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	89	92	85	97

Organochlorine Pesticides in soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	95	92	88	97

Organophosphorus Pesticides						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	97	90	91	100	95

Organophosphorus Pesticides						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	89	92	85	97

Organophosphorus Pesticides						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	95	92	88	97

PCBs in Soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Aroclor 1016	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1221	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1232	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1242	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1248	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1254	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Aroclor 1260	mg/kg	<0.2	<0.1	<0.2	<0.2	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.2	<0.1	<0.3	<0.3	<0.1
Surrogate TCLMX	%	97	90	91	100	95

PCBs in Soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	89	89	92	85	97

PCBs in Soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.2
Surrogate TCLMX	%	102	95	92	88	97

Acid Extractable metals in soil						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Arsenic	mg/kg	8	7	6	7	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	11	12	10	16
Copper	mg/kg	16	13	22	23	15
Lead	mg/kg	70	12	140	590	94
Mercury	mg/kg	<0.1	<0.1	0.1	0.1	0.1
Nickel	mg/kg	5	3	6	5	4
Zinc	mg/kg	35	25	63	400	66

Acid Extractable metals in soil						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Arsenic	mg/kg	<4	6	9	9	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	17	23	25	15
Copper	mg/kg	190	14	13	26	14
Lead	mg/kg	550	14	20	44	14
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	8	3	6	18	2
Zinc	mg/kg	320	20	33	120	32

Acid Extractable metals in soil						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Date analysed	-	06/10/2017	06/10/2017	06/10/2017	06/10/2017	06/10/2017
Arsenic	mg/kg	<4	9	12	7	12
Cadmium	mg/kg	<0.4	0.6	<0.4	<0.4	<0.4
Chromium	mg/kg	2	16	14	16	15
Copper	mg/kg	<1	43	16	16	35
Lead	mg/kg	1	250	66	24	400
Mercury	mg/kg	<0.1	0.2	<0.1	<0.1	0.1
Nickel	mg/kg	<1	14	5	5	9
Zinc	mg/kg	8	170	54	42	400

Acid Extractable metals in soil		
Our Reference		177105-16
Your Reference	UNITS	Dup1
Depth		-
Date Sampled		04/10/2017
Type of sample		Soil
Date prepared	-	06/10/2017
Date analysed	-	06/10/2017
Arsenic	mg/kg	9
Cadmium	mg/kg	<0.4
Chromium	mg/kg	13
Copper	mg/kg	18
Lead	mg/kg	91
Mercury	mg/kg	<0.1
Nickel	mg/kg	5
Zinc	mg/kg	55

Moisture						
Our Reference		177105-1	177105-2	177105-3	177105-4	177105-5
Your Reference	UNITS	BH1	BH1	BH2	BH3	BH3
Depth		0.1-0.3	0.5-0.95	0-0.2	0.3-0.4	0.5-0.7
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	6/10/2017	6/10/2017	6/10/2017	6/10/2017	6/10/2017
Date analysed	-	9/10/2017	9/10/2017	9/10/2017	9/10/2017	9/10/2017
Moisture	%	21	19	17	9.7	19

Moisture						
Our Reference		177105-6	177105-7	177105-8	177105-9	177105-10
Your Reference	UNITS	BH4	BH4	BH5	BH6	BH6
Depth		0-0.2	0.5-0.95	0.1-0.3	0-0.1	0.6-0.8
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	6/10/2017	6/10/2017	6/10/2017	6/10/2017	6/10/2017
Date analysed	-	9/10/2017	9/10/2017	9/10/2017	9/10/2017	9/10/2017
Moisture	%	5.5	21	13	17	21

Moisture						
Our Reference		177105-11	177105-12	177105-13	177105-14	177105-15
Your Reference	UNITS	BH7	BH101	BH102	BH102	BH103
Depth		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2
Date Sampled		27/09/2017	04/10/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	6/10/2017	6/10/2017	6/10/2017	6/10/2017	6/10/2017
Date analysed	-	9/10/2017	9/10/2017	9/10/2017	9/10/2017	9/10/2017
Moisture	%	6.5	17	16	6.8	6.1

Moisture		
Our Reference		177105-16
Your Reference	UNITS	Dup1
Depth		-
Date Sampled		04/10/2017
Type of sample		Soil
Date prepared	-	6/10/2017
Date analysed	-	9/10/2017
Moisture	%	16

Asbestos ID - soils						
Our Reference		177105-1	177105-3	177105-4	177105-6	177105-8
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0.1-0.3	0-0.2	0.3-0.4	0-0.2	0.1-0.3
Date Sampled		27/09/2017	27/09/2017	27/09/2017	27/09/2017	27/09/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	12/10/2017	12/10/2017	12/10/2017	12/10/2017	12/10/2017
Sample mass tested	g	Approx. 30g	Approx. 20g	Approx. 20g	Approx. 40g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown sandy soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		177105-9	177105-11	177105-12	177105-13	177105-15
Your Reference	UNITS	BH6	BH7	BH101	BH102	BH103
Depth		0-0.1	0-0.2	0-0.2	0-0.2	0-0.2
Date Sampled		27/09/2017	27/09/2017	04/10/2017	04/10/2017	04/10/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	12/10/2017	12/10/2017	12/10/2017	12/10/2017	12/10/2017
Sample mass tested	g	Approx. 20g	Approx. 45g	Approx. 15g	Approx. 20g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Beige sandy soil	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

BTEX in Water		
Our Reference		177105-18
Your Reference	UNITS	FR 1
Depth		-
Date Sampled		04/10/2017
Type of sample		Water
Date extracted	-	06/10/2017
Date analysed	-	09/10/2017
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	105
Surrogate toluene-d8	%	94
Surrogate 4-BFB	%	103

Method ID	Methodology Summary
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.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	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. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
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-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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			09/10/2017	1	09/10/2017	09/10/2017		09/10/2017	09/10/2017
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	95	74
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	95	74
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	86	73
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	96	81
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	98	74
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	97	72
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	97	73
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	95	1	97	112	14	97	74

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	09/10/2017	09/10/2017		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	11	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	11	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	11	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	11	98	95	3	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	97	87
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	93	85
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	120	130	8	91	86
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	97	87
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	130	160	21	93	85
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	91	86
Surrogate o-Terphenyl	%		Org-003	95	1	102	109	7	83	92

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	11	107	120	11	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	0.1	0	94	91
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.3	40	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	0.2	67	98	94
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	1.5	2.6	54	103	99
Anthracene	mg/kg	0.1	Org-012	<0.1	1	0.4	0.7	55	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	2.7	3.6	29	93	90
Pyrene	mg/kg	0.1	Org-012	<0.1	1	2.8	3.6	25	88	85
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	1.2	1.5	22	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	1.2	1.5	22	97	92
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	2.0	2.4	18	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	1.2	1.5	22	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	0.6	0.8	29	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	0.1	0.2	67	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	0.8	1.0	22	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	91	1	99	100	1	107	104

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	11	94	95	1	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	93	93
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	97	96
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	89	90
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	86
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	86
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	94	96
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	97	99
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	83	83
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	89	90
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	89	88
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	88	1	97	89	9	70	65

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
HCB	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-005	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	[NT]	11	102	102	0	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	88	86
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	80	79
Dimethoate	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	86	85
Fenitrothion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	101	94
Malathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	107	87
Parathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	104	101
Ronnel	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	98	98
Surrogate TCMX	%		Org-008	88	1	97	89	9	74	75

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-008	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-008	[NT]	11	102	102	0	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date extracted	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	110	115
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	88	1	97	89	9	74	75

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	[NT]	11	102	102	0	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	177105-2
Date prepared	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Date analysed	-			06/10/2017	1	06/10/2017	06/10/2017		06/10/2017	06/10/2017
Arsenic	mg/kg	4	Metals-020	<4	1	8	7	13	106	86
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	100	91
Chromium	mg/kg	1	Metals-020	<1	1	13	13	0	104	94
Copper	mg/kg	1	Metals-020	<1	1	16	17	6	103	100
Lead	mg/kg	1	Metals-020	<1	1	70	77	10	104	92
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	102	100
Nickel	mg/kg	1	Metals-020	<1	1	5	5	0	100	89
Zinc	mg/kg	1	Metals-020	<1	1	35	32	9	103	95

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Date analysed	-			[NT]	11	06/10/2017	06/10/2017		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	2	2	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	<1	<1	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	1	1	0	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	<1	<1	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	8	7	13	[NT]	[NT]

QUALITY CONTROL: BTEX in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/10/2017	[NT]	[NT]	[NT]	[NT]	06/10/2017	[NT]
Date analysed	-			09/10/2017	[NT]	[NT]	[NT]	[NT]	09/10/2017	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	110	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Surrogate Dibromofluoromethane	%		Org-016	103	[NT]	[NT]	[NT]	[NT]	106	[NT]
Surrogate toluene-d8	%		Org-016	93	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate 4-BFB	%		Org-016	120	[NT]	[NT]	[NT]	[NT]	117	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

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 (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics 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.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

PCBs in Soil (sample 1,1d,3,4,15) - PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

PAHs in Soil (Sample 1,1d) - The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

Asbestos: Excessive sample volumes were provided for asbestos analysis.
A portion of the supplied samples were sub-sampled according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples requested for asbestos testing were sub-sampled from bags provided by the client.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 217649

Client Details

Client	Environmental Investigation Services
Attention	Para Bokalawela
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30910KG, Strathfield**
Number of Samples	11 SOIL
Date samples received	16/05/2019
Date completed instructions received	16/05/2019

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	21/05/2019
Date of Issue	21/05/2019

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Panika Wongchanda
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Giovanni Agosti, Group Technical Manager
Lucy Zhu, Senior Asbestos Analyst
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		217649-1	217649-3	217649-4	217649-5	217649-6
Your Reference	UNITS	BH201	BH202	BH202	BH202	BH203
Depth		0.0-0.2	0.1-0.2	0.4-0.2	0.6-0.7	0.0-0.2
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	18/05/2019	18/05/2019	18/05/2019	18/05/2019	18/05/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	86	97	66	90	75

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		217649-7	217649-10	217649-11
Your Reference	UNITS	BH203	MPDUP1	TB1
Depth		0.2-0.3	-	-
Date Sampled		16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	18/05/2019	18/05/2019	18/05/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	83	91	95

svTRH (C10-C40) in Soil						
Our Reference		217649-1	217649-3	217649-4	217649-5	217649-6
Your Reference	UNITS	BH201	BH202	BH202	BH202	BH203
Depth		0.0-0.2	0.1-0.2	0.4-0.2	0.6-0.7	0.0-0.2
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	18/05/2019	18/05/2019	18/05/2019	18/05/2019	18/05/2019
TRH C_{10} - C_{14}	mg/kg	<50	59	<50	91	<50
TRH C_{15} - C_{28}	mg/kg	530	290	430	110	450
TRH C_{29} - C_{36}	mg/kg	340	220	300	<100	760
TRH >C_{10} -C_{16}	mg/kg	<50	96	120	130	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	96	120	130	<50
TRH >C_{16} -C_{34}	mg/kg	780	410	590	110	980
TRH >C_{34} -C_{40}	mg/kg	210	130	190	<100	350
Total +ve TRH (>C10-C40)	mg/kg	990	640	890	250	1,300
Surrogate o-Terphenyl	%	99	93	97	87	99

svTRH (C10-C40) in Soil			
Our Reference		217649-7	217649-10
Your Reference	UNITS	BH203	MPDUP1
Depth		0.2-0.3	-
Date Sampled		16/05/2019	16/05/2019
Type of sample		SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019
Date analysed	-	18/05/2019	18/05/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	190	160
TRH C_{29} - C_{36}	mg/kg	250	190
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	360	300
TRH >C_{34} -C_{40}	mg/kg	140	100
Total +ve TRH (>C10-C40)	mg/kg	500	400
Surrogate o-Terphenyl	%	88	87

PAHs in Soil						
Our Reference		217649-1	217649-3	217649-4	217649-6	217649-7
Your Reference	UNITS	BH201	BH202	BH202	BH203	BH203
Depth		0.0-0.2	0.1-0.2	0.4-0.2	0.0-0.2	0.2-0.3
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	20/05/2019	20/05/2019	20/05/2019	20/05/2019	20/05/2019
Naphthalene	mg/kg	0.2	0.2	0.2	<0.1	0.2
Acenaphthylene	mg/kg	1.2	1.2	1.1	<0.1	0.7
Acenaphthene	mg/kg	0.4	0.1	0.2	<0.1	<0.1
Fluorene	mg/kg	0.6	1	0.8	<0.1	0.3
Phenanthrene	mg/kg	22	7.7	7.2	1.1	3.7
Anthracene	mg/kg	4.9	1.6	1.6	0.2	0.9
Fluoranthene	mg/kg	34	10	11	1.9	6.5
Pyrene	mg/kg	35	9.7	11	1.9	6.2
Benzo(a)anthracene	mg/kg	17	4.7	5.0	0.8	3.5
Chrysene	mg/kg	20	5.1	5.8	1.1	3.9
Benzo(b,j+k)fluoranthene	mg/kg	24	7.1	7.7	1	6.0
Benzo(a)pyrene	mg/kg	17	4.7	5.0	0.91	4.0
Indeno(1,2,3-c,d)pyrene	mg/kg	7.6	1.9	2.3	0.4	1.9
Dibenzo(a,h)anthracene	mg/kg	1.4	0.3	0.4	<0.1	0.3
Benzo(g,h,i)perylene	mg/kg	9.9	2.4	2.8	0.6	2.3
Total +ve PAH's	mg/kg	190	58	62	10	40
Benzo(a)pyrene TEQ calc (zero)	mg/kg	23	6.4	6.9	1.2	5.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	23	6.4	6.9	1.2	5.6
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	23	6.4	6.9	1.3	5.6
Surrogate p-Terphenyl-d14	%	109	103	102	106	96

PAHs in Soil		
Our Reference		217649-10
Your Reference	UNITS	MPDUP1
Depth		-
Date Sampled		16/05/2019
Type of sample		SOIL
Date extracted	-	17/05/2019
Date analysed	-	20/05/2019
Naphthalene	mg/kg	0.2
Acenaphthylene	mg/kg	1.1
Acenaphthene	mg/kg	0.1
Fluorene	mg/kg	0.6
Phenanthrene	mg/kg	6.0
Anthracene	mg/kg	1.2
Fluoranthene	mg/kg	8.3
Pyrene	mg/kg	7.8
Benzo(a)anthracene	mg/kg	4.1
Chrysene	mg/kg	4.7
Benzo(b,j+k)fluoranthene	mg/kg	6.9
Benzo(a)pyrene	mg/kg	4.5
Indeno(1,2,3-c,d)pyrene	mg/kg	2.0
Dibenzo(a,h)anthracene	mg/kg	0.3
Benzo(g,h,i)perylene	mg/kg	2.5
Total +ve PAH's	mg/kg	50
Benzo(a)pyrene TEQ calc (zero)	mg/kg	6.2
Benzo(a)pyrene TEQ calc(half)	mg/kg	6.2
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	6.2
Surrogate p-Terphenyl-d14	%	96

Organochlorine Pesticides in soil						
Our Reference		217649-1	217649-3	217649-5	217649-6	217649-9
Your Reference	UNITS	BH201	BH202	BH202	BH203	SS1
Depth		0.0-0.2	0.1-0.2	0.6-0.7	0.0-0.2	-
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	1.5
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	103	97	104	112

Organophosphorus Pesticides						
Our Reference		217649-1	217649-3	217649-5	217649-6	217649-9
Your Reference	UNITS	BH201	BH202	BH202	BH203	SS1
Depth		0.0-0.2	0.1-0.2	0.6-0.7	0.0-0.2	-
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	89	103	97	104	112

PCBs in Soil				
Our Reference		217649-1	217649-3	217649-6
Your Reference	UNITS	BH201	BH202	BH203
Depth		0.0-0.2	0.1-0.2	0.0-0.2
Date Sampled		16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	17/05/2019	17/05/2019	17/05/2019
Aroclor 1016	mg/kg	<0.5	<0.1	<0.1
Aroclor 1221	mg/kg	<0.5	<0.1	<0.1
Aroclor 1232	mg/kg	<0.5	<0.1	<0.1
Aroclor 1242	mg/kg	<0.5	<0.1	<0.1
Aroclor 1248	mg/kg	<0.5	<0.1	<0.1
Aroclor 1254	mg/kg	<0.5	<0.1	<0.1
Aroclor 1260	mg/kg	<0.5	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.5	<0.1	<0.1
Surrogate TCLMX	%	89	103	104

Acid Extractable metals in soil						
Our Reference		217649-1	217649-3	217649-4	217649-6	217649-7
Your Reference	UNITS	BH201	BH202	BH202	BH203	BH203
Depth		0.0-0.2	0.1-0.2	0.4-0.2	0.0-0.2	0.2-0.3
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Arsenic	mg/kg	10	6	7	6	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	15	14	20	21
Copper	mg/kg	24	29	31	88	37
Lead	mg/kg	110	150	160	66	230
Mercury	mg/kg	0.1	<0.1	0.1	0.2	0.2
Nickel	mg/kg	6	9	9	7	8
Zinc	mg/kg	100	120	130	140	90

Acid Extractable metals in soil			
Our Reference		217649-9	217649-10
Your Reference	UNITS	SS1	MPDUP1
Depth		-	-
Date Sampled		16/05/2019	16/05/2019
Type of sample		SOIL	SOIL
Date prepared	-	17/05/2019	17/05/2019
Date analysed	-	17/05/2019	17/05/2019
Arsenic	mg/kg	8	8
Cadmium	mg/kg	0.6	<0.4
Chromium	mg/kg	17	20
Copper	mg/kg	49	35
Lead	mg/kg	270	240
Mercury	mg/kg	0.2	0.2
Nickel	mg/kg	9	8
Zinc	mg/kg	330	85

Moisture						
Our Reference		217649-1	217649-3	217649-4	217649-5	217649-6
Your Reference	UNITS	BH201	BH202	BH202	BH202	BH203
Depth		0.0-0.2	0.1-0.2	0.4-0.2	0.6-0.7	0.0-0.2
Date Sampled		16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	17/05/2019	17/05/2019	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	20/05/2019	20/05/2019	20/05/2019	20/05/2019	20/05/2019
Moisture	%	21	16	15	17	25

Moisture				
Our Reference		217649-7	217649-9	217649-10
Your Reference	UNITS	BH203	SS1	MPDUP1
Depth		0.2-0.3	-	-
Date Sampled		16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	17/05/2019	17/05/2019	17/05/2019
Date analysed	-	20/05/2019	20/05/2019	20/05/2019
Moisture	%	14	8.8	14

Asbestos ID - soils				
Our Reference		217649-1	217649-3	217649-6
Your Reference	UNITS	BH201	BH202	BH203
Depth		0.0-0.2	0.1-0.2	0.0-0.2
Date Sampled		16/05/2019	16/05/2019	16/05/2019
Type of sample		SOIL	SOIL	SOIL
Date analysed	-	17/05/2019	17/05/2019	17/05/2019
Sample mass tested	g	Approx. 40g	Approx. 30g	Approx. 15g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
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.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	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. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
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-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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			18/05/2019	1	18/05/2019	18/05/2019		18/05/2019	18/05/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	90	74
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	90	74
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	88	72
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	89	73
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	91	74
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	92	75
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	90	72
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	86	1	86	72	18	85	72

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			18/05/2019	1	18/05/2019	18/05/2019		18/05/2019	18/05/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	113	106
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	530	810	42	114	122
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	340	480	34	114	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	54	8	113	106
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	780	1200	42	114	122
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	210	220	5	114	#
Surrogate o-Terphenyl	%		Org-003	88	1	99	109	10	99	93

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			20/05/2019	1	20/05/2019	20/05/2019		20/05/2019	20/05/2019
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	114	107
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	1.2	1	18	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	0.4	1.1	93	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	0.6	0.8	29	104	73
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	22	26	17	96	#
Anthracene	mg/kg	0.1	Org-012	<0.1	1	4.9	4.8	2	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	34	48	34	94	#
Pyrene	mg/kg	0.1	Org-012	<0.1	1	35	50	35	98	#
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	17	20	16	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	20	24	18	126	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	24	31	25	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	17	22	26	100	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	7.6	9.7	24	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	1.4	1.8	25	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	9.9	13	27	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	101	1	109	101	8	100	98

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	91	100
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	106	132
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	103	128
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	118
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	106	131
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	109	138
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	115	122
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	109	129
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	109	#
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	113	138
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	134	1	89	88	1	102	112

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	111	125
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	97	93
Dimethoate	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	113	95
Fenitrothion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	123	109
Malathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	92	112
Parathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	120	108
Ronnel	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	109	114
Surrogate TCMX	%		Org-008	100	1	89	88	1	96	100

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date extracted	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	100	128
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.5	<0.5	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	105	1	89	88	1	100	100

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217649-3
Date prepared	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Date analysed	-			17/05/2019	1	17/05/2019	17/05/2019		17/05/2019	17/05/2019
Arsenic	mg/kg	4	Metals-020	<4	1	10	11	10	80	91
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	96	74
Chromium	mg/kg	1	Metals-020	<1	1	15	22	38	106	88
Copper	mg/kg	1	Metals-020	<1	1	24	24	0	105	105
Lead	mg/kg	1	Metals-020	<1	1	110	120	9	101	71
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.1	0.1	0	100	94
Nickel	mg/kg	1	Metals-020	<1	1	6	7	15	100	81
Zinc	mg/kg	1	Metals-020	<1	1	100	95	5	98	43

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics 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.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 217649-1, 3, 6 were sub-sampled from bags provided by the client.

PAHs in Soil -
Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in sample 217649-3 have caused interference.
The RPD for duplicate results is accepted due to the non homogenous nature of sample 217649-1.

TRH Soil C10-C40 NEPM - # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in sample 217649-3 have caused interference.

Acid Extractable Metals in Soil - Spike recovery for Zinc in sample 3 at 43% which is outside lab acceptance criteria (70-130%), however, the LCS recovery is acceptable at 98%. Sample heterogeneity suspected.

OC's in Soil - # Percent recovery for the matrix spike is not possible to report due to interference from analytes (other than those being tested) in sample 217649-3

PCBs in Soil - The PQL has been raised due to interferences from analytes (other than those being tested) in sample 1.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Para Bokalawela

Sample Login Details

Your reference	E30910KG, Strathfield
Envirolab Reference	217649
Date Sample Received	16/05/2019
Date Instructions Received	16/05/2019
Date Results Expected to be Reported	21/05/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	11 SOIL
Turnaround Time Requested	3 days
Temperature on Receipt (°C)	18.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	Organophosphorus Pesticides	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	On Hold
BH201-0.0-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH201-0.7-0.9									✓
BH202-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH202-0.4-0.2	✓	✓	✓				✓		
BH202-0.6-0.7	✓	✓		✓	✓				
BH203-0.0-0.2	✓	✓	✓	✓	✓	✓	✓	✓	
BH203-0.2-0.3	✓	✓	✓				✓		
BH203-0.6-0.7									✓
SS1				✓	✓		✓		
MPDUP1	✓	✓	✓				✓		
TB1	✓								

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	EIS Job Number: E30910KG Date Results Required: 20-05-2019 (3 days) Page: 1 of 1	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Para Bokalawela

Location:	Strathfield, NSW	Sample Preserved in Esky on Ice
Sampler:	MMP	Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3	Combo 6	Combo 6a	8 Metals	PAHs	TRH/BTEX	BTEX	Asbestos	OCP/OPP		
16/05/2019	1	BH201	0.0-0.2	G, A	1.6	FILL				X								
16/05/2019	2	BH201	0.7-0.9	G, A	3.1	CLAY												
16/05/2019	3	BH202	0.1-0.2	G, A	7.2	FILL				X								
16/05/2019	4	BH202	0.4-0.2	G, A	37.8	FILL		X										
16/05/2019	5	BH202	0.6-0.7	G, A	151	CLAY							X			X		
16/05/2019	6	BH203	0.0-0.2	G, A	0	FILL				X								
16/05/2019	7	BH203	0.2-0.3	G, A	3	FILL		X										
16/05/2019	8	BH203	0.6-0.7	G, A	0.4	CLAY												
16/05/2019	9	SS1	-	G, A	0	FILL					X					X		
16/05/2019	10	MPDUP1	-	G,	-	SOIL		X										
16/05/2019	11	TB1	-	G	-	SOIL								X				

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 217649
Date Received: 16-05-19
Time Received: 15:20
Received by: TC
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Remarks (comments/detection limits required):

Sample Containers:
G - 250mg Glass Jar
A - Ziplock Asbestos Bag
P - Plastic Bag

Relinquished By:	Date: 16-05-2019	Time: 15:20.	Received By: ELS	Date: 16.05.19 15:20

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 217649-A

Client Details

Client	Environmental Investigation Services
Attention	Para Bokalawela
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E30910KG, Strathfield**
Number of Samples	11 SOIL
Date samples received	16/05/2019
Date completed instructions received	24/05/2019

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.

Report Details

Date results requested by	29/05/2019
Date of Issue	29/05/2019

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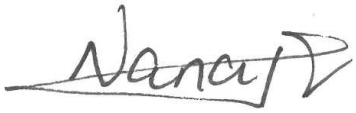
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

svTRH (C10-C40) in Soil		
Our Reference		217649-A-4
Your Reference	UNITS	BH202
Depth		0.4-0.2
Date Sampled		16/05/2019
Type of sample		SOIL
Date extracted	-	28/05/2019
Date analysed	-	28/05/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	370
TRH C_{29} - C_{36}	mg/kg	270
TRH >C_{10} -C_{16}	mg/kg	97
TRH >C_{16} -C_{34}	mg/kg	520
TRH >C_{34} -C_{40}	mg/kg	190
Total +ve TRH (>C10-C40)	mg/kg	800
Surrogate o-Terphenyl	%	93

sTPH in Soil (C10-C40)-Silica		
Our Reference		217649-A-4
Your Reference	UNITS	BH202
Depth		0.4-0.2
Date Sampled		16/05/2019
Type of sample		SOIL
Date extracted	-	28/05/2019
Date analysed	-	29/05/2019
TPH C_{10} - C_{14}	mg/kg	<50
TPH C_{15} - C_{28}	mg/kg	140
TPH C_{29} - C_{36}	mg/kg	<100
TPH >C_{10} -C_{16}	mg/kg	<50
TPH >C_{16} -C_{34}	mg/kg	200
TPH >C_{34} -C_{40}	mg/kg	<100
Surrogate o-Terphenyl	%	91

Method ID	Methodology Summary
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-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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			28/05/2019	4	28/05/2019	28/05/2019		28/05/2019	[NT]
Date analysed	-			28/05/2019	4	28/05/2019	28/05/2019		28/05/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	4	<50	<50	0	91	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	4	370	420	13	86	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	4	270	320	17	130	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	4	97	96	1	91	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	4	520	610	16	86	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	4	190	230	19	130	[NT]
Surrogate o-Terphenyl	%		Org-003	103	4	93	94	1	130	[NT]

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			28/05/2019	4	28/05/2019	28/05/2019		28/05/2019	[NT]
Date analysed	-			29/05/2019	4	29/05/2019	29/05/2019		29/05/2019	[NT]
TPH C_{10} - C_{14}	mg/kg	50	Org-003	<50	4	<50	<50	0	70	[NT]
TPH C_{15} - C_{28}	mg/kg	100	Org-003	<100	4	140	110	24	83	[NT]
TPH C_{29} - C_{36}	mg/kg	100	Org-003	<100	4	<100	<100	0	77	[NT]
TPH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	4	<50	<50	0	70	[NT]
TPH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	4	200	150	29	83	[NT]
TPH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	4	<100	<100	0	77	[NT]
Surrogate o-Terphenyl	%		Org-003	81	4	91	99	8	80	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics 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.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Andrew Fitzsimons

From: Nancy Zhang
Sent: Friday, 24 May 2019 6:05 PM
To: Para Bokalawela
Cc: Samplereceipt
Subject: RE: Silica Gel Clean-up Request -- 217649 -- E30910KG, Strathfield

Follow Up Flag: Follow up
Flag Status: Flagged

Ref: 217649-A
TAT: 3 days
Due: 29/5/19

Hi Para,

No problem, when do you need the result by?

Regards,

Nancy Zhang | Laboratory Manager, Sydney | Envirolab Services Pty Ltd

Great Science, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 F 612 9910 6201
E nzhang@envirolab.com.au | W www.envirolab.com.au

From: Para Bokalawela <PBokalawela@jkenvironments.com.au>
Sent: Friday, 24 May 2019 5:05 PM
To: Nancy Zhang <NZhang@envirolab.com.au>
Subject: Silica Gel Clean-up Request -- 217649 -- E30910KG, Strathfield

Hi Nancy,

#4

Please do Silica Gel Clean-up for the sample BH202 (0.4-0.2) and re-test for TRH.

Regards,

Para Bokalawela
Senior Environmental Engineer

Appendix F: Report Explanatory Notes

Standard Sampling Procedure

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by EIS. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

A. Soil Sampling

- Prepare a borehole/test pit log or made a note of the sample description for stockpiles.
- Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill rig/excavator such that the machine can operate in a safe manner.
- Ensure all sampling equipment has been decontaminated prior to use.
- Remove any surface debris from the immediate area of the sampling location.
- Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of any volatiles. If possible, fill the glass jars completely.
- Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- Label the sampling containers with the EIS job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
- Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
- Record the lithology of the sample and sample depth on the borehole/test pit log generally in accordance with AS1726-1993[15].
- Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with the standards outlined in the report.
- Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork where it is safe to do so. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.
- Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

B. Decontamination Procedures for Soil Sampling Equipment

- All sampling equipment should be decontaminated between every sampling location. This excludes single use PVC tubing used for push tubes etc. Equipment and materials required for the decontamination include:
  - Phosphate free detergent (Decon 90);
  - Potable water;
  - Stiff brushes; and
  - Plastic sheets.
- Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- Fill both buckets with clean potable water and add phosphate free detergent to one bucket.
- In the bucket containing the detergent, scrub the sampling equipment until all the material attached to the equipment has been removed.
- Rinse sampling equipment in the bucket containing potable water.

[15] Standards Australia, (1993), *Geotechnical Site Investigations.* (AS1726-1993)

- Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes, then the equipment should not be used until it has been thoroughly cleaned.

C. Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adhesion to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

- After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.
- Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling, the condition of each well should observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
- Measure the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or other low flow) techniques.
- Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
  - Stericup single-use filters (for heavy metals samples);
  - Bucket with volume increments;
  - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles;
  - Bucket with volume increments;
  - Flow cell;
  - pH/EC/Eh/Temperature meters;
  - Plastic drums used for transportation of purged water;
  - Esky and ice;
  - Nitrile gloves;
  - Distilled water (for cleaning);
  - Electronic dip meter;
  - Low flow peristaltic pump and associated tubing; and
  - Groundwater sampling forms.
- Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.

- Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- Groundwater samples are obtained from the monitoring wells using low flow sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.
- All measurements are recorded on specific data sheets.
- Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.
- All samples are preserved in accordance with water sampling requirements specified by the laboratory and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice.
- At the end of each water sampling complete a chain of custody form for samples being sent to the laboratory.

D. <u>Decontamination Procedures for Groundwater Sampling Equipment</u>

- All equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- The following equipment and materials are required for the decontamination procedure:
  - Phosphate free detergent;
  - Potable water;
  - Distilled water; and
  - Plastic Sheets or bulk bags (plastic bags).
- Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.
- Flush pump head with distilled water.
- Change water and detergent solution after each sampling location.
- Rinse sampling equipment in the bucket containing distilled water.
- Place cleaned equipment on clean plastic sheets.
- If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned

QA/QC Definitions

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)[16] methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (1991)[17].

A. Practical Quantitation Limit (PQL), Limit of Reporting (LOR) & Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection Limit for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations: *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit*" (Keith, 1991).

B. Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD).

C. Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured (i.e. the proximity of an averaged result to the true value, where all random errors have been statistically removed). The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes. Accuracy is typically reported as percent recovery.

D. Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handing and analysis protocols and use of proper chain-of-custody and documentation procedures.

E. Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;

[16] US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* (US EPA SW-846)

[17] Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide.*

- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

F. Comparability

Comparability is the evaluation of the similarity of conditions (e.g. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel; Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).

G. Blanks

The purpose of laboratory and field blanks is to check for artefacts and interferences that may arise during sampling, transport and analysis.

H. Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula below. Acceptable recovery limits are 70% to 130%.

$$\frac{\text{(Spike Sample Result – Sample Result) x 100}}{\text{Concentration of Spike Added}}$$

I. Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

J. Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2) \times 100}{\{(D1 + D2)/2\}}$$

Appendix G: Data (QA/QC) Evaluation

Data (QA/QC) Evaluation

A. INTRODUCTION

This Data (QA/QC) Evaluation forms part of the validation process for the DQOs documented in Section 5.1 of this report. Checks were made to assess the data in terms of precision, accuracy, representativeness, comparability and completeness. These 'PARCC' parameters are referred to collectively as DQIs and are defined in the Report Explanatory Notes attached in the report appendices.

1. Field and Laboratory Considerations

The quality of the analytical data produced for this project has been considered in relation to the following:

- Sample collection, storage, transport and analysis;
- Laboratory PQLs;
- Field QA/QC results; and
- Laboratory QA/QC results.

2. Field QA/QC Samples and Analysis

A summary of the field QA/QC samples collected and analysed for this assessment is provided in the following table:

Sample Type	Sample Identification	Frequency (of Sample Type)	Analysis Performed
Intra-laboratory duplicate (soil)	MP Dup 1 (primary sample BH203 0.2-0.3m)	Approximately 17% of primary samples	Heavy metals, TRH/BTEX, PAHs
Trip blank (soil)	TB1 (16 May 2019e)	One for the screening to demonstrate adequacy of storage and transport methods	BTEX

The results for the field QA/QC samples are detailed in the laboratory summary tables (Table F and Table G) attached to the assessment report and are discussed in the subsequent sections of this Data (QA/QC) Evaluation report.

3. Data Assessment Criteria

EIS adopted the following criteria for assessing the field and laboratory QA/QC analytical results:

Field Duplicates

Acceptable targets for precision of field duplicates in this report will be less than 50% RPD for concentrations greater than 10 times the PQL, less than 75% RPD for concentrations between five and 10 times the PQL and less than 100% RPD for concentrations that are less than five times the PQL. RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blank

Acceptable targets for field blank and rinsate samples in this report will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to typical background concentrations in soils and published drinking water guidelines for waters.

Laboratory QA/QC

The suitability of the laboratory data is assessed against the laboratory QA/QC criteria which is outlined in the laboratory reports. These criteria were developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines. A summary of the acceptable limits adopted by the primary laboratory (Envirolab) is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics;
- 60-140% recovery acceptable for organics; and
- 10-140% recovery acceptable for VOCs.

Surrogate Spikes

- 60-140% recovery acceptable for general organics; and
- 10-140% recovery acceptable for VOCs.

Method Blanks

- All results less than PQL.

B. DATA EVALUATION

1. Sample Collection, Storage, Transport and Analysis

Samples were collected by trained field staff in accordance with the EIS SSP. The SSP was developed to be consistent with relevant guidelines, including NEPM (2013) and other guidelines made under the CLM Act 1997. Appropriate sample preservation, handling and storage procedures were adopted. Laboratory analysis was undertaken within specified holding times in accordance with Schedule B(3) of NEPM (2013) and the laboratory NATA accredited methodologies.

Review of the project data also indicated that:

- COC documentation was adequately maintained;
- Sample receipt advice documentation was provided for all sample batches;
- All analytical results were reported; and
- Consistent units were used to report the analysis results.

2. Laboratory PQLs

Appropriate PQLs were adopted for the analysis and all PQLs were below the SAC.

3. Field QA/QC Sample Results

Field Duplicates

The results indicated that field precision was acceptable.

Trip Blank

During the investigation, one soil trip blank was placed in the esky during sampling and transported back to the laboratory. The results were all less than the PQLs, therefore cross contamination between samples that may have significance for data validity did not occur.

4. Laboratory QA/QC

The analytical methods implemented by the laboratory were performed in accordance with their NATA accreditation and were consistent with Schedule B(3) of NEPM (2013). The frequency of data reported for the laboratory QA/QC (i.e. duplicates, spikes, blanks, LCS) was considered to be acceptable for the purpose of this assessment.

A review of the laboratory QA/QC data identified the following minor non-conformances:

- Percent recovery for the PAH matrix spike is not possible to report as the high concentration of analytes in sample 217649-3 have caused interference. The RPD for duplicate results is accepted due to the non homogenous nature of sample 217649-1;
- Percent recovery for the TRH C10-C40 matrix spike is not possible to report as the high concentration of analytes in sample 217649-3 have caused interference;
- Spike recovery for Zinc in sample 3 at 43% which is outside lab acceptance criteria (70-130%), however, the LCS recovery is acceptable at 98%. Sample heterogeneity suspected;
- Percent recovery for the OC matrix spike is not possible to report due to interference from analytes (other than those being tested) in sample 217649-3;
- The PQL for PCBs has been raised due to interferences from analytes (other than those being tested) in sample 1.

C. DATA QUALITY SUMMARY

EIS are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the investigation objectives.

Appendix H: Guidelines and Reference Documents

Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). Acid Sulfate Soils Manual

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

CRC Care, (2011). Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document

CRC Care, (2017). Technical Report No. 39 – Risk-based management and guidance for benzo(a)pyrene

Contaminated Land Management Act 1997 (NSW)

Department of Land and Water Conservation, (1997). 1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

National Health and Medical Research Council (NHMRC), (2011). National Water Quality Management Strategy, Australian Drinking Water Guidelines

NSW Department of Environment and Conservation, (2007). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA, (1995). Contaminated Sites Sampling Design Guidelines

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Olszowy, H., Torr, P., and Imray, P., (1995). Trace Element Concentrations in Soils from Rural and Urban Areas of Australia. Contaminated Sites Monograph Series No. 4. Department of Human Services and Health, Environment Protection Agency, and South Australian Health Commission

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy No.55 – Remediation of Land 1998 (NSW)
World Health Organisation (WHO), (2008). Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality

Western Australia Department of Health, (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia