Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Site Investigation

Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Macarthur Heights,
Campbelltown, NSW

Prepared for
Campbelltown City Council

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Table of Contents

Page

1. Introduction....1
2. Scope of Works....1
3. Site Background....2
   - 3.1 Site Identification....2
   - 3.2 Geology....3
   - 3.3 Soil Landscapes....3
   - 3.4 Hydrogeology and Hydrology....3
4. Site History Summary....3
   - 4.1 Historical Aerial Photograph Review....3
   - 4.2 Search of EPA Register....5
   - 4.3 Section 149 Certificate....5
5. Previous Investigations....6
6. Site Walkover....7
7. Preliminary Conceptual Site Model....7
   - 7.1 Potential Sources....7
   - 7.2 Potential Receptors....8
   - 7.3 Potential Pathways....8
   - 7.4 Summary of Preliminary CSM....9
8. Sampling Analysis Plan....9
   - 8.1 Sampling Rationale....9
   - 8.2 Sampling Procedure....11
   - 8.3 Quality Assurance and Quality Control....11
9. Site Assessment Criteria....11
   - 9.1 Health Investigation and Screening Levels....12
   - 9.2 Ecological Investigation and Screening Levels....13
   - 9.3 Management Limits – Petroleum Hydrocarbons....14
   - 9.4 Asbestos in Soil....14
10. Results....15
    - 10.1 Field Work Results....15
    - 10.2 Laboratory Results....15
    - 10.3 Quality Assurance and Quality Control....16
11. Discussion....16
    - 11.1 Revised CSM....16
12. Conclusions and Recommendations....16
    - 12.1 Unexpected Finds....17
13. Limitations....17

Appendix A: About This Report

Drawings 1 to 8

Appendix B: Site Photographs

Appendix C: Data Quality Objectives

Appendix D: Laboratory Analytical Certificates

Appendix E: Summary Tables

Appendix F: Soil Logs

Appendix G: QAQC

Report on Preliminary Site Investigation
Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by Campbelltown City Council (Council) to undertake a Preliminary Site Investigation with limited sampling (PSI) for the site of a proposed sports and health centre of excellence ('the proposed development') on land located off Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW ('the site'). The site comprises an approximate area of 3.2 hectares; the site location is presented in Drawing 1, Appendix A.

DP understands the proposed development includes sports facilities, a sports hall, as well as support facilities and offices. The current investigation comprised a review of published mapping, site history information, the excavation of test pits, followed by laboratory testing of selected samples, environmental analysis and reporting. This investigation was completed in conjunction with a salinity and geotechnical investigation for the site, and as such soil samples were collected from the test pits to inform these investigations. The findings of the salinity and geotechnical investigations have been reported under separate cover (Project Number 34255.27 and 34255.25 respectively).

The purpose of this assessment was to evaluate the contamination status of the site and its suitability, from a contamination standpoint, for the proposed development.

2. Scope of Works

The scope of works comprised:

- Review of regional geology, hydrogeology and topography, including a search of the Department of Primary Industries Water (DPI Water) database of registered groundwater bores;
- Review of available historical aerial photography obtained through the Land Information Section of the Department of Planning;
- Search of the NSW EPA public registers established under the *Contaminated Land Management Act* 1997 (CLM) and the *Protection of the Environment Operations Act* 1997 (POEO);
- Review of readily available Council records and Section 149 certificate;
- A site walkover to identify any potential areas of environmental concern (PAEC) and to assess the current site condition;
- Development of a preliminary conceptual site model (CSM);
- Excavation and sampling from 15 test pits carried out to a minimum depth of 0.5 m into natural material or prior refusal;

- Field sampling and laboratory analysis in compliance with standard environmental protocols, including a Quality Assurance / Quality Control (QC/QC) plan consisting of 10% replicate sampling and appropriate Chain-of-Custody procedures and in-house laboratory QA/QC testing;
- Laboratory analysis of selected soil samples for the following common contaminants at a NATA accredited laboratory for:
    - Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
    - Total petroleum hydrocarbons (TPH);
    - Monocyclic aromatic hydrocarbons (Benzene, Toluene, Ethylbenzene and Xylene - BTEX);
    - Polycyclic aromatic hydrocarbons (PAH);
    - Phenols;
    - Organochloride pesticides (OCP), organophosphorus pesticides (OPP) and polychlorinated biphenyls (PCB); and
    - Asbestos.
- Interpretation of results in accordance with current NSW EPA endorsed guidelines; and
- Preparation of this report detailing the methodology and results of the assessment and assessing the suitability of the site for the proposed development.

3. Site Background

3.1 Site Identification

The site is formally identified as part Lot 3099 on Deposited Plan 120509; refer to Drawing 1, Appendix A for the site location and layout.

The site is currently zoned R3 Medium Density Residential, a former sports centre and basketball court associated with Western Sydney University is located in the centre of the site and is surrounded by open fields and sparse bushland. The site is accessed via a paved road running from Goldsmith Avenue from the northern site boundary towards the south west. Temporary Heras type fence is located between the sports centre running north west, preventing general access to much of the south eastern and south western portions of the site. Bow Bowing Creek which runs in a concrete channel is located in the southern portion of the site, running west to east across the site. The Macarthur railway is located near parallel to the south eastern site boundary.

The site topography generally slopes gently towards the south east; the highest point at the site is located in the north west portion (approximately 84 mAHD) and the lowest elevation is located in the south east (approx. 74 mAHD). A ridgeline running north west to south east appears to be a historical access way running above Bow Bowing Creek between Goldsmith Avenue and the railway.

To the north of the site on the northern side of Goldsmith Avenue is the Macarthur Heights residential development which was in construction at the time of reporting.

3.2 Geology

Reference to the *Geological Survey of New South Wales (1985), Wollongong-Port Hacking 1: 100 000 Geological Sheet 9029-9129* indicates that the site is underlain by Ashfield Shale comprising laminate and dark-grey siltstone and potentially Bringelly Shale comprising shale, carbonaceous claystone, laminite and minor coal of the Wianamatta Group. Localised Quaternary Alluvium deposits comprising quartz and lithic "fluvial" sand, silty and clay may also be encountered.

3.3 Soil Landscapes

Reference to the *Soil Conservation Service of NSW (1990) Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet* indicates that the site is underlain by Blacktown soils comprising shallow to moderately deep (<100 cm) red and brown podzolic soils on crests, upper slopes and well drained areas and deep yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. Blacktown soils can be moderately reactive, highly plastic soils with characteristic low soil fertility and poor soil drainage.

3.4 Hydrogeology and Hydrology

Groundwater investigations undertaken by DP in the Camden and Campbelltown area and previous studies of areas underlain by the Wianamatta Group indicate that:

- The shales have a very low intrinsic permeability, hence groundwater flow is likely to be dominated by fracture flow with resultant low yields (typically <1 L/s) in bores; and
- The groundwater in the Wianamatta Group is typically brackish to saline with total dissolved solids (TDS) in the range 4000 - 5000 mg/L (but with cases of TDS up to 31750 mg/L being reported). The dominant ions are typically sodium and chloride and the water being generally unsuitable for livestock or irrigation.

Groundwater and surface water flow is anticipated to flow with the dominant local topography, i.e. towards the south east.

4. Site History Summary

4.1 Historical Aerial Photograph Review

Historical aerial photographs are presented in Drawings 2 - 7, Appendix A. A summary of the findings of the review is given below.

1956: Bow Bowing Creek is visible in the southern portion of the site and is surrounded by trees. A second creek with surrounding trees is located in the northern portion of the site. The remaining portion of the site comprises is cleared. Little development is present in the surrounding area with the exception of the railway and Menangle Road which are visible south of the site. A small structure is visible south east of the site near the banks of the creek.

1961: The available resolution for this aerial photograph is low. No discernible change to the site is visible, with the exception of possible minor disturbance along the banks of the second creek, located in the north eastern portion of the site. A road, likely an unpaved road is visible running south east to north west to the south east of the site, alongside the structure that was first observed in the 1956 aerial photograph.

1975: The available resolution for this aerial photograph is low. No discernible change to the site and surrounding area is visible, however the railway appears to have been extended. Possible localised land disturbance is visible in portions of the surrounding area, outside of the site boundary. The small structure near the creek is no longer present (beyond the site boundary)

1984: Trees surrounding Bow Bowing Creek appear to have been cleared; there may also have been possible land disturbance, infilling in the south eastern portion of the site. Little change appears to have occurred in the surrounding area.

1994: Land clearance and disturbance is visible in the area surrounding the site, particularly to the east. Bow Bowing creek has been channelized. An access road (likely unpaved) is visible in the south of the site, running east to west. A second access road (also likely unpaved) runs south east to north west, through the site (this may be the construction access for the future sports centre). Land clearance and disturbance is visible in the western portion of the site. The creek and associated bushland in the northern portion of the site is still visible.

2005: The sports centre has been constructed and much of the surrounding grass cover appears to have been cleared and Goldsmith Avenue is visible. Land to the south of Menangle Road is currently under development. The south western boundaries of the site overlap with a large constructed grass-covered field which is located largely outside of the extent of the site. Numerous small stockpiles are located approximately 70 m south west of the site.

Post 2005 (review of aerial photographs on Google Earth and Nearmap[1]): Much development was visible in the surrounding area from 2013 onwards and Goldsmith Avenue was constructed in 2014. The sports centre appears to have been in use until early / mid 2014 and the Heras fence (see Section 3) was first erected in early / mid 2016. A small fenced compound located in the western portion of the site was used by contractor TRN Group for storage of vehicles and materials until late 2016 when it appears to have been cleared. The access road in the south western part of the site appears to have been used for the storage of machinery, soil stockpiles and other unknown materials throughout (see Figure 1 below).

[1] Last accessed 3 January 2018.

Figure 1: Storage of soil stockpiles, machinery and materials in the south western portion of the site, as observed in Nearmap aerial photograph dated 25 February 2016.

4.2 Search of EPA Register

A search of the NSW EPA website on 7 December 2017 indicated that:

- The site has not been included on the list of NSW contaminated sites notified to the EPA;
- No notices or orders made under the Contaminated Land Management (CLM) Act 1997 have been issued for the site; and
- No licences under Schedule 1 of the Protection of the Environment Operations (POEO) Act, 1997 have been issued for the site.

4.3 Section 149 Certificate

DP has requested a copy of the site Section 149 certificate from Council, however it had not yet been received at the time of reporting. The report will be revised and re-issued once the certificate is received and reviewed by DP.

5. Previous Investigations

Landcom (then UrbanGrowth NSW) engaged several consultants in 2015 to undertake a Due Diligence investigation of the site and surrounding area proposed at the time to be redeveloped into a series of playing fields. The due diligence investigation included contamination, geotechnical, salinity, ecological and aboriginal studies. A copy of the reports was provided by Council to DP for review[2] including the following reports of relevance to this investigation:

- JBS & G Australia Pty Ltd (JBS & G) *Phase 1 Contamination Assessment, University of Western Sydney, Campbelltown Campus – Playing Fields, Goldsmith Avenue, Campbelltown, NSW.* Reference 50682 / 100235 (Rev0), dated 10 April 2015 (JBS & G, 2015).

The findings of the JBS & G (2015) report are summarised below:

- The development proposed by UrbanGrowth NSW includes the construction of three playing fields, re-alignment of the existing concrete lined surface water drainage (Bow Bowing Creek) and associated cut and fill works to assist with surface water management;
- The scope of works completed by JBS & G included
- review of site history, regional ground conditions, Section 149 certificates and a detailed site inspection;
- A review of the site Section 149 certificates by JBS & G concluded that the site has historically been used for rural residential and agricultural purposes;
- JBS & G concluded that there was no evidence of gross or widespread impacts that suggests contamination issues likely to prevent the proposed site development activities and the permissible site uses. There remains the potential for isolated impacted fill, stockpiled materials and former building structures. Overall JBS & G concluded that there was a low potential for contamination impacts at the site that will require specific management and/or remediation during the proposed recreational / open space development works. As such, JBS & G concluded that the subject site (including the current site) is suitable for the proposed ongoing recreational and open space use; and
- JBS & G recommended an Unexpected Finds Protocol (UXF) is developed to manage unexpected potential contamination that may potentially be encountered during the development works.

DP has also prepared contamination investigations for the Macarthur Heights development located to the north of the site, on the other side of Goldsmith Avenue. No significant contamination issues that may pose a risk to the site or the proposed development were identified by DP during these investigations.

[2] Provided to DP on 30 January 2018.

6. Site Walkover

A site walkover was undertaken by a DP environmental engineer on 8 January 2018. Photographs taken during the site walkover are presented in Appendix B (Photographs 1 - 8). Key observations are shown on Drawing 8 (Appendix A).

The following key observations were made during the site walkover:

- A Heras-type fence was present between the sports centre and the north western site boundary (Photograph 1), however it was possible to access the whole site via the eastern side of the former sports centre;
- An unpaved by-road was located just north west of the site (between the site and Goldsmith Avenue) which was recently in use by TRN Group for the storage of building materials. Minor fly-tipping including a tipped-over domestic bin, a discarded washing machine and a small (approximately 10 m^3) stockpile was visible next to this road, but outside of the site boundary;
- The access road running from Goldsmith Avenue to the front (north side) of the sports centre was covered with asphalt in poor repair in places. Further south west the road was unpaved (Photograph 2). The boundary of this road were marked with occasional timber fenced bollards;
- The former sports centre was in generally good condition (Photograph 3) – the windows and the basic structure remained intact and some gym equipment was still present inside the building;
- Bow Bowing Creek in the south of the site appears to be largely located underground, below concrete cover present at surface level and ran under the embankment through a tunnel (Photograph 5). A vent shaft associated with the sewer main was also located here (Photograph 6); and
- With the exception of localised littering, the site appeared to be in general good condition with no potential visual / olfactory indicators of contamination visible (general site photographs – Photographs 7 and 8).

7. 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 (linkages). A preliminary CSM provides a framework to identify potential contamination sources 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).

7.1 Potential Sources

Based on a review of site history information and the site walkover, the identified potential sources, description of sources and contaminants of potential concern (COPC) at the site have been summarised in Table 1 below.

Table 1: Potential Contamination Sources and COPC

Potential Source	Description of Potential Source	Contaminants of Potential Concern
Stockpiling of soil (S1)	Minor stockpiling was evident during the site walkover. Historical stockpiling may have resulted in residual material at the footprint.	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos
Potential filling (S2)	Historical filling may have occurred associated with the embankment, the current playing fields and the former sports centre footprint.	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos
Historical building structures (S3)	Historical building structures may have been present on site.	Asbestos and other hazardous building materials e.g. lead
Agricultural land use (S4)	The site has potentially historically been used for agricultural (pastoral) purposes.	Metals, OCP, OPP, PCB

7.2 Potential Receptors

The following potential human receptors (R) have been identified for the site:

- R1 – Construction and maintenance workers (during redevelopment);
- R2 – Future site users following development; and
- R3 – Land users in adjacent areas (residential and commercial).

The following potential ecological receptors (R) have been identified for the site:

- R4 – Local groundwater and receiving water bodies;
- R5 – Surface water bodies (e.g. Bow Bowing Creek); and
- R6 – Local ecology. DP notes that potential ecological receptors are usually associated with the upper 2 m (root zone and habitation zone for many species) of the soil profile.

7.3 Potential Pathways

Potential pathways for contamination include the following:

- P1 – Ingestion and dermal contact;
- P2 – Inhalation of fibres and/or dust and/or vapours;
- P3 – Leaching of contaminants and vertical migration into groundwater;
- P4 – Surface water runoff;
- P5 – Lateral migration of groundwater providing base flow to watercourses; and
- P6 – Direct contact with ecological receptors.

7.4 Summary of Preliminary CSM

A 'source-pathway-receptor' approach has been used to assess the potential risks of harm being caused to human or ecological receptors from contamination sources on or in the vicinity of the site, via exposure pathways. The possible pathways between the above sources (S1 - S4) and receptors (R1 to R6) are provided in Table 2. Assessment of the preliminary CSM was used to determine data gaps and the requirement for sampling and analysis to assess the suitability of the site for the proposed residential use.

Table 2: Preliminary Conceptual Site Model

Source	Exposure Pathway	Receptor	Requirement for Additional Data and/or Management
Stockpiling of soil (S1) Potential filling (S2) Historical building structures (S3) Agricultural land use (S3)	P1 – Ingestion and dermal contact. P2 – Inhalation of fibres and/or dust and/or vapours.	R1 – Construction and maintenance workers. R2 – Future site users following development of the site.	An intrusive investigation is required to quantify and assess possible contamination including chemical testing of soil (and groundwater if deemed necessary).
	P2 – Inhalation of fibres and/or dust and/or vapours	R3 – Land users in adjacent areas.	
	P3 – Leaching of contaminations and vertical migration into groundwater.	R4 – Local groundwater and receiving water bodies.	
	P4 – Surface water run-off. P5 – Lateral migration of groundwater providing base flow to watercourses.	R5 – Surface water bodies.	
	P6 – Direct contact of contaminated ground with ecological receptors.	R6 – Local ecology.	

8. Sampling Analysis Plan

8.1 Sampling Rationale

Field investigations were undertaken on 8 and 9 January 2018 by a DP environmental engineer. The fieldwork comprised the excavation of ten test pits using a Hyundai 60CR-9 6 ton excavator with a 450 mm bucket. Test pits were excavated to a maximum depth of 3 m bgl or to prior refusal. Test pit locations are shown on Drawing 1, Appendix A. The rationale for the selected sampling locations investigated and analytes tested is provided in Table 3 below. All samples analysed targeted the fill materials encountered.

Table 3: Summary Sampling Rationale

Location	Sample Depth (m bgl)	TP Depth (m bgl)	Depth of Observed Filling (m bgl)	Analytes	Location Target	Sample Target
TP101	0 – 0.2	3	0.1	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, asbestos	General site condition	General site condition
TP102	0.4 – 0.5	1.7	0.6	Testing?	General site condition	Filling
TP103	0.4 – 0.5	1	0	Metals, TRH, BTEX	Historical stockpiling	General site condition / filling
TP104	0 – 0.2	1.5	0.1	Metals, TRH, BTEX		
TP105	0 – 0.05	3	0.1	Metals, TRH, BTEX		
TP106	0.1 – 0.2	0.8	0.6	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, asbestos		
TP107	0 – 0.2	3	0.1	Metals, TRH, BTEX	General site condition	General site condition
TP108	0.4 – 0.5	1.5	0.1	Metals, TRH, BTEX	General site condition	General site condition / filling
TP109	0.1 – 0.2	0.8	0.6	Metals, TRH, BTEX, asbestos		
TP110	0.1 – 0.2	1	0.5	Testing?		
TP111	0 – 0.2	1.5	0.2	Metals, TRH, BTEX, asbestos		
TP112	0.4 – 0.5	3	0.3	Metals, TRH, BTEX		
TP113	0.4 – 0.5	1	1> (potentially reworked natural)	Metals, TRH, BTEX	Possible filling on embankment	Reworked natural
TP114	0.4 – 0.5	1.5	0	Metals, TRH, BTEX	General site condition	Background (natural)
TP115	0.4 – 0.5	3	2.8	Metals, TRH, BTEX, asbestos	Filling on embankment	Filling
TP116	0.1 – 0.2 & 2.4 – 2.5	2	0.5	Metals, TRH, BTEX	General site condition	Filling

Notes: TRH: Total Recoverable Hydrocarbons
BTEX: Benzene, toluene, ethylbenzene and total xylenes
PAH: Polycyclic Aromatic Hydrocarbons
OCP: Organochlorine Pesticides
OPP: Organophosphorus Pesticides
PCB: Polychlorinated Biphenyls

All field measurements and mapping for this project have been carried out using the Geodetic Datum of Australia 1994 (GDA94) and the Map Grid of Australia (MGA94), Zone 56. All reduced levels are given in relation to the Australian Height Datum (AHD).

The adopted Data Quality Objectives are provided in Appendix C.

8.2 Sampling Procedure

Sampling data was recorded with reference to routine Chain-of-Custody requirements and DP's standard operating procedures. The general sampling, handling, transport and tracking procedures are detailed below:

- Where relevant, targeted sample locations were selected during the site walkover;
- Disposable nitrile gloves were used to collect all samples. Gloves were replaced prior to the collection of each sample in order to prevent cross contamination;
- A Hyundai 60CR-9 6 ton excavator with a 450 mm toothed bucket attached was used to excavate all test pits. Samples were collected from the freshly exposed walls of the test pits and placed into laboratory prepared glass jars. In addition, 500 mL bag samples were collected for asbestos analysis;
- Each sample was transferred into a new laboratory prepared glass jar, with minimal headspace, and sealed with a Teflon lined lid. Each jar was individually sealed to reduce the potential for cross contamination during transportation to the laboratory;
- Sample containers were labelled with individual and unique identification including project number, sample ID, depth and date of sampling; and
- Logs were completed for all test pits. Test pit logs include location coordinates, date of collection, a description of the soil strata encountered, visual or olfactory evidence of contamination, the depth of samples collected, QA/QC samples collected, the sampler's initials and equipment used.

8.3 Quality Assurance and Quality Control

Laboratory analysis of primary and intra-laboratory samples was conducted by Envirolab Services Pty Ltd (Envirolab). Envirolab is accredited by the National Association of Testing Authorities (NATA) and is required to conduct in-house QA/QC procedures. These are normally incorporated into every analytical run and include assessment of spike recovery, surrogate recovery and laboratory duplicates.

The analytical methods used are summarised in the laboratory certificates of analysis (COA), included in Appendix D.

9. Site Assessment Criteria

The proposed use for the site after development will be for recreational purposes with open space. The relevant human health and ecological site assessment criteria (SAC) has been selected accordingly.

Analytical results were assessed (as a Tier 1 assessment) against the investigation and screening levels as per Schedule B1, National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013). Petroleum based health screening levels for direct contact have been adopted from the CRC CARE (2011) *Technical Report No.10 Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater* as referenced by NEPC (2013).

9.1 Health Investigation and Screening Levels

The Health Investigation Levels (HILs) and Health Screening Levels (HSLs) are scientifically - based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential risks to human health from chronic exposure to contaminants. HILs are applicable to assessing health risks arising from direct contact (dermal contact and incidental ingestion and inhalation of soil particles) to a range of contaminants. HSLs are used to assess selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact with affected soils. HSLs have been development for a range of petroleum hydrocarbons as either petrol or diesel mixtures, and for different land uses, media, pathways, soil types and depths to contamination.

The investigation and screening levels are not intended to be used as clean up levels. They establish concentrations above which further appropriate investigation (e.g. Tier 2) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land uses.

Potential exposure pathways considered were:

- Soil vapour intrusion and vapour inhalation (for hydrocarbon contamination); and
- Direct contact (dermal contact and incidental ingestion and inhalation of soil particles).

Soil types (relevant to HSL only) considered were:

- Silt, given the predominance of clay and silty clay soils at the site (Section 10.1).

Depth to contamination considered was:

- 0 to <1 m for soil HSLs have been adopted as an initial conservative screen; and
- HILs apply generally to the top 3 m of soil for commercial land use.

Relevant land use criteria considered were:

- HIL A – Residential (with accessible soils); and
- HSL A – Residential (with accessible soils).

Only those contaminants common to both Table 1A (1) (NEPC, 2013) and the list of potential contaminants have been included.

The adopted soil HIL and HSL for the potential contaminants of concern are provided in summary tables presented in Appendix E.

9.2 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, where

ABC = Ambient Background Concentration
ACL = Added Contaminant Limit

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* was 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 Table 2. The following site specific data and assumptions have been used to determine the EILs:

- A protection level of 80 % has been adopted;
- The EILs will apply to the top 2 m of the soil profile;
- Given the potential sources of soil contaminants are from historic use, the contamination is considered as “aged” (> 2 years);
- ABCs have been derived using the Interactive (Excel) Calculation Spreadsheet using input parameters of the State of NSW in which the Site is located, and low for traffic volumes. No background concentration is assumed for lead (conservative); and
- Site specific pH and CEC values obtained as part of the salinity investigation (DP reference 92255.01) have been used as input parameters in the Interactive (Excel) Calculation Spreadsheet. The pH and CEC values for the upper soil layers have an average pH of 6.1 (range 4.7 to 8.7)] and average CEC of 14.75 $cmol_c$ / kg (range 3.5 to 22).

The adopted EILs are presented in the summary tables in Appendix E.

9.3 Management Limits – Petroleum Hydrocarbons

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

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

Management Limits (MLs) to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance where TRH has been recorded. MLs have been derived in NEPC (2013) for the same four petroleum fractions as the HSL (F1 to F4). The adopted Management Limits, from Table 1B(7), Schedule B1 of NEPC (2013) are shown in the following Table 5. The following Site specific data and assumptions have been used to determine the MLs:

- The MLs will apply to any depth within the soil profile;
- The MLs for residential, parkland and public open space apply; and
- A fine soil texture has been adopted.

Management limits are presented in the summary tables in Appendix E.

9.4 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.

A detailed asbestos assessment as outlined in NEPC (2013) was not undertaken as part of the investigation. Asbestos was screened from select samples taken for general analysis and assessment of contaminants. 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.

10. Results

10.1 Field Work Results

The test pit logs are included in Appendix F, together with notes defining classification methods and descriptive terms.

Relatively uniform conditions were encountered across most of the site, with filling observed at all test pit locations. The general strata across the site are summarised as follows (in general order):

- FILLING – filling material generally comprised medium to dark brown clayey silts were encountered in TP 101, 102, 104, 105 - 112, 115 and 116. Trace rootlets and grass cover (topsoil) was encountered in the top approximately 0.2 m of the fill soil profile at TP 101, 103, 107 - 109 and 111 to 116;
- CLAYEY SILT - brown clayey silt was encountered in shallow stratum in test pits located in the central / southern portion of the site (TP 103, 107, 108, 111 and 114);
- SILTY CLAY – light to dark brown and orange in places silty clay mottled grey in places was encountered in most test pits, typically below clayey silt where present (TP 101, 104 and 107 - 115);
- CLAY – light brown / orange / grey mottled grey clays were encountered at depth in TP 101, 107, 112 and 116. Typically, clay was encountered 2 m bgl and below, however in TP 116 located in the north west portion of the site, clay was present in shallower depths above shale (0.5 - 1.5 m bgl); and
- SHALE – grey, occasionally brown shale was encountered in TP 102, 104 - 106, 109 and 116. Depth to shale was typically shallow (0.1 - 0.8 m bgl) with the exception of TP 116 (1.5 m bgl).

No free groundwater was observed in the pits during excavation for the short time that they were left open. No signs of efflorescence were noted at the time of the inspection.

10.2 Laboratory Results

The analytical results for the soil samples collected during this PSI are summarised in Appendix E, together with the adopted SAC. The laboratory certificates of analysis for this PSI are provided in Appendix D. All analytical results were below the laboratory limit of reporting (LOR) and/or the corresponding human health and ecological criteria. Recorded concentrations of TRH and PAH in TP 104 and TP110 is considered likely to be sourced from fragments of asphalt / road base in the sampled material

10.3 Quality Assurance and Quality Control

A review of the adopted QA/QC procedures and results (Appendix G) indicates that the DQIs have generally been met. On this basis, the sampling and laboratory methods used during the investigation were found to meet DQOs for this project.

11. Discussion

The site history review indicated that prior to the most recent land use (sports centre and playing fields) the site comprised bushland and/or grazing land. Recent Nearmap aerial photographs show stockpiling in the north west portion of the site and the general site topography indicates some localised filling is possible at the site. Minor rubbish / flytipping was observed during the investigation and the site was noted to be accessible to the general public, however it is noted that University security staff do visit the site from time to time.

A total of 16 test pits were competed as part of the current investigation and sampled and analysed for contaminants associated with identified potential sources. Reported concentrations of contaminants of concern in the soil samples analysed were within the adopted SAC.

Based on the findings of the investigation, impacts to groundwater and soil vapour are considered to be unlikely and therefore investigation is not warranted.

11.1 Revised CSM

Based on the findings of the investigation, DP considers the likelihood of significant contamination at the site is low. As such, no complete pathways of relevance to the proposed development have been observed at the site.

12. Conclusions and Recommendations

Based on the findings of this investigation, DP concludes that the potential for contamination constraints to the proposed development is low.

A hazardous building materials survey should be conducted prior to demolition of the former sports centre. Demolition of structures containing hazardous building materials should be carried out by a licenced asbestos removal contractor. After removal of the former sports centre, an inspection of the footprint should be conducted and targeted soil sampling and analysis to confirm the contamination status of the footprint.

12.1 Unexpected Finds

There is the potential that hidden, below ground structures (such as fuel tanks, septic tanks, filled gullies, ACM pipes) may be present at the site and accordingly this should be considered both prior to (planning) and during bulk earthworks for the proposed development. An Unexpected Finds Protocol will therefore need to be established prior to earthworks commencement and for implementation during redevelopment in order to deal with any unexpected soil contamination. In addition there is wide spread shallow filling across the site. While DP has not observed any building demolition waste within the fill, we acknowledge that our sampling density is low. There is therefore the risk that impacted fill may be present at locations in between the sampling locations, this can be managed by undertaking further more detailed investigation or by incorporating an unexpected finds protocol. DP would happily provide a proposal to Council for the further work if it was deemed necessary to reduce the risk of unexpected finds.

13. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report (or services) for this project at Goldsmith Avenue, Campbelltown in accordance with DP's proposal MAC170409 Rev1 dated 7 December 2017 and acceptance received from Ares Liu dated 15 December 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of 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.

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.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the (geotechnical / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

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Appendix A

About This Report
Drawings 1 to 8

About this Report

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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.

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 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate 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 $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

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 longer 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:

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

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

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 1726-1993, 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.

Symbols & Abbreviations

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

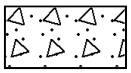
Symbols & Abbreviations

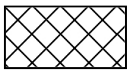
Graphic Symbols for Soil and Rock

General

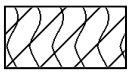

Asphalt

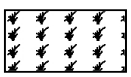

Road base

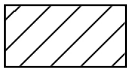

Concrete

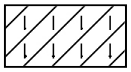

Filling

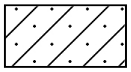
Soils


Topsoil

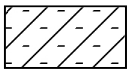

Peat

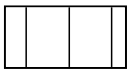

Clay

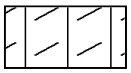

Silty clay

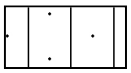

Sandy clay

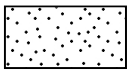

Gravelly clay

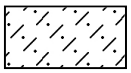

Shaly clay

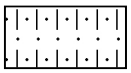

Silt


Clayey silt


Sandy silt

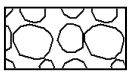

Sand

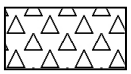

Clayey sand


Silty sand


Gravel

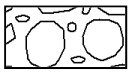

Sandy gravel


Cobbles, boulders

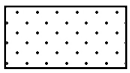

Talus

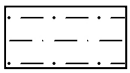
Sedimentary Rocks

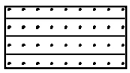

Boulder conglomerate

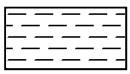

Conglomerate


Conglomeratic sandstone

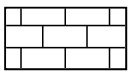

Sandstone


Siltstone

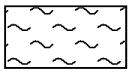

Laminite

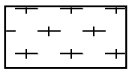

Mudstone, claystone, shale

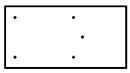

Coal


Limestone

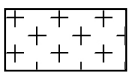
Metamorphic Rocks

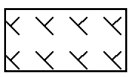

Slate, phyllite, schist

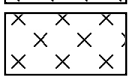

Gneiss

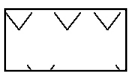

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote

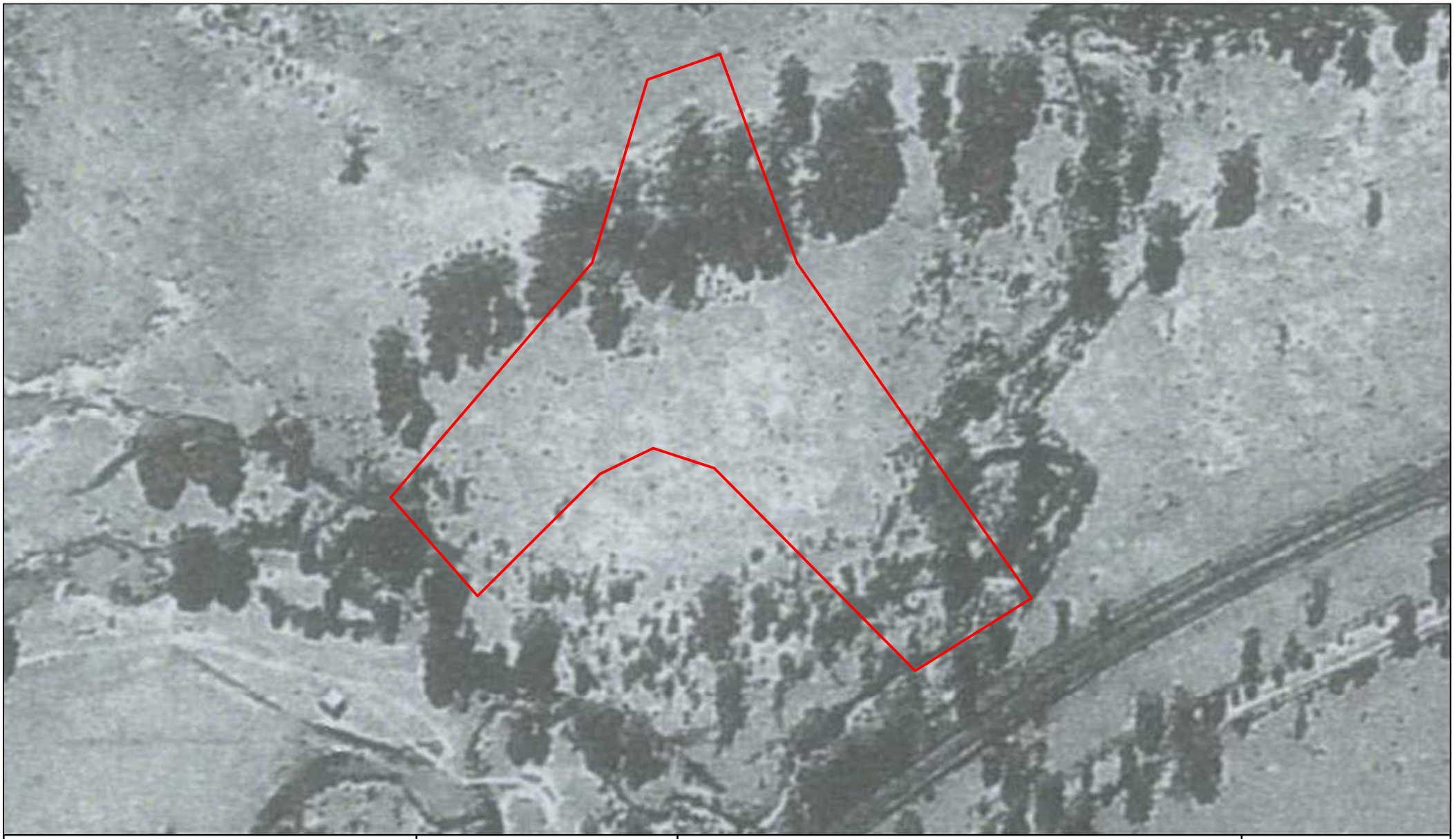

Tuff, breccia


Porphyry

TITLE: **Site Locality and Test Pit Locations**
Proposed Sports and Heath Centre of Excellence
Goldsmith Avenue, Campbelltown NSW

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 22.01.2018

CLIENT: Campbelltown City Council
PROJECT No: 34255.27
DRAWING No: 1
REVISION: A
SCALE: As shown



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 1956

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	2
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 1961

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	3
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 1975

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	4
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 1984

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	5
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 1994

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	6
REVISION:	A

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Geotechnics | Environment | Groundwater

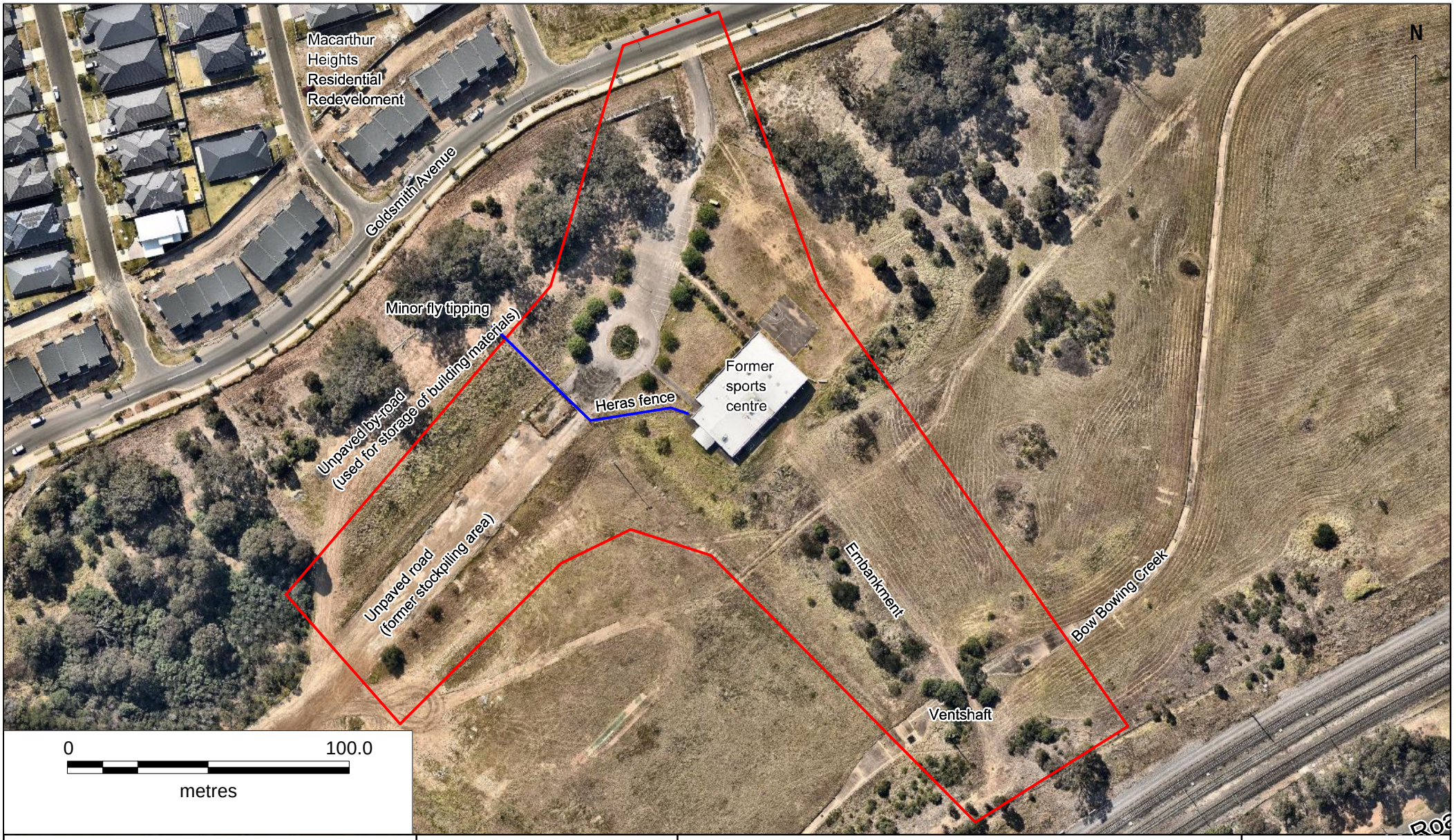
CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Historical Aerial Photographs - 2005

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	7
REVISION:	A



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Campbelltown City Council
OFFICE:	Macarthur
DATE:	3-Jan-18

Key Site Features

Proposed Sports and Health Centre of Excellence

Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW

PROJECT No:	34255.26
DRAWING No:	8
REVISION:	A

Appendix B

Site Photographs

Photograph 1 - Heras-type fencing located at the site in nearground. Fenced storage compound visible immediately behind. View due south west

Photograph 2 - Unpaved access road. View due south west

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **Goldsmith Avenue, Macarthur Heights, NSW**	PROJECT: 34255.26 PLATE No: 1 REV: 0
	CLIENT: Campbelltown City Council	DATE: 9-Feb-18

Photograph 3 - Former sports centre

Photograph 4 - Dilapidated suspected water cart on property 1402

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 34255.26
	Preliminary Site Investigation	PLATE No: 2
	Goldsmith Avenue, Macarthur Heights, NSW	REV: 0
	CLIENT: Campbelltown City Council	DATE: 9-Feb-18

Photograph 5 - tunnel through embankment. Bow Bowing Creek is located below the concrete surface

Photograph 6 - Chimney / flue stack visible on embankment. Bow Bowing Creek is visible in the tree break

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 34255.26
	Preliminary Site Investigation	PLATE No: 3
	Goldsmith Avenue, Macarthur Heights, NSW	REV: 0
	CLIENT: Campbelltown City Council	DATE: 9-Feb-18

Photograph 7 - General site conditions

Photograph 8 - General site conditions

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **Goldsmith Avenue, Macarthur Heights, NSW**	PROJECT: 34255.26 PLATE No: 4 REV: 0
	CLIENT: Campbelltown City Council	DATE: 9-Feb-18

Appendix C

Data Quality Objectives

Appendix C - 1 Data Quality Objectives

The CI has been devised broadly in accordance with 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:

C1.1 State the Problem

Existing buildings at the site will be demolished and new buildings erected in their place – the site will continue to be used as a secondary school. The "problem" to be addressed is the extent and nature of potential contamination at the site which is unknown, and as such, it is unclear whether the site is suitable for the proposed redevelopment.

The objectives of the investigation are as follows:

- Undertake intrusive investigations of the site to assess and describe the nature and extent of contamination;
- Determine the suitability of the site for the proposed recreational land use; and
- Recommend further investigation where the investigation found the site to be unsuitable for the proposed land use.

C1.2 Identify the Decision / Goal of the Study

The suitability of the site for the proposed continued use as a secondary school was assessed based on a comparison of the analytical results for all COPC with the adopted site assessment criteria (SAC) as detailed in the report.

The site has an area of approximately 2.4 ha. Given the presence of buildings across much of the building footprint areas, DP has proposed to conduct contamination investigations in portions of the site located outside of the building footprints. DP initially proposed to conduct ten soil bores, however an additional four were conducted with extra drilling time available so to provide additional information on the ground conditions at the site. Of the 14 soil cores conducted, ten were subject to soil sampling and analysis.

The main COPC are expected to be total recoverable hydrocarbons (TRH), benzene, toluene, ethyl benzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), heavy metals and asbestos. Other commonly found contaminants which may be present include phenols, organochlorine pesticides (OCP), organophosphate pesticides (OPP) and polychlorinated biphenyls (PCB).

The following specific decisions were considered as part of the PSI:

- Did field observation and analytical results identify potential contamination sources which were not included in the preliminary CSM?
- Were COPC present in soil at concentrations that pose a potential risk to identified receptors?
- Were COPC present in background areas of the site at concentrations that are above expected background ranges?

- Does concentration of COPC in soil present a risk to groundwater beneath the site?
- Is the data sufficient to make a decision regarding the abovementioned risks, the suitability of the site for the proposed development, or are additional investigations required?
- Does contamination at the site, if encountered, trigger the Duty to Report requirements under the CLM Act 1997?
- Are there any off-site migration issues that need to be considered?
- Is the data sufficient to enable the preparation of a Remediation Action Plan (RAP) and / or Environmental Management Plan (EMP) should the data suggest these are required?

C1.3 Identify Information Inputs

Inputs into the decisions are as follows:

- Review of regional geology, topography and hydrogeology information;
- Review of site history information;
- Completion of a site walkover;
- 14 soil cores were completed and select samples analysed for COPC;
- The lithology of the site as described in the test pit logs (Appendix C);
- Laboratory QA / QC data to assess the suitability of the environmental data for the PSI (Appendix F);
- All analysis was undertaken at a NATA accredited laboratory; and
- Laboratory reported concentrations of contaminants of concern were compared with the NEPC (2013) criteria as discussed in the main report.

C1.4 Define the Study Boundaries

The site is located at 480 Argyle Street, Picton and is identified as Lot 2 Deposited Plan 520158 within the local government area of Wollondilly Shire Council (refer Drawing 1, Appendix A). The site is roughly rectangular shaped and comprises an area of approximately 5.8 hectares (ha), of which approximately 2.4 ha shall be subject to the proposed redevelopment. The site consists predominately of single and multi-storey school buildings and associated classrooms. Multiple demountable single storey building/sheds are present at the northwest and the centre of the site. There is a car park area along the western-most part of the site, adjacent to Argyle Street. The eastern portion of the site includes a grassed playground area/open space, and asphalt basketball courts are located within the south-western portion of the site. There is partial tree cover along the northern and eastern site boundary as well as scattered trees throughout, mainly within the northern half of the site. Access roads around the buildings at the front of the site and parking area are mainly bitumen paved.

Field investigations were undertaken in January 2018 by a DP Environmental Engineer.

C1.5 Develop the Analytical Approach (or decision rule)

The information obtained during the assessment was used to characterise the site in terms of contamination issues and risk to human health and the environment. The decision rules used in characterising the site were as follows:

- The adopted SAC comprised NSW Environment Protection Authority (EPA) endorsed criteria; and
- The contaminant concentrations in soil were compared to the adopted SAC to determine whether further investigation or remedial action was required.

Field and laboratory test results were considered useable for the assessment after evaluation against the following data quality indicators (DQIs):

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

The specific limits are outlined in the data QA/QC procedures and results (Appendix F).

C1.6 Specify the Performance or Acceptable Criteria

Decision errors for the respective COPC for fill and natural soils are:

1. Deciding that fill and natural soil at the site exceeds the adopted SAC when they truly do not; and
2. Deciding that fill and natural soil at the site is within the adopted SAC when they truly are not.

Decision errors for the PSI were minimised and measured by the following:

- The sampling regime targeted each stratum identified to account for site variability;
- Sample collection and handling techniques were in accordance with DP's *Field Procedures Manual*;
- Samples were prepared and analysed by a NATA-accredited laboratory with the acceptance limits for laboratory QA/QC parameters based on the laboratory reported acceptance limits and those stated in NEPC (2013);
- The analyte selection is based on the available site history, past site activities and site features. The potential for contaminants other than those proposed to be analysed is considered to be low;
- The SAC were adopted from established and NSW EPA endorsed guidelines. The SAC have risk probabilities already incorporated; and
- A NATA accredited laboratory using NATA endorsed methods are used to perform laboratory analysis. Where NATA endorsed methods are not used, the reasons are stated. The effect of using non – NATA methods on the decision making process are explained.

C1.7 Optimise the design for obtaining data

Sampling design and procedures that were implemented to optimise data collection for achieving the DQOs included the following;

- A NATA accredited laboratory using NATA endorsed methods were used to perform laboratory analysis;
- Additional soil samples were collected but kept 'on hold' pending details of initial analysis so that they could be analysed if further delineation was required; and
- Adequately experienced environmental scientists/engineers were chosen to conduct field work and sample analysis interpretation.

Appendix D

Laboratory Analytical Certificates

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

CERTIFICATE OF ANALYSIS 183054

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Lachlan Clement, Emily McGinty
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**34255.26, Campbelltown**
Number of Samples	74 soil
Date samples received	10/01/2018
Date completed instructions received	10/01/2018

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	17/01/2018
Date of Issue	15/01/2018

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 ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Matt Tang
Authorised by Asbestos Approved Signatory: Lulu Scott

Results Approved By
Dragana Tomas, Senior Chemist
Leon Ow, Chemist
Long Pham, Team Leader, Metals
Lulu Scott, Asbestos Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Senior Chemist

Authorised By

David Springer, General Manager

VOCs in soil		
Our Reference		183054-40
Your Reference	UNITS	TP110
Depth		0.1-0.2
Date Sampled		08/01/2018
Type of sample		soil
Date extracted	-	11/01/2018
Date analysed	-	12/01/2018
Dichlorodifluoromethane	mg/kg	<1
Chloromethane	mg/kg	<1
Vinyl Chloride	mg/kg	<1
Bromomethane	mg/kg	<1
Chloroethane	mg/kg	<1
Trichlorofluoromethane	mg/kg	<1
1,1-Dichloroethene	mg/kg	<1
trans-1,2-dichloroethene	mg/kg	<1
1,1-dichloroethane	mg/kg	<1
cis-1,2-dichloroethene	mg/kg	<1
bromochloromethane	mg/kg	<1
chloroform	mg/kg	<1
2,2-dichloropropane	mg/kg	<1
1,2-dichloroethane	mg/kg	<1
1,1,1-trichloroethane	mg/kg	<1
1,1-dichloropropene	mg/kg	<1
Cyclohexane	mg/kg	<1
carbon tetrachloride	mg/kg	<1
Benzene	mg/kg	<0.2
dibromomethane	mg/kg	<1
1,2-dichloropropane	mg/kg	<1
trichloroethene	mg/kg	<1
bromodichloromethane	mg/kg	<1
trans-1,3-dichloropropene	mg/kg	<1
cis-1,3-dichloropropene	mg/kg	<1
1,1,2-trichloroethane	mg/kg	<1
Toluene	mg/kg	<0.5
1,3-dichloropropane	mg/kg	<1
dibromochloromethane	mg/kg	<1
1,2-dibromoethane	mg/kg	<1
tetrachloroethene	mg/kg	<1
1,1,1,2-tetrachloroethane	mg/kg	<1
chlorobenzene	mg/kg	<1
Ethylbenzene	mg/kg	<1

VOCs in soil		
Our Reference		183054-40
Your Reference	UNITS	TP110
Depth		0.1-0.2
Date Sampled		08/01/2018
Type of sample		soil
bromoform	mg/kg	<1
m+p-xylene	mg/kg	<2
styrene	mg/kg	<1
1,1,2,2-tetrachloroethane	mg/kg	<1
o-Xylene	mg/kg	<1
1,2,3-trichloropropane	mg/kg	<1
isopropylbenzene	mg/kg	<1
bromobenzene	mg/kg	<1
n-propyl benzene	mg/kg	<1
2-chlorotoluene	mg/kg	<1
4-chlorotoluene	mg/kg	<1
1,3,5-trimethyl benzene	mg/kg	<1
tert-butyl benzene	mg/kg	<1
1,2,4-trimethyl benzene	mg/kg	<1
1,3-dichlorobenzene	mg/kg	<1
sec-butyl benzene	mg/kg	<1
1,4-dichlorobenzene	mg/kg	<1
4-isopropyl toluene	mg/kg	<1
1,2-dichlorobenzene	mg/kg	<1
n-butyl benzene	mg/kg	<1
1,2-dibromo-3-chloropropane	mg/kg	<1
1,2,4-trichlorobenzene	mg/kg	<1
hexachlorobutadiene	mg/kg	<1
1,2,3-trichlorobenzene	mg/kg	<1
Surrogate Dibromofluorometha	%	98
Surrogate aaa-Trifluorotoluene	%	83
Surrogate Toluene-d_8	%	97
Surrogate 4-Bromofluorobenzene	%	95

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	113	122	117	118	117

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	117	122	121	118	83

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	119	124	129	128	126

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		183054-65	183054-68	183054-73	183054-74
Your Reference	UNITS	TP115	BD2-080118	TB	TS
Depth		2.4-2.5	-	-	-
Date Sampled		09/01/2018	08/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	93%
Toluene	mg/kg	<0.5	<0.5	<0.5	92%
Ethylbenzene	mg/kg	<1	<1	<1	89%
m+p-xylene	mg/kg	<2	<2	<2	90%
o-Xylene	mg/kg	<1	<1	<1	90%
naphthalene	mg/kg	<1	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<1	<1	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	123	137	132	100

svTRH (C10-C40) in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	700	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	360	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	140	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	140	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	870	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	240	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	1,200	<50
Surrogate o-Terphenyl	%	104	110	102	138	105

svTRH (C10-C40) in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	210
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	220
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	250
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	470
Surrogate o-Terphenyl	%	104	92	85	85	87

svTRH (C10-C40) in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	84	89	87	87	90

svTRH (C10-C40) in Soil			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	87	89

PAHs in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
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	0.2	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.09	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	0.61	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	110	103	105	103	108

PAHs in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
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	<0.1	<0.1	<0.1	0.2
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.9
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	1.0
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.6
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	1
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.68
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.8
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	6.6
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Surrogate p-Terphenyl-d14	%	108	106	107	105	105

PAHs in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
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	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	106	108	109	109	107

PAHs in Soil		
Our Reference		183054-65
Your Reference	UNITS	TP115
Depth		2.4-2.5
Date Sampled		09/01/2018
Type of sample		soil
Date extracted	-	11/01/2018
Date analysed	-	11/01/2018
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	110

Organochlorine Pesticides in soil			
Our Reference		183054-1	183054-23
Your Reference	UNITS	TP101	TP106
Depth		0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	100	106

PCBs in Soil			
Our Reference		183054-1	183054-23
Your Reference	UNITS	TP101	TP106
Depth		0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	100	106

Acid Extractable metals in soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	7	14	9	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	12	6	14	8	8
Copper	mg/kg	26	38	25	24	23
Lead	mg/kg	14	15	22	19	9
Mercury	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	21	17	12	7
Zinc	mg/kg	39	87	60	49	31

Acid Extractable metals in soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	<4	8	7	10	4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	5	14	14	16	13
Copper	mg/kg	32	24	22	31	36
Lead	mg/kg	10	21	17	21	28
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	12	13	18	17
Zinc	mg/kg	26	45	39	57	54

Acid Extractable metals in soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	11	7	7	5	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	14	15	11	14
Copper	mg/kg	38	27	24	22	29
Lead	mg/kg	30	16	15	17	18
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	16	14	15	17
Zinc	mg/kg	55	44	41	42	51

Acid Extractable metals in soil			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date prepared	-	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018
Arsenic	mg/kg	7	12
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	15	6
Copper	mg/kg	21	39
Lead	mg/kg	17	14
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	10	29
Zinc	mg/kg	29	120

Moisture						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	9.1	8.8	10	8.9	0.9

Moisture						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	2.8	6.0	13	9.4	10

Moisture						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	12	10	10	10	11

Moisture			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date prepared	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
Moisture	%	14	8.4

Asbestos ID - soils						
Our Reference		183054-1	183054-23	183054-38	183054-42	183054-60
Your Reference	UNITS	TP101	TP106	TP109	TP111	TP115
Depth		0.0-0.2	0.1-0.2	0.1-0.2	0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Sample mass tested	g	Approx. 25g	Approx. 35g	Approx. 15g	Approx. 20g	Approx. 25g
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

Misc Inorg - Soil						
Our Reference		183054-2	183054-3	183054-4	183054-5	183054-7
Your Reference	UNITS	TP101	TP101	TP101	TP101	TP101
Depth		0.4-0.5	0.9-1.0	1.4-1.5	1.9-2.0	2.9-3.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	6.8	7.3	8.0	8.8	8.2
Electrical Conductivity 1:5 soil:water	µS/cm	270	520	540	660	360
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	280
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	10

Misc Inorg - Soil						
Our Reference		183054-9	183054-10	183054-11	183054-12	183054-17
Your Reference	UNITS	TP102	TP102	TP102	TP102	TP104
Depth		0.4-0.5	0.9-1.0	1.4-1.5	1.6-1.47	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	5.3	9.4	8.5	9.4	9.9
Electrical Conductivity 1:5 soil:water	µS/cm	230	270	310	220	240
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	200	130
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<10	<10

Misc Inorg - Soil						
Our Reference		183054-18	183054-19	183054-24	183054-25	183054-27
Your Reference	UNITS	TP104	TP104	TP106	TP106	TP107
Depth		0.9-1.0	1.4-1.5	0.4-0.5	0.7-0.8	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.6	9.6	9.2	9.8	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	200	140	110	140	440
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	<10	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	28	[NA]	[NA]

Misc Inorg - Soil						
Our Reference		183054-28	183054-29	183054-30	183054-31	183054-32
Your Reference	UNITS	TP107	TP107	TP107	TP107	TP107
Depth		0.9-1.0	1.4-1.5	1.9-2.0	2.4-2.5	2.9-3.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.2	9.3	9.6	9.4	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	370	430	580	400	300
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	510	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	66	[NA]

Misc Inorg - Soil						
Our Reference		183054-34	183054-35	183054-36	183054-43	183054-44
Your Reference	UNITS	TP108	TP108	TP108	TP111	TP111
Depth		0.4-0.5	0.9-1.0	1.4-1.5	0.4-0.5	0.9-1.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	7.9	9.0	9.3	8.2	9.7
Electrical Conductivity 1:5 soil:water	µS/cm	44	590	800	36	320
Chloride, Cl 1:5 soil:water	mg/kg	<10	[NA]	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	<10	[NA]	[NA]	[NA]	[NA]

Misc Inorg - Soil						
Our Reference		183054-45	183054-46	183054-47	183054-48	183054-49
Your Reference	UNITS	TP111	TP112	TP112	TP112	TP112
Depth		1.4-1.5	0.0-0.2	0.4-0.5	0.9-1.0	1.4-1.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.5	7.5	8.5	9.3	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	410	87	310	520	550
Chloride, Cl 1:5 soil:water	mg/kg	420	[NA]	[NA]	[NA]	790
Sulphate, SO4 1:5 soil:water	mg/kg	100	[NA]	[NA]	[NA]	69

Misc Inorg - Soil						
Our Reference		183054-50	183054-51	183054-56	183054-57	183054-61
Your Reference	UNITS	TP112	TP112	TP114	TP114	TP115
Depth		1.9-2.0	2.4-2.5	0.4-0.5	0.9-1.0	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.5	9.0	7.9	8.0	8.7
Electrical Conductivity 1:5 soil:water	µS/cm	670	690	34	35	370
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	10	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	20	[NA]

Misc Inorg - Soil						
Our Reference		183054-62	183054-63	183054-64	183054-65	183054-66
Your Reference	UNITS	TP115	TP115	TP115	TP115	TP115
Depth		0.9-1.0	1.4-1.5	1.9-2.0	2.4-2.5	2.9-3.0
Date Sampled		09/01/2018	09/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	8.8	8.7	8.9	7.3	7.1
Electrical Conductivity 1:5 soil:water	µS/cm	550	410	260	220	150
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	230	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	80	[NA]	[NA]

ESP/CEC				
Our Reference		183054-7	183054-34	183054-64
Your Reference	UNITS	TP101	TP108	TP115
Depth		2.9-3.0	0.4-0.5	1.9-2.0
Date Sampled		08/01/2018	08/01/2018	09/01/2018
Type of sample		soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018
Exchangeable Ca	meq/100g	2.8	5.9	5.3
Exchangeable K	meq/100g	0.2	0.2	0.1
Exchangeable Mg	meq/100g	8.4	4.8	8.7
Exchangeable Na	meq/100g	2.2	0.31	1.6
Cation Exchange Capacity	meq/100g	14	11	16
ESP	%	16	3	10

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-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-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Alternatively determined by colourimetry/turbidity using Discrete Analyer.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date extracted	-			11/01/2018	40	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	40	12/01/2018	12/01/2018		12/01/2018	12/01/2018
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	81	83
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-014	<1	40	<1	<1	0	94	94
2,2-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	84	85
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	78	79
1,1-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-014	<0.2	40	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	85	86
bromodichloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	98	100
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-014	<0.5	40	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	104	106
1,2-dibromoethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	88	88
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-014	<2	40	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-014	97	40	98	99	1	97	98
Surrogate aaa-Trifluorotoluene	%		Org-014	75	40	83	81	2	85	82
Surrogate Toluene-d_8	%		Org-014	98	40	97	97	0	98	97
Surrogate 4-Bromofluorobenzene	%		Org-014	97	40	95	95	0	99	99

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	106	89
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	106	89
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	100	82
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	104	86
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	101	91
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	112	92
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	100	90
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	114	1	113	115	2	107	82

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	12/01/2018	12/01/2018		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	40	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	40	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	40	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	40	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	40	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	40	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	40	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	40	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	40	83	81	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-23
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	120	126
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	130	126
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	123	120
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	120	126
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	130	126
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	123	120
Surrogate o-Terphenyl	%		Org-003	104	1	104	105	1	114	104

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	12/01/2018	12/01/2018		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	40	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	40	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	40	210	230	9	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	40	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	40	220	240	9	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	40	250	260	4	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	40	87	101	15	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-23
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	88	82
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	91	86
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	95	88
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	98	94
Pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	119	113
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	88	88
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	<0.05	<0.05	0	81	83
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	107	1	110	104	6	105	106

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	40	0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	40	0.2	0.2	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	40	0.2	0.1	67	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	40	0.9	0.8	12	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	40	1.0	0.9	11	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	40	0.6	0.6	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	40	0.5	0.4	22	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	40	1	0.9	11	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	40	0.68	0.63	8	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	40	0.4	0.4	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	40	0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	40	0.8	0.7	13	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	40	105	103	2	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	[NT]
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	[NT]
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	83	[NT]
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	93	[NT]
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	99	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	100	[NT]
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	94	[NT]
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	99	[NT]
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	[NT]
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	112	1	100	111	10	116	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	[NT]
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	112	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	112	1	100	111	10	99	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date prepared	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Arsenic	mg/kg	4	Metals-020	<4	1	7	6	15	106	82
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	104	80
Chromium	mg/kg	1	Metals-020	<1	1	12	12	0	107	81
Copper	mg/kg	1	Metals-020	<1	1	26	26	0	107	122
Lead	mg/kg	1	Metals-020	<1	1	14	13	7	102	85
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	114	126
Nickel	mg/kg	1	Metals-020	<1	1	13	12	8	103	71
Zinc	mg/kg	1	Metals-020	<1	1	39	41	5	103	76

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	23	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	23	11/01/2018	11/01/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	23	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	23	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	23	5	5	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	23	32	32	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	23	10	8	22	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	23	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	23	7	6	15	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	23	26	23	12	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-12
Date prepared	-			12/01/2018	9	12/01/2018	12/01/2018		12/01/2018	12/01/2018
Date analysed	-			12/01/2018	9	12/01/2018	12/01/2018		12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	9	5.3	5.3	0	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	9	230	260	12	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	64	230	260	12	118	96
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	64	80	92	14	118	103

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			[NT]	19	12/01/2018	12/01/2018		12/01/2018	[NT]
Date analysed	-			[NT]	19	12/01/2018	12/01/2018		12/01/2018	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	19	9.6	9.6	0	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	19	140	140	0	104	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	43	12/01/2018	12/01/2018		[NT]	[NT]
Date analysed	-			[NT]	43	12/01/2018	12/01/2018		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	43	8.2	7.9	4	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	43	36	33	9	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	64	12/01/2018	12/01/2018		[NT]	[NT]
Date analysed	-			[NT]	64	12/01/2018	12/01/2018		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	64	8.9	8.8	1	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	64	260	360	32	[NT]	[NT]

QUALITY CONTROL: ESP/CEC					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			12/01/2018	[NT]	[NT]	[NT]	[NT]	12/01/2018	[NT]
Date analysed	-			12/01/2018	[NT]	[NT]	[NT]	[NT]	12/01/2018	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Asbestos: Excessive sample volumes were provided for asbestos analysis.
A portion of the supplied samples were sub-sampled according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 183054-1, 23, 38, 42, & 60 were sub-sampled from bags provided by the client.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes: Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	Notes/preservation
TP101/0.0-0.2	1	08/01/18	S	G	x		x		x		x								Job No: 183054.
TP101/0.4-0.5	2	08/01/18	S	G									x						Date Received: 100118.
TP101/0.9-1.0	3	08/01/18	S	G									x						Time Received: 1425
TP101/1.4-1.5	4	08/01/18	S	G									x						Received by: ELS.
TP101/1.9-2.0	5	08/01/18	S	G									x						Temp: Cool/Ambient
TP101/2.4-2.5	6	08/01/18	S	G														x	Cooling: Ice/Icepack
TP101/2.9-3.0	7	08/01/18	S	G									x		x		x		Security: Intact/Broken/None
TP102/0.0-0.2	8	08/01/18	S	G														x	
TP102/0.4-0.5	9	08/01/18	S	G	x		x						x						
TP102/0.9-1.0	10	08/01/18	S	G									x						
TP102/1.4-1.5	11	08/01/18	S	G									x						
TP102/1.6-1.7	12	08/01/18	S	G									x		x				
TP103/0.0-0.2	13	08/01/18	S	G														x	

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

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Elen MK ELS. 100118 14:25.	

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP103/0.4-0.5	14	08/01/18	S	G	x		x												
TP103/0.9-1.0	15	08/01/18	S	G														x	
TP104/0.0-0.2	16	08/01/18	S	G	x		x												
TP104/0.4-0.5	17	08/01/18	S	G									x		x				
TP104/0.9-1.0	18	08/01/18	S	G									x						
TP104/1.4-1.5	19	08/01/18	S	G									x						
TP105/0.0-0.05	20	08/01/18	S	G	x		x												
TP105/0.1-0.2	21	08/01/18	S	G														x	
TP106/0.0-0.05	22	08/01/18	S	G														x	
TP106/0.1-0.2	23	08/01/18	S	G	x		x		x		x								
TP106/0.4-0.5	24	08/01/18	S	G									x		x				
TP106/0.7-0.8	25	08/01/18	S	G									x						

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:** Ellen Wh. ELS 100118. 1425.		

183054

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP107/0.0-0.2	26	08/01/18	S	G	x		x												
TP107/0.4-0.5	27	08/01/18	S	G									x						
TP107/0.9-1.0	28	08/01/18	S	G									x						
TP107/1.4-1.5	29	08/01/18	S	G									x						
TP107/1.9-2.0	30	08/01/18	S	G									x						
TP107/2.4-2.5	31	08/01/18	S	G									x		x				
TP107/2.9-3.0	32	08/01/18	S	G									x						
TP108/0.0-0.2	33	09/01/18	S	G														x	
TP108/0.4-0.5	34	09/01/18	S	G	x		x						x		x		x		
TP108/0.9-1.0	35	09/01/18	S	G									x						
TP108/1.4-1.5	36	09/01/18	S	G									x						
TP109/0.0-0.1	37	09/01/18	S	G														x	
TP109/0.1-0.2	38	09/01/18	S	G	x		x				x								

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:** Ellen W ELS 100118 1426.		

183054

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil W - Water)	Container Type (G - Glass P - Plastic)	Analytes: Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	Notes/preservation
TP109/0.4-0.5	39	09/01/18	S	G														x	
TP110/0.1-0.2	40	08/01/18	S	G	x		x					x							
TP110/0.4-0.5	41	08/01/18	S	G														x	
TP111/0.0-0.2	42	09/01/18	S	G	x		x				x								
TP111/0.4-0.5	43	09/01/18	S	G									x						
TP111/0.9-1.0	44	09/01/18	S	G									x						
TP111/1.4-1.5	45	09/01/18	S	G									x		x				
TP112/0.0-0.2	46	08/01/18	S	G									x						
TP112/0.4-0.5	47	08/01/18	S	G	x		x						x						
TP112/0.9-1.0	48	08/01/18	S	G									x						
TP112/1.4-1.5	49	08/01/18	S	G									x		x				
TP112/1.9-2.0	50	08/01/18	S	G									x						
TP112/2.4-2.5	51	08/01/18	S	G									x						

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Ellen Wh. ENS. 100118. 1425.	

183054

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CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil W - Water)	Container Type (G - Glass P - Plastic)	Analytes: Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	Notes/preservation
TP112/2.9-3.0	52	08/01/18	S	G														x	
TP113/0.0-0.2	53	09/01/18	S	G														x	
TP113/0.4-0.5	54	09/01/18	S	G	x		x												
TP114/0.0-0.2	55	09/01/18	S	G														x	
TP114/0.4-0.5	56	09/01/18	S	G	x		x						x						
TP114/0.9-1.0	57	09/01/18	S	G									x		x				
TP114/1.4-1.5	58	09/01/18	S	G														x	
TP115/0.0-0.1	59	09/01/18	S	G														x	
TP115/0.1-0.2	60	09/01/18	S	G	x		x				x								
TP115/0.4-0.5	61	09/01/18	S	G									x						
TP115/0.9-1.0	62	09/01/18	S	G									x						
TP115/1.4-1.5	63	09/01/18	S	G									x						
TP115/1.9-2.0	64	09/01/18	S	G									x		x		x		

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Ellen W. ES. 100118. 1425.	

183054

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil W - Water)	Container Type (G - Glass P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP115/2.4-2.5	65	09/01/18	S	G	x		x						x						
TP115/2.9-3.0	66	09/01/18	S	G									x						
BD1-080118	67	08/01/18	S	G														x	
BD2-080118	68	08/01/18	S	G	x		x												
BD3-080118	69	08/01/18	S	G														x	
BD4-090118	70	09/01/18	S	G														x	
BD5-090118	71	09/01/18	S	G														x	
SP1	72	09/01/18	S	G														x	
TB	73											x							
TS	74											x							

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address** 19 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0076 **Fax:** (02) 4646 1887

Relinquished by: LOC **Transported to laboratory by:**

Signed: **Date & Time:** 10/01/2018 **Received by:** Ellen Wr. ELS. 100118 1425.

183054

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Lachlan Clement, Emily McGinty

Sample Login Details

Your reference	34255.26, Campbelltown
Envirolab Reference	183054
Date Sample Received	10/01/2018
Date Instructions Received	10/01/2018
Date Results Expected to be Reported	17/01/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	74 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	3.0
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP101-0.0-0.2		✓	✓	✓	✓	✓	✓	✓						
TP101-0.4-0.5									✓	✓				
TP101-0.9-1.0									✓	✓				
TP101-1.4-1.5									✓	✓				
TP101-1.9-2.0									✓	✓				
TP101-2.4-25														✓
TP101-2.9-3.0									✓	✓	✓	✓	✓	
TP102-0.0-0.2														✓
TP102-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP102-0.9-1.0									✓	✓				
TP102-1.4-1.5									✓	✓				
TP102-1.6-1.47									✓	✓	✓	✓		
TP103-0.0-0.2														✓
TP103-0.4-0.5		✓	✓	✓			✓							
TP103-0.9-1.0														✓
TP104-0.0-0.2		✓	✓	✓			✓							
TP104-0.4-0.5									✓	✓	✓	✓		
TP104-0.9-1.0									✓	✓				
TP104-1.4-1.5									✓	✓				
TP105-0.0-0.05		✓	✓	✓			✓							
TP105-0.1-0.2														✓
TP106-0.0-0.05														✓
TP106-0.1-0.2		✓	✓	✓	✓	✓	✓	✓						
TP106-0.4-0.5									✓	✓	✓	✓		
TP106-0.7-0.8									✓	✓				
TP107-0.0-0.2		✓	✓	✓			✓							
TP107-0.4-0.5									✓	✓				
TP107-0.9-1.0									✓	✓				
TP107-1.4-1.5									✓	✓				
TP107-1.9-2.0									✓	✓				
TP107-2.4-2.5									✓	✓	✓	✓		
TP107-2.9-3.0									✓	✓				

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ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
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Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP108-0.0-0.2														✓
TP108-0.4-0.5		✓	✓	✓			✓		✓	✓	✓	✓	✓	
TP108-0.9-1.0									✓	✓				
TP108-1.4-1.5									✓	✓				
TP109-0.0-0.1														✓
TP109-0.1-0.2		✓	✓	✓			✓	✓						
TP109-0.4-0.5														✓
TP110-0.1-0.2	✓	✓	✓	✓			✓							
TP110-0.4-0.5														✓
TP111-0.0-0.2		✓	✓	✓			✓	✓						
TP111-0.4-0.5									✓	✓				
TP111-0.9-1.0									✓	✓				
TP111-1.4-1.5									✓	✓	✓	✓		
TP112-0.0-0.2									✓	✓				
TP112-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP112-0.9-1.0									✓	✓				
TP112-1.4-1.5									✓	✓	✓	✓		
TP112-1.9-2.0									✓	✓				
TP112-2.4-2.5									✓	✓				
TP112-2.9-3.0														✓
TP113-0.0-0.2														✓
TP113-0.4-0.5		✓	✓	✓			✓							
TP114-0.0-0.2														✓
TP114-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP114-0.9-1.0									✓	✓	✓	✓		
TP114-1.4-1.5														✓
TP115-0.0-0.1														✓
TP115-0.1-0.2		✓	✓	✓			✓	✓						
TP115-0.4-0.5									✓	✓				
TP115-0.9-1.0									✓	✓				
TP115-1.4-1.5									✓	✓				
TP115-1.9-2.0									✓	✓	✓	✓	✓	

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Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP115-2.4-2.5		✓	✓	✓			✓		✓	✓				
TP115-2.9-3.0									✓	✓				
BD1-080118														✓
BD2-080118		✓	✓				✓							
BD3-080118														✓
BD4-090118														✓
BD5-090118														✓
SP1														✓
TB		✓												
TS		✓												

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

Additional Info

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

Appendix E

Summary Tables

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Table 1: Summary of Laboratory Results – Metals, TRH, BTEX

			Metals								TRH						BTEX			
			Arsenic	Cadmium	Chromium (VI)	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Ethylbenzene	Toluene	Total Xylenes
			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
Sample ID	Depth	Sampled date																		
TP101	0 - 0.2m	08/01/2018	**7** 300 160	<0.4 90 NC	**12** 300 670	**26** 17000 310	**14** 600 1800	<0.1 80 NC	**13** 1200 360	**39** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP102	0.4 - 0.5m	08/01/2018	**14** 300 160	<0.4 90 NC	**6** 300 670	**38** 17000 310	**15** 600 1800	**0.1** 80 NC	**21** 1200 360	**87** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP103	0.4 - 0.5m	08/01/2018	**9** 300 160	<0.4 90 NC	**14** 300 670	**25** 17000 310	**22** 600 1800	<0.1 80 NC	**17** 1200 360	**60** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP104	0 - 0.2m	08/01/2018	**6** 300 160	<0.4 90 NC	**8** 300 670	**24** 17000 310	**19** 600 1800	<0.1 80 NC	**12** 1200 360	**49** 30000 870	<25 NC NC	**140** NC NC	<25 NL 215	**140** NL 170	**870** NC 2500	**240** NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP105	0 - 0.05m	08/01/2018	<4 300 160	<0.4 90 NC	**8** 300 670	**23** 17000 310	**9** 600 1800	<0.1 80 NC	**7** 1200 360	**31** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP106	0.1 - 0.2m	08/01/2018	<4 300 160	<0.4 90 NC	**5** 300 670	**32** 17000 310	**10** 600 1800	<0.1 80 NC	**7** 1200 360	**26** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP107	0 - 0.2m	08/01/2018	**8** 300 160	<0.4 90 NC	**14** 300 670	**24** 17000 310	**21** 600 1800	<0.1 80 NC	**12** 1200 360	**45** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP108	0.4 - 0.5m	08/01/2018	**7** 300 160	<0.4 90 NC	**14** 300 670	**22** 17000 310	**17** 600 1800	<0.1 80 NC	**13** 1200 360	**39** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP109	0.1 - 0.2m	08/01/2018	**10** 300 160	<0.4 90 NC	**16** 300 670	**31** 17000 310	**21** 600 1800	<0.1 80 NC	**18** 1200 360	**57** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP110	0.1 - 0.2m	08/01/2018	**4** 300 160	<0.4 90 NC	**13** 300 670	**36** 17000 310	**28** 600 1800	<0.1 80 NC	**17** 1200 360	**54** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	**220** NC 2500	**250** NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP111	0 - 0.2m	08/01/2018	**11** 300 160	<0.4 90 NC	**14** 300 670	**38** 17000 310	**30** 600 1800	<0.1 80 NC	**13** 1200 360	**55** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP112	0.4 - 0.5m	08/01/2018	**7** 300 160	<0.4 90 NC	**14** 300 670	**27** 17000 310	**16** 600 1800	<0.1 80 NC	**16** 1200 360	**44** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP113	0.4 - 0.5m	09/01/2018	**7** 300 160	<0.4 90 NC	**15** 300 670	**24** 17000 310	**15** 600 1800	<0.1 80 NC	**14** 1200 360	**41** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP114	0.4 - 0.5m	09/01/2018	**5** 300 160	<0.4 90 NC	**11** 300 670	**22** 17000 310	**17** 600 1800	<0.1 80 NC	**15** 1200 360	**42** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP115	0.1 - 0.2m	09/01/2018	**8** 300 160	<0.4 90 NC	**14** 300 670	**29** 17000 310	**18** 600 1800	<0.1 80 NC	**17** 1200 360	**51** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95
TP115	2.4 - 2.5m	09/01/2018	**7** 300 160	<0.4 90 NC	**15** 300 670	**21** 17000 310	**17** 600 1800	<0.1 80 NC	**10** 1200 360	**29** 30000 870	<25 NC NC	<50 NC NC	<25 NL 215	<50 NL 170	<100 NC 2500	<100 NC 6600	<0.2 NL 95	<1 NL 185	<0.5 NL 135	<2 NL 95

HIL / HSL exceedance
EIL / ESL exceedance
ML exceedance
HIL/HSL and EIL/ESL exceedance
ML and HIL/HSL/EIL/ESL exceedance

NT Not tested
NL Not limited
NC No criteria

Key: Lab result (HIL/HSL value | EIL/ESL value)

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Table 2: Summary of Laboratory Results – PAH, OCP, PCB

			PAH				OCP								PCB
			Naphthalene	Benzo(a)pyrene (BaP)	Total PAHs	Benzo(a)pyrene TEQ	Endrin	HCB	Heptachlor	Methoxychlor	DDT+DDE+DDD	Aldrin & Dieldrin	Chlordane	Total Endosulfan	Total PCB
			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
Sample ID	Depth	Sampled date													
TP101	0 - 0.2m	08/01/2018	<1	<0.05	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			NL 370	NC 1.4	300 NC	3 NC	20 NC	10 NC	10 NC	400 NC	400 640	10 NC	70 NC	340 NC	1 NC
TP102	0.4 - 0.5m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP103	0.4 - 0.5m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP104	0 - 0.2m	08/01/2018	<1	**0.09**	**0.61**	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP105	0 - 0.05m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP106	0.1 - 0.2m	08/01/2018	<1	<0.05	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			NL 370	NC 1.4	300 NC	3 NC	20 NC	10 NC	10 NC	400 NC	400 640	10 NC	70 NC	340 NC	1 NC
TP107	0 - 0.2m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP108	0.4 - 0.5m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP109	0.1 - 0.2m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP110	0.1 - 0.2m	08/01/2018	<1	**0.68**	**6.6**	**1**	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP111	0 - 0.2m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP112	0.4 - 0.5m	08/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP113	0.4 - 0.5m	09/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP114	0.4 - 0.5m	09/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP115	0.1 - 0.2m	09/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -
TP115	2.4 - 2.5m	09/01/2018	<1	<0.05	<0.05	<0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
			NL 370	NC 1.4	300 NC	3 NC	- -	- -	- -	- -	- -	- -	- -	- -	- -

HIL / HSL exceedance
EIL / ESL exceedance
ML exceedance
HIL/HSL and EIL/ESL exceedance
ML and HIL/HSL/EIL/ESL exceedance

NT Not tested
NL Not limited
NC No criteria

Key: Lab result (HIL/HSL value | EIL/ESL value)

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Table A1: Derivation Table

Sample Id	Applied depth	Soil Type	Soil Texture	Clay Content	CEC	pH
TP101	0.0m	Silt	Fine	10.00	13.60	8.60
TP102	0.4m	Silt	Fine	10.00	13.60	8.60
TP103	0.4m	Silt	Fine	10.00	13.60	8.60
TP104	0.0m	Silt	Fine	10.00	13.60	8.60
TP105	0.0m	Silt	Fine	10.00	13.60	8.60
TP106	0.1m	Silt	Fine	10.00	13.60	8.60
TP107	0.0m	Silt	Fine	10.00	13.60	8.60
TP108	0.4m	Silt	Fine	10.00	13.60	8.60
TP109	0.1m	Silt	Fine	10.00	13.60	8.60
TP110	0.1m	Silt	Fine	10.00	13.60	8.60
TP111	0.0m	Silt	Fine	10.00	13.60	8.60
TP112	0.4m	Silt	Fine	10.00	13.60	8.60
TP113	0.4m	Silt	Fine	10.00	13.60	8.60
TP114	0.4m	Silt	Fine	10.00	13.60	8.60
TP115	0.1m	Silt	Fine	10.00	13.60	8.60

Appendix F

Soil Logs

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295784
NORTHING: 6227645

PIT No: 101
PROJECT No: 34255.26
DATE: 8/1/2018
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)
80	0.1	TOPSOIL - dry brown clayey silt with trace rootlets		D	0.0				
		SILTY CLAY - dry light brown silty clay			0.2				
	0.5			D	0.4				
		SILTY CLAY - brown/dark brown silty clay with trace rootlets			0.5				
79	1			D	0.9				1
					1.0				
				D	1.4				
					1.5				
				D	1.9				
78	2 2.0	CLAY - grey mottled grey clay, mc<pl			2.0				2
				D	2.4				
					2.5				
				D	2.9				
77	3 3.0	Pit discontinued at 3.0m - limit of investigation			3.0				3
76	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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)

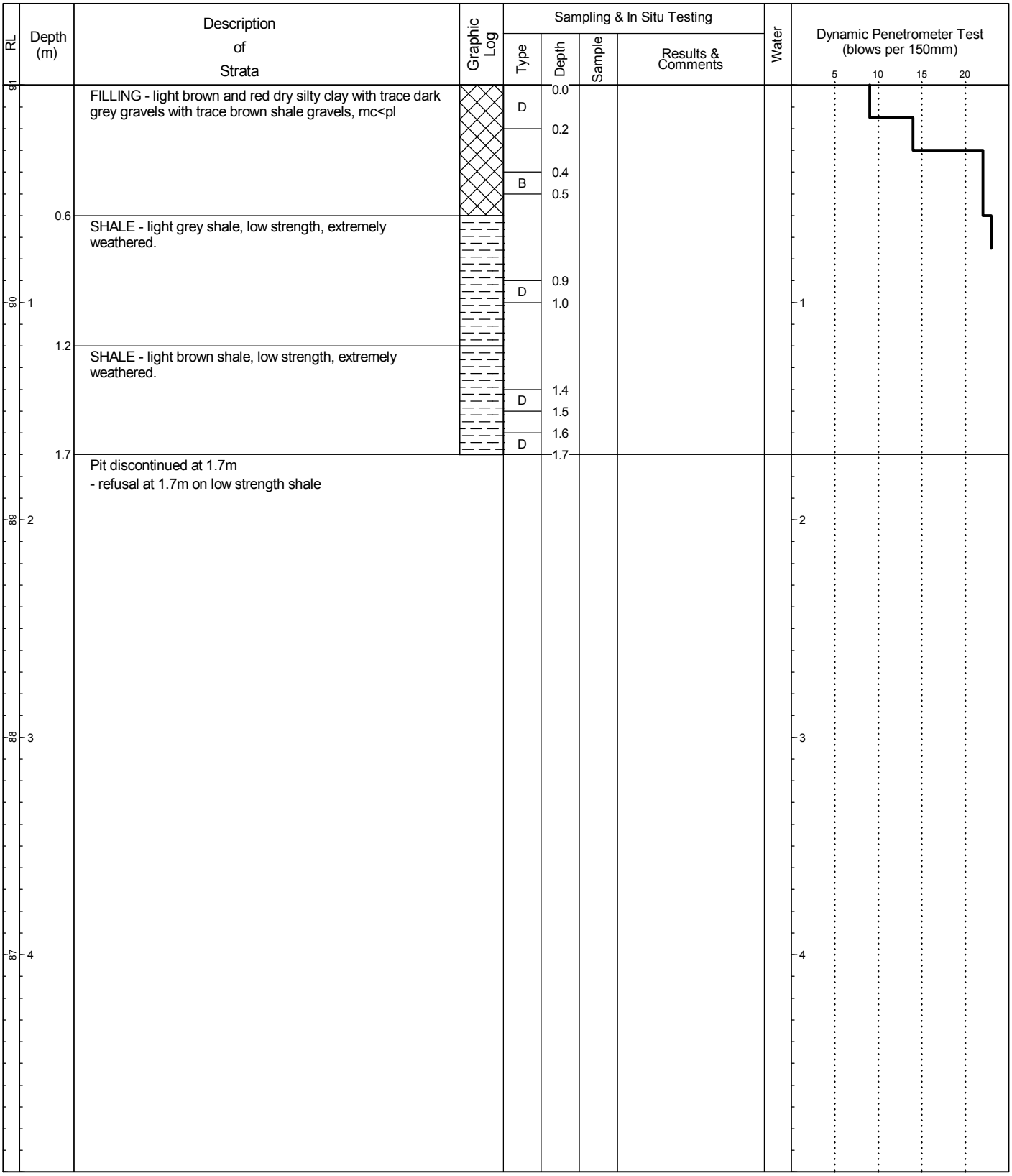
Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 91 AHD
EASTING: 295739
NORTHING: 6227615

PIT No: 102
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1



RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD2/080118 collected. No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 86 AHD
EASTING: 295677
NORTHING: 6227534

PIT No: 103
PROJECT No: 34255.26
DATE: 8/1/2018
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)
86		CLAYEY SILT - brown clayey silt with trace rootlets		D	0.0				
					0.2				
				D	0.4				
					0.5				
		- becoming brown clayey silt with trace gravels							
				D	0.9				
85	1 1.0	Pit discontinued at 1.0m - limit of investigation			1.0				1
84	2								2
83	3								3
82	4								4

5 10 15 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295664
NORTHING: 6227489

PIT No: 104
PROJECT No: 34255.26
DATE: 8/1/2018
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)
82	0.1	FILLING - road base, light brown clayey silt with some gravels with trace very light gray sandstone gravels		D	0.0				
		SILTY CLAY - orange mottled grey sandy silty clay, mc<pl			0.2				
				D	0.4				
	0.75				0.5				
		SHALE - low strength slightly weathered dark grey shale with some orange mottled grey silty sandy clay		D	0.9				
81	1.0				1.0				1
		SHALE - medium strength, slightly weathered, dark grey shale.		D	1.4				
	1.5				1.5				
		Pit discontinued at 1.5m - limit of investigation							
80	2								2
79	3								3
78	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295687
NORTHING: 6227519

PIT No: 105
PROJECT No: 34255.26
DATE: 8/1/2018
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 50mm)
82	0.1	FILLING - (roadbase) light brown silty clay with basaltic gravels		D	0.0 0.05				
		SHALE - slightly weathered brown grey medium strength shale		B	0.2 0.3				
81	1								1
80	2								2
79	3	3.0 Pit discontinued at 3.0m - refusal at 0.25m on shale							3
78	4								4

Dynamic Penetrometer Test (blows per 50mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295718
NORTHING: 6227555

PIT No: 106
PROJECT No: 34255.26
DATE: 8/1/2018
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)
80	0.01	FILLING - very dark grey basaltic gravels (roadbase - loose)		D	0.0				
				D	0.05				
		FILLING - light grey and light brown sandy silty with light grey/brown gravels and trace light grey sandstone gravels			0.1				
	0.3				0.2				
		FILLING - medium orange mottled grey silty clay with trace light grey gravels		D	0.4				
					0.5				
	0.6	SHALE - highly weathered low strength dark grey shale							
				D	0.7				
	0.8	Pit discontinued at 0.8m - refusal at 0.8m on shale			0.8				
79	1								1
78	2								2
77	3								3
76	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 85 AHD
EASTING: 295719
NORTHING: 6227501

PIT No: 107
PROJECT No: 34255.26
DATE: 8/1/2018
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)
85	0.1	TOPSOIL - light red brown clayey silty with trace rootlets and trace gravels		D	0.0				
		SILTY CLAY - red mottled orange and grey silty clay with trace rootlets, mc<pl			0.2				
				D	0.4				
	0.75	SILTY CLAY - red mottled grey silty clay, mc<pl			0.8				
				D	0.9				
84	1				1.0				1
					1.1				
				D					
					1.5				
				D	1.9				
83	2				2.0				2
					2.4				
	2.5			D	2.5				
		CLAY - light brown light orange mottled light grey clay, mc<pl							
				D	2.9				
82	3				3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
81	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD1/080118 collected. No odour, no staining.

☐ 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: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 78 AHD
EASTING: 295761
NORTHING: 6227530

PIT No: 108
PROJECT No: 34255.26
DATE: 9/1/2018
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)
78	0.1	TOPSOIL - brown clayey silt with trace rootlets and trace gravels		D	0.0				
		CLAYEY SILT - brown clayey silt with trace rootlets			0.1				
				D	0.4				
	0.7				0.5				
		SILTY CLAY - grey mottled brown silty clay with trace rootlets							
77	1			D	0.9				1
	1.3				1.0				
		SILTY CLAY - light grey mottled light orange silty clay with trace rootlets		D	1.4				
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
76	2								2
75	3								3
74	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 84 AHD
EASTING: 295803
NORTHING: 6227549

PIT No: 109
PROJECT No: 34255.26
DATE: 9/1/2018
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
84	0.0	TOPSOIL - brown clayey silt with trace rootlets		D	0.0				
	0.1	FILLING - light brown mottled orange and dark grey silty clay with trace rootlets		D	0.1				
	0.2				0.2				
	0.4	FILLING - dry brown silty clay with some dry grey silty clay with trace grey shale gravels		D	0.4				
	0.5				0.5				
	0.6	SILTY CLAY - brown mottled orange and light grey silty clay							
	0.8	Pit discontinued at 0.8m - refusal at 0.8m on grey shale							
83	1								1
82	2								2
81	3								3
80	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD4/090118 collected. No odour, no staining.

☐ 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: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 92 AHD
EASTING: 295804
NORTHING: 6227587

PIT No: 110
PROJECT No: 34255.26
DATE: 9/1/2018
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)
92	0.1	ASPHALT CONCRETE			0.1				
		FILLING - brown silty sand with some gravels		D	0.2				
	0.3	FILLING - orange red brown silty clay with trace gravels			0.4				
	0.5	SILTY CLAY - orange mottled grey silty clay with trace gravels, mc<pl		D	0.5				
91	1 1.0	Pit discontinued at 1.0m - limit of investigation							1
90	2								2
89	3								3
88	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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
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TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295813
NORTHING: 6227491

PIT No: 111
PROJECT No: 34255.26
DATE: 9/1/2018
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)
80	0.2	TOPSOIL - dark brown clayey silt with some dark grey shale gravels and trace rootlets.		D	0.0				
		CLAYEY SILT - dry, light brown clayey silt with trace rootlets		D	0.2 0.4 0.5				
	0.6	SILTY CLAY - light brown/orange/grey silty clay, mc<pl		D	0.9 1.0				
79	1			D	1.4				1
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
78	2								2
77	3								3
76	4								4

5 10 15 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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
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TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 79 AHD
EASTING: 295843
NORTHING: 6222539

PIT No: 112
PROJECT No: 34255.26
DATE: 8/1/2018
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)
79	0.0	TOPSOIL - dry, brown silty clay with trace rootlets.		D	0.0				
					0.2				
	0.3	SILTY CLAY - dry, light brown mottled dark grey silty clay with trace rootlets, mc<pl		D	0.4				
					0.5				
				D	0.9				
78	1				1.0				1
				D	1.4				
					1.5				
				D	1.9				
77	2				2.0				2
	2.2	CLAY - grey mottled brown clay, mc<pl		D	2.4				
					2.5				
				D	2.9				
76	3				3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
75	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD3/080118 collected. No odour, no staining.

☐ 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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 81 AHD
EASTING: 295851
NORTHING: 6277439

PIT No: 113
PROJECT No: 34255.26
DATE: 9/1/2018
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
81		SILTY CLAY - light brown/orange mottled light/dark grey and red silty clay with trace rootlets - potentially reworked.		D	0.0				
					0.2				
				D	0.4				
		- becoming light orange mottled light grey silty clay at 0.7m			0.5				
80	1 1.0	Pit discontinued at 1.0m - limit of investigation							1
79	2								2
78	3								3
77	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD5/090118 collected. No odour, no staining.

☐ 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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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295875
NORTHING: 6227489

PIT No: 114
PROJECT No: 34255.26
DATE: 9/1/2018
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)
80	0.0	CLAYEY SILT - brown clayey silt with trace rootlets		D	0.0				
					0.2				
	0.3	SILTY CLAY - dark grey brown silty clay with trace rootlets, mc<pl		D	0.4				
					0.5				
	0.6	SILTY CLAY - orange-brown silty clay, mc<pl							
79	1			D	0.9				1
					1.0				
	1.4	SILTY CLAY - light orange mottled light grey silty clay, mc<pl		D	1.34				
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
78	2								2
77	3								3
76	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 84 AHD
EASTING: 295878
NORTHING: 6227438

PIT No: 115
PROJECT No: 34255.26
DATE: 9/1/2018
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)
84	0.0			D	0.0				
	0.1	FILLING - brown clayey silt with some large very dark grey basaltic gravels and trace rootlets		D	0.1				
		FILLING - orange to light brown silty clay with mottled light grey/red/dark grey with trace rootlets and trace gravels, mc<pl			0.2				
				D	0.4				
	0.6				0.5				
		FILLING - brown/orange silty clay with trace light grey silty clay and gravels, mc<pl							
83	1			D	0.9				1
					1.0				
				D	1.4				
					1.5				
				D	1.9				
82	2				2.0				2
				D	2.4				
					2.5				
	2.8	SILTY CLAY - dark grey/orange silty clay, mc<pl		D	2.9				
81	3				3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
80	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295725
NORTHING: 6227571

PIT No: 116
PROJECT No: 34255.26
DATE: 9/1/2018
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 150mm)
82	0.2	FILLING - dry brown clayey silt with trace rootlets							
	0.5	FILLING - dry brown silty clay with trace rootlets and gravels							
		CLAY - red clay mottled orange, dry with trace rootlets, mc<pl		B	0.5 0.7				
81	1								1
	1.5	SHALE - light grey, low strength, extremely weathered shale							
80	2	2.0 Pit discontinued at 2.0m - limit of investigation							2
79	3								3
78	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ 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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Appendix G

QA/QC

Appendix G
Data Quality Assurance and Quality Control Assessment

G1 Data Quality Indicators

Field and laboratory procedures were assessed against the following data quality indicators (DQIs):

Table G1: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range
Precision		
Field considerations Laboratory considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%
	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0% - 50%
	laboratory-prepared volatile trip spikes	Recovery of 60-140%
Accuracy (bias)		
Field considerations Laboratory considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Analysis of:	
	laboratory-prepared volatile trip spikes	Recovery of 60-140%
	Laboratory-prepared trip blanks (field blanks)	<PQL
	method blanks (laboratory blanks)	Recovery of 60-140%
	matrix spikes	Recovery of 70-130% (inorganics); 60-140% (organics)
	matrix spike duplicates	Recovery of 70-130% (inorganics); 60-140% (organics); Recovery 70 “low” to 130% “high” indicates interference
	surrogate spikes	Recovery of 70-130% (inorganics); 60-140% (organics)
	laboratory control samples	Recovery of 70-130% (inorganics); 60-140% (organics)
Completeness		
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the DQO’s (Appendix D)
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Engineer to conduct field work and sampling
	Documentation correct	Maintain COC documentation at all times
	Sample holding times complied with	Sample holding times complied with

DQI	Performance Indicator	Acceptable Range
Laboratory considerations	All critical samples analysed according to DQO's	All critical locations analysed in accordance with the DQO's
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory
	Sample documentation complete	Maintain COC documentation at all times
Comparability		
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Engineer to conduct field work and sampling
	Same types of samples collected	Same types of samples collected
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used
Representativeness		
Field considerations	Appropriate media sampled according to DQO's (Appendix C)	Appropriate media sampled according to DQO's (Appendix C)
	All media identified in DQO's sampled	All media identified in DQO's sampled
Laboratory considerations	All samples analysed according to DQO's	All samples analysed according to DQO's

Notes to Table 1: SOP – Standard Operating Procedure
DQO – Data Quality Objectives (Appendix C)

G2 Field Quality Assurance and Quality Control

The field QC procedures for sampling as prescribed in the standard operating procedures (SOPs) in the Douglas Partners *Field Procedures Manual* were followed at all times during the assessment. All sample locations and media were in accordance with the DQO (i.e. as per scope of work in DP's proposal).

G2.1 Sampling Team

Sampling was undertaken by an experienced DP Environmental Engineer.

G2.2 Sample Collection and Weather Conditions

Sample collection procedures and dispatch are reported in body of the report. Sampling was undertaken during sunny and warm conditions.

G2.3 Logs

Logs for each soil sampling location were recorded in the field. The individual samples were recorded on the field logs along with the sample identity, location, depth, initials of sampler, duplicate locations, duplicate type and site observations. Logs are presented in Appendix F.

G2.4 Chain-of-Custody

Chain-of-Custody information was recorded on the Chain-of-Custody (COC) sheets and accompanied samples to the analytical laboratory. Signed copies of COCs are presented in Appendix D, prior to the laboratory certificates.

G2.5 Sample Splitting Techniques

Replicate samples were collected in the field as a measure of precision of the results. Field replicates samples for soil were collected from the same location and an identical depth to the primary sample. Equal portions of the primary sample were placed into the sampling jars and sealed. The sample was not homogenised in a bowl to prevent the loss of volatiles from the soil. Replicate samples were labelled with a DP identification number, recorded on DP logs, so as to conceal their relationship to their primary sample from the analysing laboratory.

G2.6 Duplicate Frequency

Field sampling comprised intra-laboratory duplicate sampling, at a rate of one duplicate sample for every 15 primary samples. Whilst more field duplicates were collected, they were not selected for analysis owing to an error in scheduling. As the actual rate of duplicate analysis is only marginally below the recommended minimum frequency of one sample per ten (per NEPC, 2013) this slight QAQC breach is not considered to impact on the quality and accuracy of the dataset as a whole.

G2.7 Relative Percentage Difference

A measure of the consistency of results for field samples is derived by the calculation of relative percentage differences (RPDs) for duplicate samples. RPDs have only been considered where a concentration is greater than five times the practical quantitation limit (PQL).

G2.7.1 Intra-Laboratory Replicate Analysis

Replicates were tested to assess data 'precision' and the reproducibility within the primary laboratory (Envirolab Pty Ltd) as a measure of consistency of sampling techniques. One replicate sample was analysed. The Relative Percent Difference (RPD) between replicate results is used as a measure of laboratory reproducibility and is given by the following:

$$\text{RPD} = \frac{(\text{Replicate result 1} - \text{Replicate result 2})}{(\text{Replicate result 1} + \text{Replicate result 2})/2} \text{ x } 100$$

The RPD can have a value between 0% and 200%. An RPD data quality objective of up to 30% is considered to be within the acceptable range.

The comparative results of analysis between primary and duplicate samples are summarised in the table below. Where one or both results were below the PQL, an RPD was not calculated.

Table G2: RPD Results

Sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP102 0.4 – 0.5	14	<0.4	6	38	15	0.1	21	87
BD2-080118	12	<0.4	6	39	14	<0.1	29	120
Difference	2	-	0	1	1	-	8	33
RPD (%)	16	-	0	3	7	-	28	28

Notes: Bold RPD >30
Concentration of either paired duplicated not greater than five times PQL

All RPD values were within the acceptable range of ± 30.

Overall, the intra-laboratory and inter-laboratory comparisons indicate that the sampling technique was consistent and repeatable and therefore acceptable precision was achieved.

G2.8 Trip (Field) Blank

The purpose of a trip blank is to assess the potential for transfer of contaminants into samples to have occurred between the time of collection and analysis of the sample by the laboratory. Laboratory prepared soil field blanks were taken out to the field unopened, subjected to the same preservation methods as the field samples, then analysed for the purposes of determining whether transfer of contaminants into the blank sample had occurred prior to reaching the laboratory. The results of the laboratory analysis for the field blanks are shown in Table H3.

Table G3 Trip Blank Results - Soils (mg / kg)

Sample ID	BTEX				
	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene
TB	<0.2	<0.5	<1	<2	<1

The concentrations of the analytes were all below laboratory detection limits indicating that significant cross contamination had not occurred during the course of the round trip from the site to the laboratory.

G3 Laboratory Quality Assurance and Quality Control

Envirolab Services was used as the primary laboratory. Appropriate methods and PQLs were used by the laboratory. Sample methods were NATA accredited (noting the exception for fibrous asbestos (FA) and asbestos fines (AF) quantification to 0.001% w/w).

G3.1 Surrogate Spike

This sample is prepared by adding a known amount of surrogate, which behaves similarly to the analyte, prior to analysis to each sample. The recovery result indicates the proportion of the known concentration of the surrogate that is detected during analysis and is used to assess data 'accuracy'. Results within acceptance limits indicate that the extraction technique was effective.

G3.2 Reference and Daily Check Sample Results – Laboratory Control Sample (LCS)

This sample comprises spiking either a standard reference material or a control matrix (such as a blank of sand or water) with a known concentration of specific analytes. The LCS is then analysed and results compared against each other to determine how the laboratory has performed with regard to sample preparation and analytical procedure and is used to assess data 'accuracy'. LCSs are analysed at a frequency of one in 20, with a minimum of one analysed per batch.

G3.3 Laboratory Duplicate Results

These are additional portions of a sample which are analysed in exactly the same manner as all other samples and is used to assess data 'precision'. The laboratory acceptance criteria for duplicate samples is: in cases where the level is <5Xpql - any RPD is acceptable; and in cases where the level is >5xPQL - 0-50% RPD is acceptable.

G3.4 Laboratory Blank Results

The laboratory blank, sometimes referred to as the method blank or reagent blank is the sample prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus and is used to assess data 'accuracy'. This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, it can be determined by processing solvents and reagents in exactly the same manner as for samples. Laboratory blanks are analysed at a frequency of 1 in 20, with a minimum of one per batch.

G3.5 Matrix Spike

This is a sample duplicate prepared by adding a known amount of analyte prior to analysis, and then treated exactly the same as all other samples. The recovery result indicates the proportion of the known concentration of the analyte that is detected during analysis and is used to assess data 'accuracy'. The laboratory acceptance criteria for matrix spike samples is generally 70 - 130% for inorganic/metals; and 60 - 140% for organics; and 10 – 140% for SVOC and speciated phenols.

G3.6 Results of Laboratory QC

The laboratory QC for surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spikes results are reported in the laboratory certificate of analysis.

The laboratory quality control samples were within the laboratory acceptance criteria. It is considered that an acceptable level of laboratory precision and accuracy was achieved and that surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spike results were of an acceptable level overall. On the basis of this assessment, the laboratory data set is considered to have complied with the DQIs.

G3.7 Overall Assessment of QA/QC

Specific limits associated with sample handling and laboratory QA/QC were assessed against the DQIs and a summary of compliance is presented in the following table.

Table G5: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range	Compliance
Precision			
Field considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*	C
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%	C
Laboratory considerations	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0% - 50%	C
	laboratory-prepared volatile trip spikes	Recovery of 60-140%	C
Accuracy (bias)			
Field considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
Laboratory considerations	Analysis of:		
	laboratory-prepared trip blanks (field blanks)	<PQL	C
	method blanks (laboratory blanks)	Recovery of 60-140%	C
	matrix spikes	Recovery of 70-130% (inorganics); 60-140% (organics)	C
	matrix spike duplicates	Recovery of 70-130% (inorganics); 60-140% (organics); Recovery 70 “low” to 130% “high” indicates interference	C
	surrogate spikes	Recovery of 70-130% (inorganics); 60-140% (organics)	C
	laboratory control samples	Recovery of 70-130% (inorganics); 60-140% (organics)	C

DQI	Performance Indicator	Acceptable Range	Compliance
Completeness			
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the SAQP	C
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Documentation correct	Maintain COC documentation at all times	C
	Sample holding times complied with	Sample holding times complied with	C
Laboratory considerations	All critical samples analysed according to SAQP	All critical locations analysed in accordance with the SAQP	C
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory	C
	Sample documentation complete	Maintain COC documentation at all times	C
Comparability			
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Same types of samples collected (filtered)	Field filtering for metals	NA
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited	C
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used	C
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used	C
Representativeness			
Field considerations	Appropriate media sampled according to DQOs	Appropriate media sampled according to DQOs	C
	All media identified in DQOs sampled	All media identified in DQOs sampled	C
Laboratory considerations	All samples analysed according to DQOs	All samples analysed according to DQOs	C

Notes to Table 5:
C – Compliance
PC – Partial Compliance
NC – Non-Compliance
NA – Not Applicable
SOP – Standard Operating Procedure
DQO – Data Quality Objectives

A review of the adopted QA/QC procedures and results indicates that the DQIs have generally been met with compliance and a minor partial-compliance. On this basis, the sampling and laboratory methods used during the investigation were found to meet DQOs for this project.