Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Detailed Site Investigation (Contamination)

Parramatta Public School
177 Macquarie Street, Parramatta

Prepared for
Grimshaw Architects LLD

Project 85374.02 Rev 2
November 2016

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	85374.02	Document No.	R.001.Rev2
Document title	Report on Detailed Site Investigation (Contamination) Parramatta Public School		
Site address	177 Macquarie Street, Parramatta		
Report prepared for	Grimshaw Architects LLD		
File name	85374.02.R.001.Rev2		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Christopher Bagia	Tim Wright	18 August 2016
Revision 1	Christopher Bagia	Tim Wright	17 October 2016
Revision 2	Christopher Bagia	Tim Wright	14 November 2016

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	Louise Browne; Grimshaw Architects LLD
Revision 1	1	0	Louise Browne; Grimshaw Architects LLD
Revision 2	1	0	Louise Browne; Grimshaw Architects LLD

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		14 November 2016
Reviewer		14 November 2016

bsi. ISO 9001 Quality Management

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1. Introduction

This report presents the results of a detailed site investigation (DSI) undertaken for contamination purposes at Parramatta Public School at 177 Macquarie Street, Parramatta NSW (the site). The investigation was commissioned by Louise Browne of Grimshaw Architects LLD and was undertaken in accordance with Douglas Partners' (DP) proposal SYD160465 dated 7 April 2016.

It is understood that the DSI is required to inform the design of the proposed redevelopment of Parramatta Public School. The redevelopment includes the retention of heritage buildings, demolition of other existing buildings and the construction of a four storey primary school.

The aim of the DSI was to address data gaps in previous reports as identified in DP report *Review of Reports – Site Contamination, Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta*, Project 85374.01 R.001, dated 9 March 2016 (DP, 2016a).

The DSI included a site walkover, sampling from nine locations and laboratory testing of selected samples. The details of the field work are presented in this report, together with recommendations for further works or remediation.

2. Scope of Works

The scope of works for the DSI was as follows:

- Assessment of the analytical data to assess the impact of the limited extent of analysis of the filling undertaken for the identified contaminants of potential concern (CoPC) to inform the requirement for further sampling and analysis;
- Further statistical analysis of the lead concentrations recorded in filling and natural soils;
- Further assessment of the potential extent of asbestos impacted filling and reassessment of the areas requiring additional asbestos quantification works;
- Seek confirmation from site personnel whether or not dangerous goods (e.g. underground or above ground storage tanks, chemicals, etc) are currently, or have been historically, stored on site;
- Excavate three hand dug test pits to c. 0.5 m depth in soft landscapes areas;
- Collect a 10 L sample from each test pit and pass through a 7 mm sieve on site to assess bonded asbestos;
- Drill six hand auger boreholes to c. 0.5 m depth in hardstand areas;

- Collect soil samples from the near surface then at regular intervals and where signs of contamination are observed;
- Screen each sample for volatile organic compounds (VOC) using a photoionisation detector (PID);
- Analyse selected samples for the following contaminants of concern to assess suitability for re-use and classification for off-site disposal:
  - Metals (eight priority metals);
  - Total recoverable hydrocarbons (TRH);
  - Benzene, toluene, ethylbenzene and xylene (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB);
  - Asbestos (500 mL sample); and
  - pH and cation exchange capacity (CEC).
- Analysis of the following (soil) samples for QA/QC purposes will also be undertaken:
  - 5% Intra-laboratory replicate soil samples for metals and TRH/BTEX;
  - One trip spike sample for BTEX; and
  - One trip blank sample for BTEX.
- Development of three groundwater wells (one on site well constructed for a previous geotechnical investigation as well as two wells previously constructed on the adjacent APHS-N and APHS-S sites[1]) by removing a minimum of three well volumes or until each well is dry;
- Collection of groundwater samples from all three monitoring well using a peristaltic sampling pump. The physical parameters of pH, conductivity, dissolved oxygen and oxidation / reduction potential will be measured and recorded whilst sampling;
- Conduct laboratory analysis on three groundwater samples (plus QA/QC) at a NATA accredited laboratory for the following common contaminants and parameters:
  - Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc);
  - Total recoverable hydrocarbons (TRH);
  - Monocyclic aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylene – BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Phenols;
  - Polychlorinated biphenyls (PCB);
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Volatile organic compounds (VOC);

[1] Arthur Phillip High School – North (APHS-N) and Arthur Phillip High School – South (APHS-S)

- Poly-fluoroalkyl substances (PFAS, including PFOS and PFOA);
- Hardness;
- QA/QC:
  - One replicate sample for metals and PAH;
  - One trip spike sample for BTEX; and
  - One blank sample for BTEX.

3. Site Identification and Description

3.1 Site Identification

The site is located at 177 Macquarie Street, Parramatta and is currently in operation as a primary school (Parramatta Public School). The site Information is provided in Table 1 and the site location is provided on Drawing 1, Appendix A.

Table 1: Site Identification

Item	Description
Site Address	177 Macquarie Street, Parramatta
Legal Description	Lots 23, 24, 25 and 26 D.P. 7809, Lot 27A D.P. 449406 and part Lot 414 D.P. 449406
Approximate Area	8,625 m^2
Local Council Area	Parramatta City Council
Current Zoning	B3 Commercial Core (including educational establishments) LEP 2011
Previous Zoning	B3 Commercial Core (including educational establishments) LEP 2007

The site is an irregular shape and is bound by Arthur Phillip High School to the west, Macquarie Street to the north, Little Street to the south and Charles Street to the east.

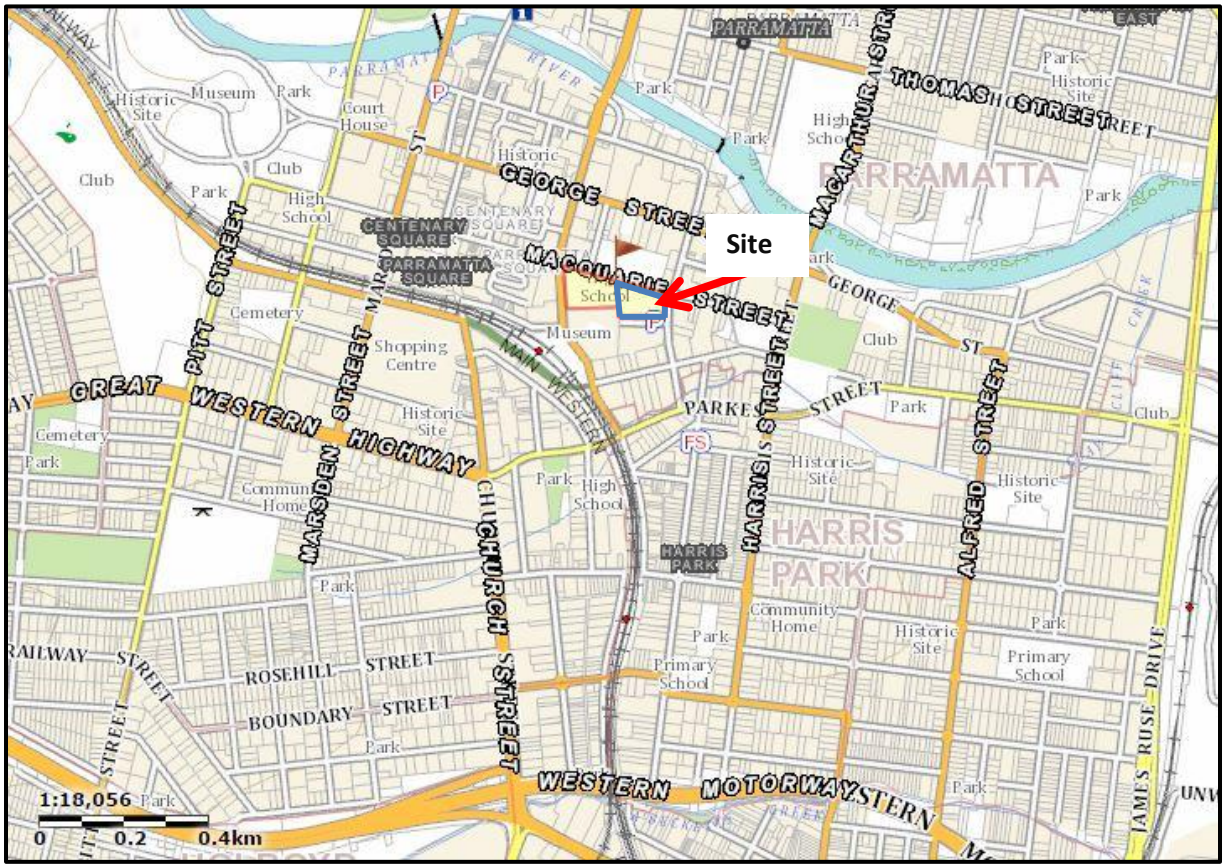


Figure 1: Site location and approximate site boundary

3.2 Site Description

A site walkover was undertaken by a DP environmental scientist on the 14 April 2016. The observations made at that time are summarised below. The site layout is shown on Drawing 1 Appendix A. Photographs are provided in Appendix B.

The following features were observed:

- A large brick building containing classrooms and school administration was located in the north of the site (Photograph 1);
- A small bitumen asphalt paved car park was located directly to the east of the main brick building, the asphalt appeared to be in good condition (Photograph 2);
- Ten demountable classrooms lined the western, southern and eastern boundary of the site (Photograph 3);

- The entire playground surface across the site was covered with soft fall rubber underlain with bitumen asphalt (Photographs 7 and 8);
- A small brick amenities block was located in the south west corner of the site (Photograph 4);
- A large metal awning was located in the center of the site (Photographs 5 and 6);
- There were several raised planters throughout the playground (Photograph 7) as well as garden beds spread sporadically around the perimeter;
- A small 10 m by 15 m shade cloth covered a playground in the south western corner of the site;
- Anecdotal evidence from the maintenance staff identified no underground storage tanks, above ground storage tanks or areas for dangerous chemical storage on site;
- No signs of distressed vegetation were observed during the site walkover; and
- No signs of gross contamination were observed during the site walkover.

The site is located on the edge of Parramatta CBD with major roads and surrounding sites comprising a range of commercial and residential uses, as well as sporting ovals and parkland.

4. Regional Topography, Geology and Hydrogeology

4.1 Topography and Surface Water

The site slopes towards Charles Street and is generally higher than the surrounding sites to the north, east and south, at an elevation of between 10 m and 12 m AHD. The the regional slope is towards Parramatta River approximately 300 m north east of the site.

4.2 Geology

Reference to the Sydney 1:100000 Geological Map indicates that the site is underlain by Ashfield Shale of the Wianamatta Group. Ashfield Shale typically comprises black to dark grey shale and laminite.

4.3 Soil Landscape

The Sydney 1:100,000 Soils Landscape Sheet indicates that the site is underlain by the residual Blacktown soil landscape group. The soil landscape group typically occurs on gently undulating rises on Wianamatta Group shales and Hawkesbury Shale where the local relief is up to 30 m and slopes are usually <5%. It is also typical of broad rounded crests and ridges with gently inclined slopes. The soil types typically include shallow to moderately deep (<1000 mm) red and brown podzolic soils on crests, upper slopes and well drained areas and deep (1500 mm to 3000 mm) yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. This soil group tends to be moderately reactive and highly plastic with low soil fertility and poor soil drainage.

The NSW National Resource Atlas Acid Sulfate Soil Risk Map indicates that the site is located in an area of 'no known occurrence of acid sulphate soil'.

The Department of Infrastructure, Planning and Natural Resources Salinity Potential in Western Sydney map 2002 indicates that the site is located in an area of moderate salinity potential. Soil salinity was considered in the previous geotechnical investigation 'Alliance Geotechnical Report; *Geotechnical Investigation Report, Arthur Phillip High School and Parramatta Public School, Macquarie Street, Parramatta*, Report Number: 1915-GR-1-1, dated 31 July 2015 (AG, 2015a) which provides recommendations for the proposed development.

4.4 Groundwater

Local contours suggest groundwater at the site is expected to conform with the anticipated regional groundwater and flow towards the north-east in the general direction of Parramatta River, approximately 300 m from the site.

A search of the NSW Department of Primary Industries, Office of Water registered groundwater bore database on 31 May 2016 revealed no registered groundwater bores within 500 m.

5. Site History Assessment

The following sections summarise the site history based on previous reports and a review of EPA public databases. Review of Council records, including 149 Certificates, and records of the storage of dangerous goods held by SafeWork NSW was not part of the agreed scope of works for this DSI.

5.1 Previous Reports

5.1.1 Alliance Geotechnical Reports

The following existing site contamination reports were reviewed by DP (2016a) which are summarised below:

- Alliance Geotechnical Report; *Detailed Site Investigation, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-1, dated 11 August 2015 (AG, 2015b); and
- Alliance Geotechnical Report; *Remedial Action Plan and Asbestos Management Plan, Arthur Phillip High School and Parramatta Public School*, Report Number: 1915-ER-1-2, dated 14 August 2015 (AG, 2015c).

AG (2015b) comprised a detailed site investigation for Parramatta Public School and the adjacent Arthur Phillip High School, and included a site history review, a site walkover and an intrusive investigation comprising soil sampling and analysis. The following relates to Parramatta Public School only.

The site history review indicated that the site appeared to have been used for agricultural purposes until c. 1918 to 1925. The site was used as a school and possibly other public uses until the present day. Minor earthworks and the construction and demolition of buildings had occurred on the site over the years.

The findings of a site walkover conducted by AG on 9, 10 and 13 July 2015 were similar to those encountered during the site walkover for this DSI (Section 3.2).

The fieldwork comprised a combination of mechanically advanced boreholes (BH13 to BH22), hand augered boreholes (HA14 to HA16) and surface samples (SS1 and SS2), with a total number of 15 sampling locations in Parramatta Public School (refer to Drawing 1, Appendix A).

AG (2015b) included a sampling and analysis plan, which comprised data quality objectives, soil sampling methodology, decontamination procedures and laboratory analysis and an assessment of quality control and quality assurance procedures. AG (2015b) concluded that based on the results of the field and laboratory QA/QC program the '*soil data is of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site'*. Whilst, in some instances, there is no rationale for some of the decisions made and there are a couple of omissions, such as no trip spike sample, this is not considered sufficient to undermine to conclusion in AG (2015b). Therefore the data provided in AG (2015b) has been considered suitable for inclusion in this DSI.

The filling was encountered to depths of between 0.4 m and 0.7 m below ground level (bgl) and comprised brown to grey gravelly clay/silty clay with foreign materials such as igneous gravel and bitumen. Fragments of asbestos-containing materials (ACM) were observed on the ground surface in the south west of the PPS site (HA16 - Drawing 1, Appendix A), however, the condition of the fragments was not given.

No indicators of contamination, other than the foreign materials and ACM, such as hydrocarbon odours or staining were observed in the site soils.

Natural material below the filling across the site comprised red to brown clay over shale.

The recorded concentrations of metals, PAH, TRH, BTEX, OCP, OPP and PCB were below the laboratory limit of reporting and the site assessment criteria (SAC). However, only a limited number of samples of filling were sent for analysis.

Asbestos was reported in the laboratory certificate to be present in the following sample (refer to Drawing 1, Appendix A):

- HA16-0.0-0.2 – chrysotile, amosite and crocidolite in fibre cement fragments and in loose fibre bundles (south site – filling).

As there was no description of the condition of the fragments of ACM identified it is not clear whether the fibre bundles are a results of degradation of ACM fragments in poor condition of whether there is a separate source of friable asbestos.

AG (2015b) concluded that '*the site is able to be made suitable for residential with accessible soils land use with the following recommendations*':

- Preparation of a remediation action plan (RAP);

- There is the potential for beneficial re-use of asbestos impacted soils on-site pending further assessment;
- Preparation of an asbestos management plan (AMP) to manage asbestos during redevelopment; and
- Preparation of a validation report to demonstrate adequate remediation of asbestos and any unexpected finds, and to provide a statement on the suitability of the site for the proposed use.

AG (2015c) comprises a RAP and asbestos management plan (AMP) and includes the following:

- A scope of additional assessment works;
- A review of remediation options;
- A remedial plan;
- A contingency plan;
- A validation plan; and
- An AMP.

AG (2015c) concluded that '*the site can be made suitable for the proposed residential with accessible soils land use'* subject to the successful implementation of the measures detailed in the RAP.

DP (2016a) recommended that the following are undertaken in addition to the recommendations in AG (2015b):

- Seek confirmation from site personnel whether or not dangerous goods (e.g. underground or above ground storage tanks, chemicals, etc) are currently, or have been historically, stored on site – Refer to Section 3.2 of this DSI;
- Re-assess the copper, nickel and zinc results against EIL calculated based on site derived criteria (soil samples analysed for CEC and pH) or based on reasonably conservative assumed values of CEC and pH for the soils types encountered- refer to Section 11.3 of this DSI;
- Undertake a detailed assessment of the analytical data to assess the impact of the limited extent of analysis of the filling undertaken for the identified CoPC to inform the requirement for further sampling and analysis either prior to or during redevelopment works – refer to Section 7.3 of this DSI;
- Further statistical analysis of the lead concentrations recorded in filling and natural soils – refer to Section 11.3 of this DSI; and
- Further assessment of the potential extent of asbestos impacted filling identified to date – refer to Section 11.3 of this DSI.

5.1.2 DP Hazardous Building Materials Report

DP report *Review of Reports – Hazardous Building Materials, Arthur Phillip High School and Parramatta Public School, Macquarie Street Parramatta NSW, 21 March 2016* (DP, 2016b) provides a review of existing and historical Hazardous Building Materials (HBM) reports relating to the proposed redevelopment of Arthur Phillip High School and Parramatta Public School. A summary of the findings of the review which relate to Parramatta Public School is presented below.

- Asbestos-containing materials were identified;
- Due to the limitations of the survey: the number of non-accessed areas, no investigation of other hazardous materials and absence of invasive survey techniques the documents are insufficient to meet the requirements of a pre-demolition survey and Register of asbestos and other hazardous materials;
- Further survey works and update of Register to be undertaken; and
- In accordance with Work Health and Safety Regulations 2011 (NSW) (specifically chapter eight) and associated Codes of Practice (How to Manage and Control Asbestos in the Workplace [Safe Work Australia (2011)] and Demolition Work Code of Practice [WorkCover NSW (2014)]) it is recommended that a full access (intrusive) asbestos and other hazardous materials survey is undertaken of all building structures on site and an updated Register of asbestos and other hazardous materials drawn up prior to the commencement of any demolition works.

5.2 Regulatory Notices Search

The EPA publishes records of contaminated sites under section 58 of the *Contaminated Land Management Act* 1997 (CLM Act) on a public database accessed via the internet. The notices relate to investigation and/or remediation of sites considered to be significantly contaminated under the definition in the CLM Act. More specifically the notices cover the following:

- Actions taken by the EPA under sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;
- Actions taken by the EPA under sections 35 or 36 of the Environmentally Hazardous Chemicals Act 1985; and
- Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an in-force remediation order.

A search of the public database on 1 June 2016 indicated that the site was not listed.

A search of the List of NSW Contaminated Sites notified to the EPA indicated that the site or surrounding areas were not listed.

It should be noted that the EPA record of Notices for contaminated land does not provide a record of all contaminated land in NSW.

The NSW EPA also issues environmental protection licenses under section 308 of the *Protection of the Environment Operations Act* 1997 (POEO Act). The register contains:

- Environmental protection licenses;
- Applications for new licenses and to transfer or vary existing licenses;
- Environment protection and noise control licenses;
- Convictions in prosecutions under the POEO Act;
- The result of civil proceedings;
- License review information;
- Exemptions from provisions of the POEO Act or Regulations;

- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register on 1 June 2016 indicated that no Environmental Protection Licences were issued to the site.

A number of sites were listed in close proximity to the site as being subject to licences, all of which are listed as 'surrendered' or 'no longer in force.'

6. Preliminary Conceptual Site Model

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

6.1 Potential Contamination Sources

The site has been previously used as a school and possible other public activities. Areas of the site may have been filled during the construction of, and amendments to, the school. Given the age of the school it is possible that near surface soils could be impacted with hazardous building materials such as asbestos and lead paint. Pesticides may have also been used in the past as pest control beneath floors and concrete slabs (school and former dwellings) and other parts of the school grounds. Hazardous building materials have been identified in the existing buildings on site. Therefore the following potential sources of contamination and associated contaminants of potential concern (CoPC) have been identified.

S1 – Filling and surficial soil: Associated with levelling, demolition of former buildings and use of the site.

CoPC include metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), organophosphorus pesticides (OPP), phenols, and asbestos.

S2 Existing Buildings.

Asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB.

6.2 Potential Contamination Receptors

The main potential receptors of contamination (current and future) are considered to be:

- (R1) Site users (students, staff and visitors);

- (R2) Construction workers (for the construction of the proposed development);
- (R3) Adjacent site users;
- (R4) Surface water (Parramatta River);
- (R5) Groundwater;
- (R6) Terrestrial ecology; and
- (R7) In-ground structures.

6.3 Potential Contamination Pathways

The potential contamination pathways through which the identified receptors could come into contact with contamination are considered to be:

- (P1) Ingestion and dermal contact;
- (P2) Inhalation of dust and / or vapours;
- (P3) Surface water run off;
- (P4) Leaching and vertical migration into groundwater;
- (P5) Lateral migration of groundwater;
- (P6) Contact with terrestrial ecology; and
- (P7) Contact with in-ground structures.

6.4 Summary of Conceptual Site Model

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible complete pathways between the above sources (S1 and S2) and receptors (R1 to R7) are provided in Table 2.

Table 2: Summary of Potential Complete Pathways

Potential Source	Transport Pathway	Receptor
(S1) Filling and surficial soil	(P1) Ingestion and dermal contact (P2) Inhalation of dust and / or vapours	(R1) Site users (R2) Construction workers
	(P2) Inhalation of dust and / or vapours	(R3) Adjacent site users
	(P3) Surface water run off (P5) Lateral migration of groundwater	(R4) Surface water
	(P4) Leaching and vertical migration into groundwater	(R5) Groundwater
	(P6) Contact with terrestrial ecology	(R6) Terrestrial ecology

Potential Source	Transport Pathway	Receptor
	(P7) Contact with in-ground structures	(R7) In-ground structures
(S2) Hazardous building materials	(P1): Ingestion and dermal contact (P2): Inhalation of dust and / or vapours	(R1) Site users (R2) Construction workers

7. Field Work Methods

7.1 Data Quality Objectives and Project Quality Procedures

The DSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of National Environment Protection Measure 1999 revised 2013, National Environment Protection Council (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

Referenced sections for the respective DQOs listed above are presented in Appendix C.

7.2 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of Data Quality Indicators (DQI), defined as follows:

Completeness: A measure of the amount of useable data from a data collection activity;

Comparability: The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event;

Representativeness: The confidence (expressed qualitatively) that data are representative of each media present on the site;

Precision: A quantitative measure of the variability (or reproducibility) of data; and

Accuracy: A quantitative measure of the closeness of reported data to the “true” value;

Further comments on the DQIs are presented in Appendix C.

7.3 Sampling Locations and Rationale

The recommended minimum sampling density as stipulated in the NSW EPA Contaminated Sites: Sampling Design Guidelines, (1995) for a 8,625 m^2 site is approximately 20 sampling points. The previous investigation (AG, 2015b) comprised 13 boreholes and two surface samples. The purpose of this investigation was to provide further insight into potential contamination on site and following review of the findings of AG (2015b) six test bores (BH1 to BH6) and three test pits (TP1 to TP3) were deemed suitable to complete the site assessment, i.e. a total of 24 locations. The test bore and test pit locations are shown on Drawing 1, Appendix A. The locations were selected on the basis of providing adequate site coverage and on the basis of previous asbestos identification.

The intrusive works were conducted on the 14 and 15 April 2016. Soil samples were collected from the six test bore locations and the three hand dug test pits.

Groundwater assessment was conducted from three wells located over APHS-N, APHS-S and PPS, with one well located on each site. Two of the wells were constructed as part of the geotechnical investigation (DP, 2016c: Wells 102 and 103). The third well was constructed in APHS-S as close as reasonably possible to Lancer Barracks to the south. This sampling design was considered appropriate given the relatively low risk of groundwater contamination at the sites. Well locations are shown on Drawing 5, Appendix A.

Groundwater contamination is considered to be low risk based on a number of factors, namely:

- The site use has been used for schools for over 70 years, which is considered to be a very low risk activity for groundwater contamination;
- Earlier uses were generally also of low risk, with the likelihood of contaminants from this time to remain in groundwater at the site with no soil source considered to be extremely low;
- The chemical contaminants detected at the site have been present in the upper 0.6 m of the soil profile;
- The PAH and TRH exceedances appearing to be associated with asphalt in most if not all locations detected, and are therefore not expected to be leachable; and
- The identified potential up-gradient source (the Lancer Barracks) has been reported[2] to have “no known contamination” and following preparation of a Limited Stage 1 investigation no further action is proposed, although the need for assessment around the former above ground tanks if the areas were to be redeveloped has been identified. Based on this assessment the risk from the site is considered to be low to moderate, and wells have been positioned to assess potential impacts from the Barracks.

7.4 Drilling Methods

Drilling was undertaken using a hand auger with a 110 mm diameter head. Soft fall was encountered at each location and was removed using a Stanley knife. The bitumen asphalt underneath the soft fall was removed using a 10 kg hand held rotary hammer, followed by augering to a maximum depth of

[2] Information leaflet on the Australian Government Department of Defence website titled Lancer Barracks, Parramatta, New South Wales, dated 1 October 2013.

1.0 m bgl. Bitumen and soft fall were reinstated once test bores were terminated. Test bore logs are provided in Appendix D.

The drilling techniques and sampling techniques (see Section7.5) were considered appropriate for the DSI based on the site history and potential contamination sources; i.e. predominantly non-volatiles contaminants of concern. The potential source of volatile contamination was filling which would have been highly disturbed at the time of placement between 50 and almost 100 years ago. However, loss of volatiles during drilling and sampling was minimised by timely sampling from auger returns and appropriate storage and preservation.

Test pits were hand dug using a shovel to a maximum depth of 0.55 m bgl with surface soils put to one side and replaced at the surface on completion. The test pits were backfilled once sampling was complete. Test pit logs are provided in Appendix D.

7.5 Soil Sampling Procedures

Environmental sampling was performed in accordance with standard operating procedures outlined in the DP *Field Procedures Manual*. All sampling data was recorded on test bore logs presented in Appendix E and selected samples for laboratory analysis were recorded on DP chain-of-custody (COC) sheets provided in Appendix E. The general soil sampling procedure comprised:

- Use of disposable sampling equipment including nitrile gloves;
- Transfer of samples into laboratory prepared glass jars and capping immediately with Teflon lined lids;
- Labelling of sampling containers with individual and unique identification, including project number sample location and sample depth; and
- Placement of sample containers and bags into a cooled, insulated and sealed container for transport to the laboratory.

Envirolab Services Pty Ltd, accredited by NATA, was employed to conduct the primary sample analysis. ALS Environmental, also accredited by NATA, was employed to conduct the secondary sample analysis. Each laboratory is required to carry out in-house QC procedures.

7.6 Groundwater Well Construction and Groundwater Sampling

Two of the wells were constructed as part of the geotechnical investigation (DP, 2016c). These wells were constructed in Bores 102 and 103 (Wells 102 and 103) which were drilled using a Scout truck mounted auger/rotary drilling rig, using auger, rotary and NMLC-coring methods. Well construction details are shown on the borehole logs, Appendix D.

One of the wells was constructed in Bore MW1 (Well MW1), which was drilled using a DT-100 truck mounted auger/rotary drilling rig, using auger drilling methods. Well construction details are shown on the borehole log, Appendix D.

Groundwater monitoring wells were constructed so that the screened interval intercepted the expected depth of the water table. No drilling muds/ liquids were used in the drilling.

The groundwater monitoring wells were constructed of 50 mm diameter acid washed class 18 PVC casing and machine slotted well screen intervals. Joints were screw threaded, thereby avoiding the use of glues and solvents which may contaminate the wells. All wells were capped and a Gatic cover placed flush with the ground surface.

The groundwater levels were measured using an interface meter and the wells were developed on 13 September 2016 by pumping until dry. No phase separated hydrocarbons (PSH) were noted during the development.

The general groundwater sampling procedure comprised:

- Use of disposable, non-teflon containing measuring and sampling equipment including nitrile gloves;
- Collection of sample for chemical analysis from water which has only been in contact with new, disposable silicon and LDPE tubing;
- Transfer of samples into appropriately preserved laboratory prepared glass jars and capping immediately. Sampling containers for PFAS did not have Teflon lined lids);
- Labelling of sampling containers with individual and unique identification, including project number sample location and sample depth; and
- Placement of sample jars into a cooled, insulated and sealed container for transport to the laboratory.

No new clothes, Tyvek suits, food wrappers, alfoil, light plastic containers, waterproof paper, self-sticking notes, re-usable ice packs or drilling fluids were used on site during PFAS sampling. Decon 90 and potentially treated (e.g. Gore-tex) clothing was used/ worn during sampling.

The wells were micro-purged and sampled between 16 and 19 September 2016 using a low flow pump (Geopump). No PSH was observed during micropurging or sampling. Samples from Wells 102 and MW1 were collected following stabilisation of field parameters (pH, temperature, dissolved oxygen (DO), electrical conductivity and redox). Insufficient water was present in Well 103 to allow micropurging before sampling.

Samples were placed with a minimum of aeration into laboratory prepared and preserved bottles. For analysis of metals the relevant sample fraction was filtered using an in-line disposable 0.45 µm filter that was changed between samples.

The samples were placed in an insulated cooler and maintained at a cool temperature using ice for transport to the analytical laboratory.

7.7 Analytical Rationale

The analytical scheme was designed to obtain an indication of the potential presence and possible distribution of contaminants that may be attributable to past and present activities, and features within the site, as discussed in Section 6.

7.8 Field Quality Assurance and Quality Control

The field QC procedures for sampling were undertaken in accordance with Douglas Partners' *Field Procedures Manual*. Field replicates were recovered and analysed for a limited suite of contaminants by means of intra-laboratory analysis. The results of the field QA programme are presented in Appendix C.

7.9 Laboratory QA/QC

The analytical laboratory, accredited by NATA, is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples.

The results of the DP assessment of laboratory QA/QC are shown in Appendix D with the laboratory certificates of analysis included in Appendix C.

8. Site Assessment Criteria

The current site use is a primary school, it is understood that the intended end use of the site is a redevelopment of the school facilities. Therefore the proposed Site Assessment Criteria (SAC) will be for residential with garden/accessible soil which also includes childcare centres, preschools and primary schools.

The SAC applied in the current investigation are informed by the CSM which identified human and ecological receptors to potential contamination on the site. Analytical results were assessed (as a Tier 1 assessment) against the SAC comprising the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013). NEPC (2013) is endorsed by the NSW EPA under the CLM Act 1997. Petroleum based health screening levels for direct contact and vapour inhalation by intrusive maintenance workers from the *Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report no.10 Health screening levels for petroleum hydrocarbons in soil and groundwater* (2011) as referenced by NEPC (2013) have not been considered in this assessment as these values are significantly higher than the soil vapour HSLs adopted.

8.1 Soil

8.1.1 Health Investigation and Screening Levels

Table 3 shows the HILs that have been adopted by NEPC (2013) Schedule B1, Table 1A(1). Table 3 only includes contaminants analysed during this assessment, not the full list provided in NEPC (2013).

Table 3: Health Investigation Levels

Contaminant	HIL A – Residential (mg/kg)
Metals and Inorganics	
Arsenic	100
Cadmium	20
Chromium (IV)	100
Copper	6000
Lead	300
Mercury (inorganic)	40
Nickel	400
Zinc	7400
PAH	
Carcinogenic PAH (as benzo(a)pyrene TEQ) [1]	3
Total PAH	300
Phenols	
Pentachlorophenol (used as an initial screen)	100
OCP	
DDT + DDD + DDE	240
Aldrin + Dieldrin	6
Chlordane	50
Endosulfan (total)	270
Endrin	10
Hepatchlor	6
HCB	10
Methoxychlor	300
Other Pesticides	
Chlorpyrifos	160
Other Organics	
PCB [2]	1

Notes:

1 sum of carcinogenic PAH

2 non dioxin-like PCBs only.

Table 4 shows petroleum hydrocarbon compounds adopted from NEPC (2013) Schedule B1, Table 1A(3). The HSLs are based on overlying soil type and depth. HSLs for sand have been used based on the sandy clay fill material encountered at the site. Given the general depth of fill encountered in the investigation during the intrusive works, and using the most conservative values, the depth range of 0 m to <1 m has been used.

Table 4: Soil Health Screening Levels for Vapour Intrusion

Contaminant	Soil Type	HIL A – Residential (mg/kg)
		Depth 0 m to <1m
Toluene	Sand	160
Ethylbenzene		55
Xylenes		40
Naphthalene		3
Benzene		0.5
TRH C_6-C_{10} less BTEX [F1]		45
TRH >C_{10}-C_{16} less naphthalene [F2]		110

8.1.2 Ecological Investigation and Screening Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the following formula:

EIL = ABC + ACL,

The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al *Trace element concentrations in soils from rural and urban areas of Australia*, Contaminated Sites monograph no. 4, South Australian Health Commission, Adelaide, Australia 1995 (Olszowy, 1995) or Hamon et al, *Geochemical indices allow estimation of heavy metal background concentrations in soils*, Global Biogeochemical Cycles, vol. 18, GB1014, (Hamon, 2004). ACL is based on the soil characteristics of pH, CEC and clay content.
EIL (and ACLs where appropriate) have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL for these contaminants, and has been provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (http://www.scew.gov.au/node/941).

The adopted EIL, derived from the *Interactive (Excel) Calculation Spreadsheet* are shown in the following Table 5. The following site specific data and assumptions have been used to determine the EILs:

- The EILs will apply to the top 2 m of the soil profile;
- Given the likely source of soil contaminants (i.e. historical site use/fill) the contamination is considered as "aged" (>2 years); and
- ABCs have been derived using the *Interactive (Excel) Calculation Spreadsheet* using input parameters of aged soil, CEC of 14 $cmol_c/kg$ and pH of 7.3 with high traffic and clay content of 1% for the samples analysed as part of this DSI (see laboratory certificates provided in Appendix E).

Table 5: Ecological Investigation Levels (EIL) in mg/kg

Analyte		EIL Residential	Comments
Metals	Arsenic	100	Adopted pH of 7.3 and CEC of 14 $cmol_c/kg$]; assumed clay content 1%
	Chromium III	200	
	Copper	230	
	Lead	1,100	
	Nickel	210	
	Zinc	650	
PAH	Naphthalene	170	
OCP	DDT	180	

Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESL apply to the top 2 m of the soil profile as for EIL.

ESL have been derived in NEPC (2013) for petroleum fractions F1 to F4 as well as BTEX and Benzo(a)pyrene. Site specific data and assumptions as summarised in Table 6 have been used to determine the ESL. The adopted ESL, from Table 1B(6), Schedule B1 of NEPC (2013) are shown in Table 7.

Table 6: Inputs to the Derivation of ESL

Variable	Input	Rationale
Depth of ESL application	Top 2 m of the soil profile	The top 2 m depth below ground level corresponds to the root zone and habitation zone of many species.
Land use	Urban Residential	Primary School
Soil Texture	Fine	Based on findings noted in test bore logs (Appendix D)

Table 7: Ecological Screening Levels (ESL) in mg/kg

Analyte		ESL (Residential)	Comments
TRH	C6 – C10 (less BTEX) [F1]	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	120*	
	>C16-C34 [F3]	1300	
	>C34-C40 [F4]	5600	
BTEX	Benzene	65	
	Toluene	105	
	Ethylbenzene	125	
	Xylenes	45	
PAH	Benzo(a)pyrene	0.7	

8.1.3 Management Limits

NEPC (2013) Table 1B(7) provides 'management limits' for TRH fractions, which are applied after consideration of relevant HSLs. The management limits have been adopted to avoid or minimise the following potential effects of petroleum hydrocarbons:

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

The presence of site TRH contamination at the levels of the management limits does not imply that there is no need for administrative notification or controls in accordance with jurisdictional requirements. The adopted management limits are shown in Table 8 and have been selected based on the CSM.

Management limits for coarse material are presented in Table 8, since variable clay textures were encountered in the samples collected, and coarse texture management limits are more conservative of the two management limits available.

Table 8: Management Limits for TRH Fractions in Soil

TRH Fraction	Soil Texture	Management Limit: Residential (mg/kg)
C_6-C_{10} [F1]	Coarse	700
>C_{10}-C_{16} [F2]	Coarse	1,000
>C_{16}-C_{34} [F3]	Coarse	2,500
>C_{34}-C_{40} [F4]	Coarse	10,000

8.1.4 Asbestos in Soil

Bonded asbestos-containing material (ACM) is the most common form of asbestos contamination across Australia, generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products;
- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites; and
- Commonly occurring in historical fill containing unsorted demolition materials.

Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibres. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos (FA) and/or asbestos fines (AF).

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air.

Three hand dug test pits were excavated in areas which were suitable for the excavation of test pits and where asbestos was previously identified (AG, 2015b) as shown on Drawing 1 in Appendix A. In accordance with NEPC (2013) 10 L and 500 ml samples were taken from the test pits for estimation of the asbestos content in soil. Samples taken from boreholes were also screened for preliminary assessment of ACM. The adopted criteria are presented in Table 9 below.

Table 9: Health Screening Levels for Asbestos Contamination in Soil

Health Screening Level (w/w)		
Form of Asbestos	**Residential A**	**Comments**
Bonded ACM	0.01%	Test pit samples
AF/FA (Friable Asbestos)	0.001%	Test pit samples
All forms	0.1 g/kg	Test bore samples
All forms	No visible asbestos for surface soil	-

In areas where asbestos sampling was not in accordance with NEPC (2013) the presence or absence of asbestos at a limit of reporting of 0.1 g/kg has been adopted for this assessment as an initial screen. The laboratory engaged to undertake the analysis (Envirolab Services Ltd) reports any asbestos detected in a sample below the limit of reporting. Any detection of asbestos in these areas will be considered to require remediation or further investigation.

8.2 Groundwater

8.2.1 Groundwater Investigation Levels

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

- *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality* 2000 (ANZECC & ARMCANZ).

The adopted GIL for the analytes included in the assessment, and the corresponding source documents, are shown in Table 10.

Table 10: Groundwater Investigation Levels (in µg/L)

Analyte		NEPC (2013) Fresh Waters [a]	Comments
Metals	Arsenic (V)	13	[#] Base threshold, which can be adjusted for site specific hardness measurements
	Arsenic (III)	24	
	Cadmium	0.2[#]	
	Chromium (VI)	1[#]	
	Copper	1.4[#]	
	Lead	3.4[#]	
	Mercury (total)	0.06	
	Nickel	11[#]	
	Zinc	8[#]	
PAH	Naphthalene	16	
	Benzo(a)pyrene	-	
BTEX	Benzene	950	
	Toluene	-	
	Ethylbenzene	-	
	Xylene (o)	350	
	Xylene (p)	200	
	Xylenes (Total)	-	
OCP	Chlordane	0.03	
	DDT	0.006	
	Endosulfan	0.03	
	Endrin	0.01	
	Heptachlor	0.01	
	Aldrin + Dieldrin	-	
	Lindane	0.2	
	Heptachlor Expoxide	-	
PCB	Aroclor 1242	0.3	
	Aroclor 1254	0.01	
Phenols	2,4,6-trichlorophenol	3	Adopted as a conservative screening threshold for total phenols
VOC	n/a	n/a	As no VOC concentrations above the laboratory reporting limits have GIL.
PFAS [c]	PFOS	0.13	Value for PFOS adopted as conservative screen for total PFAS
	PFOA	220	

Notes:

a Investigation levels apply to typically slightly-moderately disturbed systems
b In cases where no high reliability trigger values are provided, the low reliability trigger values provided in ANZECC &ARMCANZ (2000) were used as screening levels
c Threshold adopted from ecological freshwater value for slightly – moderately disturbed ecosystems (95% species protection) values from Government of Western Australia Department of Environment Regulation (DER) *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Contaminated Sites Guidelines* (2016) (DER, 206) in the absence of EPA endorsed criteria

8.2.2 Health Screening Levels – Petroleum Hydrocarbons

The generic HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HSL are:

- **HSL- AB** – Low – high density residential

In addition, the HSL adopted is predicated on the following inputs prescribed in Table 11.

Table 11: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Groundwater vapour intrusion (inhalation)	Exposure pathway via groundwater vapour intrusion affects the adopted HSL.
Soil Type	Sand and Clay	Given the variable texture of soils identified at the site HSL for sand and clay have been included
Depth to contamination	4-8 m	Recorded depths to groundwater (prior to sampling) ranged between 4.7 m and 7.2 m (Appendix D) which is considered to be potentially conservative given site levels are proposed to be raised as part of the current development.

The adopted groundwater HSL for vapour intrusion, from Table 1A(4), Schedule B1 of NEPC (2013) are shown in the following Table 12.

Table 12: Groundwater Health Screening Levels (HSL) for Vapour Intrusion (µg/L)

Analyte	HSL A (vapour intrusion) (µg/L)	
	Depth 4 m to <8m	
Soil Texture	Clay	Sand
Toluene	NL [1]	NL [1]
Ethylbenzene	NL [1]	NL [1]
Xylenes	NL [1]	NL [1]
Naphthalene	NL [1]	NL [1]
Benzene	5,000	800
TRH C_6-C_{10} less BTEX [F1]	NL [1]	1,000
TRH >C_{10}-C_{16} less Naphthalene [F2]	NL [1]	1,000

Note: NL -The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour which is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil-vapour source concentration

for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'.

8.3 Contaminants with No Assessment Criteria

Where no guidance is provided in NEPC (2013) for a specific analyte, the PQL was used as the initial screening criteria.

If concentrations are recorded above the PQL, reference criteria will be sourced from other national and international guidance as relevant and used to determine the significance of the detected analyte.

9. Field Work Results

9.1 Field Observations

Detailed descriptions of the conditions encountered in each of the test bores and test pits are provided in the logs in Appendix D. The conditions encountered are summarised below.

SOFT FALL: Rubber soft fall to depths of between 0.01 m and 0.02 m bgl in test bores BH2 to BH6.

ASPHALT: To depths of between 0.04 m and 0.07 m bgl.

TOPSOIL Dark brown clayey sand / sandy clay with some bark, gravel and roots to depths of between 0.01 m and 0.03 m bgl in all test pits.

ROADBASE: Typically light brown sandy gravel to depths of between 0.2 m and 0.3 m bgl.

FILL: Typically consisted of brown / grey / orange gravelly sandy clay or clayey gravel filling to depths of between 0.42 m and 0.62 m bgl.

CLAY: Orange / grey mottled red clay was noted to depths of between 0.7 m and 1.0 m bgl where boreholes were terminated.

The PID readings in each sample were all below 5 ppm (refer to logs in Appendix D) suggesting that the potential for organic contaminants was low.

There were no signs of significant potential contamination observed, however, fragments of bonded ACM were recorded in the filling at TP3 and fragments of asphalt and brick were recorded in the topsoil and filling across the site. Green staining and an unidentified odour was detected in the filling at BH3.

9.2 Groundwater

Well construction details are provided on the test bores logs, provided in Appendix D along with field records from the groundwater well development and sampling.

Groundwater was sampled from three wells, Well 102 (located within APHS-N), Well MW1 (APHS-S) and Well 103 (PPS). Groundwater levels recorded at the time of sampling (Appendix D) were generally consistent with a north easterly groundwater flow direction. Note, groundwater levels are transitory and subject to change over time.

No phase separated hydrocarbons, petroleum sheen or other signs of contamination concern were recorded during well development or sampling.

Water from Well 103 was noted to be silty, and some silt was observed to splash into the metals bottle during filtration.

Table 13: Groundwater Levels

Well ID	Approximate Surface Level[1]	Groundwater Level	
		16.09.16	
	m AHD	m bgl	m AHD
102	7.15	4.8	2.4
103	11	6.6	4.4
MW1	13	5.8	7.2

Notes:

1 Draft levels interpolated from survey drawing. Final levels subject to dGPS survey not yet available

10. Laboratory Testing

Selected soil samples were analysed for the potential contaminants identified in the conceptual site model (CSM, refer to Section 6) comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos.

Groundwater samples were tested for metals, PAH, TRH, BTEX, total phenols, OCP, OPP, PCB, VOC, PFAS and hardness.

The results of the laboratory analysis from this PSI and AG (2015b) are presented in Tables E1 and E2, Appendix E with the SAC. The laboratory certificates and chain of custody information from this DSI are presented in Appendix E.

11. Discussion of Results

The key findings of the desktop and site history investigation were as follows:

- The site appeared to have been used for agricultural purposes until c. 1918 to 1925;

- The site was used as a school and possibly other public uses until the present day;
- Minor earthworks and the construction and demolition of buildings had occurred on the site over the years; and
- Asbestos has been identified in the buildings on site.

Based on the findings of the desktop assessment a number of potential contaminants were identified in the CSM comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos.

11.1 Field Observations

Asbestos fragments were identified in one of the four bulk 10L samples taken from locations TP1 to TP3 (Sample TP3/0.2 – 0.4 m). The weight of ACM collected was 0.022% w/w (33.4g), which exceeded the Health Screening Level for bonded asbestos (residential A (0.01%)). The size range of fragments was from 5 mm to 40 mm. Field notes are provided in Appendix D.

Fragments of asphalt and brick were recorded in the topsoil and filling across the site and green staining and an unidentified odour was detected in the filling at BH3/0.3 – 0.4 m.

11.2 Soil Analytical Results

Selected soil samples were analysed for the potential contaminants of concern comprising metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos. The results of the soil analysis from this DSI and from AG (2015b), and the SAC are presented in Table E1, Appendix E.

The recorded concentrations of BTEX, OCP, OPP, PCB and phenols were below the laboratory limit of reporting and therefore the SAC.

The recorded concentrations of TRH were below the SAC.

The recorded concentrations of metals were below the SAC for all samples apart from lead in the following sample:

- BH19_0.5-0.6 740 mg/kg which exceeded the HIL A of 300 mg/kg.

The material is described as natural in AG (2015b), however, DP conducted a statistical review of the lead data for both natural and fill material. Given the high standard of deviation (160.6, exceeds 50% SAC), the statistical analysis was not considered appropriate for the results and that the concentration recorded in BH19 was an outlier. The statistical output table from ProUCL 5.1 is provided in Appendix E.

The recorded concentrations of total PAH were below the SAC in all samples but the recorded concentrations of benzo(a)pyrene (BaP) exceeded the SAC in three of the nine samples analysed for BaP as follows:

- BH2_0.25-0.35 - B(a)P TEQ (3.7 mg/kg) exceeded the HIL A (3 mg/kg) and B(a)P (2.5 mg/kg) exceeded the ESL (0.7 mg/kg);

- BH5_0.3-0.4 - B(a)P (0.74 mg/kg) exceeded the ESL (0.7 mg/kg); and
- HA14_0-0.2 - B(a)P (1.8 mg/kg) exceeded the ESL (0.7 mg/kg).

As these results did not appear to be characteristic of concentrations in the fill across the site, statistical analysis was not considered appropriate for the results.

DP requested additional assessment of the PAH results from BH2 by the laboratory to determine whether bitumen fragments were included in the sample analysed. The chromatogram and advice are included in Appendix E. The advice from the laboratory was that the sample did contain bitumen and therefore it is considered that the reported concentration may be attributed to small surficial fragments of bitumen which have been included in the sample. Therefore it is considered that the reported concentration of B(a)P does not pose an unacceptable risk under the proposed development.

Positive identification for asbestos was determined for the following samples:

- TP3_0.2-0.4 – 0.022% w/w (33.4g), which exceeded the HSL for bonded asbestos (0.01%);
- Material sample T3 A01 (retrieved from TP3) - chrysotile asbestos/amosite asbestos/crocidolite asbestos;
- TP3_0.2-0.4 - chrysotile asbestos below the FA/AF HSL; and
- HA16_0-0.2 - chrysotile asbestos/amosite asbestos/crocidolite asbestos detected in fibre cement fragments and in loose fibre bundles however no respirable fibres were detected.

11.3 Groundwater Analytical Results

Groundwater results for Well 103, located at PSS were within the GIL with the exception of copper and nickel which were reported at concentrations of 23 µg/L (GIL of 9 µg/L) and 340 µg/L (GIL of 53 µg/L) respectively (Table E2, Appendix E). Water from Well 103 was noted to be silty, and some silt was observed to splash into the metals bottle during filtration. Therefore it is considered that the higher concentrations of metals reported in Well 103, compared to the results from the other two wells, are due to the silt within the sample.

It is noted that a minor concentration of TRH C_6-C_{10}, was detected in the well. The detected concentration is considered to be low and likely to represent background concentrations in the area.

The results of the groundwater investigation are not considered to indicate a potential risk to site users.

12. Conclusions and Recommendations

Based on the findings of this DSI and the current use of the site as a primary school the following management works are recommended:

- Restriction of access in the vicinity of TP3 and HA16 (near Little Street); and
- Capping / covering of the affected area at HA16 with woodchips to limit the possibility of the material spreading in wind or rain events.

Based on the findings of this DSI it is considered that the site can be made suitable for the proposed development as a primary school provided that the identified areas of concern are appropriately managed prior to or during the construction phase of the development. A remediation action plan (RAP) for the redevelopment of PPS and the Arthur Phillip High School should be prepared detailing the soil remediation and management requirements to render the site suitable for the continued primary school use. The RAP should include (in relation to PSS):

- Delineation of contamination identified to be of potential concern;
- Assessment of the filling and natural soil for a range of options including re-use on-site and disposal off-site (to include sampling and analysis of the potential contaminants of concern identified in Section 6);
- Inspection and assessment of the site surface following removal of the hardstand and buildings; and
- An unexpected finds protocol which sets out procedures to be followed should unexpected contamination be encountered during the works.

A pre-demolition hazardous building material survey of all buildings has been undertaken and is reported in DP report *Pre-demolition Hazardous Building Materials Report, Parramatta Public School, Macquarie Street, Parramatta, NSW*, 85374.04.R.002, October 2016.

13. Limitations

This report presents the results of a detailed site investigation (DSI) undertaken for a due diligence purposes at 177 Macquarie Street, Parramatta. The investigation was commissioned by Louise Browne of Grimshaw Architects LLD and was undertaken in accordance with Douglas Partners' proposal SYD160465 dated 7 April 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Grimshaw Architects LLP for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible, considering the previous land uses that hazardous building materials, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

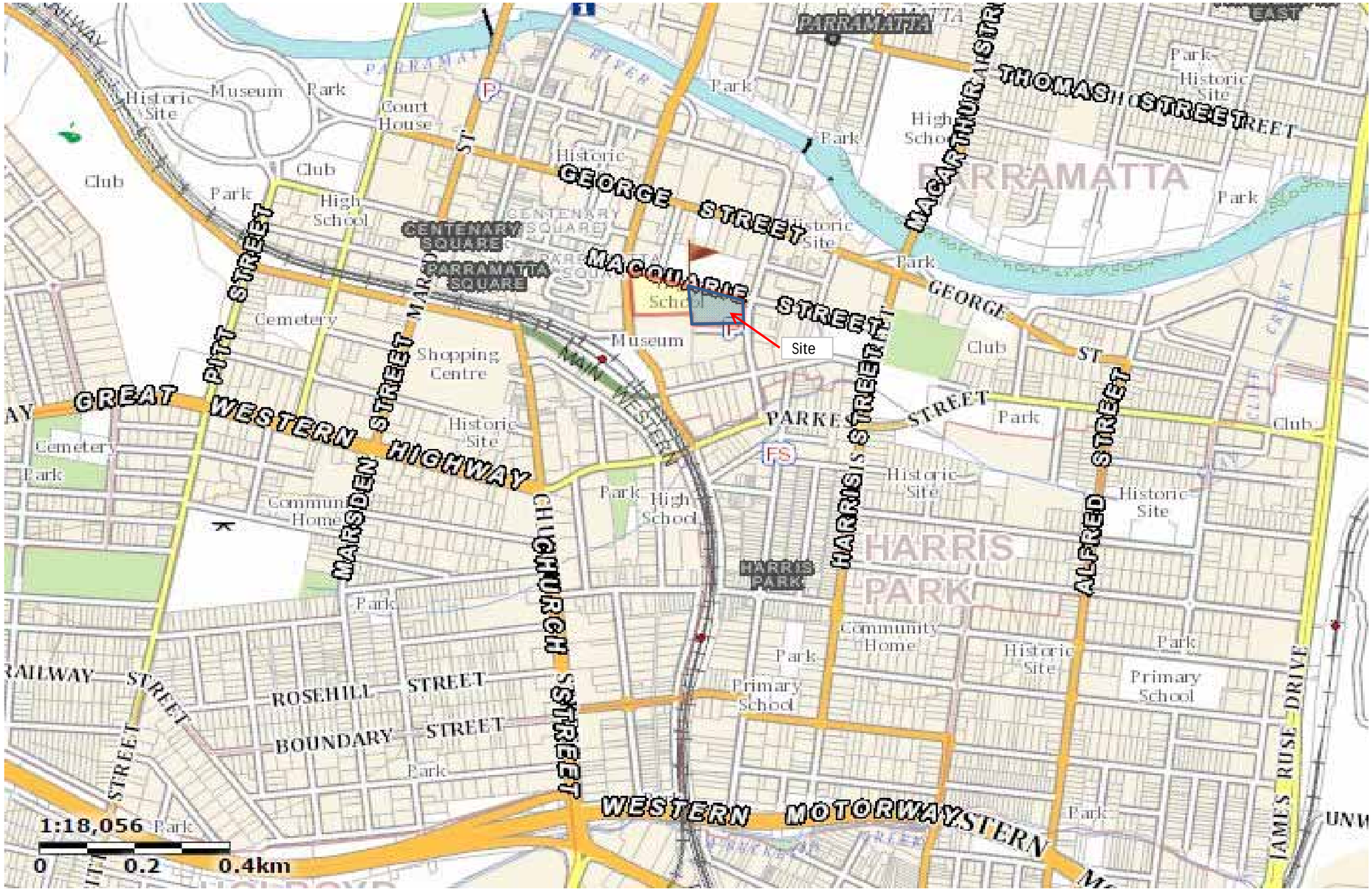
This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation,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

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

Douglas Partners Pty Ltd

Appendix A

Drawings



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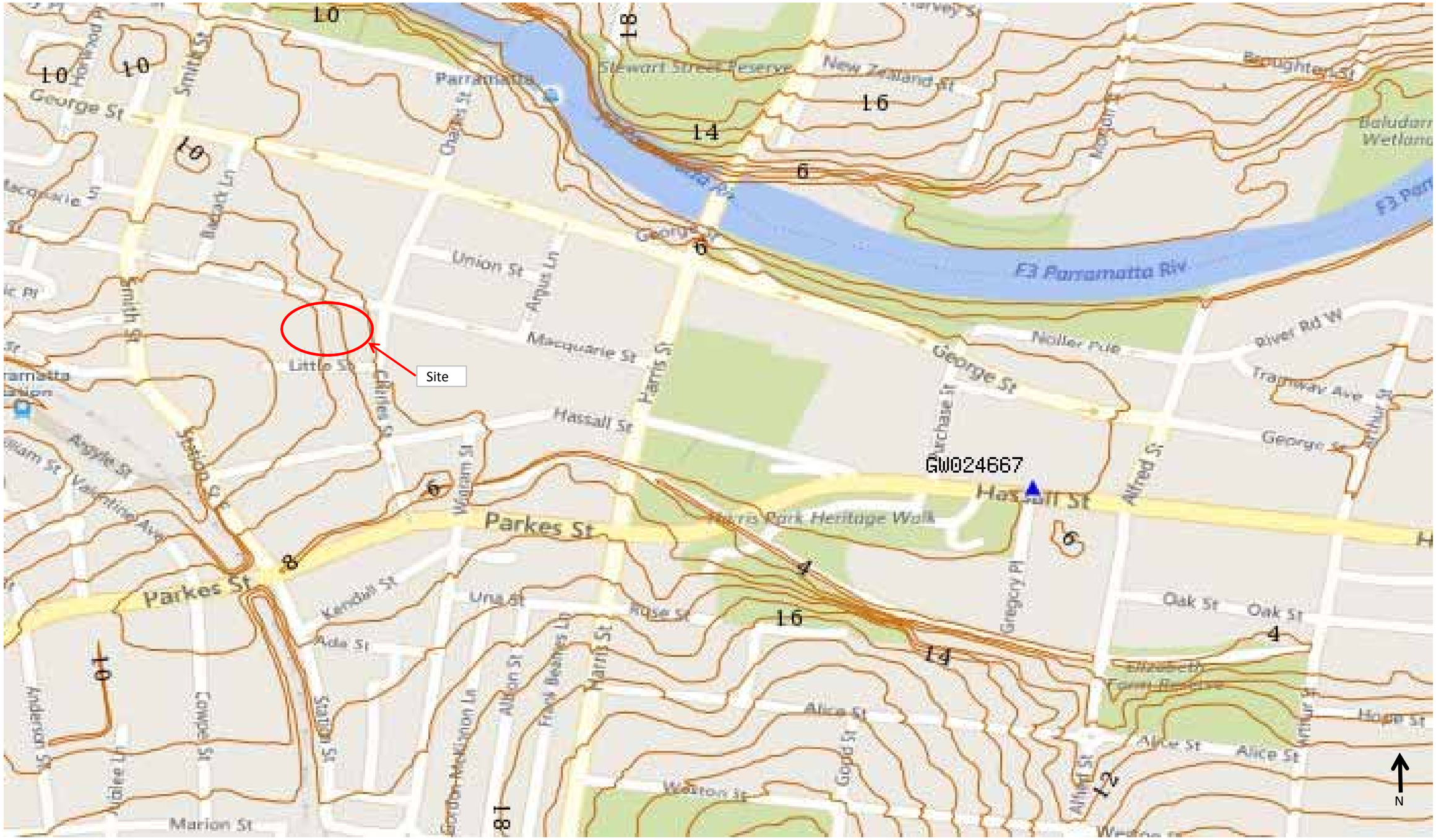
	OFFICE: Sydney	DRAWN BY: CB		DRAWING No:	1
	SCALE: No Scale	DATE: 2 Jun 2016		REVISION:	B



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Grimshaw Architects LLD		TITLE: **Parramatta Public School - Site Topography**	PROJECT No:	85374.02
	OFFICE: Sydney	DRAWN BY: CB	**Contamination and Asbestos Assessment**	DRAWING No:	2
	SCALE: No Scale	DATE: 2 Jun 2016	**174 Macquarie Street, Parramatta**	REVISION:	

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Grimshaw Architects LLD		TITLE: **Parramatta Public School**	PROJECT No:	85374.02
	OFFICE: Sydney	DRAWN BY: CB	**Contamination and Asbestos Assessment**	DRAWING No:	3
	SCALE: No Scale	DATE: 2 Jun 2016	**174 Macquarie Street, Parramatta**	REVISION:	

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Grimshaw Architects LLD		TITLE:	**Parramatta Public School**	PROJECT No: 85374.02
	OFFICE: Sydney	DRAWN BY: CB		**Contamination and Asbestos Assessment**	DRAWING No: 4
	SCALE: No Scale	DATE: 2 Jun 2016		**174 Macquarie Street, Parramatta**	REVISION:

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Grimshaw Architects LLD		TITLE: **Groundwater Sampling Locations** **Detailed Site Investigation** **177 Macquarie Street, Parramatta**	PROJECT No:	85374.02
	OFFICE: Sydney	DRAWN BY: NLE		DRAWING No:	5
	SCALE: NTS	DATE: 06.10.2016		REVISION:	B

Appendix B

Photographs

Photograph 1 - Large Brick Building

Photograph 2 - Small Bitumen Asphalt Carpark

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Detailed Site Investigation** **Parramatta Public School**	PROJECT: 85374.02 PLATE No: B1 REV: A
	CLIENT: Grimshaw Architects LLD	DATE: 2-Jun-16

Photograph 3 - Demountable Classrooms

Photograph 4 - Brick Amenities Block

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Detailed Site Investigation** **Parramatta Public School**	PROJECT: 85374.02 PLATE No: B2 REV: A
	CLIENT: Grimshaw Architects LLD	DATE: 2-Jun-16

Photograph 5 - Metal Awning

Photograph 6 - Metal Awning

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Detailed Site Investigation** **Parramatta Public School**	PROJECT: 85374.02 PLATE No: B3 REV: A
	CLIENT: Grimshaw Architects LLD	DATE: 2-Jun-16

Photograph 7 - Soft Fall Playground and Raised Planters

Photograph 8 - Soft Fall Playgound

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Detailed Site Investigation** **Parramatta Public School**	PROJECT: 85374.02 PLATE No: B4 REV: A
	CLIENT: Grimshaw Architects LLD	DATE: 2-Jun-16

Appendix C

Data Quality Assessment

DATA QUALITY ASSESSMENT

Q1. Data Quality Objectives

The Detailed Site Investigation (DSI) was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

The DQOs have been addressed within the report as shown in Table Q1.

Table Q1: Data Quality Objectives

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S11 Discussion of Results S12 Recommendations and Conclusion
Identify Inputs to the Decision	S1 Introduction S3 Site Identification and Description S4 Previous Reports S5 Site History Assessment S6 Conceptual Site Model S8 Site Assessment Criteria S9 Fieldwork Results S10 Laboratory Testing
Define the Boundary of the Assessment	S3 Site Identification and Description Drawings - Appendix A
Develop a Decision Rule	S8 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S7 Fieldwork Methods S8 Site Assessment Criteria QA/QC Procedures and Results – Sections Q2, Q3
Optimise the Design for Obtaining Data	S2 Scope of Works S7 Fieldwork Methods QA/QC Procedures and Results – Sections Q2, Q3

Q2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory quality control (QC) procedures and results are summarised in Tables Q2 and Q3. Reference should be made to the fieldwork and analysis procedures in Section 7 and the laboratory certificates in Appendix E for further details.

Table Q2: Field QC

Item	Evaluation / Acceptance Criteria	Achievement
Intra-laboratory replicates	5% primary samples; <30% RPD (inorganics), <50% RPD (organics)	yes[1,2]
Trip Spikes	1 per day, per sampling event; 60-140% recovery	Yes[3]
Trip Blanks	1 per day, per sampling event; <PQL	Yes[3]

Notes: 1 qualitative assessment of RPD results overall; refer Section Q2.1
2 applies where concentrations are >5 x LOR/PQL
3 groundwater only, soil trip spikes and blanks not analysed for soil investigation as volatiles were not considered to be primary contaminants of concern

Table Q3: Laboratory QC

Item	Evaluation / Acceptance Criteria	Achievement
Analytical laboratories used	NATA accreditation	yes
Holding times	In accordance with NEPC (2013) which references various Australian and international standards	yes
Laboratory / Reagent Blanks	1 per batch; <PQL	yes
Matrix Spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols)	yes
Surrogate Spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols)	yes
Control Samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC and speciated phenols)	yes

The Envirolab Services Pty Ltd (ELS) laboratory certificate notes state that the practical quantitation limits (PQLs) were raised due to interference from analytes for TRH (semivol) and OC/OP/PCBs in soil.

In summary, the QC data is considered to be of sufficient quality to be acceptable for the assessment.

Q2.1 Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory Envirolab Services Pty Ltd and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Tables Q4 and Q5.

Note that, where both samples are below LOR/PQL the difference and RPD has been given as zero. Where one sample is reported below LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the less than LOR/PQL sample.

Table Q4: Relative Percentage Difference Results – Intra-laboratory Replicate (Soil)

Lab	Sample ID	Date Sampled	Media	Units	Metals								BTEX				PAH	
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Benzene	Toluene	Ethylbenzene	xylene	Naphthalene	Total
Envirolab	BH06_0.5-0.6	15/04/2016	filling	mg/kg	7	<0.4	24	18	16	<0.1	11	27	<2	<0.5	<1	<3	<0.1	NIL(+)VE
Envirolab	BD1 150416	15/04/2016	filling	mg/kg	7	<0.4	31	20	18	<0.1	19	28	<2	<0.5	<1	<3	<0.1	NIL(+)VE
Difference				mg/kg	0	0	7	2	2	0	8	1	0	0	0	0	0	0
RPD				%	0	0	25	11	12	0	**53**	4	0	0	0	0	0	0

Table Q4: Continued - Relative Percentage Difference Results – Intra-laboratory Replicate (Soil)

Lab	Sample ID	Date Sampled	Media	Units	TRH			
					C6-C10	>C10-C16	>C16-C34	>C34-C40
Envirolab	BH06_0.5-0.6	15/04/2016	filling	mg/kg	<25	<50	<100	<100
Envirolab	BD1 150416	15/04/2016	filling	mg/kg	<25	<50	<100	<100
Difference				mg/kg	0	0	0	0
RPD				%	0	0	0	0

Table Q5: Relative Percentage Difference Results – Intra-laboratory Replicate (Groundwater)

Sample ID	Date Sampled	Units	Priority Heavy Metals (total dissolved)								PAH		
			As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Naphthalene	B(a)P	PAH
102	16/09/16	µg/L	<1	<0.1	<1	<1	<1	<0.05	1	12	<1	<1	NIL (+)VE
BD1	16/09/16	µg/L	<1	<0.1	<1	<1	<1	<0.05	1	11	<1	<1	NIL (+)VE
Difference		µg/L	0	0	0	0	0	0	0	1	0	0	0
RPD		%	0	0	0	0	0	0	0	9	0	0	0

The calculated RPD values were within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics with the exception of the one in bold. However, this is not considered to be significant because:

- The replicate pair being collected from fill soils which were heterogeneous in nature;
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- The majority of RPDs within a replicate pair being within the acceptable limits; and
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

Q3. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in the following Table Q6.

Table Q6: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Planned systematic locations sampled; Preparation of field logs, sample location plan and chain of custody (COC) records; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for contaminants of potential concern (COPC) identified in the Conceptual Site Model (CSM); Completion of COC documentation; NATA endorsed laboratory certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory QC samples as discussed in Section Q2.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Works undertaken by appropriately experienced and trained DP environmental scientist / engineer; Use of NATA registered laboratory; Satisfactory results for field and laboratory QC samples.

Data Quality Indicator	Method(s) of Achievement
Representativeness	Target media sampled; Spatial and temporal distribution of sample locations; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the analysis request.
Precision	Acceptable RPD overall between original samples and replicates; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Satisfactory results for all field and laboratory QC samples.

Based on the above, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

Appendix D

Test Bore and Test Pit Logs

and Notes About this Report

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Sampling Methods

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Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

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Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

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Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

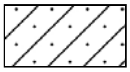
Soils


Topsoil

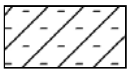

Peat


Clay

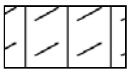

Silty clay

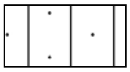

Sandy clay

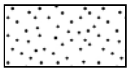

Gravelly clay

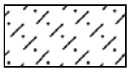

Shaly clay

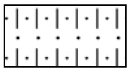

Silt


Clayey silt


Sandy silt

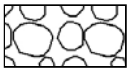

Sand

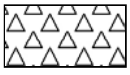

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

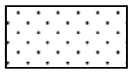

Talus

Sedimentary Rocks

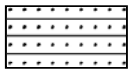

Boulder conglomerate

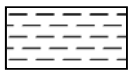

Conglomerate


Conglomeratic sandstone

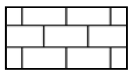

Sandstone


Siltstone


Laminite

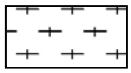

Mudstone, claystone, shale

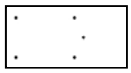

Coal


Limestone

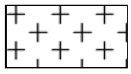
Metamorphic Rocks

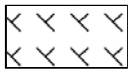

Slate, phyllite, schist

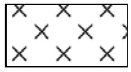

Gneiss

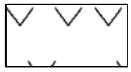

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.04	ASPHALT							
		ROADBASE - apparently poorly compacted, light brown, clayey sandy gravel roadbase		A	0.1 0.15		PID<5		
	0.2	FILLING - brown and orange, sandy clay filling with some fine to coarse gravel, asphalt fragments and medium to coarse brick fragments		A	0.3 0.4		PID<5		
				A	0.5 0.6		PID<5		
	0.62	Bore discontinued at 0.62m - refusal on brick and coarse gravel							
	1								1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	SOFT FALL RUBBER							
	0.06	ASPHALT		A	0.06		PID<5		
		ROADBASE - apparently poorly compacted, light brown, clayey sandy gravel roadbase			0.1				
	0.25	FILLING - brown and grey, clay filling with a trace of sand and some fine to medium gravel and fine brick fragments		A	0.25		PID<5		
	0.35	FILLING - dark grey, clay filling with some fine to medium gravel and fine asphalt fragments, moist		A	0.35 0.36		PID<5		
	0.4	FILLING - orange-brown, clay filling with some brick fragments		A	0.4		PID<5		
	0.5	CLAY - orange clay with some ironstone gravel		A	0.5		PID<5		
					0.6				
	0.8	Bore discontinued at 0.8m - target depth reached							
	1								1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	SOFT FALL RUBBER							
	0.04	ASPHALT		A	0.04		PID<5		
		ROADBASE - apparently poorly compacted, light brown, sandy gravel roadbase			0.1				
	0.2	FILLING - brown-grey, sandy clay filling with some fine to medium gravel and fine brick fragments, slight green colour with odour			0.3				
				A			PID<5		
	0.4	FILLING - dark grey, clay filling with some fine to medium gravel and some fine to medium brick and asphalt fragments			0.4				
					0.5				
				A			PID<5		
	0.6	CLAY - light grey and orange clay			0.6				
					0.7				
				A			PID<5		
					0.8				
1	1.0	Bore discontinued at 1.0m - target depth reached							1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 85374.02
DATE: 15/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	SOFT FALL RUBBER							
	0.06	ASPHALT							
		ROADBASE - apparently poorly compacted, light brown, clayey sandy gravel roadbase		A	0.1		PID<5		
	0.2	FILLING - grey, brown and orange mottled, sandy clay filling with some fine to coarse gravel, fine to medium asphalt and brick fragments and roots			0.2				
				A	0.3		PID<5		
					0.4				
	0.5	CLAY - grey and red clay with some roots		A	0.5		PID<5		
					0.6				
	0.7	Bore discontinued at 0.7m - refusal on large tree root							
	1								1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 85374.02
DATE: 15/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.02	SOFT FALL RUBBER							
	0.06	ASPHALT							
		ROADBASE - apparently poorly compacted, light brown, clayey sandy gravel roadbase		A	0.1		PID<5		
					0.2				
	0.3	FILLING - brown, sandy clay filling with some fine to coarse gravel, coarse brick fragments and medium asphalt fragments		A	0.3		PID<5		
	0.43	Bore discontinued at 0.43m - refusal on coarse gravel and brick fragments			0.4				
	1								1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 85374.02
DATE: 15/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	SOFT FALL RUBBER							
	0.07	ASPHALT							
		ROADBASE - apparently poorly compacted, light brown, clayey sandy gravel roadbase		A	0.1		PID<5		
	0.2	FILLING - brown-grey, gravelly sandy clay filling with some brick and asphalt fragments			0.2				
				A	0.3		PID<5		
	0.4	FILLING - brown and orange, sandy clay filling with fine to medium gravel and some brick fragments and some ironstone gravel			0.4				
				A*	0.5		PID<5		
	0.6	CLAY - stiff, orange and grey clay with some ironstone gravel			0.6			▽	
				A	0.8		PID<5		
					0.9				
1	1.0	Bore discontinued at 1.0m - target depth reached							1

RIG: Hand tools **DRILLER:** CB **LOGGED:** CB **CASING:** Uncased

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: Water observed at 0.7m (seepage)

REMARKS: *BD1-150416 taken at depth 0.5m to 0.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:

PIT No: TP1
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
	0.02	TOPSOIL - dark brown, clayey sand topsoil with some bark, fine gravel and roots							
		FILLING - light brown, fine to medium clayey sandy gravel filling (roadbase?)		D	0.05				
	0.15	FILLING - light brown, fine to medium gravelly sand filling with a trace of clay and some fine to medium brick fragments			0.15				
		- orange clay clumped at 0.3m		D	0.25				
					0.35				
	0.43	Pit discontinued at 0.43m - refusal on coarse gravel							
	1								1

RIG: Hand tools
LOGGED: CB
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:

PIT No: TP2
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
	0.01	TOPSOIL - dark brown-orange, clayey sand topsoil with some bark and roots							
		FILLING - orange and brown, sandy clay filling with some fine to medium gravel		D	0.2				
					0.4				
	0.55	Pit discontinued at 0.55m - target depth reached							
	1								1

RIG: Hand tools
LOGGED: CB
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Parramatta Public School
LOCATION: 175 Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:

PIT No: TP3
PROJECT No: 85374.02
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
	0.03	TOPSOIL - brown, sandy clay topsoil with some bark, fine to medium gravel, asphalt fragments and roots							
		FILLING - brown, sandy clay filling with some fine to medium gravel, brick fragments and asbestos fragments		D	0.2				
					0.4				
	0.5	Pit discontinued at 0.5m - refusal on coarse gravel							
	1								1

RIG: Hand tools
LOGGED: CB
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects LLD
PROJECT: Arthur Phillip High School (South)
LOCATION: Macquarie Street, Parramatta

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: MW1
PROJECT No: 85374.02
DATE: 10/9/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	ASPHALT		A	0.1				Gatic cover
	0.4	FILLING - dark grey, clayey, coarse sand and basalt filling with trace asphalt gravel (roadbase)		A	0.2				
	0.6	- some crushed sandstone gravel at 0.2m to 0.3m		A	0.3				
		FILLING - dark brown mottled red, clay filling with traces of sand, basalt and asphalt gravel		A	0.4				
		CLAY - brown mottled red clay			0.5				
		- becoming mottled grey at 1.4m		A	0.9				Backfill 0.2-2.5m
	2.3	SHALE			1.0				
				A	1.4				Bentonite 2.5-3.0m
					1.5				
									Gravel 3.0-10.0m
									Machine slotted PVC screen 4.0-10.0m
	10.15	Bore discontinued at 10.15m - target depth reached							End cap

RIG: DT-100 **DRILLER:** LC **LOGGED:** MW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed during drilling

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects
PROJECT: Arthur Philip High School
LOCATION: Macquarie Street, Parramatta

SURFACE LEVEL: 7.15 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 85374.00
DATE: 12/7/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
7		FILLING - grey silty sandy clay filling with a trace of roadbase gravel and brick fragments, moist							A			
6									A			
1	1.0								A			
	1.2	FILLING - poorly compacted, dark grey to black, slag filling with some charcoal and sand, moist							S			1,0,2 N = 2
5		SILTY CLAY - stiff to very stiff, light brown silty clay with some fine sand, moist							U_{50}			pp = 300
2												
									S			3,5,5 N = 10
4												
3	3.3	SAND - medium dense, light brown, fine to medium grained sand with some silt and clay, wet										
3								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			7,7,10 N = 17
	4.8	LAMINITE - extremely low strength, grey laminite										
5	5.1											
2		LAMINITE - medium then high strength, fresh stained then fresh, slightly fractured then unbroken, grey-brown to grey laminite with approximately 20% fine sandstone laminations						5.31m: B0°, fe 5.35m: J60°, un, ro, fe				PL(A) = 0.53
												PL(A) = 1.37
6								5.84m: J60°, ti, fe				
1									C	100	96	
								6.32m: B0°, fe				PL(A) = 2.1
7												
0								7.2, 7.25 & 7.35m: J (x3) 30°- 45°, pl, sm, cln 7.53m: J45°, pl, ro, cln				PL(A) = 2.16
8								7.94m: J30°, pl, sm, cln				
-1								8.27m: J45°, pl, sm, ti				
									C	100	100	PL(A) = 2.24
9								8.72m: B0°, fg, 5mm				
-2												PL(A) = 2.4

RIG: Scout **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 5.1m; NMLC-Coring to 15.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 7.0m (screen 4.0-7.0m; gravel 3.0-7.0m; bentonite 2.5-3.0m; backfill to 0.2m with gatic cover to GL)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects
PROJECT: Arthur Philip High School
LOCATION: Macquarie Street, Parramatta

SURFACE LEVEL: 7.15 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 85374.00
DATE: 12/7/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-3		LAMINITE - medium then high strength, fresh stained then fresh, slightly fractured then unbroken, grey-brown to grey laminite with approximately 20% fine sandstone laminations *(continued)*						>>	C	100	100	PL(A) = 2.37
-4	11											
-5	12								C	100	100	PL(A) = 1.71
	12.3	SHALE - high then medium to high strength, fresh, slightly fractured and unbroken, grey shale										PL(A) = 1.4
-6	13							13.03 & 13.75m: J20°, pl, sm, cln				
-7	14								C	100	100	PL(A) = 1.08
												PL(A) = 0.91
-8	15							14.52-14.89m: J (x3) 30°- 45°, pl, sm, cln				
	15.1	Bore discontinued at 15.1m										PL(A) = 1.18
-9	16											
-10	17											
-11	18											
-12	19											

RIG: Scout **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 5.1m; NMLC-Coring to 15.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 7.0m (screen 4.0-7.0m; gravel 3.0-7.0m; bentonite 2.5-3.0m; backfill to 0.2m with gatic cover to GL)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Grimshaw Architects
PROJECT: Arthur Philip High School
LOCATION: Macquarie Street, Parramatta

SURFACE LEVEL: 11.00 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 85374.00
DATE: 8/7/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
11	0.04	CARPET & ASPHALTIC CONCRETE							A			
	0.2	ROADBASE GRAVEL							A			
	0.45	FILLING - grey to grey-brown, sandy clay filling, moist							U_{50}			pp = 400
10	1	CLAY - stiff to very stiff, red-brown clay, slightly silty, moist							S			3,7,10 N = 17
	1.5	CLAY - very stiff, light grey clay, moist						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
9	2											
	2.2	SHALY CLAY - very stiff, light grey mottled brown shaly clay, damp										
	2.5											
	2.53	SHALE - extremely low strength, extremely weathered, slightly fractured, light grey shale						2.5m: CORE LOSS: 30mm 2.62-3.62m: relict joints (x5) 70°, pl, ro, cly				pp >600
8	3											pp = 450
	3.45	SHALE - extremely low to very low strength, extremely to highly weathered, slightly fractured, light grey-brown shale with some ironcemented bands						3.8-4.38m: B (x5) 0°, fe, cly	C	92	0	
7	4											pp = 400
	4.5	SHALE - very low strength, highly weathered, slightly fractured, grey-brown shale						4.52-4.64m: fg, fe				
6	5							4.92m: J60°- 70°, st, ro, cln				
	5.4							5.18m: CORE LOSS: 220mm 5.46m: B0°, fe				
5	6							6.06-6.26m: B0°, fe, cly, 10-20mm 6.25-6.7m: B (x7) 0°, cly co, 1-3mm 6.3m: J45°, fe, cly, he				PL(A) = 0.25
	6.35	SHALE - low then medium strength, slightly weathered then fresh, fractured then slightly fractured, grey shale							C	100	53	
4	7							7.2m: J70°, pl, ro, cln				PL(A) = 0.5
								7.42m: J30° & 60°, st, ro, cln 7.52m: J60°, pl, ro, cly 7.84m: J70°, pl, ro, cln				
3	8											
		8.35-8.5m: very high strength siderite band										PL(A) = 5.13
2	9								C	100	97	PL(A) = 0.38
	9.6	LAMINITE - description next page						9.52m: J45°, pl, sm, cly 9.6m: J45°, pl, sm, cly 9.88m: J60°, un, ro, cln				

RIG: Scout 1 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger to 2.5m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 7.5m (screen 1.5-7.5m; gravel 1.0-7.5m; bentonite 0.2-10.0m; backfill to GL with gatic cover)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Grimshaw Architects
PROJECT: Arthur Philip High School
LOCATION: Macquarie Street, Parramatta

SURFACE LEVEL: 11.00 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 85374.00
DATE: 8/7/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
0	11	LAMINITE - high strength, fresh, slightly fractured then unbroken, light grey to grey laminite with approximately 30% fine sandstone laminations *(continued)*						10.6m: B0°, cly co, 1mm	C	100	97	PL(A) = 1.22
												PL(A) = 1.55
-1	12							12.32m: J30°, pl, ro, cly				PL(A) = 1.64
-2	13								C	100	100	
												PL(A) = 2.2
-3	14											
												PL(A) = 2.17
-4	15 15.0	Bore discontinued at 15.0m							C			
-5	16											
-6	17											
-7	18											
-8	19											

RIG: Scout 1 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger to 2.5m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 7.5m (screen 1.5-7.5m; gravel 1.0-7.5m; bentonite 0.2-10.0m; backfill to GL with gatic cover)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**102**		
Project Name:	Detailed Site Investigation		
Project Number:	85374.02		
Site Location:	APHS-N		
Bore Easting:		Northing:	
Installation Date:	12.07.16	Ground RL:	7.15 m AHD
GW Level (during drilling):	- m bgl	-0.4 m AHD	
Well Depth:	7.5 m bgl	-0.4 m AHD	
Screened Interval:	4-7.5 m bgl		
Contaminants/Comments:			
Bore Development Details			
Date/Time:	13.09.2016, 7am		
Purged By:	CB		
GW Level (pre-purge):	3.70 m bgl	3.5 m AHD	
GW Level (post-purge):	5.65 m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	7.21 m bgl		
Estimated Bore Volume:	25 L		
Total Volume Purged:	17 L	purged dry	
Equipment, decontamination:	twister' 12 volt pump and hand bailer		
Appearance/Comments:	water was silty, brown		
Micropurge and Sampling Details			
Date/Time:	16.09.2016		
Sampled By:	MW		
Weather Conditions:	fine		
GW Level (pre-purge):	4.75 m bgl	2.4 m AHD	
GW Level (post sample):	4.80 m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	7.17 m bgl		
Estimated Bore Volume:	17 L		
Total Volume Purged:	10 L	(prior to sampling)	
Equipment, decontamination:	geopump, peristaltic pump		

Water Quality Parameters

Time	Volume (L)	Temp (^{o}C)	DO (ppm)	EC (µS/cm)	pH	Redox (mV)
Stabilisation Criteria (3 readings)		**-**	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10 mV**
7.02		17	4.41	0.2	5.17	225
7.03		17.8	2.33	261	5.7	194
7.04		18	2.09	284	5.76	187
7.05		18.2	1.87	282	5.81	185
7.06		18.3	1.78	284	5.84	188
7.07		18.3	1.78	284	5.86	179
Additional Readings Following stabilisation:						

Sample Details	
Sampling Depth (rationale):	m bgl,
Sample Appearance:	no odour, clear
Sample ID:	102
Replicate Samples:	BD1/160916
Sampling containers, preservatives, filtration:	1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic (H_2SO_4), 1x 100mL plastic (HNO_3 (filtered)), 1L glass (no Teflon lined lid)
Comments / Observations:	

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**103**		
Project Name:	Detailed Site Investigation		
Project Number:	85374.02		
Site Location:	PPS		
Bore Easting:		Northing:	
Installation Date:	8.07.16	Ground RL:	11 m AHD
GW Level (during drilling):	- m bgl	3.5 m AHD	
Well Depth:	7.5 m bgl	3.5 m AHD	
Screened Interval:	1.5-7.5 m bgl		
Contaminants/Comments:			
Bore Development Details			
Date/Time:	13.09.2016, 6am		
Purged By:	CB		
GW Level (pre-purge):	3.88 m bgl	7.1 m AHD	
GW Level (post-purge):	6.70 m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	7.4 m bgl		
Estimated Bore Volume:	25 L		
Total Volume Purged:	11 L	purged dry	
Equipment, decontamination:	twister' 12 volt pump and hand bailer		
Appearance/Comments:	water was silty, brown		
Micropurge and Sampling Details			
Date/Time:	19.09.2016		
Sampled By:	MW		
Weather Conditions:	raining		
GW Level (pre-purge):	6.62 m bgl	4.4 m AHD	
GW Level (post sample):	4.80 m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	7.22 m bgl		
Estimated Bore Volume:	4 L		
Total Volume Purged:	5 L	(prior to sampling)	
Equipment, decontamination:	geopump, peristaltic pump		

Water Quality Parameters

Time	Volume (L)	Temp (^{o}C)	DO (mg/L)	EC (µS or mS/cm)	pH	Redox (mV)
Stabilisation Criteria (3 readings)		**-**	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10 mV**
Insufficient water						
Additional Readings Following stabilisation:						

Sample Details	
Sampling Depth (rationale):	6.9 m bgl,
Sample Appearance:	initially very silty, becoming clear then silty again
Sample ID:	103
Replicate Samples:	
Sampling containers, preservatives, filtration:	1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic (H_2SO_4), 1x 100mL plastic (HNO_3 (filtered)), 1L glass (no Teflon lined lid)
Comments / Observations:	some silt in metals bottle

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**MW1**		
Project Name:	Detailed Site Investigation		
Project Number:	85374.02		
Site Location:	APHS-S		
Bore Easting:		Northing:	
Installation Date:	10.09.2016	Ground RL (approx):	13 m AHD
GW Level (during drilling):	- m bgl	2.9 m AHD	
Well Depth:	10.15 m bgl	2.9 m AHD	
Screened Interval:	4-10.15 m bgl		
Contaminants/Comments:			
Bore Development Details			
Date/Time:	13.09.2016, 6.37am		
Purged By:	CB		
GW Level (pre-purge):	5.57 m bgl	7.4 m AHD	
GW Level (post-purge):	9.56 m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	10.1 m bgl		
Estimated Bore Volume:	33 L		
Total Volume Purged:	18 L	purged dry	
Equipment, decontamination:	twister' 12 volt pump and hand bailer		
Appearance/Comments:	water was silty, brown		
Micropurge and Sampling Details			
Date/Time:	16.09.2016		
Sampled By:	MW		
Weather Conditions:	raining		
GW Level (pre-purge):	7.24 m bgl	5.8 m AHD	
GW Level (post sample):	m bgl		
PSH observed:	No (interface/visual)		
Observed Well Depth:	10.1 m bgl		
Estimated Bore Volume:	21 L		
Total Volume Purged:	L	(prior to sampling)	
Equipment, decontamination:	geopump, peristaltic pump		

Water Quality Parameters

Time	Volume (L)	Temp (°C)	DO (ppm)	EC (µS/cm)	pH	Redox (mV)
Stabilisation Criteria (3 readings)		**-**	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10 mV**
7.45		18.9	5.04	10.6	5.37	181
7.46		19.1	4.86	8.6	5.43	163
7.47		19.5	4.5	2.5	5.54	126
7.52		20.6	3.27	2.9	5.53	132
7.53		21	2.96	2.89	5.52	126
7.54		21.3	3.03	2.87	5.51	130
7.55		21.4	2.95	2.86	5.51	132
7.56		21.4	2.92	2.86	5.5	134
Additional Readings Following stabilisation:						

Sample Details	
Sampling Depth (rationale):	m bgl,
Sample Appearance:	clear, becoming slightly silty
Sample ID:	MW1
Replicate Samples:	
Sampling containers, preservatives, filtration:	1L glass, 2x 40mL glass vials (HCl) , 1x500ml plastic, 1x200ml plastic (H_2SO_4), 1x 100mL plastic (HNO_3 (filtered)), 1L glass (no Teflon lined lid)
Comments / Observations:	some silt in metals bottle

Appendix E

Summary of Laboratory Results for Soil

Laboratory Certificates

and Chain of Custody Documentation

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Table E1 – Summary of Laboratory Results for Soils

Sample	Date Sampled	Filling/ Natural	Heavy Metals								PAH				TRH/TPH					TRH (NEPM 2013)						BTEX				VOC	PCB [h, i]	asbestos	Asbestos	Phenols	OCP	DDT+DDD+DDE	DDT	OPP
			As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	total [b]	BaP TEQ upper	BaP	Naphthalene	C_6 - C_9	C_{10} - C_{14}	C_{15} - C_{28}	C_{29} - C_{36}	C_{10} - C_{36} [j]	C6-C10	>C10-C16	F1 - C6 – C10 less BTEX	F2 - >C10-C16 less naphthalene	>C16-C34	>C34-C40	Benzene	Toluene	Ethylbenzene	xylene									
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	0.1g/kg			mg/kg			-
EQL			2	0.4	1	1	1	0.05	1	1			0.05	0.1	20	20	50	50	50	20	50	20	50	100	100	0.1	0.1	0.1	0.3				0.001%			240		
Soil Assessment Criteria (SAC) - NEPM (as amended 2013) (refer to report body)																																						
Health Investigation Level for Residential A			100	20	100	6000	300	40	400	7400	300	3																										
Health Screening Level for Vapour Intrusion (0-1m) SAND HSLA Residential																						45				0.5	160	55	40									
Management Limit Residential																				**700**	**1000**			**2500**	**10000**													
Ecological Investigation Levels Residential			100		200	230	1100		210	650				170																						180		
Ecological Screening Levels Residential												0.7	0.7									180	120	1300	5600	65	105	125	45									
Waste Classification CT1			100	20	100		100	4	40		200		0.8																									
Current Investigation																																						
BH01_0.3-0.4	15/04/16	F -clay	5	0.4	14	48	56	0.5	27	70	4.3	0.7	0.4	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BH02_0.25-0.35	15/04/16	F -clay	7	<0.4	16	57	54	0.2	28	84	20	3.7	2.5	<0.1	<25	<50	110	170	330	<25	<50	<25	<50	240	110	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BH03_0.5-0.6	15/04/16	F -clay	9	<0.4	16	14	63	<0.1	5	33	NIL(+)VE	<0.5	<0.05	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BH04_0.3-0.4	15/04/16	F -clay	10	0.4	16	28	47	<0.1	10	49	3.6	0.6	0.4	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BH05_0.3-0.4	15/04/16	F -clay	<4	<0.4	6	36	22	<0.1	18	220	7.1	1.2	0.74	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BH06_0.5-0.6	15/04/16	F -clay	7	<0.4	24	18	16	<0.1	11	27	NIL(+)VE	<0.5	<0.05	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
BD1 150416 a	15/04/16	F -clay	7	<0.4	31	20	18	<0.1	19	28	NIL(+)VE	<0.5	<0.05	<0.1	<25	<50	<100	<100	<250	<25	<50	<25	<50	<100	<100	<2	<0.5	<1	<3	-	<0.1	NAD	-	<5	<0.1	<0.1	<0.1	<0.1
TP1_0.05-0.15	15/04/16	F -clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	<0.001	-	-		-	-
TP1_0.25-0.35	15/04/16	F -clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	<0.001	-	-		-	-
TP2_0.2-0.4	15/04/16	F -clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	<0.001	-	-		-	-
TP3_0.2-0.4	15/04/16	F -clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	<0.001	-	-		-	-
MATERIAL SAMPLE T3 A01		material	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD		-	-		-	-
Previous Investigation																																						
BH13_0.4-0.5		N clay	4.6	<0.4	17	37	18	<0.05	37	33	<0.5	1.2	<0.5	<0.5																		NAD						
BH14_0.5-0.6		N clay	10	<0.4	23	47	21	<0.05	40	43																						NAD						
BH15_0.5-0.6		N clay	5	<0.4	12	42	13	<0.05	34	45																												
BH16_0.5-0.6		N clay	6.1	<0.4	16	43	11	<0.05	39	28																						NAD						
BH17_0.2-0.3		F -clay	5	<0.4	18	28	31	<0.05	24	26																												
BH18_0.5-0.6		N clay	10	<0.4	19	13	15	<0.05	6.3	15																						NAD						
BH19_0.5-0.6		N clay	6	<0.4	15	25	740	0.19	6.2	110																												
BH20_0.5-0.6		N clay	7.3	<0.4	18	16	40	<0.05	8.1	24																												
BH21_0.5-0.6		N clay	5.6	<0.4	11	9.7	16	<0.05	<5	17																						NAD						
BH22_0.5-0.6		N clay	11	<0.4	23	17	40	0.06	8.3	36																												
HA14_0.0-0.2		F	8.9	0.4	26	35	170	0.38	12	360	14	2.9	1.8	<0.5	<20	<20	170	210	380	<20	<50	<20	<50	420	130							NAD						
HA15_0.0-0.2		F	31	<0.4	89	79	51	1.6	8.9	170																												
HA16_0.0-0.2		F	11	<0.4	58	21	63	0.2	7.3	260																						AD						
QA02			13	<0.4	35	35	150	0.36	17	340																												
SS1																																NAD						
SS2																																NAD						

Notes

a	QA/QC replicate/triplicate of sample listed directly above
b	where results of one or more component compound are above practical quantitation limit (PQL) sum of all results above PQL given, when all results are below PQL results quoted as <PQL of majority of individual analytes
c	guideline concentrations are for Cr (III)
-	not analysed/ not defined/ not applicable
Highlight orange	exceedance of HILA residential based on NEPM (2013) guideline
Highlight yellow	exceedance of Residential soil vapour
Highlight green	exceedance of Residential EIL/ESL (prior to statistical analysis)
Bold	exceedance of Management Limits
Highlight red	asbestos detected

Acronyms

AD	asbestos detected
As	arsenic
BaP	benzo(a)pyrene
BaP TEQ	benzo(a)pyrene toxic equivalencies
BTEX	benzene, toluene, ethyl benzene, total xylenes
Cd	cadmium
Cr	chromium (total)
Cu	copper
EIL	Ecological Investigation Levels
ESL	Ecological Screening Level
Hg	mercury
HIL	health investigation level
HSL	Health Screening Levels
NAD	No asbestos detected
NL	The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived HSL exceeds the Csat, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'
OCP	organochlorine pesticides
OPP	organophosphorus pesticides
PAH	polycyclic aromatic hydrcarbons
Pb	lead
PCB	polychlorinated biphenyls
Ni	nickel
TPH	total petroleum hydrocarbons
TRH	total recoverable hydrocarbons (including total petroleum hydrocarbons)
VOC	volatile organic compounds
Zn	zinc

Table E2: Summary of Laboratory Results for Groundwater Analysis

Sample ID	Depth[e]	Date Sampled	Hardness	Applicable Soil Type[f]	Priority Heavy Metals (total dissolved)								TRH						BTEX					PAH			Total Phenols	OCP	OPP	PCB	VOC				PFAS
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	TRH C_6 - C_{10}	TRH >C_{10} - C_{16}	C6-C10 less BTEX (F1)	>C10-C16 less Naphthalene (F2)	>C16-C34	>C34-40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Naphthalene	B(a)P	PAH					Chloroform	Bromodichloromethane	1,2,4-trimethyl benzene	Other VOC	
	m bgl		mgCaCO3/L		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Groundwater Assessment Criteria																																		
GIL (freshwater)			-	-	24/ 13[c]	0.2	1[d]	1.4	3.4	0.06	11	8	-	-	-	-	-	-	950	-	-	200[h]	350	16	-	-	0.003[g]	-	-	-	-	-	-	-	-
GIL (freshwater, hardness adjusted)[b]			277	-	-	1.4	-	9	57	-	73	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSLs (Residential)																																		
HSL-A&B	4-<8m		-	Sand	-	-	-	-	-	-	-	-	-	-	1,000	1,000	-	-	800	NL	NL	NL	-	NL	-	-	-	-	-	-	-	-	-	-
HSL-A&B	4-<8m		-	Clay	-	-	-	-	-	-	-	-	-	-	NL	NL	-	-	5,000	NL	NL	NL	-	NL	-	-	-	-	-	-	-	-	-	-
ADWG	(health-based)		-	-	10	2	50[d]	2,000	10	1	20	-	-	-	-	-	-	-	1	800	300	600		-	0.01	-	0.01[l]	-	-	-	-	-	-	-
ADWG	(aesthetic-based)		-	-	-	-	-	1,000	-	-	-	3,000	-	-	-	-	-	-	-	25	3	20		-	-	-	-	-	-	-	-	-	-	-
Reference Level			-	-	-	-	-	-	-	-	-	-	-	-	150[j]	600[j]	-	-	-	180[k]	80[k]	75[k,i]	-	-	0.1[k]	-	-	-	-	-	-	-	-	-	0.13[m]
Laboratory Results																																		
MW1	7.2	16/09/16	100		2	<0.1	<1	2	<1	<0.05	12	**65**	15	<50	15	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	16	4	<1	<1/<10	<0.01
102	4.7	16/09/16	190		<1	<0.1	<1	<1	<1	<0.05	1	12	<10	<50	<10	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	<1	<1	<1	<1/<10	<0.01
BD1[a]	6.6	16/09/16			<1	<0.1	<1	<1	<1	<0.05	1	11												<1	<1	NIL (+)VE									
103	6.6	16/09/16	540		<1	0.2	<1	**23**	2	<0.05	53	**340**	24	<50	24	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	<1	<1	1	<1/<10	<0.01

Notes:

a	Replicate sample of sample listed directly above
b	Adjusted in accordance with ANZECC (2000) for a hardness of 277mg/L ,which is the average of the hardness values recorded in the primary samples
c	24µg/L as As(III) 13µg/L as As(V)
d	Threshold value for Cr (VI)
e	Depth to groundwater as measured immediately prior to sampling
f	Overlying material applying for HSL.
g	threshold for 2,4,6-trichlorophenol as a conservative screen
h	As p-xylene
i	As m-xylene
j	Airport (Environment Protection) Regulations (1997), Schedule 2 Water Pollution Accepted Limits: Table 1.03 – Accepted limits of contamination
k	ANZECC Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000), Low reliability values
l	threshold for pentachlorophenol as a conservative screen
m	DER (2016) value for PFOS for slightly - moderately disturbed freshwater ecosystems
-	Not defined/ not analysed/ not applicable
BOLD	Concentration Detected at or above the PQL

Table E2: Summary of Laboratory Results for Groundwater Analysis

Sample ID	Depth [e]	Date Sampled	Hardness	Applicable Soil Type [f]	Priority Heavy Metals (total dissolved)								TRH						BTEX					PAH			Total Phenols	OCP	OPP	PCB	VOC				PFAS
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	TRH C_6 - C_{10}	TRH $>C_{10}$ - C_{16}	C6-C10 less BTEX (F1)	>C10-C16 less Naphthalene (F2)	>C16-C34	>C34-40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Naphthalene	B(a)P	PAH					Chloroform	Bromodichloromethane	1,2,4-trimethyl benzene	Other VOC	
	m bgl		mgCaCO3/L		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Groundwater Assessment Criteria																																		
GIL (freshwater)			-	-	24/ 13 [c]	0.2	1 [d]	1.4	3.4	0.06	11	8	-	-	-	-	-	-	950	-	-	200 [h]	350	16	-	-	0.003 [g]	-	-	-	-	-	-	-
GIL (freshwater, hardness adjusted) [b]			277	-	-	1.4	-	9	57	-	73	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSLs (Residential)																																		
HSL-A&B	4-<8m		-	Sand	-	-	-	-	-	-	-	-	-	-	1,000	1,000	-	-	800	NL	NL	NL	-	NL	-	-	-	-	-	-	-	-	-	-
HSL-A&B	4-<8m		-	Clay	-	-	-	-	-	-	-	-	-	-	NL	NL	-	-	5,000	NL	NL	NL	-	NL	-	-	-	-	-	-	-	-	-	-
ADWG	(health-based)		-	-	10	2	50 [d]	2,000	10	1	20	-	-	-	-	-	-	-	1	800	300	600		-	0.01	-	0.01 [l]	-	-	-	-	-	-	-
ADWG	(aesthetic-based)		-	-	-	-	-	1,000	-	-	-	3,000	-	-	-	-	-	-	-	25	3	20		-	-	-	-	-	-	-	-	-	-	-
Reference Level			-	-	-	-	-	-	-	-	-	-	-	-	150 [j]	600 [j]	-	-	-	180 [k]	80 [k]	75 [k,i]	-	-	0.1 [k]	-	-	-	-	-	-	-	-	-	0.13 [m]
Laboratory Results																																		
MW1	7.2	16/09/16	100		2	<0.1	<1	2	<1	<0.05	12	**65**	15	<50	15	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	16	4	<1	<1/<10	<0.01
102	4.7	16/09/16	190		<1	<0.1	<1	<1	<1	<0.05	1	12	<10	<50	<10	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	<1	<1	<1	<1/<10	<0.01
BD1 [a]	6.6	16/09/16			<1	<0.1	<1	<1	<1	<0.05	1	11												<1	<1	NIL (+)VE									
103	6.6	16/09/16	540		<1	0.2	<1	**23**	2	<0.05	53	**340**	24	<50	24	<50	<100	<100	<1	<1	<1	<2	<1	<1	<1	NIL (+)VE	<0.05	<0.2	<0.2	<2	<1	<1	1	<1/<10	<0.01

Notes:

a Replicate sample of sample listed directly above

b Adjusted in accordance with ANZECC (2000) for a hardness of 277mg/L ,which is the average of the hardness values recorded in the primary samples

c 24µg/L as As(III) 13µg/L as As(V)

d Threshold value for Cr (VI)

e Depth to groundwater as measured immediately prior to sampling

f Overlying material applying for HSL.

g threshold for 2,4,6-trichlorophenol as a conservative screen

h As p-xylene

i As m-xylene

j Airport (Environment Protection) Regulations (1997), Schedule 2 Water Pollution Accepted Limits: Table 1.03 – Accepted limits of contamination

k ANZECC Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000), Low reliability values

l threshold for pentachlorophenol as a conservative screen

m DER (2016) value for PFOS for slightly - moderately disturbed freshwater ecosystems

- Not defined/ not analysed/ not applicable

BOLD Concentration Detected at or above the PQL

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

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envirolab.com.au

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

CERTIFICATE OF ANALYSIS 145323

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Michael Whittaker, Tim Wright

Sample log in details:

Your Reference:	**85374.02, Parramatta**
No. of samples:	14 Soils 1 Material
Date samples received / completed instructions received	21/04/2016 / 21/04/2016

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:	29/04/16 / 28/04/16
Date of Preliminary Report:	Not Issued

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	---------- -	BH01	BH02	BH03	BH04	BH05
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	89	86	90	88

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	---------- -	BH06	BH07	BH08	BH09	BH10
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	85	82	87	87	88

vTRH(C6-C10)/BTEXN in Soil					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	---------- -	BH11	BH12	BD1	BD1
Depth	----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRHC6 - C9	mg/kg	<25	<25	<25	<25
TRHC6 - C10	mg/kg	<25	<25	<25	<25
vTPHC6 - C10 less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	90	92	97

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	---------- -	BH01	BH02	BH03	BH04	BH05
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	110	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	170	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	240	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	110	<100	<100	<100
Surrogate o-Terphenyl	%	82	86	84	84	82

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	---------- -	BH06	BH07	BH08	BH09	BH10
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	160	150
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	980	<100	8,200	8,200
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	630	<100	4,400	4,800
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	530	570
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	530	570
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	1,500	<100	12,000	12,000
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	320	<100	2,200	2,500
Surrogate o-Terphenyl	%	86	124	81	#	#

svTRH (C10-C40) in Soil					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
Depth	- ----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	1,300	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	1,100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	56	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	56	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	2,200	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	660	<100	<100
Surrogate o-Terphenyl	%	82	136	81	84

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145323-1 BH01 0.3-0.4 14/04/2016 Soil	145323-2 BH02 0.25-0.35 14/04/2016 Soil	145323-3 BH03 0.5-0.6 14/04/2016 Soil	145323-4 BH04 0.3-0.4 15/04/2016 Soil	145323-5 BH05 0.3-0.4 15/04/2016 Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
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	<0.1	0.1	0.2
Anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	0.1
Fluoranthene	mg/kg	0.6	2.3	<0.1	0.5	0.9
Pyrene	mg/kg	0.7	3.5	<0.1	0.6	1.0
Benzo(a)anthracene	mg/kg	0.4	1.9	<0.1	0.3	0.6
Chrysene	mg/kg	0.4	1.9	<0.1	0.4	0.7
Benzo(b,j+k)fluoranthene	mg/kg	0.9	4.4	<0.2	0.8	2
Benzo(a)pyrene	mg/kg	0.4	2.5	<0.05	0.4	0.74
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	1.6	<0.1	0.3	0.6
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.3	<0.1	<0.1	0.1
Benzo(g,h,i)perylene	mg/kg	0.3	1.5	<0.1	0.3	0.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.6	3.7	<0.5	0.5	1.2
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.7	3.7	<0.5	0.6	1.2
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.7	3.7	<0.5	0.6	1.2
Total Positive PAHs	mg/kg	4.3	20	NIL (+)VE	3.6	7.1
Surrogate p-Terphenyl-d14	%	89	96	93	92	93

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145323-6 BH06 0.5-0.6 15/04/2016 Soil	145323-7 BH07 0.35-0.45 19/04/2016 Soil	145323-8 BH08 0.3-0.4 19/04/2016 Soil	145323-9 BH09 0.3-0.4 19/04/2016 Soil	145323-10 BH10 0.4-0.5 19/04/2016 Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Naphthalene	mg/kg	<0.1	0.2	<0.1	1.2	1.5
Acenaphthylene	mg/kg	<0.1	1.2	<0.1	2.4	2.3
Acenaphthene	mg/kg	<0.1	0.1	<0.1	13	21
Fluorene	mg/kg	<0.1	1.4	<0.1	8.1	11
Phenanthrene	mg/kg	<0.1	25	<0.1	290	140
Anthracene	mg/kg	<0.1	5.9	<0.1	64	44
Fluoranthene	mg/kg	<0.1	36	0.2	250	230
Pyrene	mg/kg	<0.1	33	0.2	220	210
Benzo(a)anthracene	mg/kg	<0.1	18	<0.1	91	91
Chrysene	mg/kg	<0.1	16	0.1	88	80
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	20	<0.2	130	120
Benzo(a)pyrene	mg/kg	<0.05	12	0.1	74	74
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	7.5	<0.1	50	48
Dibenzo(a,h)anthracene	mg/kg	<0.1	1.6	<0.1	11	9.4
Benzo(g,h,i)perylene	mg/kg	<0.1	6.4	<0.1	47	44
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	19	<0.5	110	110
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	19	<0.5	110	110
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	19	<0.5	110	110
Total Positive PAHs	mg/kg	NIL (+)VE	180	0.58	1,300	1,100
Surrogate p-Terphenyl-d14	%	94	89	94	91	91

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145323-11 BH11 0.45-0.55 19/04/2016 Soil	145323-12 BH12 0.2-0.3 19/04/2016 Soil	145323-13 BD1 - 15/04/2016 Soil	145323-14 BD1 - 19/04/2016 Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Naphthalene	mg/kg	<0.1	0.9	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	1.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.4	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	13	<0.1	<0.1
Anthracene	mg/kg	<0.1	5.3	<0.1	<0.1
Fluoranthene	mg/kg	0.2	29	<0.1	0.2
Pyrene	mg/kg	0.2	30	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	20	<0.1	<0.1
Chrysene	mg/kg	<0.1	20	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	36	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.07	21	<0.05	0.06
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	17	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	3.3	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	14	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	32	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	32	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	32	<0.5	<0.5
Total Positive PAHs	mg/kg	0.41	210	NIL (+)VE	0.38
Surrogate p-Terphenyl-d14	%	94	88	98	96

Organochlorine Pesticides in soil						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
Depth	- ----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	97	89	88	83

Organochlorine Pesticides in soil						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
Depth	- ----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<1	<1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<1	<1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<1	<1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<1	<1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<1	<1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<1	<1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<1	<1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<1	<1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<1	<1
Endrin	mg/kg	<0.1	<0.5	<0.1	<2	<2
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<1	<1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<1	<1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<1	<1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<1	<1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<1	<1
Methoxychlor	mg/kg	<0.1	<0.5	<0.1	<2	<2
Surrogate TCMX	%	87	80	89	88	93

Organochlorine Pesticides in soil					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
Depth	- ----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016
HCB	mg/kg	<0.1	<1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<1	<0.1	<0.1
Endrin	mg/kg	<0.1	<1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<1	<0.1	<0.1
Surrogate TCMX	%	93	93	87	87

Organophosphorus Pesticides						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
Depth	- ----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	97	89	88	83

Organophosphorus Pesticides						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
Depth	- ----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<1	<1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<1	<1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<1	<1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<1	<1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<1	<1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<1	<1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<1	<1
Ethion	mg/kg	<0.1	<0.1	<0.1	<1	<1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<1	<1
Malathion	mg/kg	<0.1	<0.1	<0.1	<1	<1
Parathion	mg/kg	<0.1	<0.1	<0.1	<1	<1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<1	<1
Surrogate TCMX	%	87	80	89	88	93

Organophosphorus Pesticides					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
Depth	----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<1	<0.1	<0.1
Ethion	mg/kg	<0.1	<1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<1	<0.1	<0.1
Malathion	mg/kg	<0.1	<1	<0.1	<0.1
Parathion	mg/kg	<0.1	<1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<1	<0.1	<0.1
Surrogate TCMX	%	93	93	87	87

PCBs in Soil						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
	-					
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	88	97	89	88	83

PCBs in Soil						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
	-					
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Aroclor 1016	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1221	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1232	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1242	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1248	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1254	mg/kg	<0.1	<1	<0.1	<5	<5
Aroclor 1260	mg/kg	<0.1	<1	<0.1	<5	<5
Surrogate TCLMX	%	87	80	89	88	93

PCBs in Soil					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
Depth	- ----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	23/04/2016	23/04/2016	23/04/2016	23/04/2016
Aroclor 1016	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<1	<0.1	<0.1
Surrogate TCLMX	%	93	93	87	87

Acid Extractable metals in soil						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
	-					
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Arsenic	mg/kg	5	7	9	10	<4
Cadmium	mg/kg	0.4	<0.4	<0.4	0.4	<0.4
Chromium	mg/kg	14	16	16	16	6
Copper	mg/kg	48	57	14	28	36
Lead	mg/kg	56	54	63	47	22
Mercury	mg/kg	0.5	0.2	<0.1	<0.1	<0.1
Nickel	mg/kg	27	28	5	10	18
Zinc	mg/kg	70	84	33	49	220

Acid Extractable metals in soil						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
	-					
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Arsenic	mg/kg	7	7	7	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	24	22	19	8	15
Copper	mg/kg	18	13	20	50	56
Lead	mg/kg	16	21	23	20	57
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Nickel	mg/kg	11	7	9	45	30
Zinc	mg/kg	27	9	21	40	70

Acid Extractable metals in soil					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
Depth	- ----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Arsenic	mg/kg	6	<4	7	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	28	19	31	23
Copper	mg/kg	11	49	20	18
Lead	mg/kg	16	110	18	25
Mercury	mg/kg	<0.1	0.3	<0.1	<0.1
Nickel	mg/kg	6	29	19	10
Zinc	mg/kg	10	59	28	19

Misc Soil - Inorg						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
	-					
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
	-					
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
	-				
Depth	----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5

Misc Inorg - Soil					
Our Reference:	UNITS	145323-2	145323-6	145323-7	145323-12
Your Reference	----------	BH02	BH06	BH07	BH12
	-				
Depth	----------	0.25-0.35	0.5-0.6	0.35-0.45	0.2-0.3
Date Sampled		14/04/2016	15/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016
pH 1:5 soil:water	pH Units	7.3	7.3	6.4	8.7

Moisture						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	----------	BH01	BH02	BH03	BH04	BH05
	-					
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Moisture	%	8.0	17	22	17	8.1

Moisture						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	----------	BH06	BH07	BH08	BH09	BH10
	-					
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Moisture	%	22	16	14	3.4	4.6

Moisture					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	----------	BH11	BH12	BD1	BD1
	-				
Depth	----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Moisture	%	17	4.6	21	15

CEC Our Reference: Your Reference	UNITS ---------- -	145323-2 BH02	145323-6 BH06	145323-7 BH07	145323-12 BH12
Depth	----------	0.25-0.35	0.5-0.6	0.35-0.45	0.2-0.3
Date Sampled		14/04/2016	15/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	27/04/2016	27/04/2016	27/04/2016	27/04/2016
Date analysed	-	27/04/2016	27/04/2016	27/04/2016	27/04/2016
Exchangeable Ca	meq/100g	12	8.4	2.3	11
Exchangeable K	meq/100g	0.3	0.2	0.1	0.1
Exchangeable Mg	meq/100g	4.4	5.1	1.8	3.1
Exchangeable Na	meq/100g	0.37	0.61	0.36	0.56
Cation Exchange Capacity	meq/100g	17	14	4.7	14

Asbestos ID - soils						
Our Reference:	UNITS	145323-1	145323-2	145323-3	145323-4	145323-5
Your Reference	---------- -	BH01	BH02	BH03	BH04	BH05
Depth	----------	0.3-0.4	0.25-0.35	0.5-0.6	0.3-0.4	0.3-0.4
Date Sampled		14/04/2016	14/04/2016	14/04/2016	15/04/2016	15/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/04/2016	28/04/2016	28/04/2016	28/04/2016	28/04/2016
Sample mass tested	g	Approx 35g	Approx 55g	Approx 30g	Approx 30g	Approx 55g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference:	UNITS	145323-6	145323-7	145323-8	145323-9	145323-10
Your Reference	---------- -	BH06	BH07	BH08	BH09	BH10
Depth	----------	0.5-0.6	0.35-0.45	0.3-0.4	0.3-0.4	0.4-0.5
Date Sampled		15/04/2016	19/04/2016	19/04/2016	19/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/04/2016	28/04/2016	28/04/2016	28/04/2016	28/04/2016
Sample mass tested	g	Approx 30g	Approx 35g	Approx 30g	Approx 45g	Approx 30g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Black coarse-grained soil & rocks	Black bitumen soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils					
Our Reference:	UNITS	145323-11	145323-12	145323-13	145323-14
Your Reference	---------- -	BH11	BH12	BD1	BD1
Depth	----------	0.45-0.55	0.2-0.3	-	-
Date Sampled		19/04/2016	19/04/2016	15/04/2016	19/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	28/04/2016	28/04/2016	28/04/2016	28/04/2016
Sample mass tested	g	Approx 30g	Approx 35g	Approx 30g	Approx 40g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - materials		
Our Reference:	UNITS	145323-15
Your Reference	----------	T3 A01
	-	
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Material
Date analysed	-	28/04/2016
Mass / Dimension of Sample	-	70x30x5mm
Sample Description	-	Green compressed fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	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.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			23/04/2016	145323-1	23/04/2016 || 23/04/2016	LCS-8	23/04/2016
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	145323-1	<25 || <25	LCS-8	112%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	145323-1	<25 || <25	LCS-8	112%
Benzene	mg/kg	0.2	Org-016	<0.2	145323-1	<0.2 || <0.2	LCS-8	106%
Toluene	mg/kg	0.5	Org-016	<0.5	145323-1	<0.5 || <0.5	LCS-8	111%
Ethylbenzene	mg/kg	1	Org-016	<1	145323-1	<1 || <1	LCS-8	111%
m+p-xylene	mg/kg	2	Org-016	<2	145323-1	<2 || <2	LCS-8	115%
o-Xylene	mg/kg	1	Org-016	<1	145323-1	<1 || <1	LCS-8	109%
naphthalene	mg/kg	1	Org-014	<1	145323-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	99	145323-1	78 || 83 || RPD: 6	LCS-8	97%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			23/04/2016	145323-1	23/04/2016 || 23/04/2016	LCS-8	23/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	145323-1	<50 || <50	LCS-8	125%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	145323-1	<100 || <100	LCS-8	132%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	145323-1	<100 || <100	LCS-8	127%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	145323-1	<50 || <50	LCS-8	125%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	145323-1	<100 || <100	LCS-8	132%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	145323-1	<100 || <100	LCS-8	127%
Surrogate o-Terphenyl	%		Org-003	85	145323-1	82 || 81 || RPD: 1	LCS-8	94%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	LCS-8	95%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	LCS-8	96%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	145323-1	0.1 || 0.2 || RPD: 67	LCS-8	109%
Anthracene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	145323-1	0.6 || 0.7 || RPD: 15	LCS-8	97%
Pyrene	mg/kg	0.1	Org-012	<0.1	145323-1	0.7 || 0.8 || RPD: 13	LCS-8	105%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	145323-1	0.4 || 0.4 || RPD: 0	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	145323-1	0.4 || 0.5 || RPD: 22	LCS-8	82%
Benzo(b,j +k)fluoranthene	mg/kg	0.2	Org-012	<0.2	145323-1	0.9 || 1 || RPD: 11	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	145323-1	0.4 || 0.5 || RPD: 22	LCS-8	90%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	145323-1	0.3 || 0.3 || RPD: 0	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	145323-1	0.3 || 0.3 || RPD: 0	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	93	145323-1	89 || 91 || RPD: 2	LCS-8	92%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			23/04/2016	145323-1	23/04/2016 || 23/04/2016	LCS-8	23/04/2016
HCB	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	78%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	75%
Heptachlor	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	75%
delta-BHC	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	82%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	77%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	79%
Dieldrin	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	79%
Endrin	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	82%
pp-DDD	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	80%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	LCS-8	70%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	90	145323-1	88 || 90 || RPD: 2	[NR]	[NR]

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			23/04/2016	145323-1	23/04/2016 || 23/04/2016	LCS-8	23/04/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	84%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	76%
Dimethoate	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	87%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	113%
Malathion	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	65%
Parathion	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	111%
Ronnel	mg/kg	0.1	Org-008	<0.1	145323-1	<0.1 || <0.1	LCS-8	93%
Surrogate TCMX	%		Org-008	90	145323-1	88 || 90 || RPD: 2	LCS-8	90%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			23/04/2016	145323-1	23/04/2016 || 23/04/2016	LCS-8	23/04/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	LCS-8	82%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	145323-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	90	145323-1	88 || 90 || RPD: 2	LCS-8	90%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Date analysed	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-8	22/04/2016
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	145323-1	5 || <4	LCS-8	117%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	145323-1	0.4 || <0.4	LCS-8	108%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	145323-1	14 || 13 || RPD: 7	LCS-8	110%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	145323-1	48 || 43 || RPD: 11	LCS-8	114%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	145323-1	56 || 60 || RPD: 7	LCS-8	109%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	145323-1	0.5 || 0.4 || RPD: 22	LCS-8	100%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	145323-1	27 || 22 || RPD: 20	LCS-8	105%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	145323-1	70 || 69 || RPD: 1	LCS-8	106%
QUALITY CONTROL Misc Soil - Inorg	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/04/2016	145323-1	22/04/2016 || 22/04/2016	LCS-1	22/04/2016
Date analysed	-			26/04/2016	145323-1	26/04/2016 || 26/04/2016	LCS-1	26/04/2016
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	145323-1	<5 || <5	LCS-1	101%
QUALITY CONTROL Misc Inorg - Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/04/2016	[NT]	[NT]	LCS-1	26/04/2016
Date analysed	-			26/04/2016	[NT]	[NT]	LCS-1	26/04/2016
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	101%
QUALITY CONTROL CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			27/04/2016	145323-7	27/04/2016 || 27/04/2016	LCS-2	27/04/2016
Date analysed	-			27/04/2016	145323-7	27/04/2016 || 27/04/2016	LCS-2	27/04/2016
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	145323-7	2.3 || 2.4 || RPD: 4	LCS-2	114%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	145323-7	0.1 || 0.1 || RPD: 0	LCS-2	110%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	145323-7	1.8 || 2.0 || RPD: 11	LCS-2	111%

QUALITY CONTROL CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Exchangeable Na	meq/100 g	0.1	Metals-009	<0.1	145323-7	0.36 || 0.37 || RPD: 3	LCS-2	100%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	23/04/2016 || 23/04/2016	145323-2	23/04/2016
TRH C_6 - C_9	mg/kg	145323-11	<25 || <25	145323-2	104%
TRH C_6 - C_{10}	mg/kg	145323-11	<25 || <25	145323-2	104%
Benzene	mg/kg	145323-11	<0.2 || <0.2	145323-2	97%
Toluene	mg/kg	145323-11	<0.5 || <0.5	145323-2	103%
Ethylbenzene	mg/kg	145323-11	<1 || <1	145323-2	105%
m+p-xylene	mg/kg	145323-11	<2 || <2	145323-2	107%
o-Xylene	mg/kg	145323-11	<1 || <1	145323-2	102%
naphthalene	mg/kg	145323-11	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	145323-11	94 || 91 || RPD: 3	145323-2	87%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	23/04/2016 || 23/04/2016	145323-2	23/04/2016
TRH C_{10} - C_{14}	mg/kg	145323-11	<50 || <50	145323-2	112%
TRH C_{15} - C_{28}	mg/kg	145323-11	<100 || <100	145323-2	105%
TRH C_{29} - C_{36}	mg/kg	145323-11	<100 || <100	145323-2	#
TRH>C_{10}-C_{16}	mg/kg	145323-11	<50 || <50	145323-2	112%
TRH>C_{16}-C_{34}	mg/kg	145323-11	<100 || <100	145323-2	105%
TRH>C_{34}-C_{40}	mg/kg	145323-11	<100 || <100	145323-2	#
Surrogate o-Terphenyl	%	145323-11	82 || 82 || RPD: 0	145323-2	86%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Naphthalene	mg/kg	145323-11	<0.1 || <0.1	145323-2	90%
Acenaphthylene	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	145323-11	<0.1 || <0.1	145323-2	92%
Phenanthrene	mg/kg	145323-11	<0.1 || <0.1	145323-2	93%
Anthracene	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	145323-11	0.2 || 0.2 || RPD: 0	145323-2	81%
Pyrene	mg/kg	145323-11	0.2 || 0.2 || RPD: 0	145323-2	76%
Benzo(a)anthracene	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	145323-11	<0.1 || 0.1	145323-2	79%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Benzo(b,j+k)fluoranthene	mg/kg	145323-11	<0.2 || 0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	145323-11	0.07 || 0.1 || RPD: 35	145323-2	73%
Indeno(1,2,3-c,d)pyrene	mg/kg	145323-11	<0.1 || 0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	145323-11	<0.1 || 0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	145323-11	94 || 100 || RPD: 6	145323-2	85%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	23/04/2016 || 23/04/2016	145323-2	23/04/2016
HCB	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	145323-11	<0.1 || <0.1	145323-2	79%
gamma-BHC	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	145323-11	<0.1 || <0.1	145323-2	74%
Heptachlor	mg/kg	145323-11	<0.1 || <0.1	145323-2	73%
delta-BHC	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	145323-11	<0.1 || <0.1	145323-2	82%
Heptachlor Epoxide	mg/kg	145323-11	<0.1 || <0.1	145323-2	73%
gamma-Chlordane	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	145323-11	<0.1 || <0.1	145323-2	76%
Dieldrin	mg/kg	145323-11	<0.1 || <0.1	145323-2	77%
Endrin	mg/kg	145323-11	<0.1 || <0.1	145323-2	79%
pp-DDD	mg/kg	145323-11	<0.1 || <0.1	145323-2	78%
Endosulfan II	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	145323-11	<0.1 || <0.1	145323-2	73%
Methoxychlor	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%	145323-11	93 || 88 || RPD: 6	[NR]	[NR]

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	23/04/2016 || 23/04/2016	145323-2	23/04/2016
Azinphos-methyl (Guthion)	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	145323-11	<0.1 || <0.1	145323-2	84%
Chlorpyriphos-methyl	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	145323-11	<0.1 || <0.1	145323-2	78%
Dimethoate	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	145323-11	<0.1 || <0.1	145323-2	81%
Fenitrothion	mg/kg	145323-11	<0.1 || <0.1	145323-2	109%
Malathion	mg/kg	145323-11	<0.1 || <0.1	145323-2	68%
Parathion	mg/kg	145323-11	<0.1 || <0.1	145323-2	83%
Ronnel	mg/kg	145323-11	<0.1 || <0.1	145323-2	98%
Surrogate TCMX	%	145323-11	93 || 88 || RPD: 6	145323-2	103%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	23/04/2016 || 23/04/2016	145323-2	23/04/2016
Aroclor 1016	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	145323-11	<0.1 || <0.1	145323-2	84%
Aroclor 1260	mg/kg	145323-11	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	145323-11	93 || 88 || RPD: 6	145323-2	103%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Arsenic	mg/kg	145323-11	6 || 7 || RPD: 15	145323-2	86%
Cadmium	mg/kg	145323-11	<0.4 || <0.4	145323-2	88%
Chromium	mg/kg	145323-11	28 || 27 || RPD: 4	145323-2	87%
Copper	mg/kg	145323-11	11 || 9 || RPD: 20	145323-2	105%
Lead	mg/kg	145323-11	16 || 17 || RPD: 6	145323-2	124%
Mercury	mg/kg	145323-11	<0.1 || <0.1	145323-2	96%
Nickel	mg/kg	145323-11	6 || 5 || RPD: 18	145323-2	89%
Zinc	mg/kg	145323-11	10 || 7 || RPD: 35	145323-2	72%

QUALITY CONTROL Misc Soil - Inorg	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	145323-11	22/04/2016 || 22/04/2016	145323-2	22/04/2016
Date analysed	-	145323-11	26/04/2016 || 26/04/2016	145323-2	26/04/2016
Total Phenolics (as Phenol)	mg/kg	145323-11	<5 || <5	145323-2	93%

Report Comments:

TRH_S(semivol):# PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

OC/OP/PCBs in soil: PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 145323-1 to 14 were sub-sampled from jars provided by the client.

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

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

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-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.

CHAIN OF CUSTODY

Douglas Partners
Geotechnics | Environment | Groundwater

Client: Douglas Partners	**Project Number** 73315.02	**To:**	Envirolab Services
Contact Person: Michael Whittaker	**Project Name:** Parramatta	**Contact Person:**	Aileen Hie
Project Mgr: Tim Wright	**PO No.:**	**Address:**	12 Ashley Street
	lab Quote No. :		Chatswood NSW 2068
Address: 96 Hermitage Road	**Date results required:**	**Phone:**	02 9910 6200
West Ryde NSW 2114	**Or choose:** standard	**Fax:**	02 9910 6201
	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	**Email:**	ahie@envirolab.com.au
Phone: 9809 0666 **Mob:** 0447 282 095	**Report format:** esdat / PDF / Excel	**Laboratory Report No:**	
Email: Tim.wright @douglaspartners.com.au	**Comments:**	**Lab Comments:**	
Michael.whittaker @douglaspartners.com.au			

Sample information						Tests Required											Comments
Lab Sample ID	Field Sample ID	Depth	Date sampled	Container Type	Type of sample	Combo 8a	PCB	pH	CEC	Asbestos ID						Combo	Provide as much information about the sample as you can
1	BH01	0.3-0.4	14.4.16	Jar	Soil	X	X	X	X								
2	BH02	0.25-0.35	14.4.16	Jar	Soil	X	X	X	X								
3	BH03	0.5-0.6	14.4.16	Jar	Soil	X	X	X	X								
4	BH04	0.3-0.4	15/ 14.4.16	Jar	Soil	X	X	X	X								
5	BH05	0.3-0.4	15/ 14.4.16	Jar	Soil	X	X	X	X								
6	BH06	0.5-0.6	15/ 14.4.16	Jar	Soil	X	X	X	X								
7	BH07	0.35-0.45	19.4.16	Jar	Soil	X	X	X	X								
8	BH08	0.3-0.4	19.4.16	Jar	Soil	X	X	X	X								
9	BH09	0.3-0.4	19.4.16	Jar	Soil	X	X	X	X								
10	BH10	0.4-0.5	19.4.16	Jar	Soil	X	X	X	X								
11	BH11	0.45-0.55	19.4.16	Jar	Soil	X	X	X	X								
12	BH12	0.2-0.3	19.4.16	Jar	Soil	X	X	X	X								
13	BD1		15/ 19.4.16	Jar	Soil	X											
14	BD1 ~~BD2~~		19.4.16	Jar	Soil	X											
15	T3 A01		14.4.16	Bag	ACM					X							

Relinquished by: Douglas Partners	**Sample Receipt**	***Lab use only:***
Hand delivered / Courier (by whom)	**Received by (Company):** ELS	**Samples Received: Cool or Ambient (circle one)**
Condition of Sample at dispatch Cool or Ambient (circle)	**Print Name:** James Goddard	**Temperature Received at:** (if applicable)
Temperature (if Applicable):	**Date & Time:** 21/4/16 1600	**Transported by: Hand delivered / courier**
Print Name: Michael Whittaker	**Signature:**	
Date & Time:		
Signature:		Page 1 of 1

ENVIROLAB

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

Job No: 145323
Date Received: 21/4/16
Time Received: 16:00
Received by: JAG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Michael Whittaker, Tim Wright

Sample Login Details	
Your Reference	85374.02, Parramatta
Envirolab Reference	**145323**
Date Sample Received	21/04/2016
Date Instructions Received	21/04/2016
Date Results Expected to be Reported	**29/04/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	14 Soils 1 Material
Turnaround Time Requested	Standard
Temperature on receipt (°C)	17.8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

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

Sample and Testing Details on following page

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

Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*Organophosphorus Pesticides*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Total Phenolics (as Phenol)*	*pH 1:5 soil:water*	*CEC*	*Asbestos ID - soils*	*Asbestos ID - materials*
BH01-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH02-0.25-0.35	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH03-0.5-0.6	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH04-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH05-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH06-0.5-0.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH07-0.35-0.45	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH08-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH09-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH10-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH11-0.45-0.55	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH12-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BD1	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BD1	✓	✓	✓	✓	✓	✓	✓	✓			✓	
T3 A01												✓

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 145732

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Chris Bagia, Tim Wright

Sample log in details:

Your Reference:	**85374.02, Parramatta**
No. of samples:	4 Soils
Date samples received / completed instructions received	29/04/2016 / 29/04/2016

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:	6/05/16 / 5/05/16
Date of Preliminary Report:	Not Issued

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

Asbestos ID - soils NEPM					
Our Reference:	UNITS	145732-1	145732-2	145732-3	145732-4
Your Reference	---------- -	TP1	TP2	TP3	TP1
Depth	----------	0.25-0.35	0.2-0.4	0.2-0.4	0.05-0.15
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	4/05/2016	4/05/2016	4/05/2016	4/05/2016
Sample mass tested	g	1349.48	1079.82	1256.92	1429.99
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (as per AS4964)	-	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
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	Not applicable	Not applicable	Chrysotile	Not applicable
ACM >7mm Estimation*	g	0.0000	0.0000	0.0000	0.0000
FA and AF Estimation*	g	0.0000	0.0000	0.0026	0.0000
FA and AF Estimation*[#2]	%(w/w)	<0.001	<0.001	<0.001	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
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.

Report Comments:

Asbestos ID-Soil NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.
This is reported outside our scope of NATA accreditation.

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.

CHAIN OF CUSTODY

Douglas Partners
Geotechnics / Environment / Groundwater

Client: Douglas Partners	**Project Number** 85374.02	**To:**	Envirolab Services
Contact Person: Christopher Bagia	**Project Name:** Parramatta	**Contact Person:**	Aileen Hie
Project Mgr: Tim Wright	**PO No.:**	**Address:**	12 Ashley Street
	lab Quote No. :		Chatswood NSW 2068
Address: 96 Hermitage Road	**Date results required:** standard	**Phone:**	02 9910 6200
West Ryde NSW 2114	**Or choose:** 24h	**Fax:**	02 9910 6201
	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	**Email:**	ahie@envirolab.com.au
Phone: 9809 0666 **Mob:** 0409 543 587 0417 527 060	**Report format:** esdat / PDF / Excel	**Laboratory Report No:**	
Email: Tim.Wright @douglaspartners.com.au	**Comments:**	**Lab Comments:**	
Chris.Bagia @douglaspartners.com.au			

Sample information						Tests Required											Comments
Lab Sample ID	Field Sample ID	Depth	Date sampled	Container Type	Type of sample	AF/FA										Combo	Provide as much information about the sample as you can
1	TP1	0.25 - 0.35	14/04/2016	Ziplock Bag	S	X											
2	TP2	0.2 - 0.4	14/04/2016	Ziplock Bag	S	X											
3	TP3	0.2 - 0.4	14/04/2016	Ziplock Bag	S	X											
4	TP1	0.05 - 0.15	14/04/2016	"	"	X											

Relinquished by: Douglas Partners	**Sample Receipt**	***Lab use only:***	
Hand delivered / Courier (by whom) Hunter Express	**Received by (Company):** ENS	**Samples Received: Cool or Ambient (circle one)**	
Condition of Sample at dispatch Cool or Ambient (circle)	**Print Name:** Daniel Ford	**Temperature Received at:** (if applicable)	
Temperature (if Applicable):	**Date & Time:** 29/04/16 @ 17:50	**Transported by: Hand delivered / courier**	
Print Name: Christopher Bagia	**Signature:**		
Date & Time: 29/04/2016 1:30pm			
Signature:		Page_____of _____	

ENVIROLAB GROUP

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

Job No: 145732
Date Received: 29/04/16
Time Received: 17:50
Received by: D.F.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Chris Bagia, Tim Wright

Sample Login Details	
Your Reference	85374.02, Parramatta
Envirolab Reference	**145732**
Date Sample Received	29/04/2016
Date Instructions Received	29/04/2016
Date Results Expected to be Reported	**06/05/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	4 Soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	20.6
Cooling Method	None
Sampling Date Provided	

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

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

Sample and Testing Details on following page

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

Sample Id	*Asbestos ID - soils NEPM*
TP1-0.25-0.35	✓
TP2-0.2-0.4	✓
TP3-0.2-0.4	✓
TP1-0.05-0.15	✓

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 154230

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Michael Whittaker

Sample log in details:

Your Reference:	**85374.02, AHPS & PPS**		
No. of samples:	6 Waters		
Date samples received / completed instructions received	26/9/16	/	26/9/16

Analysis Details:

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

Report Details:

Date results requested by: / Issue Date:	4/10/16	/	4/10/16
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 - Testing **Tests not covered by NATA are denoted with *.**

Results Approved By:

David Springer
General Manager

VOCs in water Our Reference: Your Reference	UNITS ---------- -	154230-1 MW1	154230-2 102	154230-3 103
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date extracted	-	27/09/2016	27/09/2016	27/09/2016
Date analysed	-	27/09/2016	27/09/2016	28/09/2016
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	16	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	4	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- - ----------	154230-1 MW1 16/09/2016 Water	154230-2 102 16/09/2016 Water	154230-3 103 16/09/2016 Water
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	124	123	125
Surrogate toluene-d8	%	99	97	98
Surrogate 4-BFB	%	121	120	126

vTRH(C6-C10)/BTEXN in Water						
Our Reference:	UNITS	154230-1	154230-2	154230-3	154230-5	154230-6
Your Reference	---------- -	MW1	102	103	Spike	Blank
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	27/09/2016	27/09/2016	27/09/2016	26/09/2016	26/09/2016
Date analysed	-	28/09/2016	28/09/2016	28/09/2016	27/09/2016	27/09/2016
TRHC6 - C9	µg/L	15	<10	13	[NA]	[NA]
TRHC6 - C10	µg/L	15	<10	24	[NA]	[NA]
TRHC6 - C10 less BTEX (F1)	µg/L	15	<10	24	[NA]	[NA]
Benzene	µg/L	<1	<1	<1	99%	<1
Toluene	µg/L	<1	<1	<1	103%	<1
Ethylbenzene	µg/L	<1	<1	<1	109%	<1
m+p-xylene	µg/L	<2	<2	<2	110%	<2
o-xylene	µg/L	<1	<1	<1	112%	<1
Naphthalene	µg/L	<1	<1	<1	[NA]	[NA]
Surrogate Dibromofluoromethane	%	124	123	125	128	126
Surrogate toluene-d8	%	99	97	98	100	97
Surrogate 4-BFB	%	121	120	126	103	105

svTRH (C10-C40) in Water				
Our Reference:	UNITS	154230-1	154230-2	154230-3
Your Reference	----------	MW1	102	103
Date Sampled	- ----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date extracted	-	28/09/2016	28/09/2016	28/09/2016
Date analysed	-	29/09/2016	29/09/2016	29/09/2016
TRHC$_{10}$ - C$_{14}$	µg/L	<50	<50	62
TRHC$_{15}$ - C$_{28}$	µg/L	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	µg/L	<100	<100	<100
TRH>C$_{10}$ - C$_{16}$	µg/L	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	µg/L	<50	<50	<50
TRH>C$_{16}$ - C$_{34}$	µg/L	<100	<100	<100
TRH>C$_{34}$ - C$_{40}$	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	64	88	96

PAHs in Water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- - ---------- 	154230-1 MW1 16/09/2016 Water	154230-2 102 16/09/2016 Water	154230-3 103 16/09/2016 Water	154230-4 BD1 16/09/2016 Water
Date extracted	-	28/09/2016	28/09/2016	28/09/2016	28/09/2016
Date analysed	-	29/09/2016	29/09/2016	29/09/2016	29/09/2016
Naphthalene	µg/L	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	68	97	94	98

OCP in water Our Reference: Your Reference	UNITS ---------- -	154230-1 MW1	154230-2 102	154230-3 103
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date extracted	-	28/09/2016	28/09/2016	28/09/2016
Date analysed	-	29/09/2016	29/09/2016	29/09/2016
HCB	µg/L	<0.2	<0.2	<0.2
alpha-BHC	µg/L	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2
Surrogate TCMX	%	92	135	138

OP Pesticides in water Our Reference: Your Reference	UNITS ----------	154230-1 MW1	154230-2 102	154230-3 103
Date Sampled	-	16/09/2016	16/09/2016	16/09/2016
Type of sample	----------	Water	Water	Water
Date extracted	-	28/09/2016	28/09/2016	28/09/2016
Date analysed	-	29/09/2016	29/09/2016	29/09/2016
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2
Dichlorovos	µg/L	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2
Surrogate TCMX	%	92	135	138

PCBs in Water Our Reference: Your Reference	UNITS ---------- -	154230-1 MW1	154230-2 102	154230-3 103
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date extracted	-	28/09/2016	28/09/2016	28/09/2016
Date analysed	-	29/09/2016	29/09/2016	29/09/2016
Aroclor 1016	µg/L	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2
Surrogate TCLMX	%	92	135	138

Total Phenolics in Water				
Our Reference:	UNITS	154230-1	154230-2	154230-3
Your Reference	----------	MW1	102	103
	-			
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date extracted	-	27/09/2016	27/09/2016	27/09/2016
Date analysed	-	27/09/2016	27/09/2016	27/09/2016
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

HM in water - dissolved					
Our Reference:	UNITS	154230-1	154230-2	154230-3	154230-4
Your Reference	----------	MW1	102	103	BD1
	-				
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water	Water
Date prepared	-	27/09/2016	27/09/2016	27/09/2016	27/09/2016
Date analysed	-	27/09/2016	27/09/2016	27/09/2016	27/09/2016
Arsenic-Dissolved	µg/L	2	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	0.2	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	2	<1	23	<1
Lead-Dissolved	µg/L	<1	<1	2	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	12	1	53	1
Zinc-Dissolved	µg/L	65	12	340	11

Perfluoroalkylated Substances in Waters				
Our Reference:	UNITS	154230-1	154230-2	154230-3
Your Reference	----------	MW1	102	103
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date prepared	-	04/10/2016	04/10/2016	04/10/2016
Date analysed	-	04/10/2016	04/10/2016	04/10/2016
Perfluorohexanesulfonic acid	µg/L	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.01	<0.01	<0.01
Surrogate $^{13}C_4$ PFOS	%	98	99	99

Cations in water Dissolved				
Our Reference:	UNITS	154230-1	154230-2	154230-3
Your Reference	----------	MW1	102	103
	-			
Date Sampled	----------	16/09/2016	16/09/2016	16/09/2016
Type of sample		Water	Water	Water
Date digested	-	27/09/2016	27/09/2016	27/09/2016
Date analysed	-	27/09/2016	27/09/2016	27/09/2016
Calcium - Dissolved	mg/L	11	23	10
Magnesium - Dissolved	mg/L	18	33	130
Hardness	mgCaCO3/L	100	190	540

Method ID	Methodology Summary
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	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.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-035	Soil samples are extracted with Methanol, evaporated and reconsistuted. Waters are directly injected and/or concentrated after SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			27/09/2016	154230-1	27/09/2016 || 28/09/2016	LCS-W1	27/09/2016
Date analysed	-			27/09/2016	154230-1	27/09/2016 || 28/09/2016	LCS-W1	27/09/2016
Dichlorodifluoromethane	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
Chloromethane	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
Vinyl Chloride	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
Bromomethane	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
Chloroethane	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
Trichlorofluoromethane	µg/L	10	Org-013	<10	154230-1	<10 || <10	[NR]	[NR]
1,1-Dichloroethene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,1-dichloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	107%
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Bromochloromethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Chloroform	µg/L	1	Org-013	<1	154230-1	16 || 16 || RPD: 0	LCS-W1	107%
2,2-dichloropropane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2-dichloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	107%
1,1,1-trichloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	107%
1,1-dichloropropene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Cyclohexane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Carbon tetrachloride	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Dibromomethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2-dichloropropane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Trichloroethene	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	114%
Bromodichloromethane	µg/L	1	Org-013	<1	154230-1	4 || 4 || RPD: 0	LCS-W1	109%
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Toluene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,3-dichloropropane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Dibromochloromethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	107%
1,2-dibromoethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Tetrachloroethene	µg/L	1	Org-013	<1	154230-1	<1 || <1	LCS-W1	104%
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Chlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Ethylbenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Bromoform	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
m+p-xylene	µg/L	2	Org-013	<2	154230-1	<2 || <2	[NR]	[NR]
Styrene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
o-xylene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
1,2,3-trichloropropane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Isopropylbenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Bromobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
n-propyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
2-chlorotoluene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
4-chlorotoluene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Tert-butyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Sec-butyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
4-isopropyl toluene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
n-butyl benzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Hexachlorobutadiene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-013	118	154230-1	124 || 117 || RPD: 6	LCS-W1	103%
Surrogate toluene-d8	%		Org-013	99	154230-1	99 || 97 || RPD: 2	LCS-W1	99%
Surrogate 4-BFB	%		Org-013	123	154230-1	121 || 121 || RPD: 0	LCS-W1	99%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			26/09/2016	154230-1	27/09/2016 || 28/09/2016	LCS-W1	26/09/2016
Date analysed	-			27/09/2016	154230-1	28/09/2016 || 28/09/2016	LCS-W1	27/09/2016
TRHC$_{6}$ - C$_{9}$	µg/L	10	Org-016	<10	154230-1	15 || 15 || RPD: 0	LCS-W1	107%
TRHC$_{6}$ - C$_{10}$	µg/L	10	Org-016	<10	154230-1	15 || 15 || RPD: 0	LCS-W1	107%
Benzene	µg/L	1	Org-016	<1	154230-1	<1 || <1	LCS-W1	99%
Toluene	µg/L	1	Org-016	<1	154230-1	<1 || <1	LCS-W1	107%
Ethylbenzene	µg/L	1	Org-016	<1	154230-1	<1 || <1	LCS-W1	110%
m+p-xylene	µg/L	2	Org-016	<2	154230-1	<2 || <2	LCS-W1	109%
o-xylene	µg/L	1	Org-016	<1	154230-1	<1 || <1	LCS-W1	113%
Naphthalene	µg/L	1	Org-013	<1	154230-1	<1 || <1	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-016	129	154230-1	124 || 117 || RPD: 6	LCS-W1	126%
Surrogate toluene-d8	%		Org-016	98	154230-1	99 || 97 || RPD: 2	LCS-W1	103%
Surrogate 4-BFB	%		Org-016	106	154230-1	121 || 121 || RPD: 0	LCS-W1	101%

QUALITY CONTROL svTRH (C10-C40) in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/09/2016	[NT]	[NT]	LCS-W3	28/09/2016
Date analysed	-			29/09/2016	[NT]	[NT]	LCS-W3	29/09/2016
TRHC$_{10}$ - C$_{14}$	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W3	119%
TRHC$_{15}$ - C$_{28}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W3	116%
TRHC$_{29}$ - C$_{36}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W3	111%
TRH>C$_{10}$ - C$_{16}$	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W3	119%
TRH>C$_{16}$ - C$_{34}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W3	116%
TRH>C$_{34}$ - C$_{40}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W3	111%
Surrogate o-Terphenyl	%		Org-003	79	[NT]	[NT]	LCS-W3	68%

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/09/2016	[NT]	[NT]	LCS-W3	28/09/2016
Date analysed	-			29/09/2016	[NT]	[NT]	LCS-W3	29/09/2016
Naphthalene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W3	73%
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-W3	82%
Phenanthrene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W3	87%
Anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W3	80%
Pyrene	µg/L	1	Org-012	<1	[NT]	[NT]	LCS-W3	81%
Benzo(a)anthracene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Chrysene	µg/L	1	Org-012	<1	[NT]	[NT]	[NR]	[NR]
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-W3	84%
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	80	[NT]	[NT]	LCS-W3	79%
QUALITY CONTROL OCP in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/09/2016	[NT]	[NT]	LCS-W1	28/09/2016
Date analysed	-			29/09/2016	[NT]	[NT]	LCS-W1	29/09/2016
HCB	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
alpha-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	82%
gamma-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
beta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	77%
Heptachlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	84%
delta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Aldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	77%
Heptachlor Epoxide	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	77%
gamma-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
alpha-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endosulfan I	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
pp-DDE	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	74%
Dieldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	77%
Endrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	71%
pp-DDD	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	73%
Endosulfan II	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
pp-DDT	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	LCS-W1	79%
Methoxychlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	103	[NT]	[NT]	LCS-W1	123%

QUALITY CONTROL OP Pesticides in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/09/2016	[NT]	[NT]	LCS-W1	28/09/2016
Date analysed	-			29/09/2016	[NT]	[NT]	LCS-W1	29/09/2016
Azinphos-methyl (Guthion)	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Bromophos ethyl	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	84%
Chlorpyriphos-methyl	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Diazinon	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Dichlorovos	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	98%
Dimethoate	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	[NR]	[NR]
Ethion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	110%
Fenitrothion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	104%
Malathion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	85%
Parathion	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	116%
Ronnel	µg/L	0.2	Org-008	<0.2	[NT]	[NT]	LCS-W1	95%
Surrogate TCMX	%		Org-008	103	[NT]	[NT]	LCS-W1	122%

QUALITY CONTROL PCBs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			28/09/2016	[NT]	[NT]	LCS-W1	28/09/2016
Date analysed	-			29/09/2016	[NT]	[NT]	LCS-W1	29/09/2016
Aroclor 1016	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	µg/L	2	Org-006	<2	[NT]	[NT]	LCS-W1	75%
Aroclor 1260	µg/L	2	Org-006	<2	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	103	[NT]	[NT]	LCS-W1	122%

QUALITY CONTROL Total Phenolics in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Date analysed	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	LCS-W1	105%
QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Date analysed	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	101%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	102%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	102%
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	LCS-W1	94%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	101%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	101%
QUALITY CONTROL Perfluoroalkylated Substances in Waters	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			04/04/2016	154230-1	04/10/2016 || 04/10/2016	LCS-W1	04/04/2016
Date analysed	-			04/04/2016	154230-1	04/10/2016 || 04/10/2016	LCS-W1	04/04/2016
Perfluorohexanesulfonic acid	µg/L	0.01	Org-035	<0.01	154230-1	<0.01 || <0.01	LCS-W1	103%
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-035	<0.01	154230-1	<0.01 || <0.01	LCS-W1	103%
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-035	<0.01	154230-1	<0.01 || <0.01	LCS-W1	101%
6:2 FTS	µg/L	0.01	Org-035	<0.01	154230-1	<0.01 || <0.01	LCS-W1	108%
8:2 FTS	µg/L	0.01	Org-035	<0.01	154230-1	<0.01 || <0.01	LCS-W1	100%
Surrogate $^{13}C_4$ PFOS	%		Org-035	100	154230-1	98 || 100 || RPD: 2	LCS-W1	98%

QUALITY CONTROL Cations in water Dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Date analysed	-			27/09/2016	[NT]	[NT]	LCS-W1	27/09/2016
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	LCS-W1	101%
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	LCS-W1	107%
Hardness	mgCaCO3/L	3		[NT]	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Perfluoroalkylated Substances in Waters	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	154230-2	04/04/2016
Date analysed	-	[NT]	[NT]	154230-2	04/04/2016
Perfluorohexanesulfonic acid	µg/L	[NT]	[NT]	154230-2	101%
Perfluorooctanesulfonic acid PFOS	µg/L	[NT]	[NT]	154230-2	98%
Perfluorooctanoic acid PFOA	µg/L	[NT]	[NT]	154230-2	100%
6:2 FTS	µg/L	[NT]	[NT]	154230-2	103%
8:2 FTS	µg/L	[NT]	[NT]	154230-2	92%
Surrogate $^{13}C_4$ PFOS	%	[NT]	[NT]	154230-2	99%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

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

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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

Measurement Uncertainty estimates are available for most tests upon request.

CHAIN OF CUSTODY

Douglas Partners
Geotechnics | Environment | Groundwater

Client:	Douglas Partners	**Project Number**	85374.02
Contact Person:	Michael Whittaker	**Project Name:**	AHPS & PPS
Project Mgr:	Tim Wright	**PO No.:**	
		lab Quote No. :	
Address:	96 Hermitage Road West Ryde NSW 2114	**Date results required:** **Or choose: standard** *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*	
Phone:	9809 0666 **Mob:** 0447 282 095	**Report format: esdat / PDF / Excel**	
Email:	michael.whittaker@douglaspartners.com.au tim.wright@douglaspartners.com.au	**Comments:**	

To:	Envirolab Services
Contact Person:	Aileen Hie
Address:	12 Ashley Street Chatswood NSW 2068
Phone:	02 9910 6200
Fax:	02 9910 6201
Email:	ahie@envirolab.com.au
Laboratory Report No:	
Lab Comments:	

Sample information						Tests Required											Comments
Lab Sample ID	**Field Sample ID**	**Depth**	**Date sampled**	**Container Type**	**Type of sample**	Combo 8	VOC	PFAS (Inlcuding PFOS and PFOA)	Hardness	Metals	PAH	Spike + Blank				**Combo**	**Provide as much information about the sample as you can**
1	MW1	-	16/9	Bottle	GW	X	X	X	X								
2	102	-	16/9	Bottle	GW	X	X	X	X								
3	103	-	16/9	Bottle	GW	X	X	X	X								
4	BD1	-	16/9	Bottle	GW					X	X						
5,6	Spike + Blank		16/9	Bottle	GW							X					

ENVIROLAB

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

Job No: 154230

Date Received: 26/09/16
Time Received: 14:00
Received by: D.F.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by: Douglas Partners	**Sample Receipt**	***Lab use only:***
Courier (by whom)	**Received by (Company):** Envirol Services	**Samples Received: Cool or Ambient (circle one)**
Condition of Sample at dispatch Cool or Ambient (circle)	**Print Name:** Daniel Ford	**Temperature Received at:** (if applicable)
Temperature (if Applicable):	**Date & Time:** 26/09/16 14:00	**Transported by: Hand delivered / courier**
Print Name: Michael Whittaker	**Signature:**	
Date & Time:		
Signature:		

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

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Michael Whittaker

Sample Login Details	
Your Reference	85374.02, AHPS & PPS
Envirolab Reference	**154230**
Date Sample Received	26/09/2016
Date Instructions Received	26/09/2016
Date Results Expected to be Reported	**04/10/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	6 Waters
Turnaround Time Requested	Standard
Temperature on receipt (°C)	6.6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

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

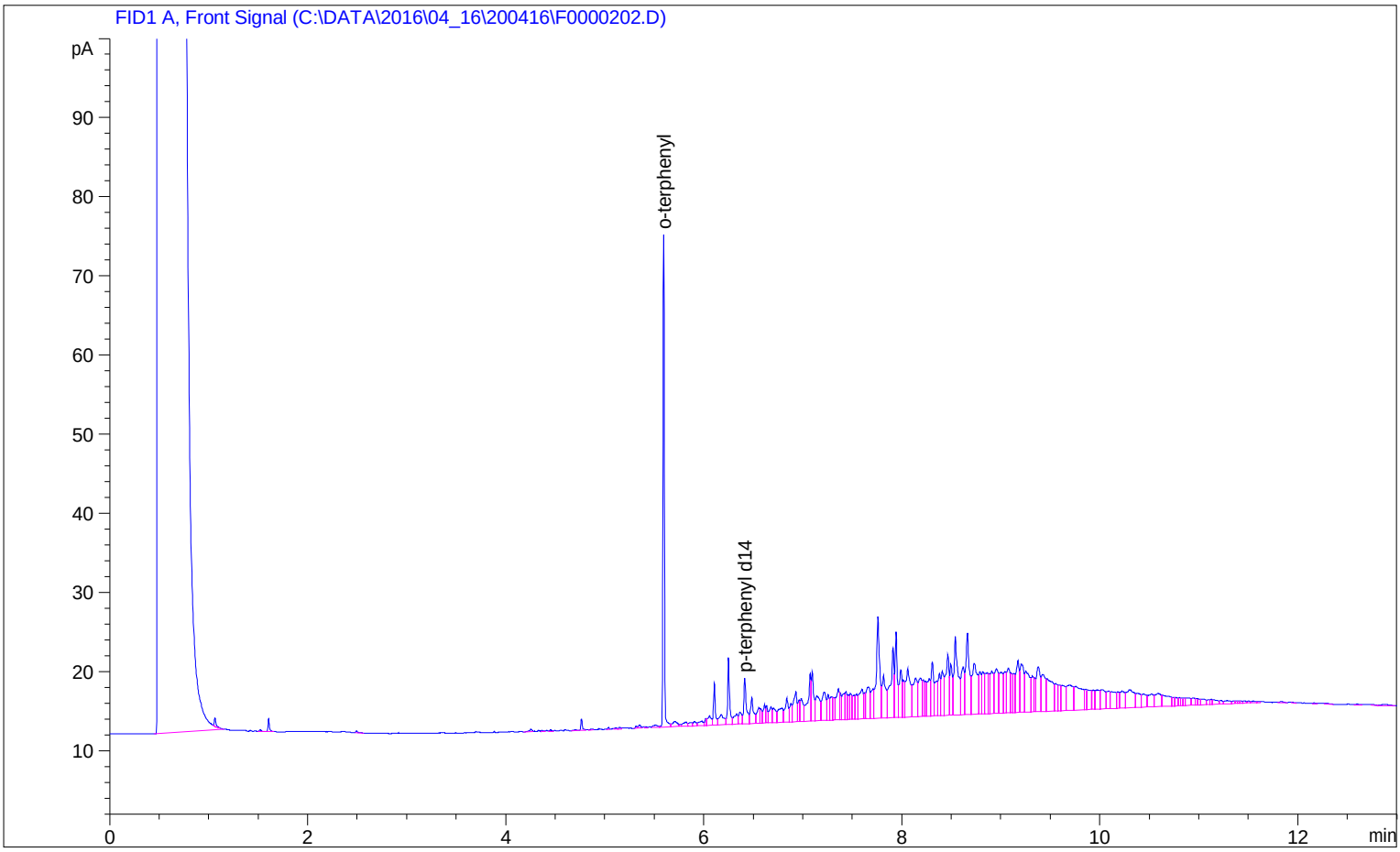
Sample and Testing Details on following page

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

Sample Id	*VOCs in water*	*vTRH(C6-C10)/BTEXN in Water*	*svTRH (C10-C40) in Water*	*PAHs in Water*	*OCP in water*	*OP Pesticides in water*	*PCBs in Water*	*Total Phenolics in Water*	*HM in water - dissolved*	*Perfluoroalkylated Substances in Waters*	*Cations in water Dissolved*
MW1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
102	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
103	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD1				✓					✓		
Spike		✓									
Blank		✓									

Data File C:\DATA\2016\04_16\200416\F0000202.D
Sample Name: s145323-2

```
==========================================================================
Acq. Operator   :                                  Seq. Line : 202
Acq. Instrument : GC#4                              Location : Vial 52
Injection Date  : 23/04/2016 9:54:13 AM                  Inj :   1
                                                 Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2016\04_16\200416F-PROCESSING.M
Last changed    : 26/04/2016 8:44:01 AM
                  (modified after loading)
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
```




```
==========================================================================
                    External Standard Report
==========================================================================

Sorted By             :      Signal
Calib. Data Modified  :      21/04/2016 10:07:05 AM
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 1: FID1 A, Front Signal

RetTime  Type     Area     Amt/Area    Amount   Grp   Name
 [min]          [pA*s]                 [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.596 VV    I   59.51939 1.43762e-1    8.55664    o-terphenyl
  6.415 VV    I   10.19207 3.42443e-1    3.49021    p-terphenyl d14
```

Data File C:\DATA\2016\04_16\200416\F0000202.D
Sample Name: s145323-2

Totals : 12.04685

==========

Summed Peaks Report

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Signal 1: FID1 A, Front Signal

Name	Start Time [min]	End Time [min]	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	2.020	4.120	3.80423e-1	0.0577
NEPM >C10-C16	2.560	4.810	2.93756	0.4458
TRH C15-C28	4.121	7.860	296.29492	45.8422
NEPM >C16-C34	4.811	9.000	652.04749	100.8835
TRH C29-C36	7.861	9.330	467.05841	70.0830
NEPM >C34-C40	9.001	10.410	290.05180	43.5229

Totals : 260.8351

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Final Summed Peaks Report

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Signal 1: FID1 A, Front Signal

Name	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	3.80423e-1	0.0577
NEPM >C10-C16	2.93756	0.4458
TRH C15-C28	296.29492	45.8422
NEPM >C16-C34	652.04749	100.8835
TRH C29-C36	467.05841	70.0830
NEPM >C34-C40	290.05180	43.5229
o-terphenyl	59.51939	8.5566
p-terphenyl d14	10.19207	3.4902

Totals : 272.8820

*** End of Report ***

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.13/06/2016 10:18:39 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Pb

General Statistics

Total Number of Observations	20	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	11	Mean	81.85
Maximum	740	Median	40
SD	160.6	Std. Error of Mean	35.92
Coefficient of Variation	1.963	Skewness	3.999

Normal GOF Test

Shapiro Wilk Test Statistic	0.43	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.397	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	144	95% Adjusted-CLT UCL (Chen-1995)	175.2
		95% Modified-t UCL (Johnson-1978)	149.3

Gamma GOF Test

A-D Test Statistic	1.694	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.776	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.291	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.201	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.831	k star (bias corrected MLE)	0.74
Theta hat (MLE)	98.47	Theta star (bias corrected MLE)	110.6
nu hat (MLE)	33.25	nu star (bias corrected)	29.6
MLE Mean (bias corrected)	81.85	MLE Sd (bias corrected)	95.16
		Approximate Chi Square Value (0.05)	18.18
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	17.47

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	133.3	95% Adjusted Gamma UCL (use when n<50)	138.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level

56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59						Minimum of Logged Data	2.398			Mean of logged Data	3.694	
60						Maximum of Logged Data	6.607			SD of logged Data	1.029	
61												
62	**Assuming Lognormal Distribution**											
63						95% H-UCL	128.4			90% Chebyshev (MVUE) UCL	116.7	
64						95% Chebyshev (MVUE) UCL	139.8			97.5% Chebyshev (MVUE) UCL	171.8	
65						99% Chebyshev (MVUE) UCL	234.8					
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71						95% CLT UCL	140.9			95% Jackknife UCL	144	
72						95% Standard Bootstrap UCL	138.2			95% Bootstrap-t UCL	306.8	
73						95% Hall's Bootstrap UCL	324.2			95% Percentile Bootstrap UCL	150.5	
74						95% BCA Bootstrap UCL	193.3					
75						90% Chebyshev(Mean, Sd) UCL	189.6			95% Chebyshev(Mean, Sd) UCL	238.4	
76						97.5% Chebyshev(Mean, Sd) UCL	306.2			99% Chebyshev(Mean, Sd) UCL	439.2	
77												
78	**Suggested UCL to Use**											
79						95% Chebyshev (Mean, Sd) UCL	238.4					
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												