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INQUIRY INTO ENROLMENT CAPACITY IN INNER CITY PUBLIC PRIMARY SCHOOLS

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ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

TANNER KIBBLE DENTON (TKD) ARCHITECTS PTY LTD

ON

ADDITIONAL ENVIRONMENTAL SITE ASSESSMENT

FOR

PROPOSED TEMPORARY SCHOOL

AT

WENTWORTH PARK SOUTH – WATTLE STREET, ULTIMO, NSW

15 JULY 2016 **REF: E29319Klet**

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ABBREVIATIONS

Ambient Background Concentrations	**ABC**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Drinking Water Guidelines	**ADWG**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Asbestos Health Screening Levels	**ASL**
Acid Sulfate Soil	**ASS**
Above Ground Storage Tank	**AST**
Below Ground Level	**BGL**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene	**BTEXN**
Cation Exchange Capacity	**CEC**
Contaminated Land Management	**CLM**
Construction Management Plan	**CMP**
Chain of Custody	**COC**
Contaminant of Primary Concern	**CoPC**
Conceptual Site Model	**CSM**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Assessment Criteria	**EAC**
Ecological Investigation Levels	**EILs**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environmental Protection Agency	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Fibre Cement Fragments	**FCF**
General Approvals of Immobilisation	**GAI**
General Solid Waste	**GSW**
Health Investigation Level	**HILs**
Hardness Modified Trigger Values	**HMTV**
Health Screening Level	**HSLs**
International Organisation of Standardisation	**ISO**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Local Government Authority	**LGA**
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**

ABBREVIATIONS

Potential Contaminants of Concern	**PCC**
Photo-ionisation Detector	**PID**
Practical Quantitation Limit	**PQL**
Preliminary Site Investigation	**PSI**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Relative Percentage Difference	**RPD**
Restricted Solid Waste	**RSW**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Site Audit Statement	**SAS**
Site Audit Report	**SAR**
Specific Contamination Concentration	**SCC**
Standard Penetration Test	**SPT**
Semi-Volatile Organic Compounds	**sVOC**
Standard Sampling Procedure	**SSP**
Standard Water Level	**SWL**
Standard Sampling Procedure	**SSP**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
Volatile Organic Chlorinated Compound	**VOCC**
Workplace, Health and Safety	**WHS**

1 INTRODUCTION

TKD Architects Pty Ltd ('the client') commissioned Environmental Investigation Services (EIS)[1] to undertake an Additional Environmental Site Assessment (ESA) for the proposed temporary school at Wentworth Park South, Wattle Street, Ultimo, NSW.

The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2. The proposed development area is referred to as 'the site' in this report.

This report has been prepared as an addendum to a previous investigation at the site by EIS (Ref: E29319Krpt, dated 2 June 2016) as part of a human health risk assessment for proposed landuse as a temporary school.

1.1 Scope of Work

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP42788K) of 29 June 2016.

The scope of work included the following:

- A site inspection to identify Areas of Environmental Concern (AEC);
- 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 presenting the results of the assessment.

The report was prepared with reference to regulations/guidelines outlined in the table below. Individual guidelines are also referenced within the text of the report.

Table 1-1: Guidelines

Guidelines/Regulations
Contaminated Land Management Act 1997[2]
State Environmental Planning Policy No.55 – Remediation of Land 1998[3]
Guidelines for Consultants Reporting on Contaminated Sites 2011[4]
Guidelines for the NSW Site Auditor Scheme, 2nd Edition 2006[5]

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

[2] NSW Government Legislation, (1997), *Contaminated Land Management Act 1997.* (referred to as CLM Act 1997)

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

[4] NSW Office of Environment and Heritage (OEH), (2011), *Guidelines for Consultants Reporting on Contaminated Sites.* (referred to as Reporting Guidelines 2011)

[5] NSW DEC, (2006), *Guidelines for the NSW Site Auditor Scheme, 2nd ed.* (referred to as Site Auditor Guidelines 2006)

Guidelines/Regulations
National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013[6]

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

2 SITE INFORMATION

2.1 Background

2.1.1 Stage 1 and Preliminary Stage 2 Environmental Site Assessment (EIS, 2016[7])

EIS conducted a Stage 1 and Stage 2 ESA of the building footprint of the proposed school in June 2016 as part of the proposed temporary school. The investigation encountered elevated concentrations of lead and B(a)P TEQ in the fill soils above the health based SAC. Elevated concentrations of heavy metals and B(a)P were encountered in fill soils above the ecological based SAC.

Based on the findings of this initial report, EIS recommended a Quantitative Human Health Risk Assessment (HHRA) be undertaken at the site to better manage/characterise the risks of the contamination. In order to obtain a more thorough data set for the HHRA, EIS were requested to expand the study to the surface soils in the grassed area to the south of the proposed school buildings. This investigation addresses that requirement.

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner:	The State of New South Wales & Wentworth Park Sporting Complex Trust
Site Address:	Wentworth Park South – Wattle Street, Ultimo, NSW
Lot & Deposited Plan:	Lot 679 DP729635
Current Land Use:	Public open space and commercial
Proposed Land Use:	Educational
Local Government Authority (LGA):	City of Sydney
Current Zoning:	Sydney Regional Environmental Plan 26 City West
Area of Proposed Development (m^2):	8,000
Geographical Location (MGA) (approx.):	N: 6249850.309 E: 333041.434
Site Location Plan:	Figure 1

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[7] EIS, (2016), *Report to TKD Architects Pty Ltd on Stage 1 and Stage 2 Environmental Site Assessment for Proposed Temporary School at Wentworth Park South, Ultimo, NSW.* (Report Ref: E29319Krpt, dated 2 June 2016) (referred to as EIS 2016 Report)

Sample Location Plan:	Figure 2

2.3 Site Location and Regional Setting

The site is located in a predominantly mixed use area of Ultimo. The site is bounded by William Henry Street to the south and Wattle Street to the east. The site is located approximately 500m to the south-east of Blackwattle Bay.

2.4 Topography

The site is located within undulating regional topography with the site located within the base of the Blackwattle Creek 'gully'. The site itself was relatively flat.

2.5 Site Inspection

A walkover inspection of the site was undertaken by EIS on 11 April 2016. The inspection was limited to accessible areas of the site and immediate surrounds. Selected site photographs obtained during the inspection are attached in the appendices.

At the time of the inspection, the proposed temporary school site was relatively flat and mostly covered with grass and scattered trees. The proposed school building footprint extended into the neighbouring 'Greyhounds' precinct, which contained several one and two storey brick buildings and sheds. The areas surrounding the buildings were covered with shrubs and asphaltic concrete (AC).

3 SAMPLING, ANALYSIS AND QUALITY PLAN

3.1 Data Quality Objectives (DQO)

The NEPM 2013 defines the DQO process as a seven step iterative planning tool used to define the type, quantity and quality of data needed to inform decisions relating to the environmental condition of the site.

The DQO process is detailed in the US EPA document *Guidance on systematic planning using the data quality process (2006*[8]*)* and the NSW DEC document *The Guidelines for the NSW Site Auditor Scheme, 2nd Edition (2006*[9]*)*.

These seven steps are applicable to this assessment as summarised in the table below:

Table 3-1: DQOs – Seven Steps

Step	Input
State the Problem	As the initial study encountered elevated concentrations of B(a)P and Lead in the fill soils within the proposed building footprint. Additional data for the surface soils to the south of the building footprint is required to complete a HHRA of the site. The EIS project team will include: project principal (PP) and/or project associate (PA); project engineer/scientist (PE); and field engineer/scientist (FE) as outlined in the quality recorded checklist maintained for the project in accordance with our ISO 9001 certification.
Identify the Decisions/ Goal of the Study	The data collection is project specific and has been designed based on the following information: • Review of site information; • AEC, PCC, receptors, pathways and medium identified in the PCSM; • Development of Site Assessment Criteria (SAC) for each media; and • The use of decision statements outlined below: i) Are any results above the SAC? ii) Is the data set suitable for inclusion in the HHRA? The data will be assessed as follows: 1) Statistical analysis will be used to assess the laboratory data against the SAC. The following criteria will be adopted: ➢ The 95%Upper Confidence Limit (UCL) value of the arithmetic mean concentration of each contaminant should be less than the SAC; ➢ The standard deviation (SD) of the results must be less than 50% of the SAC; and ➢ No single value exceeds 250% of the relevant SAC. 2) Statistical calculations will not be undertaken if all results are below the SAC.

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[8] US EPA, (2006), *Guidance on Systematic Planning using the Data Quality Objectives Process.* (referred to as US EPA 2006)

[9] NSW DEC, (2006), *Guidelines for the NSW Site Auditor Scheme, 2nd ed.* (referred to as Site Auditor Guidelines 2006)

Step	Input
Identify Information Inputs	The following information will be collected: • Soil samples based on subsurface conditions; • The SAC will be designed based on the criteria outlined in NEPM 2013. Other criteria will be used as required and detailed in this report; • The samples will be analysed in accordance with the analytical methods outlined in NEPM 2013; and • Any additional information that may arise during the field work will also be used as data inputs.
Define the Study Boundary	The sampling will be confined to the proposed grassed recreational area to the south of the proposed temporary school.
Develop the analytical approach (or decision rule)	The following acceptable limits will be adopted for the data quality assessment: • The following acceptance criteria will be used to assess the RPD results: ➢ results > 10 times the practical quantitation limit (PQL), RPDs < 50% are acceptable; ➢ results between 5 and 10 times PQL, RPDs < 75% are acceptable; ➢ results < 5 times PQL, RPDs < 100% are acceptable; and ➢ An explanation is provided if RPD results are outside the acceptance criteria. • Acceptable concentrations in Field Rinsate (FR) samples. Non-compliance to be documented in the report; • The following acceptance criteria will be used to assess the primary laboratory QA/QC results. Non-compliance to be documented: ➢ <u>RPDs</u>: - Results that are < 5 times the PQL, any RPD is acceptable; and - Results > 5 times the PQL, RPDs between 0-50% are acceptable; ➢ <u>LCS recovery and matrix spikes</u>: - 70-130% recovery acceptable for metals and inorganics; - 60-140% recovery acceptable for organics; and - 10-140% recovery acceptable for VOCs; ➢ <u>Surrogate spike recovery</u>: - 60-140% recovery acceptable for general organics; and - 10-140% recovery acceptable for VOCs; ➢ <u>Blanks</u>: All less than PQL.
Specify the performance or acceptance criteria	NEPM 2013 defines decision errors as '*incorrect decisions caused by using data which is not representative of site conditions*'. This can arise from errors during sampling or analytical testing. A combination of these errors is referred to as '*total study error*'. The study error can be managed through the correct choice of sample design and measurement. 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.

Step	Input
	The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. In this case, for example, the PCC identified in the PCSM is considered to pose a risk to receptors unless proven not to. The null hypothesis has been adopted for this assessment.
Optimise the design for obtaining data	The most resource-effective design will be used in an optimum manner to achieve the assessment objectives.

3.2 Soil Sampling Plan and Methodology

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

Table 3-2: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	The NSW EPA Contaminated Sites Sampling Design Guidelines (1995[10]) recommend a sampling density for an environmental assessment based on the size of the investigation area. The guideline provides a minimum number of sampling points required for the investigation on a systematic sampling pattern. The guidelines recommend sampling from a minimum of 19 evenly spaced sampling points for this site with an area of approximately 8,000m^2. Samples for this investigation were obtained from 19 sampling points as shown on the attached Figure 2. This density meets the minimum sampling density recommended by the EPA.
Sampling Plan	The sampling locations were placed on a systematic plan with even spacing between sampling locations. A systematic plan was considered suitable to address potential contaminants associated with the fill material.
Exclusion Areas (Data Gaps)	Sampling was not undertaken in inaccessible areas of the site such as beneath existing buildings. These areas have been excluded from the investigation.
Sampling Equipment	Soil samples were obtained on 11 July 2016 in accordance with the standard sampling procedure (SSP) attached in the appendices. Sampling locations were set out using a hand held GPS unit (with an accuracy of ±5m). The sample locations were excavated using hand equipment.

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

Aspect	Input
Sampling Collection and Field QA/QC	Soil samples were collected from the fill and natural profiles based on field observations. The sampling depths are shown on the logs attached in the appendices. Additional samples were obtained when relatively deep fill (>0.5m) was encountered. Samples were also obtained when there was a distinct change in lithology or based on the observations made during the investigation. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. 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. Sampling personnel used disposable nitrile gloves during sampling activities. The samples were labelled with the job number, sampling location, sampling depth and date in accordance with the SSP.
Field PID Screening for VOCs	A portable Photoionisation Detector (PID) was used to screen the samples for the presence of VOCs and to assist with selection of samples for hydrocarbon analysis. The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source. The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents. PID factory calibration records are attached in the appendices. PID field check records are maintained in the job file. 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.
Decontamination and Sample Preservation	The decontamination procedure adopted during sampling is outlined in the SSP. Where applicable, the sampling equipment was decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water. One rinsate sample was obtained during the decontamination process as part of the field QA/QC. Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with the SSP.

Aspect	Input
	On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.

3.3 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 3-3: Analytical Schedule

CoPC	Fill Samples
Lead	19
PAHs	19
Asbestos	19

Lead and PAHs (specifically B(a)P) were the principal contaminants identified at the site. Asbestos was also included as the proposed site is a school.

3.3.1 Laboratory Analysis

The samples were analysed by the NATA Accredited laboratory/s 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 3-4: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	149916

4 SITE ASSESSMENT CRITERIA (SAC)

The SAC adopted for the assessment is outlined in the table below. The SAC has been derived from the NEPM 2013 and other guidelines as applicable. The guideline values for individual contaminants are presented in the attached report tables.

Table 4-1: SAC Adopted for this Investigation

Guideline	Applicability
Health Investigation Levels (HILs) (NEPM 2013)	The HIL-A criteria for 'residential with accessible soil' have been adopted for this assessment.

5 INVESTIGATION RESULTS

5.1 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the table below. Reference should be made to the borehole logs attached in the appendices for further details.

5.2 Field Screening

A summary of the field screening results are presented in the table below.

Table 5-1: Summary of Field Screening

Aspect	Details (m in bgl)
PID Screening of Soil Samples for VOCs	PID soil sample headspace readings are presented in the COC documents attached in the appendices. The results ranged from 0.2ppm to 1.7ppm equivalent isobutylene. These results do not indicate the presence of significant concentrations of PID detectable VOC's.

5.3 Soil Laboratory Results

The soil laboratory results are compared to the relevant SAC in the attached report tables. Statistical calculations undertaken on the results using ProUCL (version 5) are attached in the appendices. A summary of the results assessed against the SAC is presented below.

Table 5-2: Summary of Soil Laboratory Results

Analyte	Results Compared to SAC
Heavy Metals	HILs: All heavy metal results were below the HIL-A criteria.
PAHs	HILs: All total PAH results were less than the HIL-A criteria. Elevated concentrations of B(a)P TEQ were encountered in two samples. The elevated concentrations were 6.1mg/kg and 3.1mg/kg. The HIL-A guideline concentrations is 4mg/kg. Summary of Statistical Calculation: The 95% UCL was calculated using the data from the fill soil samples. The 95% UCL for B(a)P was 2.669mg/kg which was below the HIL-A criterion of 3mg/kg. The statistical analysis is outlined below:

Analyte	Max	Mean	SD	95% UCL
B(a)P	6.1	1.64	1.48	2.5

Analyte	Results Compared to SAC
Asbestos	Asbestos was not detected in the samples analysed for the investigation.

6 DATA QUALITY ASSESSMENT

As part of the data quality assessment the following data quality indicators (DQIs) were assessed: precision, accuracy, representativeness, completeness and comparability as outlined in the table below. Reference should be made to the appendices for an explanation of the individual DQI.

Table 6-1: Assessment of DQIs

Completeness

Field Considerations:

- The investigation was designed to target the AEC identified at the site. A systematic, sampling plan was adopted based on the AEC as outlined in the report;
- Samples were obtained from various depths based on the subsurface conditions encountered at the sampling locations. All samples were recorded on the borehole logs. All sampling points are shown on the attached Figure 2;
- The investigation was undertaken by trained staff in accordance with the SSP; and
- Documentation maintained during the field work is attached in the appendices where applicable.

Laboratory Considerations:

- Selected samples were analysed for lead, PAHs and asbestos;
- All samples were analysed by NATA registered laboratory/s in accordance with the analytical methods outlined in NEPM 2013;
- Appropriate analytical methods and PQLs were used by the laboratory/s.
- Appropriate sample preservation, handling, holding time and COC procedures were adopted for the investigation.

Comparability

Field Considerations:

- The investigation was undertaken by trained staff in accordance with the SSP;
- The climate conditions encountered during the field work were noted on the site description record maintained in the job file; and
- Consistency was maintained during sampling in accordance with the SSP.

Laboratory Considerations:

- All samples were analysed in accordance with the analytical methods outlined in NEPM 2013;
- Appropriate PQLs were used by the laboratory for all analysis;
- All primary, intra-laboratory duplicate and other QA/QC samples were analysed by the same laboratory; and
- The same units were used by the laboratory for all of the analysis.

Representativeness

Field Considerations:

- The investigation was designed to obtain accessible soil encountered during the field work as outlined in the SAQP. Dust and/or vapour sampling was outside the scope of this assessment; and

- Only accessible soil based on the subsurface conditions encountered during the field work was sampled.

Laboratory Considerations:

- All samples were analysed in accordance with the SAQP.

Precision

Field Considerations:

- The investigation was undertaken in accordance with the SSP.

Laboratory Considerations:

- Analysis of field QA/QC samples including inter and intra-laboratory duplicates and field rinsate (FR) as outlined below;
- The field QA/QC frequency adopted for the investigation is outlined below;
- Calculation of the Relative Percentage Difference (RPD) from the primary and duplicate results (the RPD calculation equation is outlined in the attached appendices);
- Assessment of RPD results against the acceptance criteria outlined in **Section 3.1.**

Intra-laboratory RPD Results:

Soil Samples at a frequency of 10% of the primary samples:

- Dup AS1 is a soil duplicate of primary sample SL101;
- Dup AS2 is a soil duplicate of primary sample SL112.

The intra-laboratory results are presented in the attached report tables. The results indicated that field precision was acceptable.

The RPD value for Acenapthylene was outside the acceptance criteria. This RPD value is the result of the very low concentration of this compound in the sample. As the concentration of the compound in a sample approaches the PQL the accuracy of the measurement decreases. This elevated RPD does not have an adverse impact on the data set as a whole.

Field Rinsate (FR):

One FR sample obtained from the field equipment decontamination process were analysed for PAHs and Lead. The results are presented in the attached report tables.

All results were below the PQL which indicates that cross-contamination artefacts associated with sampling equipment was not present.

Accuracy

Field Considerations:

- The investigation was undertaken in accordance with the SSP.

Laboratory Considerations:

- The analytical quality assessment adopted by the laboratory/s was in accordance with the NATA and NEPM 2013 requirements as outlined in the analytical report/s;

- A review of the report/s indicates the following comments noted by the laboratory/s:

Envirolab Report 149916 – The laboratory RPD acceptance criteria was exceeded in one sample for lead. A triplicate result was issued to account for this.

7 CONCLUSION

EIS consider that the report objectives outlined in **Section 1** have been addressed.

All lead concentrations were below the SAC adopted for this assessment.

Two samples contained elevated concentrations of benzo(a)pyrene above the SAC. However, the statistical analysis returned a 95% UCL value below the criteria for B(a)P. No B(a)P TEQ value exceeded 250% of the SAC and the standard deviation of the B(a)P TEQ results was less that 50% of the SAC.

This data should be incorporated into the human health risk assessment for the site and its intended landuse.

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.

7.1 Regulatory Requirement

The regulatory requirements applicable for the site are outlined in the following table:

Table 7-1: Regulatory Requirement

Guideline	Applicability
Duty to Report Contamination 2009[11]	The requirement to notify the NSW EPA regarding site contamination should be assessed once the results of the additional investigation work have been reviewed and a remedial strategy (if necessary) has been selected.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.

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[11] NSW Department of Environment and Climate Change, (2009), *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.* (referred to as Duty to Report Contamination 2009)

8 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.

LIST OF IN-TEXT TABLES

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.

REPORT FIGURES

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE NC.

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

Title: **SITE LOCATION PLAN**	
Location: LOT 679, DP729635 WENTWORTH PARK SOUTH, WATTLE STREET, ULTIMO, NSW	
Report No: E29319K	Figure No: 1
ENVIRONMENTAL INVESTIGATION SERVICES	

PLOT DATE 14/07/2016 4 40 23 PM DWG FILE S \5 ES\5C ES JOBS\29000'S\E29319K ULTIMO\CAD\E29319K LOT679.DWG

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO, 7.1 5.1557, 2015.

LEGEND

▬ ▬ ▬ APPROXIMATE SITE BOUNDARY

● BH (Fill Depth) BOREHOLE LOCATION

0 8 16 24 32 40
SCALE 1:800 @A3 METRES

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

Title:
SAMPLE LOCATION PLAN

Location: LOT 679, DP729635 WENTWORTH PARK SOUTH,
WATTLE STREET, ULTIMO, NSW

Report No: E29319K

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

PLOT DATE: 14/07/2016 4:41:30 PM DWG FILE: S:\5 EIS\5C EIS JOBS\29000'S\E29319K ULTIMO\CAD\E29319K_LOT679.DWG

LABORATORY SUMMARY TABLES

TABLE A
SOIL LABORATORY RESULTS COMPARED TO HILs
All data in mg/kg unless stated otherwise

				PAHs		
			Lead	Total PAHs	B(a)P TEQ [2]	ASBESTOS FIBRES
PQL - Envirolab Services			1	-	0.5	100
Site Assessment Criteria (SAC) [1]			300	300	3	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**				
SL101	0.0-0.05	Fill - Silty sandy clay	38	0.06	LPQL	Not Detected
SL102	0.0-0.05	Fill - Silty sandy clay	82	0.52	LPQL	Not Detected
SL103	0.0-0.05	Fill - Silty sandy clay	170	5	0.7	Not Detected
SL104	0.0-0.05	Fill - Silty sandy clay	140	1.8	LPQL	Not Detected
SL105	0.0-0.05	Fill - Silty sandy clay	150	5.2	0.7	Not Detected
SL106	0.0-0.05	Fill - Silty sandy clay	230	7.4	1.1	Not Detected
SL107	0.0-0.05	Fill - Silty sandy clay	9	0.14	LPQL	Not Detected
SL108	0.0-0.05	Fill - Silty sandy clay	290	38	**6.1**	Not Detected
SL109	0.0-0.05	Fill - Silty sandy clay	180	17	2.2	Not Detected
SL110	0.0-0.05	Fill - Silty sandy clay	190	12	1.8	Not Detected
SL111	0.0-0.05	Fill - Silty sandy clay	130	4.4	0.6	Not Detected
SL112	0.0-0.05	Fill - Silty sandy clay	150	6.4	1.1	Not Detected
SL113	0.0-0.05	Fill - Silty sandy clay	120	4.5	0.7	Not Detected
SL114	0.0-0.05	Fill - Silty sandy clay	200	8.2	1.3	Not Detected
SL115	0.0-0.05	Fill - Silty sandy clay	120	4.9	0.8	Not Detected
SL116	0.0-0.05	Fill - Silty sandy clay	180	12	2	Not Detected
SL117	0.0-0.05	Fill - Silty sandy clay	200	19	**3.1**	Not Detected
SL118	0.0-0.05	Fill - Silty sandy clay	110	4.9	0.8	Not Detected
SL119	0.0-0.05	Fill - Silty sandy clay	92	2.4	LPQL	Not Detected
Total Number of Samples			19	19	19	19
Maximum Value			290	38	6.1	NC

Statistical Analysis on Fill Samples				
Number of Fill Samples [4]	NC	NC	19	NC
Mean Value [4]	NC	NC	1.64	NC
Standard Deviation [4]	NC	NC	1.48	NC
% UCL [4]	NC	NC	95	NC
UCL Value [4]	NC	NC	2.5	NC

Explanation:

1 - Site Assessment Criteria (SAC): NEPM 2013, HIL-A: 'Residential with garden/accessible soils; children's day care centers; preschools; and primary schools'

2 - B(a)P TEQ - Benzo(a)pyrene Toxicity Equivalence Quotient has been calculated based on 8 carcinogenic PAHs and their Toxic Equivalence Factors (TEFs) outlined in NEPM 2013

3 - Statistical calculation undertaken using ProUCL version 5.0 (USEPA). Statistical calculation has only been undertaken using data from fill samples

Concentration above the SAC	VALUE
Standard deviation exceeds data assessment criteria	VALUE

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL

TABLE B
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 = SL101	Lead	1	38	27	32.5	34
Dup Ref = AS1	Naphthalene	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	LPQL	0.2	0.1	120
Envirolab Report: 149916	Acenaphthene	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	LPQL	LPQL	NC	NC
	Anthracene	0.1	LPQL	LPQL	NC	NC
	Fluoranthene	0.1	LPQL	0.1	0.1	67
	Pyrene	0.1	LPQL	0.1	0.1	67
	Benzo(a)anthracene	0.1	LPQL	LPQL	NC	NC
	Chrysene	0.1	LPQL	LPQL	NC	NC
	Benzo(b,j+k)fluoranthene	0.2	LPQL	LPQL	NC	NC
	Benzo(a)pyrene	0.05	0.06	0.08	0.1	29
	Indeno(123-cd)pyrene	0.1	LPQL	LPQL	NC	NC
	Dibenzo(ah)anthracene	0.1	LPQL	LPQL	NC	NC
	Benzo(ghi)perylene	0.1	LPQL	LPQL	NC	NC
	Benzo(a)pyrene TEQ	0.5	LPQL	LPQL	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

Abbreviations:

PQL: Practical Quantitation Limit	OCP: Organochlorine Pesticides
LPQL: Less than PQL	OPP: Organophosphorus Pesticides
NA: Not Analysed	PCBs: Polychlorinated Biphenyls
NC: Not Calculated	TRH: Total Recoverable Hydrocarbons

TABLE C
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 = SL112	Lead	1	150	150	150.0	0
Dup Ref = AS2	Naphthalene	0.1	LPQL	LPQL	NC	NC
	Acenaphthylene	0.1	LPQL	0.1	0.1	67
Envirolab Report: 149916	Acenaphthene	0.1	LPQL	LPQL	NC	NC
	Fluorene	0.1	LPQL	LPQL	NC	NC
	Phenanthrene	0.1	0.3	0.3	0.3	0
	Anthracene	0.1	0.1	0.1	0.1	0
	Fluoranthene	0.1	0.9	1	1.0	11
	Pyrene	0.1	1	1.1	1.1	10
	Benzo(a)anthracene	0.1	0.7	0.7	0.7	0
	Chrysene	0.1	0.6	0.6	0.6	0
	Benzo(b,j+k)fluoranthene	0.2	1	1	1.0	0
	Benzo(a)pyrene	0.05	0.69	0.79	0.7	14
	Indeno(123-cd)pyrene	0.1	0.4	0.4	0.4	0
	Dibenzo(ah)anthracene	0.1	0.1	0.1	0.1	0
	Benzo(ghi)perylene	0.1	0.5	0.5	0.5	0
	Benzo(a)pyrene TEQ	0.5	1.1	1.2	1.2	9

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

Abbreviations:

PQL: Practical Quantitation Limit
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated

OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PCBs: Polychlorinated Biphenyls
TRH: Total Recoverable Hydrocarbons

TABLE D
SUMMARY OF FIELD QA/QC RESULTS

ANALYSIS	µg/L	RS1[s] 11/07/2016 149916 mg/kg
Lead	1	LPQL
Naphthalene	1	LPQL
Acenaphthylene	1	LPQL
Acenaphthene	1	LPQL
Fluorene	1	LPQL
Phenanthrene	1	LPQL
Anthracene	1	LPQL
Fluoranthene	1	LPQL
Pyrene	1	LPQL
Benzo(a)anthracene	1	LPQL
Chrysene	1	LPQL
Benzo(b,j+k)fluoranthene	2	LPQL
Benzo(a)pyrene	1	LPQL
Indeno(123-cd)pyrene	1	LPQL
Dibenzo(ah)anthracene	1	LPQL
Benzo(ghi)perylene	1	LPQL
Benzo(a)pyrene TEQ	5	LPQL

Explanation:

[w] Sample type (water)

[s] Sample type (sand)

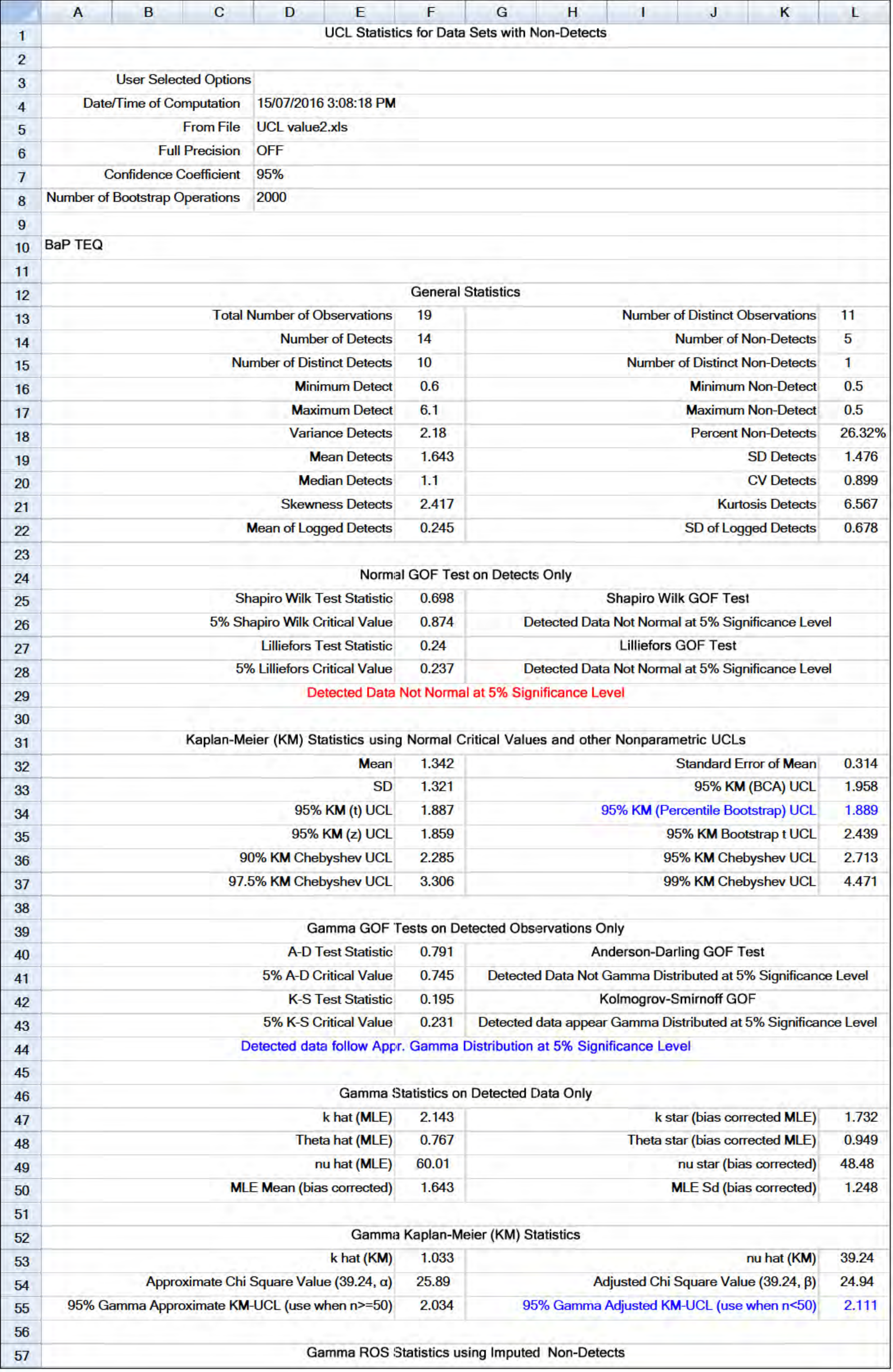
BTEX concentrations in trip spikes are presented as % recovery

Values above PQLs/Acceptance criteria **VALUE**

Abbreviations:

PQL: Practical Quantitation Lim
LPQL: Less than PQL
NA: Not Analysed
NC: Not Calculated

TB: Trip Blank
TS: Trip Spike
RS: Rinsate Sample
TRH: Total Recoverable Hydrocarbons



UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	15/07/2016 3:08:18 PM
From File	UCL value2.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BaP TEQ

General Statistics

Total Number of Observations	19	Number of Distinct Observations	11
Number of Detects	14	Number of Non-Detects	5
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	0.6	Minimum Non-Detect	0.5
Maximum Detect	6.1	Maximum Non-Detect	0.5
Variance Detects	2.18	Percent Non-Detects	26.32%
Mean Detects	1.643	SD Detects	1.476
Median Detects	1.1	CV Detects	0.899
Skewness Detects	2.417	Kurtosis Detects	6.567
Mean of Logged Detects	0.245	SD of Logged Detects	0.678

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.698	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.24	Lilliefors GOF Test
5% Lilliefors Critical Value	0.237	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.342	Standard Error of Mean	0.314
SD	1.321	95% KM (BCA) UCL	1.958
95% KM (t) UCL	1.887	95% KM (Percentile Bootstrap) UCL	1.889
95% KM (z) UCL	1.859	95% KM Bootstrap t UCL	2.439
90% KM Chebyshev UCL	2.285	95% KM Chebyshev UCL	2.713
97.5% KM Chebyshev UCL	3.306	99% KM Chebyshev UCL	4.471

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.791	Anderson-Darling GOF Test
5% A-D Critical Value	0.745	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.195	Kolmogrov-Smirnoff GOF
5% K-S Critical Value	0.231	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

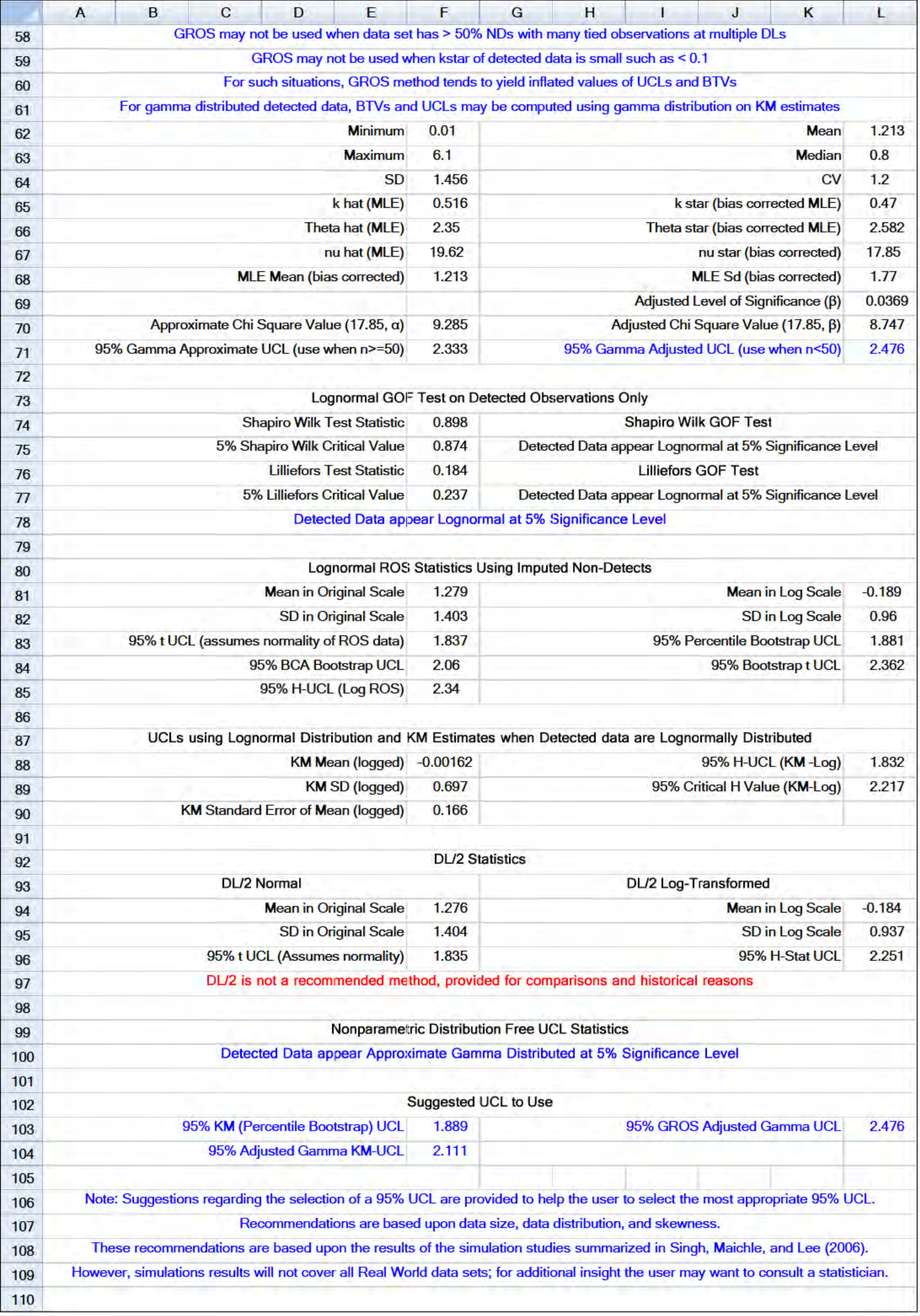
Gamma Statistics on Detected Data Only

k hat (MLE)	2.143	k star (bias corrected MLE)	1.732
Theta hat (MLE)	0.767	Theta star (bias corrected MLE)	0.949
nu hat (MLE)	60.01	nu star (bias corrected)	48.48
MLE Mean (bias corrected)	1.643	MLE Sd (bias corrected)	1.248

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.033	nu hat (KM)	39.24
Approximate Chi Square Value (39.24, α)	25.89	Adjusted Chi Square Value (39.24, β)	24.94
95% Gamma Approximate KM-UCL (use when n>=50)	2.034	95% Gamma Adjusted KM-UCL (use when n<50)	2.111

Gamma ROS Statistics using Imputed Non-Detects



58	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
59	GROS may not be used when kstar of detected data is small such as < 0.1			
60	For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
61	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
62	Minimum	0.01	Mean	1.213
63	Maximum	6.1	Median	0.8
64	SD	1.456	CV	1.2
65	k hat (MLE)	0.516	k star (bias corrected MLE)	0.47
66	Theta hat (MLE)	2.35	Theta star (bias corrected MLE)	2.582
67	nu hat (MLE)	19.62	nu star (bias corrected)	17.85
68	MLE Mean (bias corrected)	1.213	MLE Sd (bias corrected)	1.77
69			Adjusted Level of Significance (β)	0.0369
70	Approximate Chi Square Value (17.85, α)	9.285	Adjusted Chi Square Value (17.85, β)	8.747
71	95% Gamma Approximate UCL (use when n>=50)	2.333	95% Gamma Adjusted UCL (use when n<50)	2.476
72				
73	Lognormal GOF Test on Detected Observations Only			
74	Shapiro Wilk Test Statistic	0.898	Shapiro Wilk GOF Test	
75	5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
76	Lilliefors Test Statistic	0.184	Lilliefors GOF Test	
77	5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level	
78	Detected Data appear Lognormal at 5% Significance Level			
79				
80	Lognormal ROS Statistics Using Imputed Non-Detects			
81	Mean in Original Scale	1.279	Mean in Log Scale	-0.189
82	SD in Original Scale	1.403	SD in Log Scale	0.96
83	95% t UCL (assumes normality of ROS data)	1.837	95% Percentile Bootstrap UCL	1.881
84	95% BCA Bootstrap UCL	2.06	95% Bootstrap t UCL	2.362
85	95% H-UCL (Log ROS)	2.34		
86				
87	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
88	KM Mean (logged)	-0.00162	95% H-UCL (KM -Log)	1.832
89	KM SD (logged)	0.697	95% Critical H Value (KM-Log)	2.217
90	KM Standard Error of Mean (logged)	0.166		
91				
92	DL/2 Statistics			
93	DL/2 Normal		DL/2 Log-Transformed	
94	Mean in Original Scale	1.276	Mean in Log Scale	-0.184
95	SD in Original Scale	1.404	SD in Log Scale	0.937
96	95% t UCL (Assumes normality)	1.835	95% H-Stat UCL	2.251
97	DL/2 is not a recommended method, provided for comparisons and historical reasons			
98				
99	Nonparametric Distribution Free UCL Statistics			
100	Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
101				
102	Suggested UCL to Use			
103	95% KM (Percentile Bootstrap) UCL	1.889	95% GROS Adjusted Gamma UCL	2.476
104	95% Adjusted Gamma KM-UCL	2.111		
105				
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
107	Recommendations are based upon data size, data distribution, and skewness.			
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
110				

Appendix A: Laboratory Report/s & COC Documents

SAMPLE AND CHAIN OF CUSTODY FORM

TO:
ENVIROLAB SERVICES PTY LTD
12 ASHLEY STREET
CHATSWOOD NSW 2067
P: (02) 99106200
F: (02) 99106201

Attention:

EIS Job Number: E29319K

Date Results Required: STANDARD

Page: 1 of 1

FROM:
EIS
ENVIRONMENTAL
INVESTIGATION
SERVICES
REAR OF 115 WICKS ROAD
MACQUARIE PARK, NSW 2113
P: 02-9888 5000 F: 02-9888 5001
Attention:

Location: Wentworth Park

Sampler: AS/HL

Sample Preserved in Esky on Ice

Tests Required

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	PAHs	Lead	Asbestos
11/07/2016	1.	SL101	0-0.05	G, A	0.0	soil	X	X	X
	2	SL102			0.0		X	X	X
	3	SL103			0.4		X	X	✓
	4	SL104			0.2		X	X	X
	5	SL105			0.2		X	X	X
	6	SL106			1.7		X	X	X
	7	SL107			0.4		X	X	X
	8	SL108			0.0		X	X	X
	9	SL109			0.0		X	X	X
	10	SL110			0.0		X	X	X
	11	SL111			0.1		X	X	X
	12	SL112			0		X	X	X
	13	SL113					X	X	X
	14	SL114					X	X	X
	15	SL115					X	X	X
	16	SL116					X	X	X
	17	SL117					X	X	X
	18	SL118					X	X	X
	19	SL119					X	X	X
	20	DUPAS1					X	X	
	21	DUPAS2					X	X	
11-7-16	22	R1	—	G	0	Water	X	X	

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 149916
Date Received: 11 07 2016
Time Received: 16:42
Received by:
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:	Time:	Received By:	Date:
	11-07-16	1642		11 07 2016

ENVIROLAB GROUP
ENVIROLAB SERVICES
mpl Laboratories

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 149916

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention:

Sample log in details:

Your Reference:	**E29319K, Wentworth Park**
No. of samples:	21 Soils, 1 Water
Date samples received / completed instructions received	11/07/16 / 11/07/16

This report supersedes the previous report R00 due to amendments to sample depth.

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	18/07/16 / 15/07/16
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

General Manager

PAHs in Soil Our Reference:	UNITS	149916-1	149916-2	149916-3	149916-4	149916-5
Your Reference	------------- -	SL101	SL102	SL103	SL104	SL105
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
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	<0.1	<0.1	0.3	<0.1	0.3
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.2	0.9	0.3	0.8
Pyrene	mg/kg	<0.1	0.2	0.9	0.3	0.9
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.5	0.2	0.5
Chrysene	mg/kg	<0.1	0.1	0.5	0.2	0.5
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.8	0.3	0.9
Benzo(a)pyrene	mg/kg	0.06	0.1	0.5	0.2	0.55
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.3	0.1	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.3	0.1	0.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.7	<0.5	0.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.7	<0.5	0.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	0.8	<0.5	0.8
Total Positive PAHs	mg/kg	0.060	0.52	5.0	1.8	5.2
Surrogate p-Terphenyl-d14	%	88	92	94	85	95

PAHs in Soil						
Our Reference:	UNITS	149916-6	149916-7	149916-8	149916-9	149916-10
Your Reference	--------------	SL106	SL107	SL108	SL109	SL110
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Naphthalene	mg/kg	<0.1	0.1	0.2	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.4	0.3	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	<0.1
Phenanthrene	mg/kg	0.4	<0.1	1.6	1.5	0.9
Anthracene	mg/kg	0.1	<0.1	0.5	0.4	0.2
Fluoranthene	mg/kg	1.2	<0.1	5.2	2.8	2.0
Pyrene	mg/kg	1.3	<0.1	5.7	2.9	2.0
Benzo(a)anthracene	mg/kg	0.7	<0.1	3.7	1.5	1.0
Chrysene	mg/kg	0.7	<0.1	3.4	1.4	1.1
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	6.6	2.4	2
Benzo(a)pyrene	mg/kg	0.75	<0.05	4.1	1.5	1.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	<0.1	2.4	0.8	0.7
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	0.7	0.2	0.2
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	2.9	1	0.8
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.1	<0.5	6.1	2.2	1.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.1	<0.5	6.1	2.2	1.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.1	<0.5	6.1	2.2	1.8
Total Positive PAHs	mg/kg	7.4	0.14	38	17	12
Surrogate p-Terphenyl-d14	%	95	99	85	89	83

PAHs in Soil						
Our Reference:	UNITS	149916-11	149916-12	149916-13	149916-14	149916-15
Your Reference	-------------	SL111	SL112	SL113	SL114	SL115
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
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	0.2	0.3	0.2	0.4	0.2
Anthracene	mg/kg	<0.1	0.1	<0.1	0.1	<0.1
Fluoranthene	mg/kg	0.7	0.9	0.7	1.2	0.7
Pyrene	mg/kg	0.7	1	0.7	1.4	0.8
Benzo(a)anthracene	mg/kg	0.5	0.7	0.5	0.8	0.5
Chrysene	mg/kg	0.4	0.6	0.4	0.7	0.4
Benzo(b,j+k)fluoranthene	mg/kg	0.8	1	0.8	1	0.9
Benzo(a)pyrene	mg/kg	0.5	0.69	0.5	0.89	0.53
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	0.4	0.3	0.5	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.1	0.1	0.1	0.1
Benzo(g,h,i)perylene	mg/kg	0.3	0.5	0.4	0.6	0.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.6	1.1	0.7	1.3	0.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.7	1.1	0.7	1.3	0.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.7	1.1	0.7	1.3	0.8
Total Positive PAHs	mg/kg	4.4	6.4	4.5	8.2	4.9
Surrogate p-Terphenyl-d14	%	100	87	87	95	99

PAHs in Soil						
Our Reference:	UNITS	149916-16	149916-17	149916-18	149916-19	149916-20
Your Reference	------------- -	SL116	SL117	SL118	SL119	DUPAS1
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	0.2	<0.1	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.5	1.2	0.2	0.2	<0.1
Anthracene	mg/kg	0.2	0.3	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.7	2.6	0.7	0.4	0.1
Pyrene	mg/kg	1.9	2.8	0.8	0.4	0.1
Benzo(a)anthracene	mg/kg	1.2	1.7	0.5	0.2	<0.1
Chrysene	mg/kg	1.0	1.7	0.4	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	2.1	3.2	0.9	0.4	<0.2
Benzo(a)pyrene	mg/kg	1.3	2.0	0.56	0.2	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	0.7	1.2	0.3	0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.3	0.5	0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.8	1.4	0.4	0.2	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.0	3.1	0.8	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.0	3.1	0.8	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.0	3.1	0.8	<0.5	<0.5
Total Positive PAHs	mg/kg	12	19	4.9	2.4	0.50
Surrogate p-Terphenyl-d14	%	89	89	88	83	97

PAHs in Soil		
Our Reference:	UNITS	149916-21
Your Reference	------------- -	DUPAS2
Depth	------------	0.0-0.05
Date Sampled		11/07/2016
Type of sample		Soil
Date extracted	-	12/07/2016
Date analysed	-	12/07/2016
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.3
Anthracene	mg/kg	0.1
Fluoranthene	mg/kg	1.0
Pyrene	mg/kg	1.1
Benzo(a)anthracene	mg/kg	0.7
Chrysene	mg/kg	0.6
Benzo(b,j+k)fluoranthene	mg/kg	1
Benzo(a)pyrene	mg/kg	0.79
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4
Dibenzo(a,h)anthracene	mg/kg	0.1
Benzo(g,h,i)perylene	mg/kg	0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.2
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.2
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.2
Total Positive PAHs	mg/kg	7.2
Surrogate p-Terphenyl-d14	%	94

Acid Extractable metals in soil						
Our Reference:	UNITS	149916-1	149916-2	149916-3	149916-4	149916-5
Your Reference	-------------	SL101	SL102	SL103	SL104	SL105
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Lead	mg/kg	38	82	170	140	150

Acid Extractable metals in soil						
Our Reference:	UNITS	149916-6	149916-7	149916-8	149916-9	149916-10
Your Reference	-------------	SL106	SL107	SL108	SL109	SL110
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Lead	mg/kg	230	9	290	180	190

Acid Extractable metals in soil						
Our Reference:	UNITS	149916-11	149916-12	149916-13	149916-14	149916-15
Your Reference	-------------	SL111	SL112	SL113	SL114	SL115
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Lead	mg/kg	130	150	120	200	120

Acid Extractable metals in soil						
Our Reference:	UNITS	149916-16	149916-17	149916-18	149916-19	149916-20
Your Reference	-------------	SL116	SL117	SL118	SL119	DUPAS1
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Lead	mg/kg	180	200	110	92	27

Acid Extractable metals in soil			
Our Reference:	UNITS	149916-21	149916-23
Your Reference	-------------	DUPAS2	SL101 - TRIPLICATE
Depth	------------	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016
Type of sample		Soil	Soil
Date prepared	-	12/07/2016	12/07/2016
Date analysed	-	12/07/2016	12/07/2016
Lead	mg/kg	150	12

Moisture						
Our Reference:	UNITS	149916-1	149916-2	149916-3	149916-4	149916-5
Your Reference	-------------	SL101	SL102	SL103	SL104	SL105
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	13/07/2016	13/07/2016	13/07/2016	13/07/2016	13/07/2016
Moisture	%	63	57	41	37	63

Moisture						
Our Reference:	UNITS	149916-6	149916-7	149916-8	149916-9	149916-10
Your Reference	-------------	SL106	SL107	SL108	SL109	SL110
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	13/07/2016	13/07/2016	13/07/2016	13/07/2016	13/07/2016
Moisture	%	69	51	20	29	24

Moisture						
Our Reference:	UNITS	149916-11	149916-12	149916-13	149916-14	149916-15
Your Reference	-------------	SL111	SL112	SL113	SL114	SL115
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	13/07/2016	13/07/2016	13/07/2016	13/07/2016	13/07/2016
Moisture	%	33	28	30	27	23

Moisture						
Our Reference:	UNITS	149916-16	149916-17	149916-18	149916-19	149916-20
Your Reference	-------------	SL116	SL117	SL118	SL119	DUPAS1
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/07/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016
Date analysed	-	13/07/2016	13/07/2016	13/07/2016	13/07/2016	13/07/2016
Moisture	%	29	24	17	32	64

Moisture		
Our Reference:	UNITS	149916-21
Your Reference	------------- -	DUPAS2
Depth	------------	0.0-0.05
Date Sampled		11/07/2016
Type of sample		Soil
Date prepared	-	12/07/2016
Date analysed	-	13/07/2016
Moisture	%	22

Asbestos ID - soils						
Our Reference:	UNITS	149916-1	149916-2	149916-3	149916-4	149916-5
Your Reference	-------------	SL101	SL102	SL103	SL104	SL105
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016
Sample mass tested	g	Approx. 5g	Approx. 15g	Approx. 20g	Approx. 15g	Approx. 15g
Sample Description	-	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris
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:	UNITS	149916-6	149916-7	149916-8	149916-9	149916-10
Your Reference	-------------	SL106	SL107	SL108	SL109	SL110
Depth	------------	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05	0.0-0.05
Date Sampled		11/07/2016	11/07/2016	11/07/2016	11/07/2016	11/07/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016
Sample mass tested	g	Approx. 5g	Approx. 10g	Approx. 20g	Approx. 25g	Approx. 15g
Sample Description	-	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris
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: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	149916-11 SL111 0.0-0.05 11/07/2016 Soil	149916-12 SL112 0.0-0.05 11/07/2016 Soil	149916-13 SL113 0.0-0.05 11/07/2016 Soil	149916-14 SL114 0.0-0.05 11/07/2016 Soil	149916-15 SL115 0.0-0.05 11/07/2016 Soil
Date analysed	-	14/07/2016	14/07/2016	14/07/2016	14/07/2016	14/07/2016
Sample mass tested	g	Approx. 35g	Approx. 25g	Approx. 30g	Approx. 20g	Approx. 35g
Sample Description	-	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris
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: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	149916-16 SL116 0.0-0.05 11/07/2016 Soil	149916-17 SL117 0.0-0.05 11/07/2016 Soil	149916-18 SL118 0.0-0.05 11/07/2016 Soil	149916-19 SL119 0.0-0.05 11/07/2016 Soil
Date analysed	-	14/07/2016	14/07/2016	14/07/2016	14/07/2016
Sample mass tested	g	Approx. 20g	Approx. 25g	Approx. 40g	Approx. 15g
Sample Description	-	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris
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
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

PAHs in Water		
Our Reference:	UNITS	149916-22
Your Reference	------------- -	R1
Depth	------------	-
Date Sampled		11/07/2016
Type of sample		Water
Date extracted	-	12/07/2016
Date analysed	-	12/07/2016
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	103

Metals in Water - Dissolved		
Our Reference:	UNITS	149916-22
Your Reference	------------- -	R1
Depth	------------	-
Date Sampled		11/07/2016
Type of sample		Water
Date digested	-	12/07/2016
Date analysed	-	12/07/2016
Lead - Dissolved	mg/L	<0.03

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. ‘TEQ 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. ‘TEQ 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. ‘TEQ 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.
Metals-020	Determination of various metals by ICP-AES.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
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.

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/07/2016	149916-1	12/07/2016 || 12/07/2016	LCS-2	12/07/2016
Date analysed	-			12/07/2016	149916-1	12/07/2016 || 12/07/2016	LCS-2	12/07/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	82%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	102%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	95%
Anthracene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	86%
Pyrene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	81%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	LCS-2	89%
Benzo(b,j +k)fluoranthene	mg/kg	0.2	Org-012	<0.2	149916-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	149916-1	0.06 || <0.05	LCS-2	87%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	149916-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	92	149916-1	88 || 94 || RPD: 7	LCS-2	82%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/07/2016	149916-1	12/07/2016 || 12/07/2016	LCS-2	12/07/2016
Date analysed	-			12/07/2016	149916-1	12/07/2016 || 12/07/2016	LCS-2	12/07/2016
Lead	mg/kg	1	Metals-020	<1	149916-1	38 || 21 || RPD: 58	LCS-2	111%

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			12/07/2016	[NT]	[NT]	LCS-W1	12/07/2016
Date analysed	-			12/07/2016	[NT]	[NT]	LCS-W1	12/07/2016
Naphthalene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	102%
Acenaphthylene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Fluorene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	108%
Phenanthrene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	130%
Anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	130%
Pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	99%
Benzo(a)anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	99%

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Benzo(b,j +k)fluoranthene	µg/L	2	Org-012	<2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W1	116%
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	132	[NT]	[NT]	LCS-W1	110%

QUALITY CONTROL Metals in Water - Dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date digested	-			12/07/2016	[NT]	[NT]	LCS-W1	12/07/2016
Date analysed	-			12/07/2016	[NT]	[NT]	LCS-W1	12/07/2016
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	LCS-W1	128%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	149916-11	12/07/2016 || 12/07/2016	149916-2	12/07/2016
Date analysed	-	149916-11	12/07/2016 || 12/07/2016	149916-2	12/07/2016
Naphthalene	mg/kg	149916-11	<0.1 || <0.1	149916-2	86%
Acenaphthylene	mg/kg	149916-11	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	149916-11	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	149916-11	<0.1 || <0.1	149916-2	116%
Phenanthrene	mg/kg	149916-11	0.2 || 0.2 || RPD: 0	149916-2	105%
Anthracene	mg/kg	149916-11	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	149916-11	0.7 || 0.6 || RPD: 15	149916-2	99%
Pyrene	mg/kg	149916-11	0.7 || 0.7 || RPD: 0	149916-2	90%
Benzo(a)anthracene	mg/kg	149916-11	0.5 || 0.4 || RPD: 22	[NR]	[NR]
Chrysene	mg/kg	149916-11	0.4 || 0.4 || RPD: 0	149916-2	99%
Benzo(b,j+k)fluoranthene	mg/kg	149916-11	0.8 || 0.7 || RPD: 13	[NR]	[NR]
Benzo(a)pyrene	mg/kg	149916-11	0.5 || 0.5 || RPD: 0	149916-2	97%
Indeno(1,2,3-c,d)pyrene	mg/kg	149916-11	0.3 || 0.3 || RPD: 0	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	149916-11	<0.1 || 0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	149916-11	0.3 || 0.4 || RPD: 29	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	149916-11	100 || 86 || RPD: 15	149916-2	101%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	149916-11	12/07/2016 || 12/07/2016	149916-2	12/07/2016
Date analysed	-	149916-11	12/07/2016 || 12/07/2016	149916-2	12/07/2016
Lead	mg/kg	149916-11	130 || 130 || RPD: 0	149916-2	128%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date extracted	-	149916-21	12/07/2016 || 12/07/2016
Date analysed	-	149916-21	12/07/2016 || 12/07/2016
Naphthalene	mg/kg	149916-21	<0.1 || <0.1
Acenaphthylene	mg/kg	149916-21	0.1 || 0.1 || RPD: 0
Acenaphthene	mg/kg	149916-21	<0.1 || <0.1
Fluorene	mg/kg	149916-21	<0.1 || <0.1
Phenanthrene	mg/kg	149916-21	0.3 || 0.3 || RPD: 0
Anthracene	mg/kg	149916-21	0.1 || 0.1 || RPD: 0
Fluoranthene	mg/kg	149916-21	1.0 || 1.1 || RPD: 10
Pyrene	mg/kg	149916-21	1.1 || 1.2 || RPD: 9
Benzo(a)anthracene	mg/kg	149916-21	0.7 || 0.8 || RPD: 13
Chrysene	mg/kg	149916-21	0.6 || 0.7 || RPD: 15
Benzo(b,j+k)fluoranthene	mg/kg	149916-21	1 || 1 || RPD: 0
Benzo(a)pyrene	mg/kg	149916-21	0.79 || 0.91 || RPD: 14
Indeno(1,2,3-c,d)pyrene	mg/kg	149916-21	0.4 || 0.5 || RPD: 22
Dibenzo(a,h)anthracene	mg/kg	149916-21	0.1 || 0.1 || RPD: 0
Benzo(g,h,i)perylene	mg/kg	149916-21	0.5 || 0.6 || RPD: 18
Surrogate p-Terphenyl-d14	%	149916-21	94 || 92 || RPD: 2

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	149916-21	12/07/2016 || 12/07/2016
Date analysed	-	149916-21	12/07/2016 || 12/07/2016
Lead	mg/kg	149916-21	150 || 160 || RPD: 6

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 149916-1 for Pb. Therefore a triplicate result has been issued as laboratory sample number 149916-23.

Asbestos ID was analysed by Approved Identifier:	Paul Ching
Asbestos ID was authorised by Approved Signatory:	Paul Ching

INS: Insufficient sample for this test
NR: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-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.

Appendix B: 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.

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[12].
- 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. 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.

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.

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

- 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.
- 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.

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.
- Take 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:
    - Micropore filtration system or Stericup single-use filters (for heavy metals samples);
    - Filter paper for Micropore filtration system; 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/T meters;
    - Plastic drums used for transportation of purged water;
    - Esky and ice;
    - Nitrile gloves;
    - Distilled water (for cleaning);
    - Electronic dip meter;

  - Low flow pump pack and associated tubing; and
  - Groundwater sampling forms.
- If single-use stericup filtration is not used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.
- 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/micro-purge 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 detailed in the NEPM 2013 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice as outlined in the report text.
- Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

<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[13]) methods and those described in *Environmental Sampling and Analysis, A Practical Guide,* (H. Keith 1991[14]).

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 (MDL) 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.

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). Acceptable targets for precision in this report will be less than 50% RPD for concentrations greater than ten times the PQL, less than 75% RPD for concentrations between five and ten times the PQL and less than 100% RPD for concentrations that are less than five times the PQL.

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured. 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.

The proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

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.

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

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

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; 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.

Comparability

Comparability is the evaluation of the similarity of conditions (eg. 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).

Blanks

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

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%.

$$\frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Concentration of Spike Added}}$$

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.

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:

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